Training, Qualifications and Competency Project

Phase 2 Report

Prepared for

Underground Coal Mining Safety Research Collaboration (UCMSRC)

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1.0 Executive Summary

The Underground Coal Mining Safety Research Collaboration (the Collaboration) is an active collaboration between stakeholders that endeavors to maintain a focus on safety-related research in the tiny but important, Canadian underground coal mining industry. The mainly volunteer organization was originally supported by limited funding from three Canadian Provinces but in 2009 joined forces with the Asia Pacific Partnership (APP). Due to the constraints of funding, the Collaboration intentionally limited the size and duration of projects that could be undertaken.

In May 2006, following the annual update to the Canadian Association of Chief Mine Inspectors, the Collaboration adopted a recommendation to pursue a project on "training, qualification and competency" for underground coal miners. As the work unfolded the project was split into two phases as described below. A Phase 1 Report was completed and presented to the Chief Inspectors in June 2008. Phase 2 progress was presented in April 2010. The Phase 1 report was compiled by Dave Forrester, DJFCL, and Fazal Hussain of the Government of Alberta, while the Phase 2 Report was compiled by Dave Forrester, DJFCL, and Charles Brooks, graduate student at University of Alberta.

It should be noted that the Phase 2 portion of the training, qualification and competency report was ultimately included on the Collaboration's Asia-Pacific Partnership (APP) project list in 2009. The related APP support is gratefully acknowledged.

In 2008, Phase 1 of the Collaboration's training project was completed recommended that a Phase 2 of the project should be conducted and focus on the following: Common core competencies for new entrants in u/g coal mining; Common core competencies for all existing key jobs (supervisor, manager, mine rescue, etc.) i.e. a standard core course outline for each; A central repository of training resources. Phase 1 had identified training resources, training provision being the responsibility of the individual mining companies to utilize their own corporate resources supported by private sector specialists.

Phase 2 objectives were specifically to: compile a data base of training curriculum; prepare a Training Fact Sheet, similar to the Light Alloy Fact Sheet (reference: www.ugcoal.ca); and write a project report, summarizing both Phase 1 and Phase 2 findings and comment on opportunities for greater consistency among Canadian jurisdictions.

The Phase 2 approach to achieve the objectives was first to extend the assessment of training practice internationally to include the USA and Australia. The latter was chosen as an appropriate source of best practice expertise over the USA due to the very prescriptive nature of the US approach and to the fact that although the US regulations state that the established training plan must include some type of competency assessment, the regulations do not provide tools to assess the miners' competency or explain what type of performance would prove a miner is competent. The intent here was to develop a system suitable for use in Canada to cover training, qualifications and *competence*. The Australian example of international best practice was then used as a basis to develop common core competencies. *Competence* for a task at a coal mine is defined *as the demonstrated skill and knowledge required to carry out the task to a standard necessary for the safety and health of persons.*

The second part of the approach was to make a comparison of typical criteria used for training, qualifications and competence for the three Canadian jurisdictions against two Australian ones for the key underground coal positions of shift supervisor (deputy), Table 1, and underground coal mine manager (Mine Manager 1st Class), Table 2 (different jurisdictions have different titles and job functions may differ slightly between them). These show many similarities, the main difference being the more structured and detailed competency standards or units developed within and common across Australia, see Appendix 1. The supporting detailed training curricula as used in Australia are included in Appendix 2.

The third part of the approach was to build on this comparison and develop an overall Training Matrix for consideration for use in Canada, for four key underground coal positions, Table 3: new entrant miner, experienced miner, shift supervisor (deputy) and underground coal mine manager) The three tables together are considered to meet the equivalent of the original

objective to produce a Training Fact Sheet. The final objective of a written report is fulfilled by this report.

The final step is for the Collaboration to discuss the report and consider its suitability and use to act as a basis to develop a common basis for training, qualifications and competence across the three Canadian jurisdictions involved. If adopted, a strategy will be needed to implement it and develop the Canadian equivalent of selected elements of the Australian training materials.

2.0 Introduction

The Underground Coal Mining Safety Research Collaboration (the Collaboration) is a collaborative partnership between stakeholders. The Collaboration was formed in 1998 to provide a forum for ongoing networking and research project work for the small and geographically stretched underground coal mining industry in Canada. Participants include operators, labour representatives, regulators, inspectors and university researchers from across four jurisdictions (Nova Scotia, Alberta, British Columbia and initially Federal). The Collaboration has two main goals, one to provide a forum for exchange of news, views and experiences between stakeholders and the other to conduct specific research projects on safety topics of mutual interest. One such project, begun in 2006, relates to the desire to find a common basis to define training competency standards and qualifications of key personnel at underground mines in Canada. Ideally this would form the basis of facilitation of reciprocity between provincial jurisdictions and recognition of standards across provincial jurisdictional boundaries.

The Project was undertaken in two phases, Phase 1 reviewed regulatory and industrial practice within Canada and Phase 2 explored two international jurisdictions (USA and Australia) to develop a basis for common core curriculum for key positions at underground coal mines in Canada. This report presents Phase 2 and as such completes the project.

The Phase 2 project was included in the Collaboration's Asia-Pacific Partnership (APP) projects in 2009, 2010 and 2011. The collaboration gratefully acknowledges APP's support.

A growing concern among the Collaboration participants, as the Canadian underground coal industry has strived to survive, has been issues associated with moving resources (personnel and equipment) around the North American continent while dealing with varying regulatory requirements. In the mid 2000's, the Collaboration concentrated its project work on a legislative review to systematically identify those differences for further consideration by our stakeholders. One key topic that illustrated the importance of the differences was the question of how training, qualifications and competency were determined, especially for mine workers, supervisory and management personnel. This led directly to this training project to investigate training, qualification and competency issues in more detail.

The current shortage of mine workers, trades and engineers puts particular pressure on mine operators to fill that shortage this can lead to the perception that long established requirements of qualifications and the depth and duration of training necessary to demonstrate the necessary competency are being relaxed. In turn this can create situations where young 'green' recruits could theoretically be pushed too far, too fast and hence beyond their capacity to perform effectively. The industry responds to this temptation in differing ways, in Ontario where they have only hard rock underground metal/mineral mines (i.e. not coal mines), the Mining Regulation of 1996 introduced a "common core" training requirement for new mine workers. In the 1990s, the Australians were facing similar issues and developed a comprehensive national training program for underground coal mining based on competency standards and qualifications.

However, the underground coal mining industry in Canada is tiny and regulators are typically faced with only one underground coal mining operation within their jurisdiction. Recognizing the inherent significant safety hazards associated with such mining (e.g. the explosibility of methane and coal dust; and spontaneous combustion), such regulators typically pose key questions, such as:

- What training requirements do the various jurisdictions set, how do they differ and why?

- What is industry best practice in Canada for ensuring adequate qualifications, appropriate training and experience to demonstrate sufficient competency to work safely and consistently?
- How do those same companies ensure the deployment of competent persons (with adequate training and knowledge)?

The training project set out to explore answers to such questions.

3.0 Project Approach

3.1 Overall Project Objectives

This project sets out to provide an informed basis upon which to answer to such questions and the following project objectives were established to:

(i) Explore the differences and identify core commonalities between jurisdictions both within Canada and further afield

(ii) Identify available sources of related training materials and

(iii) Attempt to compile a curriculum for use by underground mining stakeholders.

In the above context, this project aimed to provide an overview of qualifications, training and competency requirements for personnel in underground coal mines in Canada from both domestic and international sources. An attempt was also made to identify suitable training, qualifications, competency and experience requirements. Specific objectives included:

Phase 1

1) Review regulatory requirements, initially within the Canadian jurisdictions.
2) Determine the regulatory components for competency, particularly for mine workers and mine management.
3) Review industry requirements, document industry best practice, and compile a data base of training curriculum – highlighting consistency and inconsistency.
4) Write a project report summarizing Phase 1, the findings, and comment on opportunities for greater consistency among Canadian jurisdictions.

Phase 2

5) Identify training resources and training providers for qualifying miners – mining companies, private sector (training), manufacturers, etc. – again highlighting consistency and inconsistency.
6) Compile a data base of training curriculum.
7) Prepare a Training Fact Sheet, similar to the Light Alloy Fact Sheet (reference: www.ugcoal.ca).
8) Write a project report, summarizing both Phase 1 and Phase 2 findings and comment on opportunities for greater consistency among Canadian jurisdictions.

3.2 Phase 1 Findings:

Phase 1 of the Training Project examined some of the differences between Canadian jurisdictions and practices and identified core commonalities, summarized as follows:

Regulatory Perspectives

- Some differences
  - philosophy (prescriptive versus performance based)
  - Boards of Examiners and certifications
  - Requirement for an Engineering Degree
  - Training – Experience – Time - Competency
- Some commonalities
  - Specific requirements in First Aid, Knowledge of Legislation,
  - Mandatory experience in lower position (come up through the ranks)
- Some observations
  - expectations (& standards) vary among jurisdictions

Industry Perspectives

- some differences in
  - documentation
  - resources available

- some commonalities
  - much on-the-job training
  - reasonable agreement in timeframe for training 'green' recruits
  - equipment training

Training Requirements by Jurisdiction:

The coal mining jurisdictions of Canada all have requirements for training and competency of underground workers and management. They differ in terms of underlying philosophy and in their extent and details.

The Canadian Federal regulations (Coal Mines (CBDC) Occupational Safety and Health Regulations SOR/90-97) were replaced in 2003 and updated in 2008 and the pre-existing Board of Examiners was replaced by a job training program administered by the employer. (In this case a "job training program" means a program made up of a series of courses provided by an employer to ensure that employees are competent to perform work in the job categories to which they are designated, or to perform that work to which they are assigned).

Industry Best Practice:

Based on the information and training material received from Grande Cache Coal Corporation and Quinsam Coal Corporation, both have formal training and examination systems in practice to test an individual for each specific worker category.

Available Sources of Training Materials:

Historical manuals have been obtained are are available in electronic format from past Canadian operators of McIntyre Mines in Alberta and Devco in Nova Scotia.

Curriculum for use by underground mining personnel

Postponed to a Phase 2.

At the end of Phase 1, the following recommendations were made:

Phase 2 of the project should have a key focus on the following:

- Common core competencies for new entrants in u/g coal mining
- Common core competencies for all existing key jobs (supervisor, manager, mine rescue, etc.) i.e. a standard core course outline for each.
- A central repository of training resources.
- Consider a SWOT analysis (strengths-weaknesses-opportunities-threats) to be undertaken of the common core training requirements for new entrants in underground coal mining in Canada. This exercise would be based on experience in both Ontario hard-rock underground mining and New South Wales Australia underground coal mining.

3.3 Phase 2 Approach

Phase 1 of the Collaboration Training Project essentially defined current regulatory requirements and industrial practice in the three Canadian provinces active in underground coal mining: British Columbia, Alberta & Nova Scotia. A principal objective of Phase 2 was to develop a proposed common core approach and curriculum for the key positions of New Entry Miner, Experienced Miner, Shift Supervisor, and Underground Coal Mine Manager. A main aim of Phase 2 was also to explore a few key international jurisdictions to help achieve this objective. The Project Team reviewed the Asia Pacific Partnership Training Report which compared requirements for new entrant miner and experienced miner (and also for mine rescue workers) for USA, Australia, China, India and Japan. It was then decided to examine the first two of these in more detail and for more positions as they are fully industrialized and of similar size (in number of workers) with a view to identify a current example of world class best practice suitable for use in developing a Canadian approach. This assessment is outlined in Section 4 below.

The Collaboration endorsed a project team preliminary recommendation that Australia was the most appropriate example of international best practice. The Australian example was then assessed against key parameters in the Canadian context for the four key positions noted above. Subsequently, a training matrix was developed to outline the pre-requirements, essential qualifications and key core curriculum content common to each of the four key underground coal mining positions. Finally, this is proposed as the basis for a common approach for underground coal mines in Canada.

4.0 Selection of World Best Practice Example

4.1 European Roots

At their core, industrial training schemes simply attempt to transfer knowledge, skills and experience and provide employers and regulators with a structured framework to assess qualifications, competency and suitability of employees for various technical and managerial tasks. The underground coal industry in the United Kingdom was nationalized in the late 1940's under the National coal Board (later called British Coal) and inherited a poor safety record. A major strategy to improve safety in the industry was to focus on developing a first class training system. Over the next three decades they established a world class reputation for training at all levels within the industry and safety performance improved dramatically. Their training system involved a systematic approach supported by adequate resources of training facilities and staff across the whole industry.

The British approach was largely based on assessment by written and oral exams by a central Mines Examiners Board to certify employees in key positions of Shotfirer (blaster), Deputy (Shift Supervisor), Under Manager (Underground coal mine manager) Mine Manger, Electrician, Mechanic, etc.. Certification was based on eligibility for and performance in examinations. Eligibility included pre-requisites in terms of skills and experience, based largely on time spent underground, especially at the coal face, and employer's support (for the applicant). Preparation was done through a formal framework of job training (including apprenticeships) giving

employees exposure to all levels of relevant work tasks, with potential upward progression to supervisory and management levels. Knowledge and worker improvement was imparted through formal national certificates, diplomas and university degrees by higher education institutions.

By 1996, international market forces has reduced the UK underground coal industry to a only a score of operating mines, employing several tens of thousands of employees and was sold by the government to the private sector. It has gradually declined in size further since then. At the same time the Australian underground coal industry based in both New South Wales and Queensland was rapidly expanding building on a training, qualification and certification process based largely on the UK model.

4.2 Australian Approach

Australia is a federation, with a Commonwealth Government at the federal level and individual governments controlling the six state and two internal territories that make up the country. The legislative powers of the Federal Parliament are set out in the Commonwealth Constitution. The Commonwealth Constitution does not give the Commonwealth a general power to legislate for occupational health and safety, hence each of the states and territories of Australia have their own statutes that regulate occupational health and safety.

In Australia, occupational health and safety legislation is Robens style legislation, in which general duties are placed on a range of parties affecting workplace health and safety (including employers, the self-employed, occupiers and employees), but in which detailed requirements to fulfil those duties are not specified. This allows a duty holder to choose the means by which they will comply with general duties and process-based and performance-based standards, to suit the particular circumstances of individual operations. For example, in New South Wales the legislation places duties on employers to ensure the health, safety and welfare of employees at work.

The coal mine safety legislation further requires that coal mine operators (the employer with the day to day control of the mining operation) ensure that any person is competent to undertake the

function, activity or work in which they are engaged. Each employer is responsible for establishing the competence of a person, by assessing that person in relation to the function. This may or may not require initial training, depending on the competence that the individual is able to demonstrate through qualifications and previous experience.

In some jurisdictions, there are legislative requirements for some of the key functions on a mine site – such as the management of the mine; and mechanical and electrical engineering functions. These requirements related to certain competencies that people performing these functions must be able to demonstrate. Individuals are required to provide evidence of competency in the form of various certificates of competency, educational qualifications and/or licences. This evidence is obtained through education, examination and competency assessment through universities, Technical and Further Education (TAFE) organisations and other Registered Training Organisations (RTOs) and various competency boards.

As each State and Territory has its own statute, there are jurisdictional variations in training requirements and practices. Australia has started using virtual reality (VR) labs for training. These labs use different types of VR technologies to provide a realistic, yet safe, training experience. (Ref. APP Training Report July 2009).

During the 1990s the National Training Authority in Australia developed a national approach to training, qualifications, and certification focusing on competency and assessment. This national approach was then applied to the black coal mining industry, including the significant underground coal component. This training system includes some measure of stipulated minimum time spent in various positions underground and advancement to some management positions still requires past experience in a lower working level. However, the system places most emphasis on demonstration of competency in terms of knowledge and skills.

Supporting information on Australian practice is given in Appendices 1, 2, 3 and 4. These documents outline how Competency Standards were developed based on component units of competency focused in seven groups: Core (7 units), General (41 units), Open-cut production,

underground production (72 units), coal preparation/ treatment, general management (21 units) and technical management (39 units). This approach resulted from a comprehensive approach including a review against best practice guidelines which confirmed the competency standards covered the range of functions that are meaningful to the workplace, provided a basis for skill formation, met the requirements of Best Practice, were sufficiently clear and detailed to allow unambiguous and consistent interpretation of industry requirements.

The Technical Management competencies were developed by industry – based workshop groups comprising representatives of management, unions, regulatory authorities, acknowledged technical experts, training / education providers and mines rescue services. The drafts were advertised and made available for consideration by all interested parties. The processes were therefore open, transparent and accessible. Validation processes resulted in some refinement of the original drafts but beyond this, Workshop Groups agreed that the final drafts satisfied both the vocational education and training and the regulatory requirements, subject to the provision that the standards may be added to or modified to maintain their currency and relevance to the industry.

The industry developed the following criteria for the identification of qualifications for production employees and operational management. Black Coal industry qualifications should:

- be structured to reflect mine-site realities in terms of work organisation and job designed in a way which earns industry respect
- be neutral in terms of remuneration and other Industrial Relations policies/ practices
- avoid leading to unnecessary training and
- Permit flexibility and recognise different entry points and development pathways
- be structured to encourage enhancement of industry management capabilities and professionalism
- be structured to recognise and respond to the evolving requirements of regulatory authorities.

Units of competency are packaged for qualification purposes, grouped to certificate, diploma and advanced diploma levels. There are seven (7) core units of competency for production employees; there are seven (7) core or mandatory units of competency for each certificate and these cover the technical management competencies which have been agreed between NSW & Queensland. This reflects the essentiality of safety in the mining environment. The Statutory Function relates to regulation requirements in a number of states. Hence, the number of mandatory units varies between qualifications. The packaging allows for, but does not infringe on, the responsibilities and prerogatives of the State – based regulatory authorities. (Ref. Appendix 2. Black Coal Training Package AQF II – Advanced Diploma ©*Australian National Training Authority, MNC98:V2.00 to be reviewed by 30 September 2003)*

Further, the need for ongoing training and continuing professional development is found in the history of coal mining safety, e.g. with significant events such as the Queensland Moura No. 2 Mine Disaster. Certificate holders may not be competent, unless they *refresh and update* their skills, knowledge and experience. The risk of losing competency has been responded to in the current state legislation. In NSW the Coal Competence Board was established to establish and maintain competence standards and examinations (whether oral or written, or both oral and written) are approved by the Board for the purposes of assessing competence to perform a function. There are now proposals for a system which will provide a suitable mix of training and/or continuing professional development (CPD) programmes, according to the type of Certificate of Competence. (Ref. Appendix 3. The System of Training and Continuing Professional Development for Certificate of Competence Holders in the NSW Coal Industry, Invitation for Public Comment; Closing date for public comment: 6 November 2009).

4.3 American Approach

In the United States of America, delivering mine health and safety training to mineworkers is accomplished through a variety of strategies. The foundational federal regulations set minimum standards for who must be trained, what must be included in the training, and who may conduct the training. The majority of the national training legislation can be located in Part 48 of the Code

of Federal Regulations (30 CFR). Some state governments have additional requirements. Coal mining companies rely on in-house safety professionals, experienced employees, contract safety trainers, community college training programs, university training programs, governmental agency training programs, and/or labor union training programs to meet the legal requirements and their additional training needs.

There are two key U.S. government agencies chiefly involved with improving coal mine health and safety. The agency that is responsible for the development, implementation, and enforcement of all mine health and safety legislation, including training, is the Mine Safety and Health Administration (MSHA). MSHA's Educational Field Service Office and their National Mine Health and Safety Academy also provide safety and health training and education for miners, inspectors, and mining health and safety instructors. The National Institute for Occupational Safety and Health (NIOSH), a part of the Centers for Disease Control and Prevention in the U.S. Department of Health and Human Services, conducts mine safety and health research. NIOSH brings together researchers from a variety of disciplines to improve the quality of methods and materials used in miners' training to help create a safer and healthier work environment. (Ref. APP Training Report, July 2009).

In the United States, there are two government agencies chiefly involved with improving coal mine health and safety: the National Institute for Occupational Safety and Health (NIOSH), which conducts research on the health and safety of mining, and the Mine Safety and Health Administration (MSHA), which develops, implements, and enforces all legislation related to mine health and safety. NIOSH is currently in the process of developing a Mine Rescue and Escape Training (MRET) lab, a VR training facility that will house similar technology to what has been developed and implemented in Australia (Ref. APP Training Report July 2009).

In contrast to the Australian more consultative approach, mine safety training in the United States is regulated by the Mine Safety and Health Administration (MSHA). The specific legal requirements for a particular mining operation depend upon the commodity that is being mined as are set out in US Code of Federal Regulations (CFR) [30 C.F.R. Part 46 and 30 C.F.R. Part

48]. These regulations mandate training for miners, the training required, provision for MSHA-approved trainers and the subjects to be covered (Ref. http://www.mshahelp.com/msha-training/newindex).

The mandate for MSHA is very comprehensive in the training field. For example, MSHA also requires that each U.S. mine operator have an approved plan for miner training which contains programs for training new miners, training experienced miners, training miners for new tasks, annual refresher training, and hazard training for miners. This plan must include: 40 hours of basic safety and health training for new miners who have no underground mining experience, before they begin work underground; 24 hours of basic safety and health training for new miners who have no surface mining experience, before they begin work at surface mining operations; eight hours of refresher safety and health training for all miners, each year; and safety-related task training for miners assigned to new jobs.

MSHA defines *New miner* to mean a miner who is not an experienced miner and an *Experienced miner* to mean a miner who has completed MSHA-approved new miner training for underground miners or training acceptable to MSHA from a State agency and who has had at least 12 months of underground mining experience.

Courses for New entrant Miner include: instruction in statutory rights, self-rescuer and respitory devices, transportation controls and communication systems, introduction to work environment, escape and emergency evacuation plans, ground controls, hazard recognition, electrical hazards, first aid, explosives, health & safety aspects of work tasks, others as required by District Manager. Health and safety training may be conducted at the job site and may involve performance of actual job tasks. Job site training must be completed under close and continuous supervision of an approved instructor, with training, not production, as the primary goal.

Courses for Experienced Miner include: introduction to work environment, mandatory health & safety standards, authority and responsibility of supervisors and miner's representatives, transportation controls and communication systems, escape and emergency evacuation plans,

ground controls, hazard recognition, prevention of accidents, emergency medical procedures, health, health & safety aspects of work tasks, others as required by District Manager. Miners assigned to new work tasks as mobile equipment operators, drilling machine operators, haulage and conveyor systems operators, ground control machine operators, AMS operators, and those in blasting operations shall not perform new work tasks in these categories until training prescribed has been completed. The exposure to mining hazards varies according to the task. The greater the hazard exposure, the greater the need for training. Hazard training should be mine specific, so that persons are advised of the hazards they may encounter at a particular mine; and conducted each time a person enters a different mine.

MSHA also distributes funds to state agency programs responsible for miners' health and safety which are used to support health and safety training courses and programs designed to reduce mining accidents, injuries, and illnesses. This translates to certification of various mining positions being the responsibility of the individual states, For example, in the state of Colorado, certificates of competency are required as a condition of employment for any person working in or about any coal mine where the Coal Mine Board of Examiners is responsible for the examination, training and certification of mine foreman, firebosses, surface mine foreman, shotfirers, blasters and electricians in coal mines. Similarly in the state of Illinois certificates of competency are issued for mine examiners, mine managers, hoisting engineers, state mine inspectors, surface mine supervisors, shot firers, mine rescue station supervisor and assistant and shaft and slope examiners and supervisors. In Alabama both General Coal Miner, Foremen and Fire-boss. It is common for applicants for supervisory and management positions to demonstrate four years practical mining experience or three years practical experience in or around coal mines and be a university graduate or have an associate degree program in mine technology.

Assessing the competency of miners is crucial to the success of health and safety training. However, U.S. mine training regulations do not require any specific proof of miners' competencies. In order to complete their training, miners must attend all required training classes and then sign a form indicating that they have completed the necessary hours. The miners then receive a MSHA certificate of training when they complete a specific training program.

Although the regulations state that the established training plan must include some type of competency assessment, the regulations do not provide tools to assess the miners' competency or explain what type of performance would prove a miner is competent. Also, the mine operator is not required to document any aspect of a competency assessment. Instructors must be qualified in order to teach health and safety training and it is up to the qualified instructor to determine a miner's competency. Some states have additional requirements beyond the national regulations. For instance, West Virginia requires a written examination to determine the competency of a new miner after having been an apprentice to an experienced miner for six months. The topics covered in this examination include but are not limited to state and federal mining laws, mining hazards, ventilation, roof control, and first aid (Ref. APP Training Project July 2009).

4.4 Asia Pacific Partnership Comparisons

4.4.1 New Miner Training Comparison (ref. APP Training Report July 2009)

Australia. New miners at coal mines must undertake generic induction training, which lasts approximately one week. Companies may then have specific induction courses, which can last from one week to up to four weeks, with training for new underground coal miners generally taking longer. All training is competency based, with written and/or practical examinations required to demonstrate competency.

China. New miners must receive 72 hours of training and then work with an experienced miner for two months. After passing an exam, a new miner can work independently.

India. New miners at underground mines must receive 18 days of classroom theory, 28 days of on-the-job training and a two-day exam. New miners at surface mines must receive five days of classroom theory, six days of on-the-job training and one day for an exam. New miners at opencast mines must receive 11 days of classroom theory, six days of on-the-job training and one day for an exam.

U.S. New miners at underground mines must receive 40 hours of training while new miners at surface mines must receive 24 hours of training, although there are additional requirements in some states. The operator administers an oral, written, or practical assessment to determine a trainee's successful completion of training. Once training is completed, a new miner must work under the supervision of an experienced miner for one year. These requirements are the national standard, but there are additional requirements for different states.

Canada. In both the Alberta and British Columbia provinces, 40 hours of training is required for new miners. In addition, new miners are required to spend a specific amount of time in the mine under the supervision of an experienced miner (generally three to six months). After this time, new miners must pass an exam in order to practice independently.

COMPARISON. Based on the above information, India has a much longer training period and more extensive training requirements for new miners, which consist of classroom training that lasts at least twice as long as the other countries' training in addition to specific on-the-job training. *China and Canada require new miners to work with an experienced miner for a number of months before taking an exam and working independently, which the other countries do not require*.

4.4.2 Experienced Miner Training (*Ref*. APP Training Report July 2009)

Australia. An experienced miner is someone who has had at least 12 months of mining experience. Separate training is necessary for specific situations, such as transferring to a new mine, transferring from surface to underground or vice versa, or being absent from work for a specified period (though the period will vary depending on a site's training scheme and the task performed). Additional training and experience is required for a number of different statutory positions in a number of jurisdictions, especially in relation to management or supervisory roles, or those with a health and safety focus.

China. Some miners are required to receive 72-90 hours of additional training depending on the type of work. Team Leaders of any type of work are required to undergo 90 hours of training while 120 hours are required for Senior Managers.

India. No additional training is necessary for a miner who has transferred to a new mine, unless he or she has been absent from work for over a year. In that case, the miner must receive refresher training before beginning work. Additional training modules are required for specific positions, including drillers, blasting crew, dumper and dozer operators, etc.

U.S. An experienced miner is someone who has had at least 12 months of mining experience. Under specific situations, such as transferring to a different mine or returning to work after being absent for over 12 months, a miner must receive training that differs depending on the specific needs of the miner. After being absent for over 12 months, a miner must undergo new miner training. Training is also required for specific positions, such as electricians.

Canada. There are additional academic and experience requirements for specific mining positions, such as mechanic, electrician, foreman, etc. These requirements may also include an additional exam.

COMPARISON. Australia, India, and the United States have very similar policies regarding experienced miners. For instance, if a miner is absent from work for a specific period (more than 12 months in India and the United States), he or she must undergo specific training before returning to work in each of these three countries. However, Australia and the United States also require training if a miner is transferred to a different mine where India, China and Canada do not. Australia, China, India, the U.S. and Canada have additional training and/or experience requirements for specific positions.

4.4.3 Task Training (*Ref*. APP Training Report July 2009.

Australia. Miners must receive training before beginning any new task. All training is competency based.

China. Training is required for miners regarding any new technologies and variations in the work place.

India. Miners must receive training before beginning any new task. The specifics of the training depend on the type of task. Retraining is required every three years for each task.

U.S. Miners must receive training before beginning any new task. The amount of training depends on the specific task. Supervised practice and operation is required for specific positions, such as equipment operators, blasting personnel, electricians, etc.

COMPARISON. All four countries have similar policies for task training where it is required before beginning any work task that is new, whether it is a new technology or a machine that the miner has never used before. In addition, India requires task retraining every three years which is not required in any of the other countries.

4.5 Selection of Best Practice Example

When considering a suitable choice for best practice example for use in this project, the choice basically lay between two fully industrialized, very large underground coal producing countries both with approx. 85,000 miners, Canada's neighbor to the south, the USA and Australia. The biggest difference between the two models for competence training in underground coal mining is the very prescriptive nature of the USA system and its lack of requirement for specific proof of miner competencies (although some individual states may require these). It is concluded that, in the English-speaking world, with the rapid demise of the UK underground coal industry in the 1980s and 1990s, the role of international leader in underground coal training has arguably been picked up by the Australians. The Australian model, with its emphasis on competence, its foundation in hazard assessment and risk management and its comprehensive, documented approach was such that the project team considered that Australia was a more appropriate model for use here. This recommendation was subsequently endorsed by the full collaboration and project was completed on that basis.

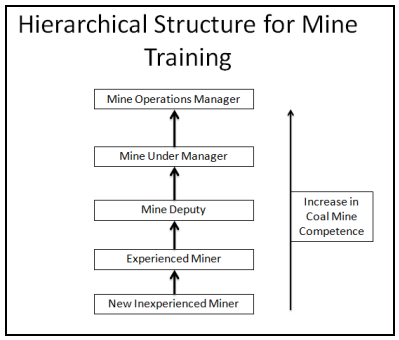
Tables 1 & 2 are an outline comparison of the current requirements of the three Canadian underground coal jurisdictions (NS, Alberta, BC) with the two Australian ones (Queensland, NSW) for the positions of Shift Supervisor (Deputy), Table 1, and Underground Coal Mine Manager (Mine Manager 1st Class or Mine Manager), Table 2 (note the titles and details of job function vary somewhat between jurisdictions. Each table compares the following for each position: prior requirements, certification, certifying body, working language, physical fitness, practical underground coal mining experience, coal face operations experience, exams, first aid, employer verification and support, and education.

5.0 Towards A Canadian Coal Mine Training Matrix:

Presently in Canada there are only two operating coal mines with two or three others in the planning and/or permitting phase. The training activities that are currently implemented at the operating mines are developed by each company within the regulatory framework of the jurisdiction in which they are located and these requirements vary. As outlined above in considering training and qualifications a key basis is that of competence and competency standards. For purposes of this report the following definitions are proposed:

> ***Competence*** for a task at a coal mine is the demonstrated skill and knowledge required to carry out the task to a standard necessary for the safety and health of persons. (Ref. Queensland Coal Mine Safety & Health Act, 1999)
>
> ***Competent person*** *for any task means a person who has acquired through training, qualification or experience, or a combination of them, the knowledge and skills to carry out that task. (*The System of Training and Continuing Professional Development for Certificate of Competence Holders in the NSW Coal Industry November, 2009)

This definition does not have a fixed time of exposure for a candidate to become competent. Competency is achieved when an individual demonstrates the skills required to complete a task safely and effectively. However, the practical implication through the various types of boards of mine examiners in Australia still include minimal time requirements and still incorporate elements of hierarchical progression, such as:



The proposed Training Matrix reflects many common components in the three Candadian jurisdictions, the USA and in the two Australian ones studied, see Table 3. For each principal position in turn (i.e. new entrant miner, experienced miner, shift supervisor (deputy), underground coal mine manger) the table outlines the pre-requirements, basic safety, core modules and other qualification modules.

The proposed approach incorporates some pre-requirements and knowledge that each candidate must have. In the case of a new inexperienced miner, these requirements will be predicated on the completion of some formal high school program or its equivalent. The additional mine training program will then build on this knowledge and prepare the candidate to become competent in a particular task in an underground coal mine.

For example, a new entrant miner would be required to take training in basic core units of competency (or modules), once they arrive on site through a classroom based training program.. These modules would commence with basic safety and also include core knowledge, geared towards the mental tools that are needed to be competent and efficient at any assigned mining task. The section would therefore deal with statutory knowledge and other regulatory information that every person must know before they would be allowed into an underground coal mine. These will demonstrate the basic competency of a new entrant, he/she would then move onto additional modules to attend full miner status and beyond to supervisor and technical management levels. Some of the modules that the candidate would be required to complete and demonstrate competence in: Basic Safety; Safe Working; Working Co-operatively; Solving Individual Work Problems; Local Risk Control Processes; and Operating Light Vehicles Underground.

For the whole exercise to be fully effective, it is important that the training matrix is administered by a mine Training Officer who is fully qualified beyond the level being taught and trained as an educator. This is an individual at the mine site whose sole duties are to train people to become competent in their job functions. After being taught by qualified personnel, candidates must demonstrate their knowledge after each module is complete. This demonstration may be in the form of a written test, a practical demonstration, or both. There is a prescribed passing mark and a maximum number of attempts at passing each individual test. The exams for the proposed competency tests for new entrant miner and experienced miner would be developed by the training officer at a mine. Other key positions such as shift supervisor are subject to prevailing regulatory requirements, often involving a Board of Examiners (BC and Alberta) or equivalent.

For each of three positions: new entrant miner, experienced miner, shift supervisor/ deputy, the following aspects of demonstrated competency would be covered but in increasing levels of depth and complexity:

- ✓ pre-requirements; basic safety;
- ✓ modules of competence:
  - working safely,
  - working cooperatively,
  - problem solving,
  - risk assessment & control;
  - ground control;
  - vehicle operation;
  - working at the face – continuous miner/long-wall;
  - conveyor line
  - shotfirer
  - surface operations
- ✓ qualifications. The idea is that each of the above categories requires completion of training modules either classroom or in-mine. The module content increases in magnitude and extent as the level of responsibility increases. Certification of

qualifications to competency standards would be subject to the relevant regulatory requirements of the jurisdiction e.g. province.

6.0 Conclusion

An earlier Collaboration Legislative Review project identified a need to explore a potential common basis for training, qualifications and competence for key positions in underground coal mines in Canada. The subsequent Training Project was done in two phases. Phase 1 identified domestic industry and regulatory practice, identified training resources and noted that training provision was typically the responsibility of the individual mining companies who would either utilize their own corporate resources and/or supporting resources from private sector specialists.

Phase 1 was completed in 2008 and recommended that a Phase 2 of the project should be conducted and focus on the following: Common core competencies for new entrants in underground coal mining; Common core competencies for all existing key jobs (supervisor, manager, mine rescue, etc.) i.e. a standard core course outline for each; and A central repository of training resources. Phase 2 objectives were specifically to: compile a data base of training curriculum; prepare a training fact sheet; and write a project report, summarizing Phase 1 and Phase 2 findings and comment on opportunities for greater consistency among Canadian jurisdictions.

The Phase 2 approach to achieve the objectives was first to extend the Phase 1 assessment of training practice internationally to include the USA and Australia. The latter was then selected as an appropriate source of best practice expertise and used as a basis to develop common core competencies. *Competence* for a task at a coal mine is defined *as the demonstrated skill and knowledge required to carry out the task to a standard necessary for the safety and health of persons.* Second, a comparison of typical criteria was then made of the three Canadian jurisdictions against two Australian ones for the key underground coal positions of shift supervisor (deputy) and underground coal mine manager (under manager/Mine Manager 2nd Class). These show many similarities, the main difference being the more structured and detailed

competency standards or units developed within common across Australia, see Appendix 1, supporting training curriculum as used in Australia are included in Appendix 2

Third, this comparison was then developed into a proposed Canadian Training Matrix for four key underground coal positions (Table 3): new entrant miner, experienced miner, shift supervisor (deputy, foreman) and underground coal mine manager. The three tables together are considered to be the equivalent of the Fact sheet objective. The final objective is fulfilled with this report.

The final step is for the Collaboration to review the report and commence a dialogue among stakeholders (including operators, training providers and regulators) to consider its suitability to form a base from which to develop a common approach for training, qualifications and competence across the three Canadian jurisdictions involved. If adopted, an implementation strategy will be needed including development of the Canadian equivalent of the Australian curriculum.

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Appendices