Project Evaluation

Ukraine Coal Mine Safety Program

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October 2012

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LIST OF ACRONYMS

PPE	Personal protective equipment
SQL	Structured query language
CSV	Comma-separated variable
PDF	Portable document format
XML	Extensible markup language
YAML	Recursive acronym for “YAML Ain’t Markup Language” (originally an acronym for “yet another markup language”)

EXECUTIVE SUMMARY

This report provides a description and evaluation of a program to reduce personal injuries to Ukrainian underground coal miners. The program had two primary objectives:

- improve the existing coal mining injury data collection and analysis process to better understand Ukrainian coal miner injuries, and
- based on the analysis of injuries, recommend safety equipment for coal miners to reduce the incidence and/or severity of injuries.

Methods used to complete the research include analysis of summary statistics for the ten-year period prior to the initiation of the project, analysis of the existing injury reporting system, analysis of several hundred injury reports, discussions with representatives from the Labor Safety Committee, discussions with representatives from the Kyiv Safety Institute, discussions with mine operators, and observation of mining methods and practices.

Outcomes of the project include the development of an on-line injury reporting system and the purchase and delivery of safety equipment to Ukrainian coal mines. The on-line injury reporting system has a password-protected form for entering injury information and having that information downloaded to a database, a password-protected program for accessing the database for correcting errors and exporting the data, a password-protected retrieval system for retrieving individual forms previously submitted to the database, and instructions for installing and using the system. Equipment supplied to coal miners was determined on the basis of injury analysis and includes chain hoists, safety glasses, safety boots, gloves, lifting belts, and knee pads. The annexes provide the Logical Framework, the information included in the on-line injury reporting form, a sample of data analysis demonstrating the utility of the on-line injury reporting system, the questionnaires used for evaluating the safety equipment and on-line injury reporting system, and evaluation details.

The evaluation shows that the on-line injury reporting system provides an effective means for collecting and analyzing injury data. However, there appears to be a lack of commitment by the Labor Safety Committee and the Kyiv Safety Institute to utilize the system in the future. The evaluation also shows that, based on interviews with mine personnel, there is evidence that the supplied safety equipment addresses the needs of miners and its use is reducing the incidence of injuries. However, mine officials also indicated that issues such as equipment cost and mild discomfort associated with the equipment may hinder the widespread acceptance and use of the recommended safety equipment in the future.

INTRODUCTION

Project Background and Overview

Since 1990, Ukraine has had the second-highest incidence of fatal injuries to coal miners in the world. And, although this number has been declining more recently, there is still a need for concern over the number of fatalities and serious injuries to Ukrainian coal miners. In January 2004, a project was undertaken to improve coal mine safety in Ukrainian underground coal mines. This project had three major components:

- improving mine ventilation,
- improving ground control, and
- reducing personal injuries.

This evaluation focuses on the personal injury reduction portion of the project. This particular program began in January 2007 and continued until July 2012 and focused on two important objectives:

(1) improving the coal mining injury data collection and analysis process, and
(2) recommending and providing safety equipment for coal miners.

"Annex I – Logical Framework" shows the objectives, outputs, and indicators for this project. Briefly, achievement of the first objective consisted of the collection and analysis of accident and injury data, determination of reporting system needs, development of a web-based accident and injury reporting system, trial implementation of the reporting system, and the delivery of a web-based accident and injury reporting system. Achievement of the second objective consisted of analysis of injury statistics and injury reports, identification of safety equipment, including personal protective equipment (PPE) with a high probability of reducing injuries, delivery of this equipment to participating mines, and evaluating the effectiveness of it.

Specific activities conducted to obtain the information required for accomplishing the objectives included learning the existing Ukrainian injury reporting system, acquiring and studying accident and injury reports, meeting and discussing coal mining injuries with mine personnel and government officials, and visiting coal mines and observing mining methods and operations.

Evaluation Objectives and Methodology

The purpose of this evaluation is to:

- evaluate the process used to achieve the project objectives,
- determine if the project objectives were met,
- evaluate the benefits and potential benefits to project beneficiaries,
- evaluate the implementation,
- assess sustainability, and
- comment on project management.

The evaluation methodology consisted of the following:

(1) Document Review. Document review included the review of quarterly reports to ascertain if the project activities were aligned with the logical framework. Other documents, such as interim

reports or special-purpose reports were reviewed to determine if they addressed project objectives.

(2) Software Review. Software developed for meeting project objectives was reviewed for suitability and functionality.

(3) Field Visit. A field visit was made to Donetsk, Lugansk, and Kyiv, Ukraine in July 2012 to interview mine personnel, Labor Safety Committee personnel, and Kyiv Safety Institute personnel regarding the effectiveness of the project.

Evaluation Team Composition

The evaluation team consisted of the following individuals:

Richard J. Sweigard, PhD, PE – Professor and Associate Dean for Administration and Academic Affairs, University of Kentucky, Lexington, KY.

Joseph Sottile, PhD – Professor, University of Kentucky, Lexington, KY.

PROJECT ACTIVITIES

As described in the Introduction, the project included (1) the development of a web-based accident and injury reporting system for improving data collection and analysis of injuries to Ukrainian coal miners and (2) the recommendation of PPE to reduce injuries and/or the severity of injuries.

In the first half of 2007, project personnel received a summary of Ukraine coal mine injury data from 1995 to 2005. The data included accident classification and number of incidents for each year. Analysis of the data showed that the classification system was very broad and not helpful for identifying the root cause of injuries. For example, the terms used in the classification system included broad categories such as *machinery*, *electrical*, *fall of roof/rib/face*, *suffocating*, *fall of persons*, and so forth.

The project personnel also received several accident investigation reports that are completed when a miner is injured. These reports, Form H-1, were translated into English and analyzed. Analysis of the reports showed that, although they contained a large amount of detailed information, they were not conducive to analysis. However, it was noticed that important information regarding the cause of the accident could be extracted from the description of the accident, the job classification, and diagnosis.

Based on this preliminary analysis, the following items were subsequently obtained,

- translation of the Table of Contents of Ukrainian Mining Regulations,
- translation of accident classification system, and
- 121 accident reports from the Bazhanova Mine for 2006 with the following items translated,
    - job classification
    - description, and
    - diagnosis.

Analysis of this data began by manually extracting information from the job classification, description, and diagnosis from the 121 H-1 forms and entering it into a spreadsheet file. During this process, it was noticed that the existing reporting system could be misleading. For example, in one of the reports, a miner was hand-picking coal from a belt and hurt his hand while attempting to pick up a large lump of coal from the moving conveyor. He "dropped it (coal) and squeezed his left-hand thumb against the transfer conveyor." This accident was classified under *Fall of Coal*. In addition, there was no indication that any equipment was involved in the injury. This injury should be associated with conveyor belts, not fall of coal. The true cause of the injury was in the description but it had to be extracted manually.

Inspection of other reports showed similar problems in properly classifying injuries. Consequently, the relevant information was extracted from the job classification, description, and diagnosis of the 121 H-1 forms and entered into the spreadsheet so that the injury analysis could be conducted using tools such as sorting, bar and pie charts, pivot tables, and pivot charts.

Preliminary results of the analysis of injuries by type showed the following body parts being injured most frequently:

- Hand/finger ≈ 33%, and
- foot/toes ≈ 15%.

Eye injuries, although only 8% of the total, were also identified as a serious problem because of the devastating impact that eye injuries can have on an individual, and also because the description indicated that the vast majority of eye injuries could have been prevented by proper PPE.

Preliminary findings of the analysis of injuries by occupation showed that miners with the following occupations were getting injured most frequently:

- operators ≈ 25%, and
- development ≈ 18%.

After completion of the preliminary analysis, trips were made to Ukraine in June 2007 and October 2007 to discuss injury statistics with mine and government personnel and to observe mining operations. The objective of the visits was to assess the findings of the preliminary analysis and to obtain a better understanding of injuries to Ukrainian coal miners. A trip was also made in March 2008 to discuss the content and functionality of the on-line form and begin discussions on appropriate safety equipment based on the preliminary analysis.

Development of the On-line Injury Reporting System

Deficiencies of the existing injury reporting system, Form H-1, included the following:

- the reporting process was manual and laborious,
- extracting injury statistics was a manual process, and
- much of the information contained on the form was not helpful for conducting injury analysis.

After discussions with mine personnel and government officials, it was decided to develop an expanded Form H-1. This form was to contain all of the information currently included on Form H-1, but enhance it with additional information that would permit easy and effective injury analysis.

The form included the following features:

- Enhancements to Existing Form. The information included on the existing Form H-1 was very general in nature and was not helpful in establishing the root cause of injuries. Therefore, the on-line form was enhanced to address the following items:
    - general location in the mine where the accident occurred,
    - injured body part(s), and
    - equipment involved in the accident.

  Table 1 shows the items that were added to the form to assist in analysis. These additions made it possible to identify the general location where injuries occurred, the equipment or tools involved, and the body parts injured.

- Extensive Use of Drop-Down Menus, Check Boxes, and Radio Buttons. Because of mistakes in spelling, or differences in the choice of words among various individuals to describe the same thing, it was difficult to obtain an accurate count of the various items in the existing injury reporting system. For example, a roof fall might be described as rock fall, roof fall, fall of roof, and so forth, making it difficult to determine the frequency of roof and rock falls. Therefore, drop-down menus, check boxes, and radio buttons were used wherever possible to assist in the data analysis process. This also permits designers the ability to create useful categories.

The original form contained 112 fields for each injury. Each field contained a unit of information, e.g., mine name, company name, accident description, and so forth. Fields also included information from check-boxes, radio-buttons, and drop-down menu selections.

Table 1. Additions to Injury Report Form.

Equipment Involved in Injury	General Location Where Injury Occurred	Injured Body Part
Longwall Shearer	Development – Face Area	Head – General
Longwall Shields	Horizontal Entry	Head – Face/Ears
Longwall-Packwall Winch/Scraper	Inclined Entry	Head – Eye
Road Header	Longwall –Development Area	Neck
Drill Jumbo	Longwall – Face Area	Shoulder
Battery/Battery Charger	Longwall – Packwall Area	Arm
Hand Tools inc. Pneumatic Pick	Vertical Shaft or Slope	Wrist
Support Arches	Surface Facilities	Hand – General
Other	Other	Hand – Fingers
		Chest
		Respiratory System
		Heart/Circulatory System
		Back or Spine
		Abdomen
		Hip
		Leg
		Ankle
		Foot – General
		Foot – Toe
		Other (Specify)

The on-line reporting form went through several iterations before it was decided that it should contain information specifically to help in conducting injury analysis rather than also containing all of the information on Form H-1. Consequently, the final version of the form contained 55 fields. Note that of these 55 fields, there were 46 fields of interest for data analysis. The additional 9 fields were due to some information being stored in multiple ways. For example, the day, month, and year of the accidents were each stored in separate fields (one each for day, month, and year) as well as in one field (for all three) to assist in data analysis, e.g., sorting. In other cases, codes were stored separately from their associated description. Table 2 shows a summary of items included in the on-line injury reporting system.

Table 2. Items Contained in On-line Injury Reporting System.

Category	Specific Items
Company information	• Name of Mine (text) • Mine Code (text) • Region (drop-down menu)
Date and time of incident	• Date (3 drop-down menus for day, month, and year) • Time of Day (text) • Day of Week (drop-down menu) • Shift (drop-down menu)
Victim information	• Sex (radio button) • Date of Birth (drop-down menu) • Profession/Position (10-item drop-down menu) • Labor Grade (7-item drop-down menu) • Years of General Work Experience (text) • Years of Experience in Profession (text)
Incident information	• Description • Type of Incident (27-item drop-down menu)
Causes of accident	• Technical (11-item drop-down menu) • Organizational (22-item drop-down menu) • Psycho physiologic (7-item drop-down menu)
Equipment, location, injured body parts, and magnitude of injuries	• Equipment, machines, mechanisms, or motor vehicles whose operation caused injury (22-item drop-down menu) • General location where injury occurred (10-item drop-down menu) • Diagnosis (text) • Injured body parts (20 check boxes) • Magnitude of injury (radio buttons) • Single or multiple injuries (radio buttons) • Number of people injured (text) • Drugs or alcohol involved (radio buttons)
Date information was entered	• Today's date (3 drop-down menus for day, month, and year)

Safety Equipment

Establishing safety equipment needs was conducted concurrently with the development and implementation of the on-line injury reporting system. Preliminary analysis of data showed that most injuries are to the following body parts:

- hands,
- feet,
- eyes, and
- back.

It was agreed in 2008 to supply PPE to one administrative development group of approximately 300 miners at the Bazhanova Mine to determine if injuries can be reduced by using this equipment. The following items were delivered to the Bazhanova Mine in January 2009:

- 333 pairs of steel toed rubber boots,
- 260 back supports,
- 576 pairs of protective gloves,
- 210 pairs of anti-vibration gloves,
- 110 pairs of kevlar gloves,
- 350 safety glasses,
- 200 pairs of knee pads,
- 3 sets of chain hoists rated at 2.5 tonnes for horizontal pulling,
- 5 sets of chain hoists rated at 5 tonnes for lifting, and
- 1 set of chain hoists rated at 10 tonnes for lifting.

At the end of the first quarter of 2009, recommendations regarding the PPE were solicited from the test group. The following comments were obtained:

- General comment from the mine director and assistant director was that the equipment has started to improve the attitude of the miners towards safety.
- Steel toed rubber boots – boots are heavier than Ukrainian boots, and for some the instep is too tight (caused by their use of wrappings instead of socks). Some miners wanted a shorter boot.
- Back support – very popular with everyone who has used it.
- Gloves – overall, very positive and the miners want more; the anti-vibration glove has proven to be very popular.
- Safety glasses – miners had a problem with the glasses becoming scratched. They suggest a harder plastic or a shatter proof glass lens. Even with the negative comments, it was noted that eye injuries have decreased from the previous year.
- Knee pads – previously the mine provided knee pads that were manufactured in China and they have found that these pads are lighter and more comfortable. Very positive comments.
- Chain hoists – The comments on the chain hoists were very positive. During the first quarter of 2009 the hoists were used 166 times with no failures. Miners suggested replacing the 2.5 tonne rated hoists with 5 tonne hoists.

Following the positive comments received from the miners that received safety equipment at the Bazhanova Mine, it was agreed that safety equipment would be supplied to a second development group at Bazhanova Mine and to add three additional mines to the program. During the remainder of 2009 and the beginning of 2010 safety equipment was supplied to Bazhanova Mine, Stakhanova Mine, Dolzhanskaya-Kapital Mine, and the Krasny Partisan Mine. At this point the following safety equipment had been provided:

Lifting Belts	1,140
Safety Glasses	1,490
Steel-toed Boots	1,448
Knee Pads	900
Various Gloves	3,947
Chain Hoists (10 tonne)	8
Chain Hoists (5 tonne)	27
Chain Hoists (3.2 tonne)	12

Further distribution of safety equipment was suspended due to the perception of the grantee that the new management installed at Labor Safety following the recent presidential election was not interested in the program. By 2011 this perception was changed enough to warrant the addition of four new mines to the program. With the consultation and approval of the new Labor Safety management, safety equipment was supplied to the following four mines: Skochinsky, Yuznodonbasskaya #3, Luganskaya, and Kirov. During 2011 and the early part of 2012 the four new mines received the following safety equipment:

Lifting Belts	3,987
Safety Glasses	4,025
Steel-toed Boots	3,795
Knee Pads	2,150
Various Gloves	3,935
Chain Hoists (10 tonne)	8
Chain Hoists (5 tonne)	32
Chain Hoists (3.2 tonne)	13
Respirators	1,000

The safety equipment for the four new mines was purchased in Ukraine at a lower cost that allowed a larger quantity of equipment to be purchased. A brief description of the equipment is given below.

Lifting Belts. Personal belts for back support had not been utilized in Ukrainian mines before the program introduced them at the eight program mines. We worked with a local distributor to design a back support device that is patterned from those used in the US – a padded belt fitted with suspenders.

Safety Glasses. Safety glasses are commonly distributed to miners in Ukraine. But due to a lack of funds, there are never enough, and they do not last very long due to the poor quality. The program introduced safety glasses that fit snuggly to the face thus reducing the amount of dust and debris that can enter the area around the eyes.

Steel-toed Boots. The common boot issued to Ukrainian miners is a rubber boot that has a thin sole and does not have any toe protection. The program introduced a rubber boot that has a thicker sole and a steel insert in the toe for additional protection.

Knee-pads. The standard knee-pad used in Ukrainian mines is cumbersome because it is rigid and heavy. The program introduced a knee-pad that is more flexible and made of a lighter-weight material.

Gloves. The standard glove issued to Ukrainian miners is a cotton mitten. The program introduced different types of gloves based on the type of work the miner performs. Miners exposed to sharp items were given gloves with a Kevlar lining. Other miners were issued gloves with additional padding protection for the fingers and the back of the hand. A third type of glove, issued to mechanics, had exposed finger tips so that the mechanics can perform detailed activities while having protection for the rest of their hand. The general work force was given a glove having a rubber palm for additional protection.

Chain Hoists. Chain hoists can be found at Ukrainian mines but not in large quantities; and those that are found are of poor quality and often fail, causing serious injuries. The program introduced chain hoists of the highest quality, and they quickly became the most popular safety device that we introduced. The program supplied one 10 tonne hoist for each of the eight mines for lifting and moving equipment at the shaft bottom, one 5 tonne hoist for each development section at all eight mines, and one 3.2 tonne hoist for each longwall section at each of the eight mines. Figure 1 shows one type of chain hoist supplied to the mines.

Figure 1. Style of Chain Hoist Supplied to Ukrainian Coal Mines.

RESULTS OF EVALUATION

Achieving Project Objectives

Findings

Safety Equipment

Over the course of this project, protective equipment, including lifting belts, safety glasses, steel-toed boots, knee pads, safety gloves, and chain hoists of various capacities were purchased and delivered to Ukrainian coal mines. The safety equipment was selected on the basis of injury analysis conducted during the project.

On-line Injury Reporting System

An on-line injury reporting system was developed, tested, and delivered to the Ukrainian Labor Safety Committee. This reporting system used EasyPHP and MySQL for developing the on-line forms and database storage. The administration of the database was through phpMyAdmin. All of these platforms are free and readily available.

The reporting system had the following characteristics:

- an on-line, password-protected injury reporting form that submits user-entered injury information (listed in Table 2) to a database,
- a password-protected database that permits all injury information to be exported to CSV, Microsoft Excel, Microsoft Word, LaTex, Open Document spreadsheet, Open Document text, PDF, SQL, XML or YAML,
- a print feature that permits users to print a hard copy of the input form before submitting it to the database,
- a retrieval system that permits users to retrieve specific reports after they are entered,
- instructions on installing and using the forms and database, and
- instructions on exporting and analyzing data.

"Annex II – On-line Injury Reporting Form" shows a screen-capture of the input form.

Figure 2 shows a portion of the database export page.

Note that the examples used here are for the input form and database installed at the University of Kentucky server. The system delivered and installed to Ukraine is identical to this one; however the username and password for it are not available to the evaluators.

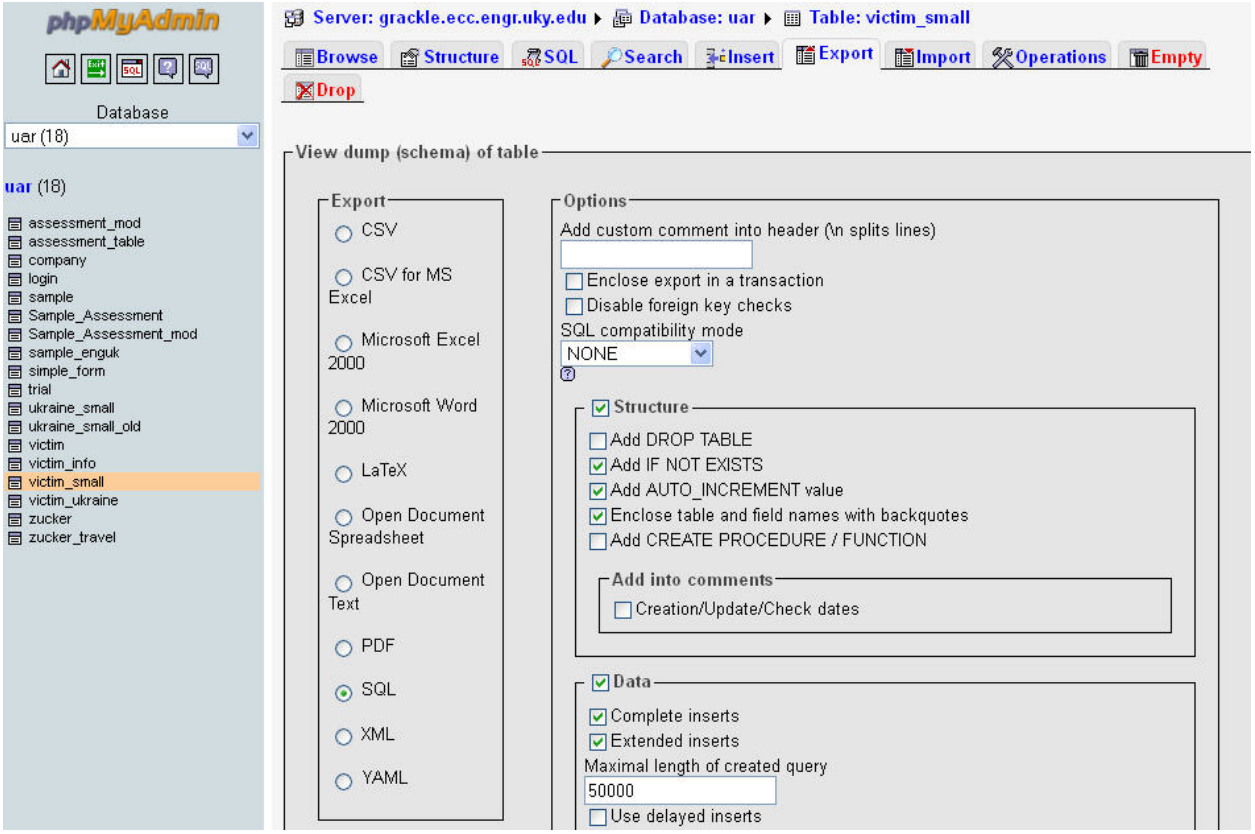

Figure 2. Sample of Database Export Tab.

The injury reporting system was developed to maintain the integrity of the database, but still permit mine operators, government officials, and others the ability to perform data analysis. Therefore, it is intended to be maintained by one person with administrative rights. This individual should be the only person who has the ability to make corrections to the database in the event a mistake is made when entering information into the on-line form. In addition, this person also has the ability to export the database information in various formats to others for performing analysis. Consequently, the database was structured to permit analysis in a spreadsheet program once exported. It is anticipated that this is the format that would be most widely used.

Analysis was conducted with the database for several hundred injury reports that were submitted by Ukrainian officials. The database was exported to Microsoft Excel format and analyzed. Figure 3 shows one example of the general location where accidents occur. "Annex III – Sample of Data Analysis" illustrates some of the analysis that was conducted with the on-line injury reporting system.

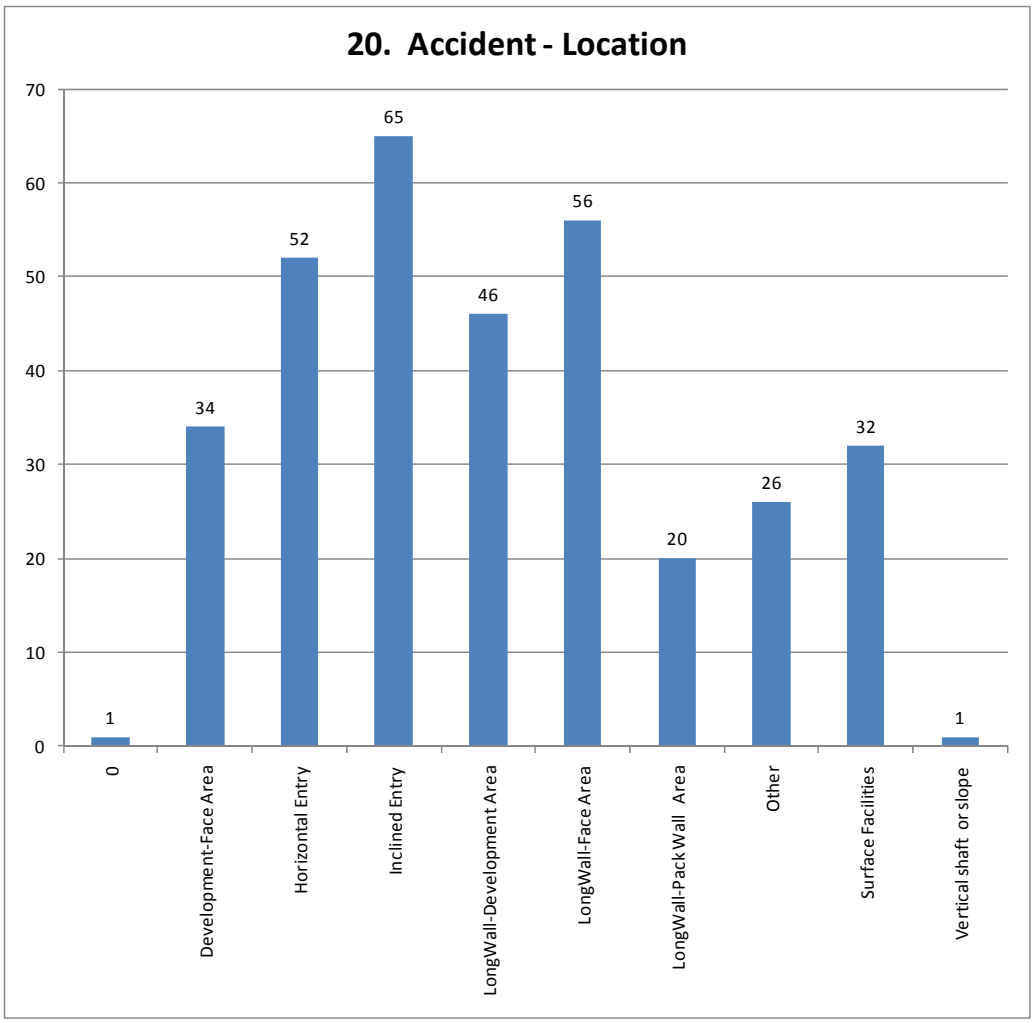

Figure 3. Summary of General Location where Injuries Occur.

Conclusions

The on-line injury reporting system was developed, tested, and delivered to the Safety Institute consistent with the project objectives; and it functioned as described in the Logical Framework. Safety equipment was purchased and delivered to eight coal mines. This equipment was selected based on the analysis of injuries and focused on prevention of injuries to the hands, feet, eyes, and back.

Impact on Project Beneficiaries

Findings

Safety Equipment

An on-site assessment was conducted July 9-13, 2012 regarding the safety equipment delivered to the Ukrainian coal mines. The interviews with mine personnel all followed the format of the questionnaire given in "Annex IV – Safety Equipment and Database Questionnaires." Initial information was gathered on the participants and then each type of safety equipment was discussed. Finally, the participants

were asked to produce a consensus ranking of the effectiveness of each of the types of personal safety equipment in reducing personal injuries. This section provides a summary of the interviews and the consensus ranking. "Annex V – Evaluation Details" contains details of the interviews.

It should be noted that when the evaluation was scheduled for July 2012 it was decided that only the last four mines that received safety equipment would be visited as the lag time for the first four mines was extensive. Also, one of the mines has stopped production, two of the mines have been privatized, and the fourth mine had mishandled the distribution of the equipment because of a change of the mine's top management.

Interview #1 – Donetsk Coal Company, Donetsk

This interview was conducted on July 9, 2012 in the office of Donetsk Coal Company and included three experts from the corporate Mine Safety Section and representatives from the Skochinsky Mine and the Yuzhno-Donbasskaya #3 Mine. From the Skochinsky Mine the Chief Engineer, Deputy Mine Operator on Safety, and four regular miners were present. From the Yuzhno-Donbasskaya #3 Mine the Chief Engineer, Deputy Operator on Mine Saftey, and four miners representing the face and development sections were present. The participants had mining experience that ranged from 10 to 32 years.

Interview #2 – Lugansk Coal Company, Lugansk

Representatives of Lugansk Coal Company were interviewed at the company office on July 10, 2012. Those interviewed included the Deputy General Director on Safety and the Chief Engineer for the company along with the Deputy Mine Operator on Safety, the Manager of Mines Section, and two mine workers from the Luganskaya Mine.

Interview #3 – Makeevugol, Makeevka

On July 11, 2012 representative from the Kirova Mine were interviewed at the office of Makeevugol. Participating in the interview were the Chief Engineer, Deputy Mine Operator on Mine Safety, Mine Operator, Acting Technical Director of the company, the General Director of Safety, and four miners.

The consensus ranking is given in Table 3 and a summary of the comments for each type of safety equipment is given in Table 4. In general, the chain hoists were very useful and were believed to reduce back injuries from strain. Knee pads were helpful in low coal and helpful for reducing knee swelling. It was believed that safety glasses reduced eye injuries, but there were issues with scratching and fogging of lenses. Gloves with the fingertips cut-out were popular; other types of gloves were not. Although the concept of a lifting belt was viewed as helpful, the miners did not like the shoulder straps or the synthetic material of these particular belts. They also felt that the belts were too large. The safety boots were popular at Lugansk coal but not very popular at Makeevugol or Donetsk. The most common complaint was the weight of the boots; however, there was general consensus that the steel toes did reduce injuries.

Table 3. Ranking of Safety Equipment Delivered to Coal Mines (1 = highest, 6 = lowest).

Safety Equipment	Donetsk Coal Company	Lugansk Coal Company	Makeevugol
Chain hoists	1	1	2
Knee Pads	2	6	1
Safety Glasses	3/4	3	5
Gloves	3/4	4/5	3/4
Belts	5	4/5	6
Boots	6	2	3/4

Table 4. Summary of Comments on Safety Equipment.

Safety Equipment	Donetsk Coal Company	Lugansk Coal Company	Makeevugol
Chain hoists	extremely useful	very useful reduced back injuries	very useful reduced back injuries
Knee Pads	helpful widely accepted	useful at longwall face comfortable	useful in low coal reduced knee swelling
Safety Glasses	useful for injury prevention easily scratched fogging problems	reduced injuries no fogging problems	reduced injuries some fogging
Gloves	helpful expensive	reduced minor injuries	reduced minor injuries expensive
Belts	too large uncomfortable shoulder straps	too large prefer different style	too large uncomfortable
Boots	poor quality expensive heavy	good quality reduced injuries heavy	good quality heavy

On-line Injury Reporting System

An interview with the Kyiv Safety Institute was conducted on July 13, 2012. The Institute is a research arm of the Labor Safety Committee. Participating in the interview were the Director, the Acting First Deputy Director, the Manager of the Lab on Statistics and Injury Analysis, the Manager of the Coal Safety Division of Labor Safety, and two programmers.

In response to the items listed in the questionnaire, representatives from the Safety Institute indicated that the following numbers of reports had been input since the database was transferred entirely to their control:

14 Skochinsky,
27 Uzhno-Donbasskaya #3,
8 Luganskaya,
18 Kirova, and
32 five additional mines.

They explained that data were originally gathered from the same four mines that received the safety equipment. Training had been conducted on March 27, 2012 in Donetsk for the mine personnel and Labor Safety inspectors who would be using the database. Individual passwords were distributed to the

mine inspectors and representatives of the mine safety sections. It was reported that there were no problems beyond those expected from the start up of a new system. The mines are required to fill out a hard copy of the report and the inspectors input the data.

With regard to analysis and future use, it was reported that it would take about one year to test the pilot program that includes only those mines listed above. After that testing is complete, they plan to add 40 to 50 more mines with the highest accident rates. The Institute is not currently analyzing data from the database. While the Institute is responsible for maintaining the database, they are only responsible for analyzing the data from the required Form H-1.

Conclusions

Interviews with Donetsk Coal Company, Lugansk Coal Company, and Makeevugol have indicated that the safety equipment has helped to reduce injuries. In particular, high-quality chain hoists were universally accepted as being extremely helpful in reducing back strain injuries. Interviews with the Kyiv Safety Institute have indicated that it is still too soon to see the impact of the on-line injury reporting system.

Recommendations

With respect to the safety equipment, it is clear that the equipment that was delivered to the mines has helped to prevent injuries. In addition, it has made miners more aware of PPE and tools that can reduce the incidence of injuries. However, it is apparent that the acceptance of PPE will be gradual because of the inconvenience that comes with protective equipment, e.g., the increased weight of steel-toed boots. Therefore, it is recommended that the most popular items be encouraged immediately with the introduction of additional equipment later. Statistics on injuries should also be monitored in the future to quantify the benefits.

With respect to the on-line injury reporting system, it is recommended that more data be entered to demonstrate its effectiveness to Ukrainian safety officials.

Project Implementation

Findings

As described in “Project Activities” the safety equipment has been selected based on the analysis of injury data and delivered to several coal mines consistent with the Logical Framework. The on-line injury reporting system has been developed, tested, and delivered consistent with the Logical Framework.

Conclusions

The safety equipment has had a positive impact on reducing injuries to Ukrainian coal miners.

It is believed that the on-line injury reporting system is not being utilized sufficiently to experience any benefits from its use, at least at this time. The total number of injury reports submitted is very low and there does not seem to be a clear plan for performing injury analysis. Discussions with the Kyiv Safety Institute have indicated that maintenance of the database has been assigned to the Safety Institute by the Labor Safety Committee. However, it does not appear that the Safety Institute has been adequately charged or supervised in the implementation of the database. Specifically, the Safety Institute did not

express any intention to fully utilize the database in analyzing accidents by generating relevant reports and developing safety improvement programs based on those analyses.

Recommendations

It is believed that the Labor Safety Committee does not realize the potential benefits of the on-line injury reporting system. For this reason, the Kyiv Safety Institute has not been given adequate guidance on implementing the system. It is recommended that injury reports for the mines currently participating in the program be entered into the on-line injury reporting system for a one- or two-year period. Once entered, the data should be analyzed to demonstrate its utility.

Sustainability

Findings

Regarding safety equipment, responses from the mine personnel indicated that the safety equipment is expensive, and in some cases (for example, safety boots), they indicated that they would not be purchasing them in the future. With respect to equipment such as the chain hoists, some managers said that they would continue buying the ones provided locally, even though they are inferior to the ones supplied through this project, because of availability.

The database for personal injuries was designed with Labor Safety's cooperation, input, suggestions, and approval, and it was often stated by Labor Safety that they wanted all of the mines in Ukraine in the database as soon as possible. However, with the complete change of management at Labor Safety following the presidential election, the attitude and interest in the program dropped significantly. With so many officials of Labor Safety that are primarily based at the regional offices that are aware of the database and are in favor of using the system for analysis, it is hopeful that the database will be eventually used.

Conclusions

Based on the interviews conducted in July 2012, sustainability may well be difficult.

With respect to the safety equipment, the cost and/or mild discomfort associated with some of it may cause mine managers not to replace the equipment when it is worn out. However, in other cases, for example, the use of safety glasses near the working face and knee pads in low coal, it is believed that the use of protective equipment can be sustained and result in a reduction in injuries.

With respect to the on-line injury reporting form, sustainability may also be difficult because of the lack of guidance from the Labor Safety Committee. Based on discussions with individuals from Labor Safety Committee and the Kyiv Safety Institute, there does not appear to be a plan in place to sustain data entry and analysis.

Recommendations

The effectiveness of using the safety equipment should continue to be monitored by Ukrainian safety officials to establish its effectiveness. Once the effectiveness of the safety equipment has been established, mining companies should adopt policies of requiring the use of certain safety equipment.

Regarding the on-line injury reporting form, the Labor Safety Committee should have one person dedicated to its continued implementation. Although this may initially seem to suggest that the use of

the form will require additional personnel, it is believed that its use will ultimately reduce manpower resources because analysis currently done manually by multiple people will be able to be conducted much more quickly by one individual using the on-line system.

Project Management

Project personnel have performed well in reaching project targets and achieving project goals. The work conducted follows the Logical Framework that was outlined. Project personnel were responsive to all suggestions by Ukrainian government and mine officials. For example, the on-line injury reporting system was modified several times to suit the needs of Labor Safety.

Seven trips to Ukraine were made during the course of the project to keep the beneficiaries apprised of progress and to obtain feedback. These trips occurred on the following dates:

- June 2007,
- October 2007,
- March 2008,
- June 2009,
- June 2010,
- August 2011, and
- July 2012.

ANNEX I – LOGICAL FRAMEWORK

USDOL/ILAB – Ukraine Coal Mine Safety Program

E9-K7-0007

Development Objective:
Reduced personal injuries in Ukrainian underground coal mines

Indicators:
- personal injuries
- use of reporting forms
- use of personal protective equipment
- use of analysis to reduce accidents

Immediate Objective 1:
Development of accident and injury reporting system to assist in identification of types, severity, and location of personal injuries

Indicators:
- Identification of reporting system needs
- Development and evaluation of preliminary reporting system
- Delivery of finalized accident and injury reporting system

Output 1:
Preliminary analysis of summary data and detailed injury data from participating mine

Indicators:
- Identification of injury types
- Identification of injury locations

Output 2:
Determination of accident and injury reporting system needs

Indicators:
- Need for electronic-based reporting system
- Need for standardization of injury types, locations, and associated equipment in reporting form
- Need for accessible electronic repository of accident and injury data

Output 3:
Development of web-based accident and injury reporting system

Indicators:
- Ability to establish accident and injury type, location of occurrence, and equipment involved
- Development of preliminary electronic reporting form

Output 4:
Trial implementation of web-based reporting system at participation mine(s)

Indicators:
- Evaluation of usability and effectiveness of preliminary reporting system
- Establishment of additional reporting system needs

Output 5:
Delivery of finalized web-based accident and injury reporting system

Indicators:
- Capability to input and store accident and injury data from multiple mines to a centralized database
- Ability to retrieve accident and injury data for analysis

Immediate Objective 2:
Recognition of effectiveness of personal protective equipment

Indicators:
- Needs determination and selection of personal protective equipment
- Use and acceptance of personal protective equipment
- Reduction of incidence and severity of injuries

Output 1:
Preliminary analysis of summary data and detailed injury reports from participating mine

Indicators:
- Identification of injury types
- Identification of injury locations

Output 2:
Identification of personal protective equipment with the potential of reducing injuries

Indicators:
- Determination of personal protective equipment to meet identified needs
- Selection and acceptance of personal protective equipment by participating mine personnel

Output 3:
Delivery of personal protective equipment to participating mine

Indicators:
- personal protective equipment ordered and delivered to participating mine
- personal protective equipment distributed to targeted miners

Output 4:
Evaluation of acceptance and effectiveness of personal protective equipment at participating mine

Indicators:
- Acceptance and use of personal protective equipment
- Reduction of incidence and severity of injuries

ANNEX II – ON-LINE INJURY REPORTING FORM

АКТ ПРО НЕЩАСНИЙ ВИПАДОК (MINE INCIDENT AND INJURY REPORT FORM)

ІНФОРМАЦІЯ ПРО ПІДПРИЄМСТВО

НАЙМЕНУВАННЯ ПІДПРИЄМСТВА (NAME OF MINE):

Код шахти (Mine Code)(Optional):

ОБЛАСТЬ (REGION): --Select--

ДАТА І ЧАС НЕЩАСНОГО ВИПАДКУ (DATE AND TIME OF INCIDENT)

ДАТА (DATE):
ЧИСЛО (DAY): -- МІСЯЦЬ (MONTH): -- РІК (YEAR): ---

ЧАС (TIME): < (години (hours)) (хвилини (minutes))

День тижня, коли сталася травма (Day of Week that the Injury Occurred): --Select--

Зміна, коли сталася травма (Shift that the Injury Occurred): --Select--

ВІДОМОСТІ ПРО ПОТЕРПІЛОГО (INFORMATION OF VICTIM)

СТАТЬ (SEX):
ЧОЛОВІЧА (MALE): ЖІНОЧА (FEMALE):

ДАТА НАРОДЖЕННЯ (DOB):
ЧИСЛО (DAY): -- МІСЯЦЬ (MONTH): -- РІК (YEAR): ---

ПРОФЕСІЯ/ПОСАДА (PROFESSION/POSITION) :
--вибір (select)--
ІНШЕ (OTHER):

Робочий розряд (LABOR GRADE): --вибір (select)--

ЗАГАЛЬНИЙ СТАЖ РОБОТИ (GENERAL WORK EXPERIENCE): РОКИ (YEARS) *(лише цифри-only numbers)*

СТАЖ РОБОТИ ЗА ПРОФЕСІЄЮ (PROFESSIONAL EXPERIENCE): РОКИ (YEARS) *(лише цифри-only numbers)*

ОБСТАВИНИ, ЗА ЯКИХ СТАВСЯ НЕЩАСНИЙ ВИПАДОК (INCIDENT INFORMATION):

ОПИС ОБСТАВИН (DESCRIPTION)

ВИД ПОДІЇ (TYPE OF INCIDENT):
16 Пожежа [16 Fire]

ПРИЧИНИ НЕЩАСНОГО ВИПАДКУ (CAUSES OF INCIDENT):

ТЕХНІЧНІ (TECHNICAL):
ВІДСУТНІ[NONE]

ОРГАНІЗАЦІЙНІ (ORGANIZATIONAL):
ВІДСУТНІ[NONE]

психофізіологічні (PSYCHOPHYSIOLOGIC): ВІДСУТНІ[None.]

УСТАТКУВАННЯ, МАШИНИ, МЕХАНІЗМИ, ТРАНСПОРТНІ ЗАСОБИ, ЕКСПЛУАТАЦІЯ ЯКИХ ПРИВЕЛА ДО НЕЩАСНОГО ВИПАДКУ (EQUIPMENT,MACHINES,MECHANISMS OR MEANS OF TRANSPORT WHOSE OPERATION CAUSED INJURY):
ВІДСУТНІ[NONE]

МІСЦЕ (ЗАГАЛЬНЕ), ДЕ СТАВСЯ НЕЩАСНИЙ ВИПАДОК (GENERAL LOCATION WHERE INJURY OCCURED):
Інше (Other)

ДІАГНОЗ ЗГІДНО З ЛИСТКОМ НЕПРАЦЕЗДАТНОСТІ (DIAGNOSIS ACCORDING TO OFFICIAL SICK-LIST):

ТРАВМОВАНА ЧАСТИНА ТІЛА(відзначити усе, що відноситься) (BODY PART INJURED(check all that apply)):
- ☐ :ГОЛОВА-ВЗАГАЛІ (HEAD-GENERAL)
- ☐ :ГОЛОВА-ОБЛИЧЧЯ/ВУХА (HEAD-FACE/EARS)
- ☐ :ГОЛОВА--ОКО (HEAD--EYE)
- ☐ :ШИЯ (NECK)
- ☐ :ПЛЕЧЕ (SHOULDER)
- ☐ :РУКА (ARM)
- ☐ :ЗАП'ЯСТЯ (WRIST)
- ☐ :КИСТЬ--ВЗАГАЛІ (HAND--GENERAL)
- ☐ :КИСТЬ--ПАЛЬЦІ (HAND--FINGERS)
- ☐ :ГРУДИ (CHEST)
- ☐ :СИСТЕМА ДИХАННЯ (RESPIRATORY SYSTEM)
- ☐ :СЕРЦЕ/СИСТЕМА КРОВООБІГУ (HEART/CIRCULATORY SYSTEM)
- ☐ :ПОПЕРЕК (BACK OR SPINE)
- ☐ :ОЧЕРЕВИНА (ABDOMEN)
- ☐ :СТЕГНО (HIP)
- ☐ :НОГА (LEG)
- ☐ :ЩИКОЛОТКА (ANKLE)
- ☐ :СТОПА-ВЗАГАЛІ (FOOT-GENERAL)
- ☐ :СТОПА-ПАЛЕЦЬ (FOOT-TOE)

ІНШЕ (OTHER):

Ступінь тяжкості (MAGNITUDE OF INJURY):
Смертельний (FATAL): ○ Загальний (NONFATAL): ○

Кількість потерпілих (NUMBER OF VICTIMS):
Поодинокий (Single): ○ Груповий (MULTIPLE): ○

Для групового випадку вкажіть кількість травмованих (For multiple injuries, please specify the number injured):

ПЕРЕБУВАННЯ В СТАНІ АЛКОГОЛЬНОГО/НАРКОТИЧНОГО СП'ЯНІННЯ (BEING UNDER ACOHOL/DRUG INFLUENCE): ТАК (YES): ○ НІ (NO): ○

Дата заповнення (TODAY'S DATE):
ЧИСЛО (DAY): -- МІСЯЦЬ (MONTH): -- РІК (YEAR): ---
ENTER

ANNEX III – SAMPLE OF DATA ANALYSIS

Overview

This annex summarizes some of the analyses that can be conducted with the On-line Injury Reporting System. The results were originally in Ukrainian and have been translated into English for convenience. The purpose of this document is to illustrate the analysis capabilities of the on-line reporting system, and to present the results of the analysis based on the input to this point.

Existing Items from Form H-1

Several items from the existing Form H-1 have been preserved in the On-Line Ukrainian Injury Reporting Form. In this section, a brief summary of the most relevant of those items is provided.

Profession

Table III. 1 and Figure III. 1 show a table and graph, respectively, of the number of injuries by profession. As shown, 75% (or 250) of the injuries involve production *face workers, development workers, operators of roadheader/shearer/locomotive,* or *other (maintenance) underground workers*. *Mechanics* and *electricians* had very few injuries.

Table III. 1. Number of Injured Employees by Profession.

Profession	Number Injured	Percent Injured
Development worker	62	18.6
Electrician	9	2.7
Mechanic	1	0.3
Operator of roadheader/shearer/locomitive	52	15.6
Operator of other equipment	15	4.5
Other (maintenance) underground workers	61	18.3
Others	37	11.1
Production face worker	75	22.5
Section manager/supervisor/foreman	21	6.3
Grand Total	333	100.0

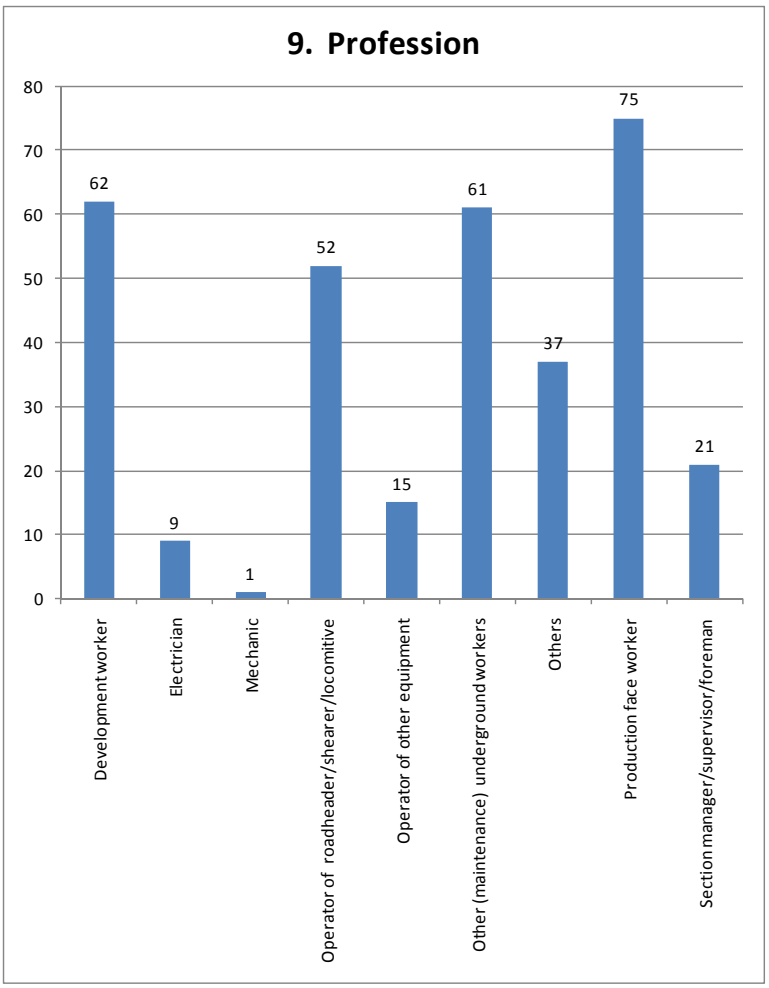

Figure III. 1. Count of Injuries by Profession.

Accident Cause - Technical

Figure III. 2 shows a summary of the technical causes of injuries. Inspection of this figure shows that 48% of the injuries had no technical cause associated with them. The largest technical cause was *unsatisfactory technical condition of productions facilities, buildings, installations, sites* with 59 injuries. It is noted that technical causes are very general and do not provide much insight into any specific technical areas that may be contributing to injuries.

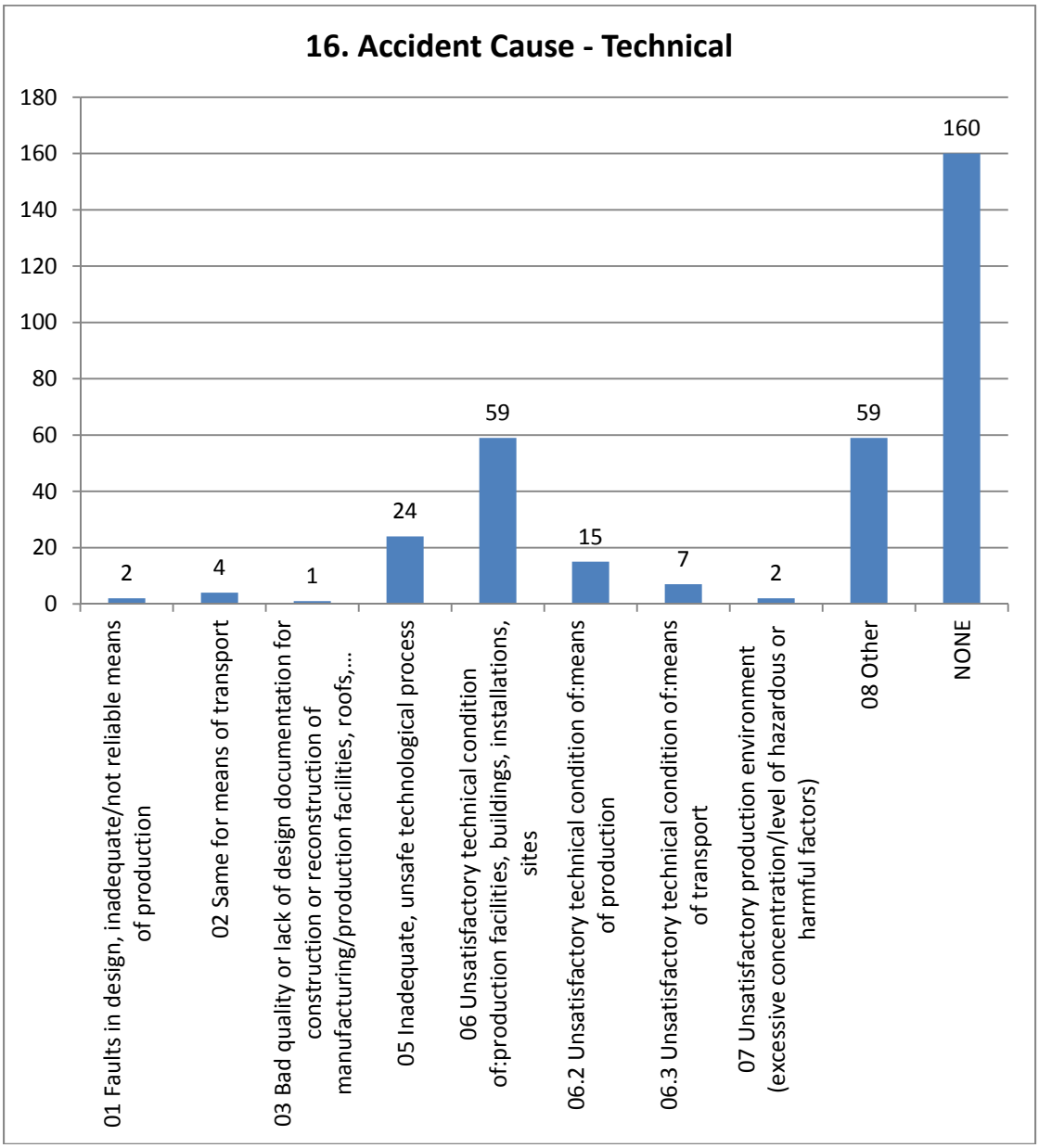

Figure III. 2. Summary of Technical Causes of Injuries.

Accident Cause - Organizational

Figure III. 3 shows that the majority, i.e., 51%, of the injuries had an organizational cause of *noncompliance with safety rules and regulations*. The second largest contributing factor was *violation of technological process*. As with the technical causes, the organizational causes are relatively unspecific in terms of identifying how and where employees are being injured.

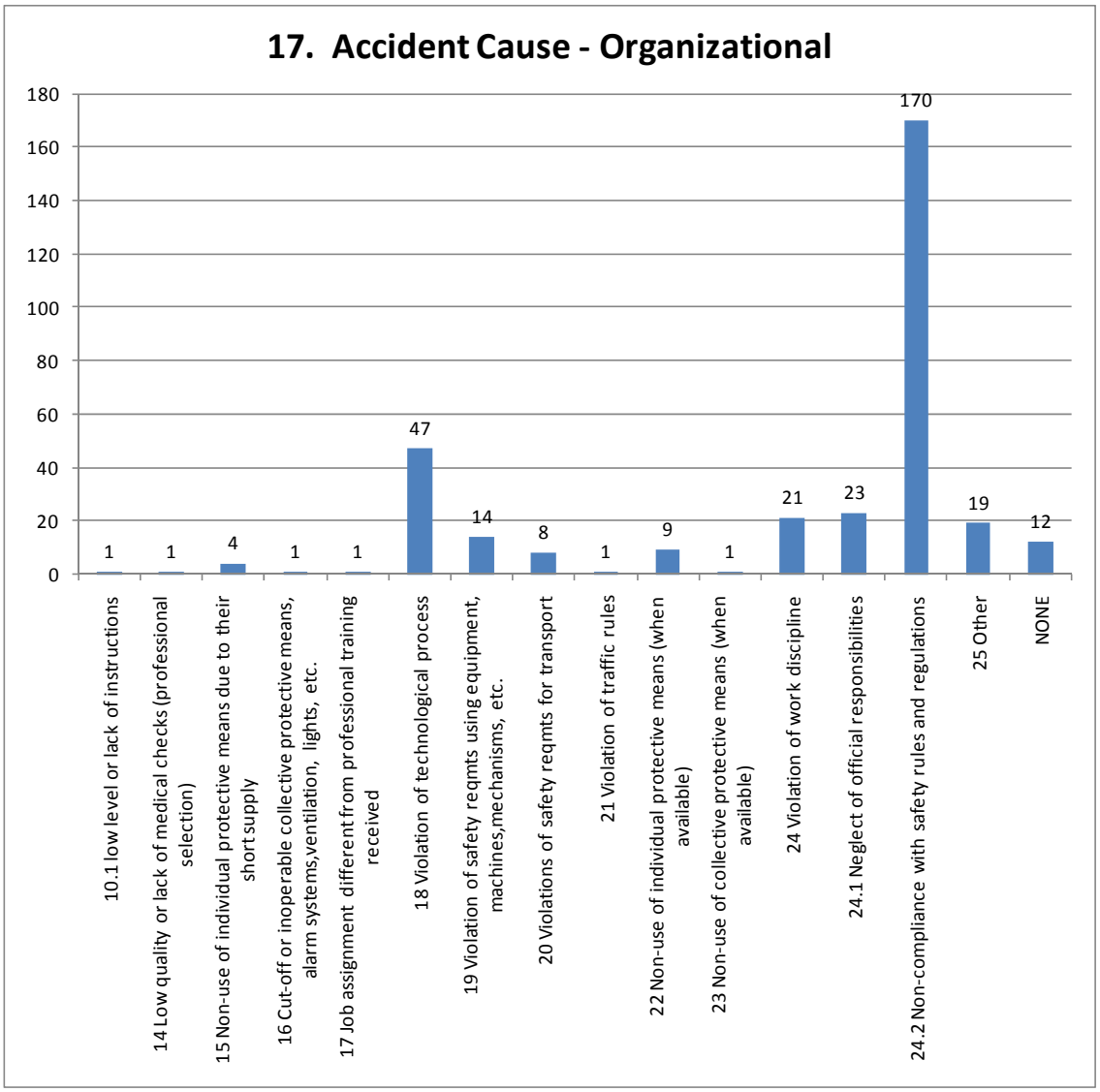

Figure III. 3. Organizational Causes of Accidents.

Accident Type

Figure III. 4 shows that nearly one-third of the injuries involved the *caving/falling of ground or rock*. Approximately one-sixth of the injuries involved *falling of personnel while walking/traveling*. These results indicate that nearly one-half of the reported injuries involve either slips and falls or the fall of rock. Although these results are not surprising, they do point to a need for improved footing, or improved mine floor conditions as well as improving methods for protecting individuals from roof/rib falls.

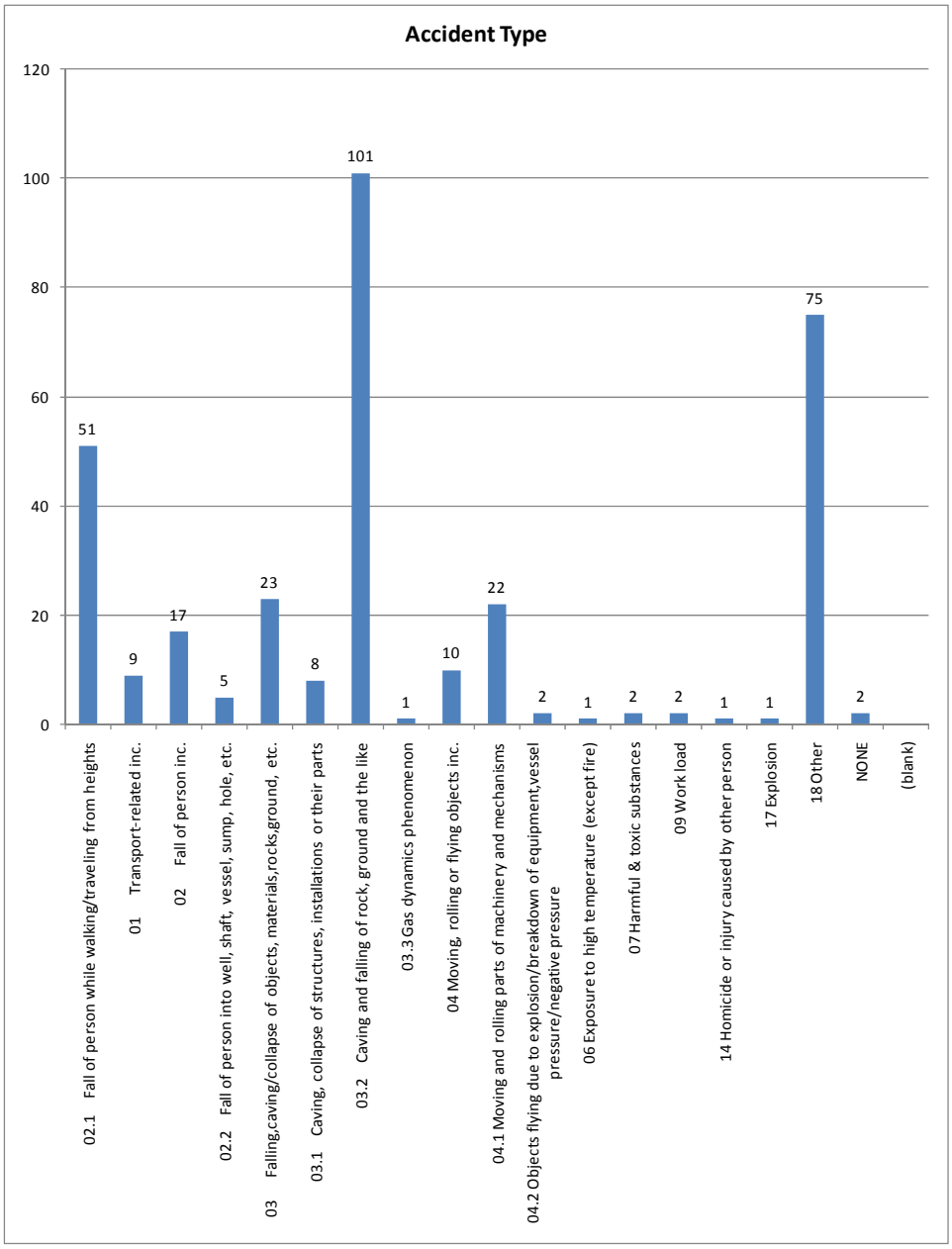

Figure III. 4. Accident Type.

New Items Included on the On-line Injury Reporting System

As previously described, new items have been added to information on the H-1 form to help in the analysis and ultimate prevention of injuries. Specifically, these items include the equipment involved in the injury, the general location in the mine where the injury occurred, and the body part(s) injured.

Accident Cause - Equipment

Figure III. 5 shows the equipment involved in the accidents. It is interesting to note that over two-thirds of the injuries did not involve a piece of mining equipment. Although this may initially seem unusual, it is consistent with the large number of roof/rock fall and slip-and-fall injuries and the amount of manual labor associated with single-entry advancing longwall mining. Besides components associated with the mine structure, the equipment most frequently involved with injuries were *conveyors* and *rail transportation*.

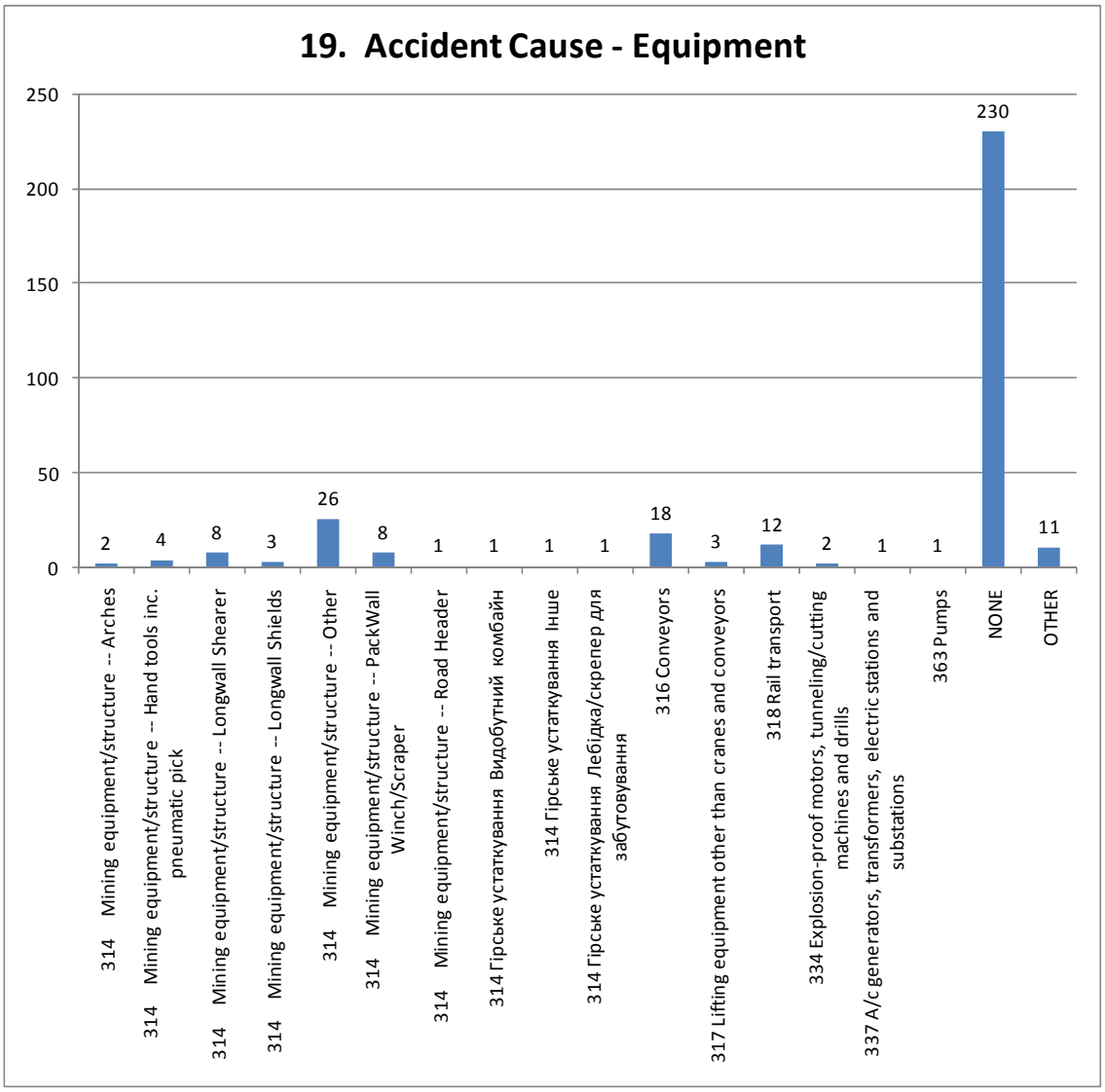

Figure III. 5. Summary of Equipment Involved with Injuries.

Accident Location

Figure III. 6 shows the general locations in mines where injuries are occurring. As shown, *inclined entries* are the most common injury location, followed by the *longwall face area* and *horizontal entries*. A significant number of injuries also occurred at the *longwall development area*. It is noted that 122 of the 333 injuries occurred at the *longwall development area*, *longwall face area* or *longwall pack wall area*.

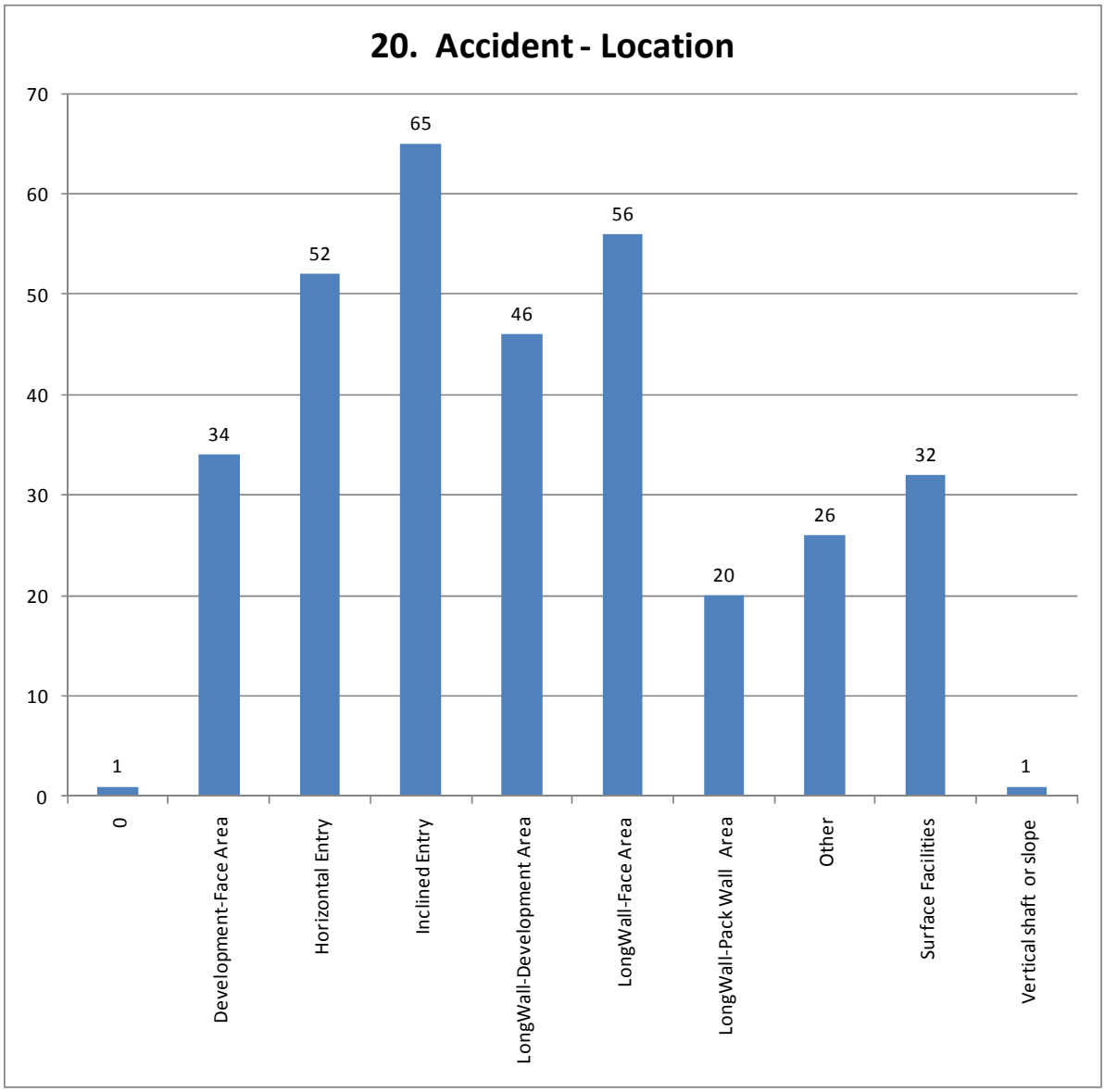

Figure III. 6. Summary of General Location where Accidents Occur.

Injured Body Parts

Figure III. 7 shows the body parts injured. As expected from the preliminary analysis results, *fingers* were the most commonly injured body part, followed by *legs*. There were also 76 head injuries and 26 of these involved injuries to the *eyes*.

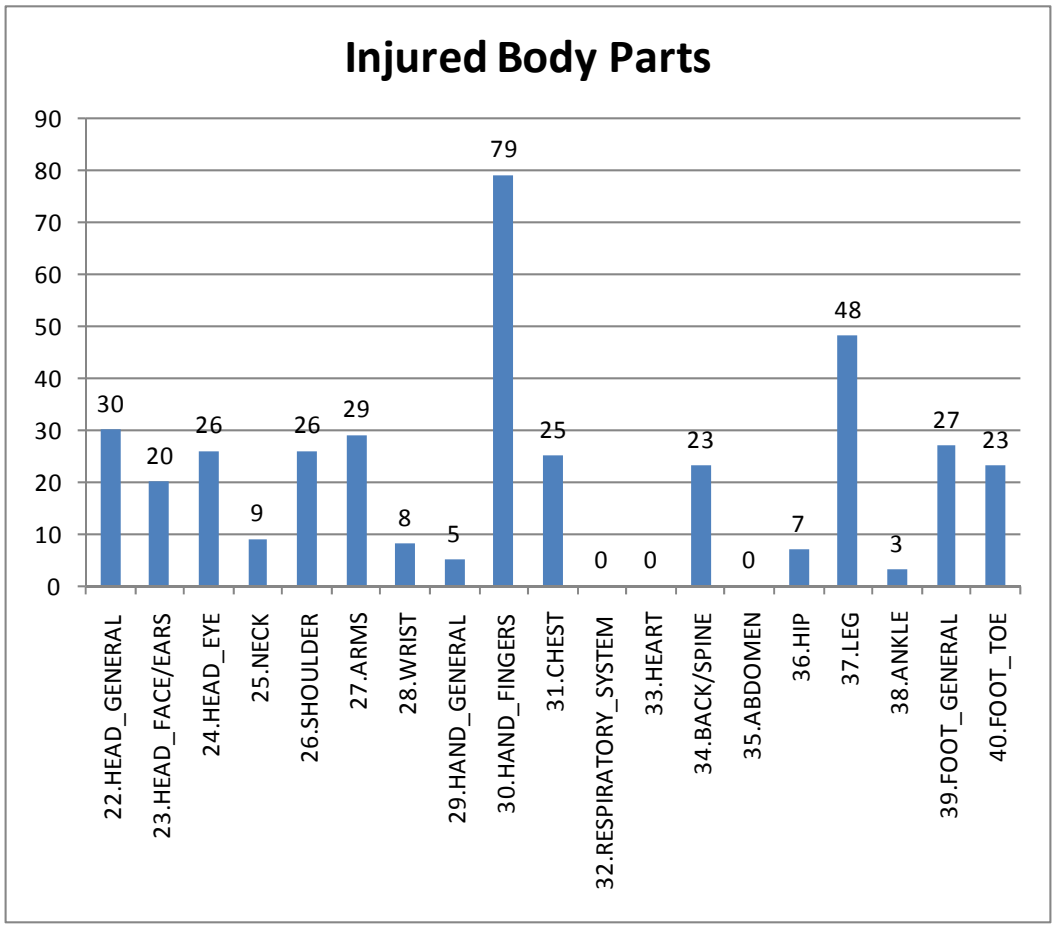

Figure III. 7. Injured Body Parts.

Pivot Queries

One advantage of the electronic database is the ability to conduct data drilling, in particular pivot queries, to establish various associations in the injuries that may be helpful for reducing the incidence of injuries in the future. The analysis and presentation of results can take many forms and the combinations of associations are numerous. Consequently, the intention of the pivot queries presented here is to illustrate the potential of the types of analyses that can be conducted through the presentation of a few examples.

Pivot Queries – Finger Injuries

As previously presented, finger injuries occur at a high rate; approximately ¼ of all incidents involved a finger injury. Pivot queries can establish items such as the profession, location, accident type, and so forth for all injuries involving fingers. To illustrate, Table III. 2 shows the accident type for all finger injuries. As shown, the largest number of finger injuries occurred as a result of *caving/falling rock*. (Note that seven of the *falling/caving* types were placed in the general category (03) rather than in one of the specific types listed (03.1, 03.2, or 03.2).) Six of the finger injuries involved *moving and rolling parts of machinery and mechanisms*.

Table III. 2. Accident type for all Finger Injuries

02.1 Fall of person while walking/traveling from heights	1
01 Transport-related inc.	2
02 Fall of person inc.	1
02.2 Fall of person into well, shaft, vessel, sump, hole, etc.	0
03 Falling,caving/collapse of objects, materials,rocks,ground, etc.	7
03.1 Caving, collapse of structures, installations or their parts	3
03.2 Caving and falling of rock, ground and the like	28
03.3 Gas dynamics phenomenon	0
04 Moving, rolling or flying objects inc.	2
04.1 Moving and rolling parts of machinery and mechanisms	6
04.2 Objects flying due to explosion/breakdown of equipment,vessel pressure/negative pressure	1
06 Exposure to high temperature (except fire)	0
07 Harmful & toxic substances	0
09 Work load	0
14 Homicide or injury caused by other person	0
17 Explosion	0
18 Other	27
NONE	1
Grand Total	**79**

Table III. 3 shows the general location in the mine for all finger injuries. As shown, 50% of the finger injuries occurred at the *longwall development, face,* or *pack wall area*.

Table III. 3. Mine Locations where Finger Injuries Occurred.

0	1
Development-Face Area	8
Horizontal Entry	6
Inclined Entry	15
LongWall-Development Area	16
LongWall-Face Area	17
LongWall-Pack Wall Area	7
Other	3
Surface Facilities	6
Vertical shaft or slope	0
Grand Total	**79**

Pivot Queries – Accident Type and Location

Table III. 4 shows a pivot table of accident type and accident location. This table shows that of the 101 *caving/falling of rock* accidents, 30 occurred at the *longwall face area*, 21 occurred at the *longwall development area*, and 13 occurred at the *longwall pack wall area*. This table also shows that 14 of the 51 *fall of person while walking/traveling* incidents occurred in *inclined entries*.

Table III. 5 shows the same information as Table III. 4; however, the information is organized by accident location instead of accident type. This table is presented to illustrate that the same information organized differently may provide additional insight into how employees are getting injured. For example, one may wish to quickly determine the types of accidents that occur at the longwall face area or longwall development area.

Table III. 4. Pivot Table of Accident Type and Accident Location.

02.1 Fall of person while walking/traveling from heights	**51**
Development-Face Area	4
Horizontal Entry	9
Inclined Entry	14
LongWall-Development Area	5
LongWall-Pack Wall Area	1
Other	7
Surface Facilities	11
01 Transport-related inc.	**9**
Horizontal Entry	4
Inclined Entry	3
LongWall-Development Area	2
02 Fall of person inc.	**17**
Development-Face Area	1
Horizontal Entry	1
Inclined Entry	5
LongWall-Development Area	1
Other	3
Surface Facilities	5
Vertical shaft or slope	1
02.2 Fall of person into well, shaft, vessel, sump, hole, etc.	**5**
Horizontal Entry	2
LongWall-Development Area	1
LongWall-Pack Wall Area	1
Surface Facilities	1
03 Falling,caving/collapse of objects, materials,rocks,ground, etc.	**23**
Development-Face Area	2
Horizontal Entry	3
Inclined Entry	3
LongWall-Development Area	2
LongWall-Face Area	4
Other	3
Surface Facilities	6
03.1 Caving, collapse of structures, installations or their parts	**8**
Horizontal Entry	2
Inclined Entry	2
LongWall-Face Area	2
Other	1
Surface Facilities	1
03.2 Caving and falling of rock, ground and the like	**101**
0	1
Development-Face Area	15
Horizontal Entry	5
Inclined Entry	14
LongWall-Development Area	21
LongWall-Face Area	30
LongWall-Pack Wall Area	13
Other	2
03.3 Gas dynamics phenomenon	**1**
LongWall-Development Area	1
04 Moving, rolling or flying objects inc.	**10**
Horizontal Entry	3
Inclined Entry	3
LongWall-Face Area	1
LongWall-Pack Wall Area	1
Other	1
Surface Facilities	1
04.1 Moving and rolling parts of machinery and mechanisms	**22**
Development-Face Area	1
Horizontal Entry	6
Inclined Entry	4
LongWall-Development Area	4
LongWall-Face Area	4
LongWall-Pack Wall Area	1
Surface Facilities	2
04.2 Objects flying due to explosion/breakdown of equipment,vessel pressure/negative pressure	**2**
LongWall-Face Area	2
06 Exposure to high temperature (except fire)	**1**
LongWall-Development Area	1
07 Harmful & toxic substances	**2**
Other	1
Surface Facilities	1
09 Work load	**2**
LongWall-Face Area	2
14 Homicide or injury caused by other person	**1**
Horizontal Entry	1
17 Explosion	**1**
Horizontal Entry	1
18 Other	**75**
Development-Face Area	11
Horizontal Entry	14
Inclined Entry	17
LongWall-Development Area	8
LongWall-Face Area	11
LongWall-Pack Wall Area	3
Other	8
Surface Facilities	3
NONE	**2**
Horizontal Entry	1
Surface Facilities	1
Grand Total	**333**

Table III. 5. Pivot Table of Accident Location and Accident Type.

Row Labels	Count of 15.ACC_TYPE
0	**1**
03.2 Caving and falling of rock, ground and the like	1
Development-Face Area	**34**
02.1 Fall of person while walking/traveling from heights	4
02 Fall of person inc.	1
03 Falling,caving/collapse of objects, materials,rocks,ground, etc.	2
03.2 Caving and falling of rock, ground and the like	15
04.1 Moving and rolling parts of machinery and mechanisms	1
18 Other	11
Horizontal Entry	**52**
02.1 Fall of person while walking/traveling from heights	9
01 Transport-related inc.	4
02 Fall of person inc.	1
02.2 Fall of person into well, shaft, vessel, sump, hole, etc.	2
03 Falling,caving/collapse of objects, materials,rocks,ground, etc.	3
03.1 Caving, collapse of structures, installations or their parts	2
03.2 Caving and falling of rock, ground and the like	5
04 Moving, rolling or flying objects inc.	3
04.1 Moving and rolling parts of machinery and mechanisms	6
14 Homicide or injury caused by other person	1
17 Explosion	1
18 Other	14
NONE	1
Inclined Entry	**65**
02.1 Fall of person while walking/traveling from heights	14
01 Transport-related inc.	3
02 Fall of person inc.	5
03 Falling,caving/collapse of objects, materials,rocks,ground, etc.	3
03.1 Caving, collapse of structures, installations or their parts	2
03.2 Caving and falling of rock, ground and the like	14
04 Moving, rolling or flying objects inc.	3
04.1 Moving and rolling parts of machinery and mechanisms	4
18 Other	17
LongWall-Development Area	**46**
02.1 Fall of person while walking/traveling from heights	5
01 Transport-related inc.	2
02 Fall of person inc.	1
02.2 Fall of person into well, shaft, vessel, sump, hole, etc.	1
03 Falling,caving/collapse of objects, materials,rocks,ground, etc.	2
03.2 Caving and falling of rock, ground and the like	21
03.3 Gas dynamics phenomenon	1
04.1 Moving and rolling parts of machinery and mechanisms	4
06 Exposure to high temperature (except fire)	1
18 Other	8
LongWall-Face Area	**56**
03 Falling,caving/collapse of objects, materials,rocks,ground, etc.	4
03.1 Caving, collapse of structures, installations or their parts	2
03.2 Caving and falling of rock, ground and the like	30
04 Moving, rolling or flying objects inc.	1
04.1 Moving and rolling parts of machinery and mechanisms	4
04.2 Objects flying due to explosion/breakdown of equipment,vessel pressure/negative pressure	2
09 Work load	2
18 Other	11
LongWall-Pack Wall Area	**20**
02.1 Fall of person while walking/traveling from heights	1
02.2 Fall of person into well, shaft, vessel, sump, hole, etc.	1
03.2 Caving and falling of rock, ground and the like	13
04 Moving, rolling or flying objects inc.	1
04.1 Moving and rolling parts of machinery and mechanisms	1
18 Other	3
Other	**26**
02.1 Fall of person while walking/traveling from heights	7
02 Fall of person inc.	3
03 Falling,caving/collapse of objects, materials,rocks,ground, etc.	3
03.1 Caving, collapse of structures, installations or their parts	1
03.2 Caving and falling of rock, ground and the like	2
04 Moving, rolling or flying objects inc.	1
07 Harmful & toxic substances	1
18 Other	8
Surface Facilities	**32**
02.1 Fall of person while walking/traveling from heights	11
02 Fall of person inc.	5
02.2 Fall of person into well, shaft, vessel, sump, hole, etc.	1
03 Falling,caving/collapse of objects, materials,rocks,ground, etc.	6
03.1 Caving, collapse of structures, installations or their parts	1
04 Moving, rolling or flying objects inc.	1
04.1 Moving and rolling parts of machinery and mechanisms	2
07 Harmful & toxic substances	1
18 Other	3
NONE	1
Vertical shaft or slope	**1**
02 Fall of person inc.	1
Grand Total	**333**

Other Pivot Queries

Considering the information that is contained in the database, there are literally thousands of pivot inquiries that can be made. To illustrate, consider the question "*Of the 79 finger injuries, what type of accident were they, and where did they occur in the mine?*" The pivot table representing this question is shown in Table III. 6. As shown in this table, 28 of the 79 *finger* injuries were a result of *caving/falling of rock/ground* (as previously shown in Table III. 2) and 10 of those 28 occurred at the *longwall face area*.

Table III. 7 illustrates a similar query, except that the injury type is *legs* instead of *fingers*. Inspection of this table shows that, unlike *finger* injuries, a large portion (i.e., 27%) are caused by *fall of person while walking/traveling from heights*. And, approximately one-half of these occur in inclined entries. In addition, another 27% of the leg injuries are caused by *caving/falling of rock/ground*. Of these injuries, the majority (i.e., 62%) occurs at the *longwall development*, *face*, or *pack wall* areas.

Summary

The results shown here are consistent with the 121 injury descriptions that were previously translated from the Bazhanova Mine H-1 Reports. However, because of the method in which the On-Line Injury Reporting System was constructed, i.e., the use of drop-down menus where practical, a summary and analysis of the results was produced quickly without the need of translation into English. In addition, the time taken to develop the results is not dependent upon the number of reports in the database. In other words, the analysis of one thousand, or even five thousand (or more) reports would not take much longer than the time taken for the 333 reports analyzed for this report.

It should be noted that all of the results in the database are in Ukrainian, not English. The results were converted to English because the translations for the items in the drop-down menus were available.

The primary objective of this study is to illustrate the ease with which analyses can be conducted, rather than attempting to draw conclusions from the limited number of reports in the database. Nevertheless, the results are consistent with previous observations, and point to a need to reduce slip and fall injuries and injuries caused by the fall of rock/ground. It is anticipated that, once several thousand reports have been entered into the database, the results will be very helpful in identifying and reducing personal injuries.

Table III. 6. Pivot Table of Finger Injuries, Accident Type, and Accident Location.

Row Labels	Sum of 30.HAND_FINGERS
02.1 Fall of person while walking/traveling from heights	**1**
Development-Face Area	0
Horizontal Entry	0
Inclined Entry	1
LongWall-Development Area	0
LongWall-Pack Wall Area	0
Other	0
Surface Facilities	0
01 Transport-related inc.	**2**
Horizontal Entry	0
Inclined Entry	1
LongWall-Development Area	1
02 Fall of person inc.	**1**
Development-Face Area	0
Horizontal Entry	0
Inclined Entry	0
LongWall-Development Area	0
Other	0
Surface Facilities	1
Vertical shaft or slope	0
02.2 Fall of person into well, shaft, vessel, sump, hole, etc.	**0**
Horizontal Entry	0
LongWall-Development Area	0
LongWall-Pack Wall Area	0
Surface Facilities	0
03 Falling,caving/collapse of objects, materials,rocks,ground, etc.	**7**
Development-Face Area	1
Horizontal Entry	2
Inclined Entry	0
LongWall-Development Area	1
LongWall-Face Area	1
Other	1
Surface Facilities	1
03.1 Caving, collapse of structures, installations or their parts	**3**
Horizontal Entry	0
Inclined Entry	1
LongWall-Face Area	2
Other	0
Surface Facilities	0
03.2 Caving and falling of rock, ground and the like	**28**
0	1
Development-Face Area	1
Horizontal Entry	0
Inclined Entry	6
LongWall-Development Area	6
LongWall-Face Area	10
LongWall-Pack Wall Area	4
Other	0
03.3 Gas dynamics phenomenon	**0**
LongWall-Development Area	0
04 Moving, rolling or flying objects inc.	**2**
Horizontal Entry	0
Inclined Entry	1
LongWall-Face Area	1
LongWall-Pack Wall Area	0
Other	0
Surface Facilities	0
04.1 Moving and rolling parts of machinery and mechanisms	**6**
Development-Face Area	1
Horizontal Entry	0
Inclined Entry	2
LongWall-Development Area	1
LongWall-Face Area	0
LongWall-Pack Wall Area	0
Surface Facilities	2
04.2 Objects flying due to explosion/breakdown of equipment,vessel pressure/negative pressure	**1**
LongWall-Face Area	1
06 Exposure to high temperature (except fire)	**0**
LongWall-Development Area	0
07 Harmful & toxic substances	**0**
Other	0
Surface Facilities	0
09 Work load	**0**
LongWall-Face Area	0
14 Homicide or injury caused by other person	**0**
Horizontal Entry	0
17 Explosion	**0**
Horizontal Entry	0
18 Other	**27**
Development-Face Area	5
Horizontal Entry	3
Inclined Entry	3
LongWall-Development Area	7
LongWall-Face Area	2
LongWall-Pack Wall Area	3
Other	2
Surface Facilities	2
NONE	**1**
Horizontal Entry	1
Surface Facilities	0
Grand Total	**79**

Table III. 7. Pivot Table of Leg Injuries, Accident Type, and Accident Location.

Row Labels	Sum of 37.LEG
02.1 Fall of person while walking/traveling from heights	**13**
Development-Face Area	0
Horizontal Entry	1
Inclined Entry	6
LongWall-Development Area	1
LongWall-Pack Wall Area	0
Other	1
Surface Facilities	4
01 Transport-related inc.	**2**
Horizontal Entry	2
Inclined Entry	0
LongWall-Development Area	0
02 Fall of person inc.	**5**
Development-Face Area	0
Horizontal Entry	1
Inclined Entry	1
LongWall-Development Area	0
Other	2
Surface Facilities	1
Vertical shaft or slope	0
02.2 Fall of person into well, shaft, vessel, sump, hole, etc.	**2**
Horizontal Entry	0
LongWall-Development Area	1
LongWall-Pack Wall Area	1
Surface Facilities	0
03 Falling,caving/collapse of objects, materials,rocks,ground, etc.	**1**
Development-Face Area	0
Horizontal Entry	1
Inclined Entry	0
LongWall-Development Area	0
LongWall-Face Area	0
Other	0
Surface Facilities	0
03.1 Caving, collapse of structures, installations or their parts	**1**
Horizontal Entry	1
Inclined Entry	0
LongWall-Face Area	0
Other	0
Surface Facilities	0
03.2 Caving and falling of rock, ground and the like	**13**
0	0
Development-Face Area	3
Horizontal Entry	0
Inclined Entry	1
LongWall-Development Area	4
LongWall-Face Area	2
LongWall-Pack Wall Area	2
Other	1
03.3 Gas dynamics phenomenon	**0**
LongWall-Development Area	0
04 Moving, rolling or flying objects inc.	**1**
Horizontal Entry	1
Inclined Entry	0
LongWall-Face Area	0
LongWall-Pack Wall Area	0
Other	0
Surface Facilities	0
04.1 Moving and rolling parts of machinery and mechanisms	**3**
Development-Face Area	0
Horizontal Entry	1
Inclined Entry	0
LongWall-Development Area	0
LongWall-Face Area	1
LongWall-Pack Wall Area	1
Surface Facilities	0
04.2 Objects flying due to explosion/breakdown of equipment,vessel pressure/negative pressure	**0**
LongWall-Face Area	0
06 Exposure to high temperature (except fire)	**0**
LongWall-Development Area	0
07 Harmful & toxic substances	**0**
Other	0
Surface Facilities	0
09 Work load	**1**
LongWall-Face Area	1
14 Homicide or injury caused by other person	**0**
Horizontal Entry	0
17 Explosion	**0**
Horizontal Entry	0
18 Other	**6**
Development-Face Area	0
Horizontal Entry	2
Inclined Entry	2
LongWall-Development Area	0
LongWall-Face Area	1
LongWall-Pack Wall Area	0
Other	1
Surface Facilities	0
NONE	**0**
Horizontal Entry	0
Surface Facilities	0
Grand Total	**48**

ANNEX IV – SAFETY EQUIPMENT AND DATABASE QUESTIONNAIRES

UKRAINE COAL MINE SAFETY PROJECT SAFETY EQUIPMENT QUESTIONNAIRE	
General Information	
Date	
Name of Person Interviewed	
Mine or Organization	
Title or Occupation	
Years of Experience	
Boots	
Frequency of use/ acceptance by workforce	
Complaints or problems associated with use	
Observed improvements in safety	
Suggestions for improvement or alternative equipment	
Will mine replace equipment when worn out	
Safety Glasses	
Frequency of use/ acceptance by workforce	
Complaints or problems associated with use	
Observed improvements in safety	
Suggestions for improvement or alternative equipment	
Will mine replace equipment when worn out	

Knee Pads	
Frequency of use/ acceptance by workforce	
Complaints or problems associated with use	
Observed improvements in safety	
Suggestions for improvement or alternative equipment	
Will mine replace equipment when worn out	
Belts	
Frequency of use/ acceptance by workforce	
Complaints or problems associated with use	
Observed improvements in safety	
Suggestions for improvement or alternative equipment	
Will mine replace equipment when worn out	
Gloves	
Frequency of use/ acceptance by workforce	
Complaints or problems associated with use	
Observed improvements in safety	
Suggestions for improvement or alternative equipment	
Will mine replace equipment when worn out	

Come-alongs	
Frequency of use/ acceptance by workforce	
Complaints or problems associated with use	
Observed improvements in safety	
Suggestions for improvement or alternative equipment	
Will mine replace equipment when worn out	
Rate the safety equipment from 1 (most effective) to 6 (least effective) in reducing personal injuries	
	Boots
	Safety Glasses
	Knee Pads
	Belts
	Gloves
	Come-alongs
Additional Comments	

UKRAINE COAL MINE SAFETY PROJECT ON-LINE INJURY REPORTING SYSTEM QUESTIONNAIRE	
General Information	
Date	
Name of Person Interviewed	
Mine or Organization	
Title of Occupation	
Years of Experience	
Database Information	
How many mines are participating?	
How many inspectors trained to input data?	
How is the input process working? Any problems?	
Number of entries in the database?	

Who is analyzing the data?	
What types of reports are they using?	
Which reports are the most useful?	
Have any safety programs or work practice changes been implemented as a result?	

ANNEX V – EVALUATION DETAILS

Safety Equipment

Interview #1 – Donetsk Coal Company, Donetsk

This interview was conducted on July 9, 2012 in the office of Donetsk Coal Company and included three experts from the corporate Mine Safety Section and representatives from the Skochinsky Mine and the Yuzhno-Donbasskaya #3 Mine. From the Skochinsky Mine the Chief Engineer, Deputy Mine Operator on Safety, and four regular miners were present. From the Yuzhno-Donbasskaya #3 Mine the Chief Engineer, Deputy Operator on Mine Safety, and four miners representing the face and development sections were present. The participants had mining experience that ranged from 10 to 32 years. Their comments on each type of safety equipment are summarized below.

Boots: There was significant dissatisfaction with the boots from both a quality and comfort perspective. It was reported that soles separated from the rest of the boot within a few months (3 to 6 months) and the miners complained that the boots were too heavy. It should be noted that these are some of the wettest mines in which the boots were used. They indicated that there was no intention to continue to use this style of boots in the future.

Safety Glasses: The safety glasses were tested but not used on a daily basis throughout the mine. They tended to be used only by face workers where coal cutting was taking place or in entries with high velocity air. Workers complained that the glasses did not provide for adequate ventilation requiring them to be wiped frequently in order to remove condensation. They also said the glasses were easily scratched. There was a consensus that they did help reduce accidents in certain locations in the mine and mine management expressed an intention to continue to use them for people employed in those areas but not throughout the entire mine.

Knee Pads: The knee pads were widely accepted and still in use, mostly by face workers. The only complaint was that the fabric straps were somewhat uncomfortable. Other than that one complaint, there was satisfaction with the knee pads and a commitment by management to replace them as needed in the future.

Belts: Many of the belts that were provided were too large and not used. Those that fit were generally well accepted and still in use. In addition to lack of appropriate sizes, there was some dissatisfaction with the style of belt. There were complaints that the straps on the belt would ride up on their bodies as they worked. They seemed to prefer belts without straps that simply braced the lower back. There was a commitment to continue to use some kind of belts in the future, though not necessarily the type provided in the project.

Gloves: The three types of gloves that were distributed were widely accepted and still in use at the time of the interview. They were deemed to be of better quality than the local gloves that are commonly used. The only problems with the gloves involved their use in wet conditions. While there was a consensus that these gloves were superior to the local gloves, there was no commitment to replace them with similar quality gloves in the future due to cost considerations.

Chain hoists: The chain hoists were readily accepted and very popular with the miners. They described them as very convenient, light-weight, and well designed. Makeshift chain hoists that they used previously were dangerous because they could break suddenly and injure the miners with its flying

parts. There were no complaints about the chain hoists, only request for more. The 3.5 tonne and 5 tonne capacity devices seem to be the optimum sizes.

The consensus opinion on the effectiveness of the various types of equipment are as follows, with 1 being the most effective and 6 being the least effective:

1	Chain hoists
2	Knee Pads
3/4	Safety Glasses
3/4	Gloves
5	Belts
6	Boots

They reported that they had a number of boots that were not being used. They also said that the importance of various types of equipment may vary from mine to mine based on their individual conditions.

Interview #2 – Lugansk Coal Company, Lugansk

Representatives of Lugansk Coal Company were interviewed at the company office on July 10, 2012. Those interviewed included the Deputy General Director on Safety and the Chief Engineer for the company along with the Deputy Mine Operator on Safety, the Manager of Mines Section, and two mine workers from the Luganskaya Mine. They had the following responses to the questions concerning safety equipment.

Boots: All of the boots were utilized. They found the boots to be waterproof and of good quality. Although there were no data to substantiate their claims, they believed the boots reduced foot injuries and reduced sickness because miners were able to keep their feet dry. The only complaint was that the boots were too heavy. They said they would continue to use boots of similar quality, which were available locally.

Safety Glasses: The glasses were also utilized, especially at the longwall face, around drilling and blasting in development sections, in return airways, where metal was being cut, and around pneumatic picks. They reported them to be lightweight, flexible, and well ventilated. They had no problem with fogging, only some initial difficulties in getting accustomed to the glasses. There was a consensus that they reduced eye injuries. All said they would like more and management indicated an intention to replace the glasses as needed.

Knee Pads: The knee pads were used exclusively in the longwall face area. The works wear pants that have a pocket for knee pads. Therefore, they didn't need or like the straps. They would rather have pads without the straps. Although there were no data related to safety improvements, the workers reported that the pads were comfortable. Management expressed a willingness to provide more in the future.

Belts: Many of the belts were too large for the miners; however, those that fit were used. There was dissatisfaction with the construction of the belts. The synthetic lining is uncomfortable and caused the

miners to perspire. Although the miners liked the concept of the belts, they did not like these particular ones. Management indicated that they would provide belts, which are available locally, to development, maintenance, and face workers.

Gloves: Of the three types of gloves provided, the miners liked the ones that had the fingertips cut out best. They referred to these as "professional gloves". They did not like the rubber gloves because they caused their hands to perspire and the gloves that were a combination of rubber and fabric were acceptable but not desired. The miners reported that the professional gloves kept hands warm and safe without sweating. There was a consensus that the number of trips to the medical station for cuts and metal splinters had declined. Management seemed to be committed to continuing to use the professional gloves.

Chain hoists: The mine received one 15 tonne chain hoist and a combination of eight 3 tonne and 5 tonne devices. The largest one was used on the surface to help loading cars but the others were used in the development sections and at the longwall face. Everyone was very pleased with these devises and claimed that there had been a reduction of back injuries. They said that chain hoists were available locally but the quality was inferior to the ones provided. Management indicated that they would probably continue to use the ones made locally due to accessibility.

When asked to rank the effectiveness of the various types of safety equipment, the consensus was as follows:

1	Chain hoists
2	Boots
3	Safety Glasses
4/5	Belts
4/5	Gloves
6	Knee Pads

The interviewees estimated that overall there had been about a 50% reduction in injuries since they started participating in the safety project. They were very appreciative of the equipment.

Interview #3 – Makeevugol, Makeevka

On July 11, 2012 representatives from the Kirova Mine were interviewed at the office of Makeevugol. Participating in the interview were the Chief Engineer, Deputy Mine Operator on Mine Safety, Mine Operator, Acting Technical Director of the company, the General Director of Safety, and four miners. Following are their responses to the questions concerning safety equipment.

Boots: The boots were used mostly in development sections, maintenance, and some remote sections of the mine. They were less useful at the longwall face. While they agreed that the boots were of good quality and provided extra protection for the toes, they were not very popular due to their weight. Management indicated that, because of cost, they would probably return to using lighter-weight boots when these boots had to be replaced.

Safety Glasses: The glasses were used widely and found to be especially useful around pneumatic picks and in high velocity airways. They found them to be convenient and durable. There was a problem with fogging. No one had experienced any eye injuries while wearing the glasses and they were deemed to provide more protection than those that have glass lenses. Management indicated that they intended to continue using this type of glasses.

Knee Pads: The knee pads were most widely used by face workers because they have to work in low coal. There were no problems with the pads and no complaints about the straps. They believed that the pads had resulted in less swelling of the knees. Previously, some plastic pads had been provided to one of the company's mines. Management indicated that they would probably replace the current rubber ones with the plastic ones provided earlier.

Belts: The belts were not widely accepted with usage limited to people who already had back problems. They found the synthetic material to be uncomfortable and there were too many large sizes. They preferred a belt with a more comfortable lining or perhaps softer elastic belts or leather belts. It was noted that some worker provide their own leather belts. Management indicated that it was too costly to provide belts for all workers.

Gloves: All of the gloves are in use but the miners preferred the professional gloves, which have the fingertips cut out. They reported that the gloves are comfortable and they reduced the number of splinters when miners are pulling cable or handling timbers. Although they liked the professional gloves, management seemed to believe they would go back to using the cloth gloves due to cost considerations.

Chain hoists: The chain hoists were used widely but especially for moving longwall equipment. They were reported to be durable and had good capacity. It was believed that the chain hoists had both reduced back strain and raised productivity. Management indicated that they do purchase chain hoists, but they needed more of this quality and capacity.

When asked to rank the effectiveness of the various types of safety equipment the interviewees responded as follows:

1	Knee Pads
2	Chain hoists
3/4	Boots
3/4	Gloves
5	Safety Glasses
6	Belts

The miners and management were appreciative of the equipment and said it came at an ideal time when they were moving the longwall.

Interview #4 – Labor Safety Committee, Kyiv

On July 12, 2012 an interview was conducted at the headquarters of the Labor Safety Committee in Kyiv. Present were the First Deputy Chairman, the Manager of the Coal Safety Division, and a person from the Public Relations Department. The purpose of the interview was to report on the findings from the

earlier interviews regarding safety equipment and assess progress in implementing the personal injury database. It was hoped that the representatives of Labor Safety would have some feedback from their mine inspectors regarding the impact of the personal safety equipment; however, no such feedback was available.

The results of the earlier interviews were discussed and the Labor Safety officials provided some interpretation of the findings. They thought the discrepancy regarding acceptance of the work boots stemmed from the environment in which they were used. It was believed that they were not liked in the mines that had a hot and dry environment but they were widely accepted in the wetter mines. The officials also acknowledged that additional chain hoists are needed to prevent injuries from heavy lifting.

On-line Injury Reporting System

Interview #1 – Donetsk Coal Company, Donetsk (same personnel as for safety equipment evaluation)

They had little knowledge of the personal injury database, but expressed an interest in interacting with the database directly.

Interview #2 – Lugansk Coal Company, Lugansk (same personnel as for safety equipment evaluation)

Management was familiar with the personal injury database. All of their mines are part of the system and they are sending accident reports electronically.

Interview #3 – Makeevugol, Makeevka (same personnel as for safety equipment evaluation)

Management was familiar with the personal injury database.

Interview #4 – Labor Safety Committee, Kyiv (same personnel as for safety equipment evaluation)

The First Deputy General indicated that the personal injury database was in use and they were working on plans for full implementation. He told us we would learn more about that when we visited the Safety Institute the next day. He also made some comments concerning the Training Center in Lugansk. They are very pleased with this facility and have had visitors from other countries who are interested in emulating its capabilities.

Interview #5 – Kyiv Safety Institute, Kyiv

The interview at the Safety Institute was conducted on July 13, 2012. The Institute is a research arm of the Labor Safety Committee. Participating in the interview were the Director, the Acting First Deputy Director, the Manager of the Lab on Statistics and Injury Analysis, the Manager of the Coal Safety Division of Labor Safety, and two programmers.

In response to the items listed in the questionnaire, representatives from the Safety Institute indicated that the following numbers of reports had been input since the database was transferred entirely to their control:

14	Skochinsky
27	Uzhno-Donbasskaya #3
8	Luganskaya
18	Kirova
32	Five additional mines.

They explained that data were originally gathered from the same four mines that received the safety equipment. Training had been conducted on March 27, 2012 in Donetsk for the mine personnel and Labor Safety inspectors who would be using the database. Individual passwords were distributed to the mine inspectors and representatives of the mine safety sections. It was reported that there were no problems beyond those expected from the start up of a new system. The mines are required to fill out a hard copy of the report and the inspectors input the data.

With regard to analysis and future use, it was reported that it would take about one year to test the pilot program that includes only those mines listed above. After that testing is complete, they plan to add 40 to 50 more mines with the highest accident rates. The Institute is not currently analyzing data from the database. We were told that while the Institute is responsible for maintaining the database, they are only responsible for analyzing the data from the required H-1 form. The responsibility for analyzing the data housed in the database lies somewhere else within Labor Safety and there were no immediate plans communicated to generate reports from the database or use such reports to implement safety programs. It was apparent from this interview that there is a disconnect between the Safety Institute and its parent organization, the Labor Safety Committee. Although the personal injury database has been assigned to the Safety Institute, there does not appear to be any intentions within the Institute to fully implement the database and to utilize it to its fullest potential.