

Assessing the Safety Culture of Coal Mining
OMB No. 0920-0835

Request for Office of Management and Budget Review and
Approval for Revision of Federally Sponsored Data Collection

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A. Justification

1. Circumstances Making the Collection of Information Necessary

Background

This Information Collection Request (ICR) is a revision request. This collection request describes a project entitled “Assessing the Safety Culture of Coal Mining” (0920-0835 Expiration 12/31/2012). The revisions being requested include 1) a three-year extension of the original period of performance for the project, and 2) an increase in participants from six coal mines to up to nine coal mines. This study is being conducted by the National Institute for Occupational Safety and Health (NIOSH). NIOSH, under P.L. 91-173 as amended by PL 95 -164 (Federal Mine Safety and Health Act of 1977) (See Attachment A), has the responsibility to conduct research to improve working conditions and to prevent accidents and occupational diseases in coal mining.

This research would relate to occupational safety and health problems in the coal mining industry. In recent years, coal mining safety has attained national attention due to highly publicized disasters. The mining industry faces many work place hazards which are a threat to human health and safety. The Bureau of Labor Statistics has found that employees in coal mining are more likely to be killed or sustain an injury or illness than workers in private industry. These injuries are also likely to be more severe [Bureau of Labor Statistics 2007]. Despite these threats to worker safety and health, the U.S. relies on the mining of coal to meet its electricity needs as more than 51% of electricity in the U.S. is generated through burning coal [United Mine Workers of America n.d.]. Furthermore, the production of coal continues to increase and reach record levels each year [Energy Information Administration 2006; National Mining Association 2007]. For this reason, the coal mining industry must continue to find ways to protect its workers while maintaining productivity. One way to do so is by improving the safety culture at coal mines. In order to achieve this culture, the operators, employees, inspectorate, etc., must share a fundamental commitment to it as a value. This type of culture is known in other industries as a “safety culture” and can be defined as the characteristics of the work environment, such as the norms, rules, and common understandings that influence facility personnel’s perceptions of the importance that the organization places on safety.

Safety culture can be aptly described using Schein’s [1992] model of organizational culture. According to Schein, organizational culture consists of three levels: artifacts, espoused values, and basic assumptions. Artifacts are “all the phenomena that one sees, hears, and feels when one encounters a new group with an unfamiliar culture” [Schein 1992, p. 17]. For example, artifacts of the safety culture in a coal mine might include personal protective equipment such as hard hats and hearing protection as well as the communication pattern between a continuous miner operator and a shuttle car operator. Espoused values are the strategies, goals, and philosophies of the organization [Schein

1992] and may become known through items such as the company's mission statement, other organizational literature, training for new hires or longtime employees, or even through direct communication from organizational members. In a coal mine, espoused values might be mottos such as "Safety first." The third level is known as basic assumptions. According to Schein, these assumptions are "unconscious, taken-for-granted beliefs, perceptions, thoughts, and feelings" [p. 17] which guide the behavior of group members as well as their expectations for and judgments of others' behavior. This level is the most difficult to detect because often these "core" assumptions are so ingrained that employees do not realize they have them. In a coal mine, these could include assumptions such as "Everyone follows safety regulations," or "You never leave someone behind in the mine." In an organization with these basic assumptions, it would be viewed as crazy or inconceivable that someone would violate a safety regulation or leave a coworker behind. Schein suggests that artifacts and espoused values develop and are sustained based on the underlying basic assumptions. Safety culture can be assessed by examining elements of each of the three levels.

In addition to a theoretical basis for study of safety culture, some knowledge of the history of safety culture is important. Safety culture first came into prominence in the U.S. after the Chernobyl nuclear accident [Cox and Flin 1998] and since that time has been used not only in the nuclear power industry [Wahlstrom 1995] but also across diverse industries including health care [Nieva et al. 2003], offshore oil and gas [Mearns et al. 2008; Tharaldsen et al. 2008], and furniture manufacturing [Brooks 2008]. Safety culture assessments have been used in other industries to diagnose areas for improvement and raise awareness about safety, evaluate safety programs and track change over time, and fulfill regulatory requirements [Nieva et al, 2003].

Despite the prevalence of safety culture research in other areas, safety culture has received limited attention within the coal mining community. This is beginning to change, as a member of Congress, a high-ranking mining official, and the Mine Safety and Training Commission have all highlighted the importance of a positive safety culture in mines. Senator Johnny Isakson was quoted regarding the development of safety culture [Sharpe's Point 2008]; he stated that contributing to a safety culture "is the best thing we could possibly do" in efforts to improve safety. In his testimony at a House Committee on Education and Labor oversight hearing, Bruce Watzman, the Vice President of Safety, Health, and Human Resources for the National Mining Association, focused on safety culture as one of three main points in discussing mine safety. He indicated that, "... perhaps the most important element in improving safety is the relentless focus on 'safety culture.'...In those companies with outstanding safety performance safety is emphasized at every shift at the mines and is an integral part of the business model" [House of Representatives 2007, p. 3]. The Mine Safety Technology and Training Commission released recommendations for risk management including developing a culture that supports safe production at the business core [Mine Safety Technology and Training Commission 2006]. Further, an initial foray into assessing the safety culture of a coal mine was conducted by Human Performance Analysis Corporation [2007]. This is the first study of its kind. Although this study only examined one underground coal mine it

does offer promising results in this area and demonstrated that assessing the safety culture of a coal mine is feasible.

Other industries have found the study of safety culture to be a worthwhile pursuit as it has been found to be a predictor of safety behavior at later dates [Pousette et al. 2008; Pronovost et al. 2003]. In coal mining, the development and maintenance of a positive safety culture presents unique challenges. This is because in coal mining, as well as in other industries, a focus on safety often competes with a focus on productivity [Zohar 2008], and coal mining presents safety challenges while also stressing productivity and efficiency with around the clock shifts in attempts to keep up with the demand for coal. Despite these challenges, safety culture is a concept that should be pursued because a safety culture assessment will likely reveal strengths and weaknesses of existing safety culture. These findings can be used to create a template for a positive safety culture in coal mines.

By conducting a safety culture assessment at a sampling of coal mines, an idea of the characteristics of the existing safety culture at coal mines can be gained. A safety culture assessment will lead to extensive findings about the strengths and weaknesses of the existing culture. These characteristics can be used to develop and maintain a positive safety culture in mining organizations which may contribute to improved safety behaviors and thus the reduction of injuries and fatalities. Because this data has never been collected in the coal mining industry prior to this project, the data collection will provide a great service to the industry by preventing injuries and fatalities.

As of May 1, 2012 safety culture assessments have been conducted at five coal mines. Because those assessments resulted in the collection of very valuable information a request is being made to revise the approved project entitled “Assessing the Safety Culture of Coal Mining” (0920-0835 Expiration 12/31/2012). The revisions being requested include 1) a three-year extension of the original period of performance for the project, and 2) an increase in participants from six coal mines to up to nine coal mines. The additional information that will be gathered during these additional years of performance and from up to three additional mines will provide an even greater service to the industry by contributing to the understanding of safety culture characteristics which may contribute to improved safety behaviors and thus the reduction of injuries and fatalities.

Privacy Impact Assessment

Overview of the Data Collection System

Data will be collected in three fashions:

Survey: A paper and pencil based survey of adult employees will be conducted. The survey takes 20 minutes to complete. As of May 1, 2012, 1,356 participants have completed the survey. Approximately 1,144 additional survey participants are expected.

Interview: An interview with a paper and pencil Behavioral Anchored Rating Scale will be conducted. The interview with Behavioral Anchored Rating Scales takes 60 minutes to complete. As of May 1, 2012, 274 participants have completed interviews with a paper and pencil Behavioral Anchored Rating Scale. Approximately 201 additional participants will complete this portion.

Observation: Participant involvement in the Behavioral Observations will be determined once the study team travels to the individual sites and determines the types of work activities that might be appropriate for observation. The observations will focus on the work activities being performed and not the individuals performing the work. Therefore, the number of participants involved in the work activities will not be tracked or recorded. All observations will be conducted by the researchers and recorded using paper and pencil.

CDC/NIOSH will employ a contractor to conduct all safety culture assessments during the period of time beginning no sooner than October, 1 2012 and ending no later than December 31, 2015.

Items of Information to be Collected

Survey: The exact information to be collected in the survey can be found in Attachment C5. Information on the following will be collected:

- Organizational Culture
- Coordination of Work
- Work Group Cohesion
- Communications
- Attention to Safety
- Commitment
- Hazardous Nature of Work
- Environment, Safety, and Health Issues.

Demographic Information: The last five questions administered as part of the survey (mentioned above) will be demographic items. The five demographic items will differ for each mine, but the options for the exact items that could be asked can be found in Attachment C6. Information on the following will be collected:

- Years of experience working in the mining industry
- Years of experience working at the current mine
- Job at the mine
- Education level
- Hourly or salaried employee
- First generation miner status
- Labor union affiliation

Interview: The exact information to be collected in the interviews can be found in Attachment C2. Information on the following will be collected:

- Attention to Safety
- Coordination of Work
- Decision Making
- External Communication
- Formalization
- Goal Setting/Prioritization
- Interdepartmental Communication
- Organizational Culture
- Organizational Knowledge
- Organizational Learning
- Performance Evaluation
- Performance Quality
- Personnel Selection
- Problem Identification and Resolution
- Resource Allocation
- Roles and Responsibilities
- Time Urgency
- Training

Observation: The exact information to be collected in the observations can be found in Attachment C4. Information on the following will be collected:

- Daily production meetings
- Shift turnover meetings
- Preventive maintenance activities
- Training sessions.

No information that directly identifies participants will be gathered in the data collection.

Identification of Website(s) and Website Content Directed at Children Under 13 years of Age

There will be no web-based data collection. Because there is no website, there will be no website content directed at children under 13 years of age.

2. Purpose and Use of Information Collection

The data collected during this project will be analyzed by NIOSH researchers and then used to formulate recommendations on how to create a positive safety culture in coal mining. It is hoped that these recommendations will be used by mine operators, employees, and safety professionals to improve the health and safety of miners.

This data collection is the first of its kind and without it the safety and health of coal miners may not improve or become worse. Since mining can be a hazardous occupation, this is extremely important. By collecting this data, NIOSH will be able to provide specific recommendations to coal mines on how to avoid negative safety and health behaviors and promote positive safety and health behaviors. It is hoped that this data collection will save lives and reduce injuries. This project and data collection has already been fully funded.

Privacy Impact Assessment Information

i. Why the information is being collected

As noted above, this information is being collected to improve the health and safety of coal miners by providing a list of recommendations to create a positive safety culture in coal mining. This data is not available from any other source. This data is essential to creating recommendations to create a positive safety culture. Positive safety cultures have been associated with improved safety and health in other areas of study.

ii. Intended use of the information

The data gathered in this research will be used by NIOSH staff to create these recommendations. Only NIOSH researchers will have access to the data. Recommendations based on the data will be shared with the public but all identifying information will be removed when the data is shared with the public.

The data that is being collected may be considered sensitive. In order to protect the privacy of respondents, all identifying information will be removed from the data. Further more stringent safeguards will be put into place to ensure that this data is not shared with anyone other than the researchers and that all respondents' responses are confidential.

3. Use of Improved Information Technology and Burden Reduction

This data collection does not involve the use of automated, electronic, mechanical or other technological collection techniques or other forms of information technology. Therefore, 0% of the responses will involve information technology. Electronic data collection procedures are not being used as they are not feasible with this population. In order to reduce burden to the miners, data collection will occur at the job site which is an underground mine. There are no computers available at these locations to employ to collect data. Further, it would be simpler for the miners to fill out a paper and pencil survey as opposed to an online survey as they tend to have limited computer experience and knowledge.

In order to reduce burden to the respondents, not all respondents will be interviewed or complete the behavioral anchored rating system. This will reduce the total burden hour. Further, the researchers will engage in observation which will be minimal, if any, burden to the participants.

4. Efforts to Identify Duplication and Use of Similar Information

A thorough literature review was conducted to identify any similar information. This literature search involved the following databases: Pub Med, Google Scholar, J-Stor, and ISI Web of Knowledge. Further, the researchers have attended conferences and meetings with stakeholders to determine that this information has not yet been collected in the mining industry. Also, the primary investigator contacted the Cincinnati office of NIOSH which has conducted numerous studies on safety culture and climate to ensure that they were also not aware of any studies assessing the safety culture of underground mining. After conducting this extensive search, the researchers concluded that numerous studies have been published and conducted about safety culture and climate in many industries. There are, however, no known studies on safety culture in underground mining.

5. Impact on Small Businesses or Other Small Entities

The burden to small mines will be somewhat lower because the number of persons we will interview and administer questionnaires to will be lower compared to those at the larger mines. It is vital that we include small mines in our sample. Over 95% of all underground coal mines employ fewer than 500 people. So if we excluded small mines from our sample, our results would not be representative of most coal mines. They would be based on a very small portion of the coal industry that is apt to differ from the majority of mining operations in various respects that could have an important influence on safety culture. The questions we will ask have been held to the absolute minimum required for the intended use of the data. All questions have been used in prior studies, and found to be reliable and valid measures of safety culture. It is critical that the same number of questions be asked at each of the mines in the sample. Otherwise, it will be impossible to make valid comparisons and to formulate appropriate conclusions and recommendations.

6. Consequences of Collecting the Information Less Frequently

The data collection for the study will be one time only. If NIOSH does not conduct this study, significantly fewer US coal mining companies will be interested in conducting safety culture assessments. Further, recommendations about how to improve safety and health that will stem from this research will not be released to the coal mines. This would be very unfortunate because safety culture assessments appear to hold much promise as a

tool for reducing occupational injuries and fatalities among workers in hazardous industries. To our knowledge there are no legal obstacles to reduce the burden.

7. Special Circumstances Relating to the Guidelines of 5 CFR 1320.5

This request fully complies with the regulation 5 CFR 1320.5.

8. Comments in Response to the Federal Register Notice and Efforts to Consult Outside of the Agency

A. A 60-day Federal Register notice was published in the *Federal Register* on Wednesday July 18, 2012, vol. 77, No 138, pp. 42314-43216. (See Attachment B1). Comments were received in response to this notice and all comments were responded to (See Attachment B2).

B. Researchers at NIOSH's Cincinnati office were consulted about this project to obtain relevant literature on this topic including data collection instruments and procedures. Also, this project involves the assistance of an outside contractor. A Simplified Acquisition Procedure was used to select an outside contractor with previous experience assessing the safety culture of different organizations. This contractor has provided consultation on the availability of data, frequency of collection, the clarity of instruction and record keeping, disclosure, or reporting format, and on the data elements to be recorded and disclosed.

Consultation:

- 2008 – 2009
- Human Performance Analysis (HPA) Corporation
- Sonja Haber, Ph.D, President
- Deborah Shurberg, Ph.D., Researcher/Consultant
- There were no problems that could not be resolved during consultation.

Consultation:

- 2009
- Work Organization and Stress Research Team , National Institute for Occupational Safety & Health
- Ted Scharf, Ph.D.
- Research Psychologist
- There were no problems that could not be resolved during consultation.

The project proposal was also peer reviewed by three blind peer reviewers. All problems that the reviewers raised were solved.

9. Explanation of Any Payment or Gift to Respondents

Respondents will not receive any form of payment or gifts.

10. Assurance of Confidentiality Provided to Respondents

Respondents will not provide any form of identifying information (e.g., name or SSN), therefore no IIF will be included in the data records. All participants will be assigned a number which will not be linked with a name or other identifying information. For the functional analysis, behavioral observations, surveys, and structured interviews, no IIF will be collected. All information provided by respondents will be maintained by CDC/NIOSH researchers in a secure manner unless compelled otherwise by law. The data files will be analyzed in the aggregate and no individual respondents will be identified.

This data collection is has been reviewed and approved by the NIOSH Human Subjects Review Board (HSRB). Please see attachment E for a copy of the approval letter.

Privacy Impact Assessment Information

10-A. The privacy act does not apply to this submission as no information in identifying format will be collected.

10-B. In terms of physical controls paper and pen surveys will be stored in a locked file cabinet at NIOSH (PRL) Pittsburgh Research Laboratory. Notes from the interviews and observations will also be stored in the locked file cabinet. This is a secure, gated facility with 24 hour guard service. Only personnel with identification badges are allowed access to the site. The contractors will have access to only part of the data collection and will not have any data that can be linked to identifying information. All of the data will be entered and combined into data files that will be stored with technical safeguards in a secure, password protected location on NIOSH PRL’s computer network. This computer network is only accessible to NIOSH employees. All networks at NIOSH are firewall protected and utilize a virtual private network. Access to this information will be restricted to researchers directly involved with the study and who need to view the data. A training session will be conducted for all researchers about the data collection and how the data will be stored. At this training session, all researchers will be made aware of their responsibilities for protecting information being collected and maintained. At the end of the data collection, the paper and pen surveys and notes from interviews and observations will be destroyed.

| |
|-------------------------------|
| Technical Controls |
| Passwords |
| Firewall |
| Virtual Private Network (VPN) |

| Physical Controls |
|--------------------------|
| Guards |
| Identification Badges |
| Locks |

| Administrative Controls |
|--------------------------------|
| Training Session |
| Least privilege |
| Limited contractor access |

10-C. Study researchers will read **Survey** respondents a waiver of documented informed consent (see Attachment D) before the survey is administered. In the consent script, respondents are advised that:

- Participation is voluntary
- The survey is anonymous
- Data will be reported by CDC/NIOSH in aggregate form only
- Any and all questions may be skipped
- Respondents have the right to discontinue participation without penalty
- Information collected will be kept private

Completion of the survey is regarded as consent to these procedures.

Interview respondents are also read a waiver of signed informed consent (see Attachment D). The consent form describes the study, the conditions of the study, and the use of information collected from the study. Respondents who agree to participate in the interview state, “I agree to participate in this study.” Respondents who decline to participate in the interview state, “I decline.” The study researcher who reads the consent document signs it to certify that they have accurately described the study to the respondent.

10-D. Survey respondents are advised in the waiver of documented informed consent that their participation is voluntary (see Attachment D).

Interview respondents are advised in the waiver of signed informed consent that their participation is voluntary (see Attachment D).

As noted above, no IIF collected will be present in the data transmitted to CDC/NIOSH.

11. Justification for Sensitive Questions

Respondents will not be asked any questions of a sensitive nature.

12. Estimates of Annualized Burden Hours

The respondents targeted for this study include mine employees: rank-and-file miners and management employees. A sample of 1,345 mine employees will be collected from selected mines which have agreed to participate. The amount of time to participate will range from 20 to 80 minutes depending on the data collection activity. Data collection will include a survey which will require 20 minutes to participate (1,144 participants) and an interview which will require 60 minutes to participate (201 participants). All of the selected participants will complete the survey. A selection of participants completing the survey will also complete the interview, but not all participants will complete both.

The following table provides an estimate of the annualized burden hours by data collection type. The estimates are based on the contractor's previous experience conducting the same data collection with numerous other companies.

| Type of Respondent | Form Name | No. of Respondents | No. Responses per Respondent | Average Burden per Response (in hours) | Total Burden Hours |
|--------------------|-----------|--------------------|------------------------------|--|--------------------|
| Mine Employee | Survey | 1,144 | 1 | 20/60 | 381 |
| Mine Employee | Interview | 201 | 1 | 60/60 | 201 |
| Total | | 1,345 | | | 582 |

12. B. Estimated Annualized Respondent Costs

The estimated total cost for this information collection is \$16,083.13.

| Type of Respondent | Total Burden Hours | Hourly Wage Rate | Total Respondent Costs |
|--------------------|--------------------|------------------|------------------------|
| Mine Employee | 381 | \$27.62 | \$10,523 |
| Mine Employee | 201 | \$27.62 | \$5,552 |
| Total | 582 | \$27.62 | \$16,075 |

The value assigned for the hourly wage rate is based on the average U.S. hourly wage rate for coal miners available in the following report: Bureau of Labor Statistics, U.S. Department of Labor, *Industries at a Glance, Mining*, on the Internet at <http://www.bls.gov/iag/tgs/iag212.htm> (visited May 8, 2012).

13. Estimates of Other Total Annual Cost Burden to Respondents or Record Keepers

None

14. Annualized Cost to the Federal Government

The estimated annual cost to the Federal Government is \$465,018.00. CDC/NIOSH will contract with a company specializing in safety culture assessments to conduct up to four assessments during the period of time beginning no sooner than October, 1 2012 and ending no later than December 31, 2015. This includes survey and interview administration, data analysis, and report writing. A CDC/NIOSH employee will monitor the project and may participate in safety culture assessments when scheduling permits. The hours designated for contractual and government staff were calculated as shown in the table below.

| | Hours | Hourly Rate | Cost at Hourly Rate | Other costs (data collection, etc.) | Total |
|-------------------------|-------|-------------|---------------------|-------------------------------------|--------------|
| Contractor | 2424 | \$145.45 | \$352,595.00 | \$46,896.00 | \$399,491.00 |
| Federal Project Monitor | 1125 | \$30.00 | \$33,750.00 | \$31,777.00 | \$65,527.00 |

15. Explanation for Program Changes or Adjustments

This is a revision to a current project, entitled “Assessing the Safety Culture of Coal Mining” (0920-0835 Expiration 12/31/2012). The revisions being requested include 1) a three-year extension of the original period of performance for the project, and 2) an increase in participants from six coal mines to up to nine coal mines.

A three-year extension is necessary in order to complete the originally planned and approved safety culture assessments at six underground coal mines. As of May 1, 2012, safety culture assessments have been conducted at five underground coal mines. Researchers are making every effort to schedule the sixth assessment prior to the expiration of the current project’s OMB approved period of performance, but that may not be possible and is dependent upon cooperation from the mining industry.

A request to increase the OMB approved number of participants from six underground coal mines to nine underground coal mines is being made because of the quality and value of the information that has been gleaned from the five safety culture assessments that have already been conducted. Management at the NIOSH Office of Mine Safety and Health Research determined that conducting three additional assessments would not only increase the strength of the project, but would provide added benefit to the underground coal mining industry. The additional information that will be gathered from the three additional mines will provide benefit to the industry by increasing the understanding of safety culture characteristics which may contribute to improved safety behaviors and thus the reduction of injuries and fatalities.

16. Plans for Tabulation and Publication and Project Time Schedule

Data analyses will be conducted for each data collection method, i.e., Structured Interviews, Behavioral Anchored Rating Scales, Behavioral Checklists, and Survey Data, using both qualitative and quantitative analyses, as appropriate. For the structured interviews, only qualitative analysis of the results will be conducted with interview comments being organized and summarized by relevant organizational behaviors. For the Behavioral Anchored Rating Scales and Behavioral Checklists, a tabulation of response frequencies in terms of the percentage of respondents, will be conducted and depicted in chart and tabular formats. Finally, for the Organizational Culture Survey, overall mean scores will be computed for the organization on each of the survey scales. In addition, mean scores for each of the survey scales will be computed by groups as specified on the demographic sheet (e.g., salary/hourly). Analyses of Variance (ANOVAs) of responses by relevant response categories or variables will be conducted. These tests will be conducted to assess respondent differences on each of the survey scales based on the variables included in the demographic sheet. To control for potential false positive results, a Bonferroni correction will be applied to adjust the significance level appropriately. This will ensure that a very conservative approach is taken in the interpretation of the data analyses performed.

Approximately three years are needed for data collection. This will allow the researchers to visit and collect data from four different mine sites and analyze this data. Following all of the data collection, researchers will need an additional eight months to create a final report for publication. The project schedule is presented below.

Project Schedule:

| A 16.-1 Project Time Schedule | |
|--------------------------------------|---------------------------------|
| Activity | Time Schedule |
| Field Work Mine One | 1-4 months after OMB approval |
| Analysis | 5-7 months after OMB approval |
| Field Work Mine Two | 8-11 months after OMB approval |
| Analysis | 12-14 months after OMB approval |
| Field Work Mine Three | 15-18 months after OMB approval |
| Analysis | 19-21 months after OMB approval |
| Field Work Mine Four | 22-25 months after OMB approval |
| Analysis | 26-28 months after OMB approval |
| Publication | 29-36 months after OMB approval |

17. Reason(s) Display of OMB Expiration Date is Inappropriate

Not applicable. The OMB expiration date will be displayed.

18. Exceptions to Certification for Paperwork Reduction Act Submissions

None.