A Guide to Safety Culture Evaluation

Generated by the Integrated Safety Management Working Group

Energy Facility Contractors Group

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Approval: A Guide to Safety Culture Evaluation is approved by Energy Facility Contractors Group (EFCOG) and recommended for use by all member contractors.

ACRONYMS AND ABBREVIATIONS

ANOVA   analysis of variance

DOE   U.S. Department of Energy

EFCOG   Energy Facility Contractors Group

HIRD   harassment, intimidation, retaliation, and discrimination

ISM   Integrated Safety Management

ISMS   Integrated Safety Management System

LOI   lines of inquiry

NEI   Nuclear Energy Institute

PI   principle investigator

POC   point of contact

R2A2   roles, responsibilities, accountabilities, and authorities

SCWE   safety conscious work environment

SME   subject matter expert

VPP   Voluntary Protection Program

WBS   Work Breakdown Structure

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1.0   INTRODUCTION

1.1   Background

In 2013, the U.S. Department of Energy (DOE) and DOE contractors at Defense Nuclear facilities performed self-evaluations to evaluate the status of Safety Conscious Work Environment (SCWE) as part of the actions associated with the DOE Implementation Plan for the Defense Nuclear Facilities Safety Board Recommendation 2011-1. SCWE is an important subset of safety culture that emphasizes the willingness of employees to raise safety concerns without fear of retaliation. The concepts of SCWE, safety culture, and organizational culture are highly interdependent. Most literature supports the notion that safety culture is not a separate function, but rather an integrated part of organizational culture. Figure 1 provides an illustration of the relationships between SCWE, safety culture, and organizational culture.

Elements of Culture

Organizational Culture
- A set of commonly shared beliefs, expectations, and values that influence and guide the thinking and behavior of organization members, and are reflected in how work is carried out.

Safety Culture
- Safety culture is an organization's values and behaviors modeled by its leaders and internalized by its members, which serve to make safe performance of work the overriding priority to protect the workers, public, and the environment.

Safety Conscious Work Environment
- A Safety Conscious Work Environment (SCWE) is a work environment in which employees feel free to raise safety concerns to management (and/or regulator) without fear of retaliation.

Figure 1. Comparisons of SCWE, Safety Culture, and Organizational Culture

Apostolakis and Wu (1995) suggested that

> [w]hen the subject is culture, we must question the wisdom of separating safety culture from the culture that exists with respect to normal plant operation and power production. The dependencies between them are much stronger because they are due to common work processes and organizational factors.

The initiation of the SCWE self-assessments was a significant undertaking for DOE led by members of the assessed organizations supplemented with subject matter expert (SME) support and, in several instances, the assistance of behavioral scientists. In February 2014, the DOE Office of Enterprise Assessments issued an independent evaluation of the quality of self-assessments and provided recommendations to improve guidance (DOE 2014). This guidance document (Guide) was undertaken after considering these recommendations as well as input from DOE contractors and because the Energy Facility Contractors Group (EFCOG) realized that all contractor organizations could benefit from

improved rigor and consistency of safety culture evaluations. Specifically the following topics and best practices were addressed within the document to provide a consistent and technically sound foundation for evaluation:

- The scope of the DOE self-evaluation guidance was broadened to include all aspects of safety culture and include best practices in the conduct of project management and self-evaluation.

- The use of common validated survey questions was emphasized.

- Enhanced guidance and tools for data collection were added.

- Data collection methods were appropriately balanced

- The report results and conclusions were revised to more accurately address organizational strengths and weaknesses

- The evaluation scope was clarified to include the organization's first line leaders and senior managers

- Knowledge, skills and abilities for self-evaluation team members were added

- The use of behavioral science experts was clarified

- An emphasis was placed on taking action to improve the safety culture based on the evaluation

This Guide is intended to replace the original EFCOG document, *Assessing Safety Culture in DOE Facilities* (EFCOG 2009) and expands upon DOE EA 2014 guidance. It should be considered a living document that will be improved as more experience and feedback are obtained.

This Guide relies on a safety culture model described in the DOE Integrated Safety Management System Guide (ISMS Guide; DOE 2011). The ISMS Guide defines safety culture as "an organization's values and behaviors modeled by its leaders and internalized by its members, which serve to make safe performance of work the overriding priority to protect the workers, public, and the environment." ISMS Guide Attachment 10, *Safety Focus Areas and Associated Attributes*, was issued in September 2011 and describes safety culture focus areas based on a joint DOE-EFCOG initiative that began in 2007 and included commercial nuclear industry experience and research over several decades. The characteristics for each safety culture attribute were developed to promote a cultural maturity shift from compliance to continuous improvement in safety and production performance. The three focus areas and their attributes are the foundation upon which this Guide was developed. The focus on safety culture does not exclude organizational culture, but rather provides DOE contractors with methods to assess organizational culture within the context of safety.

Below are the three focus areas and high-level summaries of each attribute, with more detail in Appendix A.

Leadership

- Demonstrated safety leadership
- Risk-informed, conservative decision-making
- Management engagement and time in field
- Staff recruitment, selection, retention, and development
- Open communication and fostering an environment free from retribution
- Clear expectations and accountability

Employee/Worker Engagement

- Personal commitment to everyone's safety
- Teamwork and mutual respect
- Participation in work planning and improvement
- Mindful of hazards and controls

Organizational Learning

- Credibility, trust, and reporting errors and problems
- Effective resolution of reported problems
- Performance monitoring through multiple means
- Use of operational experience
- Questioning attitude.

The theoretical basis for the material in this Guide was derived from the thoughts and teachings of Dr. Edgar Schein, noted author, lecturer, consultant, and Professor Emeritus from the Sloan School of Management at the Massachusetts Institute of Technology. Dr. Schein sought to help people be less puzzled, irritated, and anxious when they encountered the unfamiliar and seemingly irrational behavior of people in organizations and have a deeper understanding not only why various groups of people or organizations can be so different but also why it is so hard to change them (Schein 2010). He described methods for cultural analysis to help perceive and decipher the cultural forces that operate in groups, organizations, and occupations. Fundamental to Schein's theory are the three levels of culture:

Artifacts – The visible products of the group such as the architecture of its physical environment; its language; its technology and products; its artistic creations; its style as embodied by clothing, manners of address, and emotional display; its myths and stories told about the organization; its published lists of values; and its observable rituals and ceremonies.

Espoused Beliefs and Values – Solutions that the group proposes when it faces a new task, issue, or problem. When the group observes that a proposed solution was successful, it is considered valid. Those beliefs and values that can be empirically tested and continue to work reliably in solving the group's problems will become transformed into assumptions.

Basic Underlying Assumptions – Consensus beliefs and values resulting from repeated success and so taken for granted that there is little variation within the group. In fact, basic assumptions may be so strongly held in a group that members will find behavior based on any other premise inconceivable.

To understand a group's culture, one must attempt to identify their shared basic assumptions and understand the learning process by which such basic assumptions evolve (Schein 2010). When conducting a safety culture evaluation, management's espoused values and beliefs (policies/programs/procedures collectively called "work-as-planned") are compared with worker implementation of management systems (artifacts and behaviors collectively called "work-as-done") to identify the organization's underlying assumptions. When there is misalignment or gaps between work-as-planned and work-as-done, there may be cultural forces at play. This concept is illustrated in Figure 2.

Figure 2. Schein's Three Levels of Culture as Basis for Safety Culture Evaluation

A well-executed safety culture evaluation can help identify misalignment and provide insight and understanding as to why the gap exists. For example, management may espouse the value of "safety first" and create slogans and banners (i.e., artifacts) to promote that value within the workplace. The workforce may accept management's value statement and exhibit behaviors consistent with "safety first" during routine operations. However, if under the stress of production deadlines management allows shortcuts that increase the risk of injury or illness to the workforce to meet schedules, it creates misalignment. Work as performed (i.e., behaviors) is then inconsistent with work planned (i.e., the espoused value of safety first). If that phenomenon occurs repeatedly without intervention, it becomes a basic underlying assumption in the organization that it is acceptable to compromise the safety first value to meet production schedules.

1.2   Purpose

The purpose of this Guide is to promote a common understanding of valid, reliable methods for conducting safety culture evaluations. It describes how to plan and conduct the evaluation in sufficient detail so that the evaluation will provide accurate insights that will help the organization build on cultural strengths and resolve cultural misalignment, should they exist. This Guide is designed to help organizations obtain meaningful information about their work environment and the effectiveness of their safety management systems through accurate evaluations of their safety culture. A key component on a healthy safety culture within each organization and across the DOE enterprise is the willingness to improve the work environment if the results of the safety culture evaluation are found wanting.

1.3   Scope

The scope of this Guide includes planning, data collection, data analysis, reporting, and continuous improvement as they relate to safety culture evaluations conducted by DOE contractors (Figure 3). The methods described may need to be adjusted if one seeks to apply them for evaluation of other types of organizations or industries. This Guide is not intended to provide a system for comparing safety culture between different DOE contractor organizations. However, contractors who manage multiple sites may gain insight into common areas of strength or weakness that enables tailoring management systems and fostering improvement.
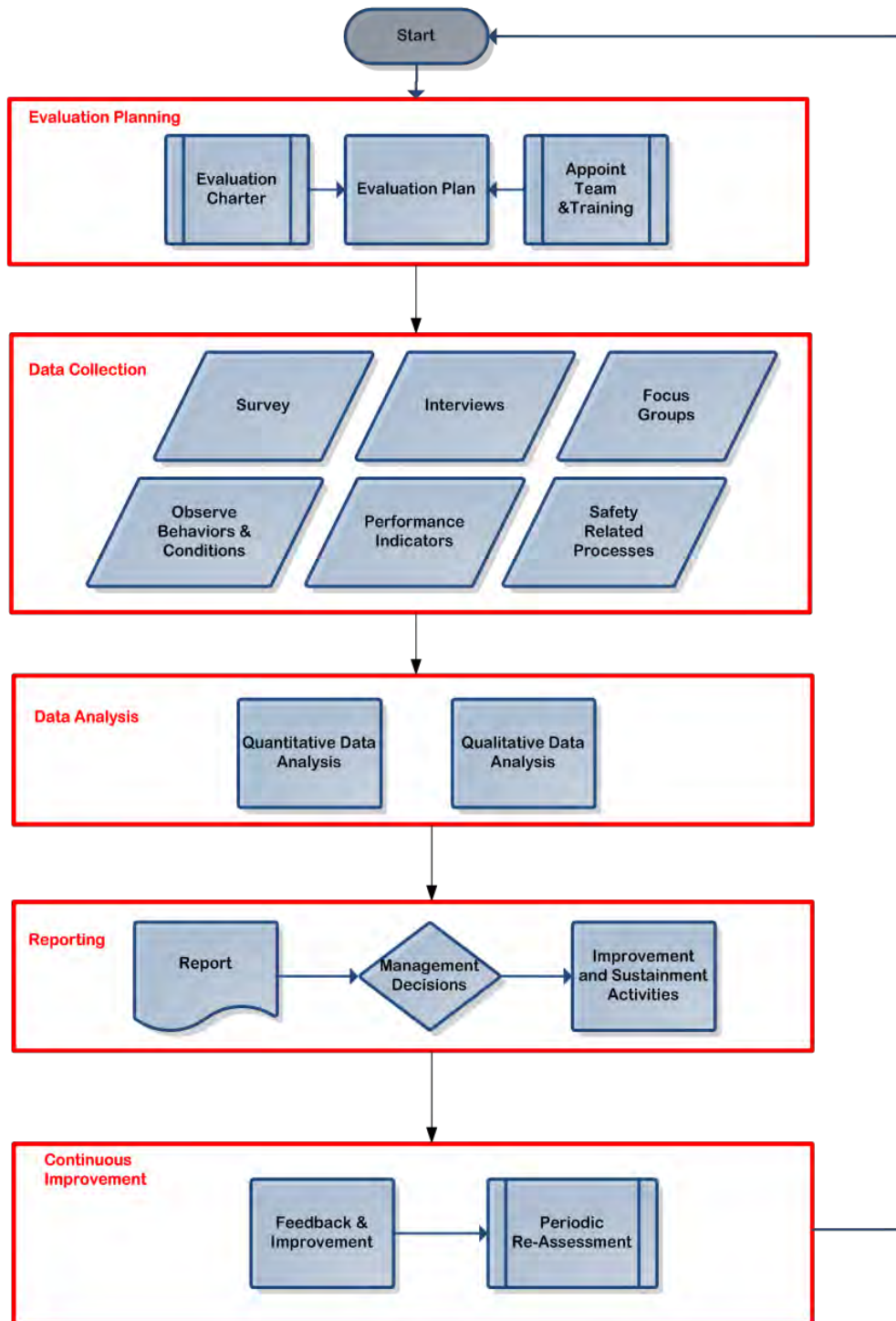
Figure 3. Safety Culture Evaluation Flow Diagram

This document promotes the most efficient use of contractor resources. Because DOE contractor organizations range in size, geography, and mission, it is important that a graded approach be applied when using this Guide. Resources to aid in conducting an evaluation including forms, reference documents, and templates are included in the appendices of this Guide and will be added to the ISM EFCOG website at www.efcog.org (EFCOG 2015).

2.0 EVALUATION PLANNING

Planning is the most important part of the evaluation process, as there are many factors that must be considered and decisions made in the early stages of the evaluation. Time to develop a comprehensive, thoughtful evaluation plan is critical to success. Obtaining initial support via an evaluation charter, along with consideration of methods, lines of inquiry, interviewees, documentation to review, etc. will enable a successful evaluation and high quality report. If organizations fall short of the Guide's intended purpose and processes, inconsistent and haphazard results can be expected. To ensure the rigor of the safety culture evaluation:

> If senior management is reluctant to champion (not merely sponsor) the safety culture evaluation, reconsider the value of the evaluation to that organization.

- Senior leadership:

    − Should have a mature understanding of the concept and meaning of safety culture that includes impacts (positive and negative) on the ability of the organization to reliably achieve mission success.

    − Must champion the safety culture evaluation, ensure the validity of the process, and maintain the integrity of the process to obtain results that are useful to the organization. Must provide required resources, communicate the results to the organization, and commit to improving the work environment if the culture is found wanting (Figure 2). At the same time, senior leadership should limit involvement in the actual evaluation so as not to influence results unduly.

- Evaluation team members should have experience conducting safety culture evaluation (refer to "The Evaluation Team" section). To obtain the most valuable results, it is strongly recommended that sites have the necessary support prior to embarking on the evaluation.

During planning, serious consideration must be given to how bias will be controlled. There are numerous potential sources of positive and negative bias that can distort the truth and invalidate the evaluation. It can be difficult to manage bias in a self-evaluation and for that reason, an independent, third-party evaluation may be the solution. Appendix B provides a detailed discussion on the types of bias that can influence a safety culture evaluation.

2.1 Organizational Size and Structure Considerations

A specific plan should be tailored according to the size and structure of the organization being evaluated.

2.1.1 Single Versus Multiple Organization Evaluations

Factors such as the type and number of contractors, contract structure, physical facility arrangement, and number of federal organizations at a site can result in a variety of options for performing self-evaluations. An important question to consider in determining whether to perform a single versus multiple organization evaluation is as follows: at what level are the results meaningful to make the necessary improvement actions? If the evaluation is rolled up to such a level (to reduce paperwork) as to make the specific results to the impacted organizations meaningless (i.e., not specific enough to indicate where to focus attention for meaningful change), then the evaluation scope should be re-evaluated.

Consider a site with multiple contractors performing work. The DOE Field Element Manager may choose to assemble a single team to evaluate all organizations on site. The site deliverable would then be a single report documenting the team's results. As another option, the Field Element Manager could also choose to establish one team to evaluate the federal organization and direct each contractor organization to perform its own evaluation. In the second case, the federal organization's final report would contain a summary and analysis of the contractor(s) results, in addition to the results of its own evaluation. A hybrid of these two approaches might also be considered. When determining the approach to be used at sites with multiple contractors, consideration should be given to the checks and balances, along with the learning opportunities created when forming a composite team to review an entire site.

As another example, consider a site with two separate federal organizations (e.g., DOE's Office of Environmental Management and the National Nuclear Security Administration) and multiple contractors performing work, one of which provides services to both federal organizations. In this example, each federal organization could develop a report documenting its safety culture evaluation as well as the results (or summary and analysis of results) for the contractor associated with their scope of work.

2.1.2   Efficient Use of Resources and Evaluation of Small Organizations

To reduce costs it is recommended that each site match the most efficient use of resources with their needs. The ISM EFCOG website has examples of contractor provided tools (planning documents, data collection protocols and survey instruments) and training materials as well as a list of contractor staff experienced in safety culture evaluation that may be used for support. In addition the use of commercially available tools that have a proven track record is recommended for those sites with limited safety culture evaluation history.

Smaller organizations represent a unique challenge from the perspective of limited expertise for team membership, choice of data collection methods and maintaining confidentiality. To assist with overcoming these limitations, consider assigning multiple roles to members of the evaluation team and design the data collection protocol to assure that confidentiality is maintained. Ideally all members of a small population should be surveyed. In very small organizations (25−50 members) offsite locations should be considered for interviews. During analysis the risk of violating confidentiality increases when data are tabulated for small groups especially if the organizational participants are known to each other. It may be necessary to report data by summarizing at a higher level so that individuals cannot be identified. In such cases the evaluation report may be appropriately reduced as long as the abbreviated report fulfills the original design intent of the safety culture evaluation report format in section 6.

2.1.3   Charter

The first step in the planning process is to develop an charter for the evaluation. At this point, management commissions the safety culture evaluation and gives the evaluation leader authority and resources to plan and execute the work. The charter should include the purpose and scope of the evaluation, rough order-of-magnitude cost estimate, a preliminary schedule, and expectations of leadership to take action on the findings of the evaluation to strengthen the safety culture. Based upon acceptance of the charter, detailed planning can begin.

2.2   Evaluation Plan

The evaluation plan should cover the entire life cycle of the evaluation and describe the purpose, scope, change control, schedule, resources, cost, quality, training, communications, security, risk management, confidentiality, safety and health, data collection, data analysis, and reporting. The Safety Culture Evaluation Tools and Checklists provided in Appendix C may be used by the evaluation leader to ensure that appropriate planning activities have been completed. The plan should be scaled appropriately based on the size and complexity of the evaluation.

2.2.1   Purpose and Scope

The purpose of the evaluation should be clearly stated and the boundaries defined. What are the geographical limits of the evaluation (one or multiple worksites)? What are the organizational limits of the evaluation (one or multiple organizations)? What are the workforce limits (all workers or a subset)? It is strategic to be as specific as possible when defining the scope.

The scope of the safety culture evaluation should include all three focus areas of Leadership, Employee/Worker Engagement, and Organizational Learning, along with their associated attributes. It is recommended that safety culture evaluations be conducted every 2−3 years. Alternatively, annual evaluations may be conducted and include a portion of the safety culture attributes so that all are reviewed over a 3-year cycle. It is recommended that two or more data collection methods be used, providing multiple data sources from which conclusions may be drawn. Methods should be balanced between management system inputs and directly observed/communicated data. When appropriate, the use of smaller scale activities performed during the evaluation period may be used as additional input to inform on specific attributes of culture. The safety culture evaluation should seek to answer the following questions:

- What do observed behaviors and collective perceptions of organizational members tell us about the work environment the organization operates within?

- What are the strengths and weaknesses of the organization with respect to safety culture attributes taken from Appendix A?

- What actions (i.e., activities with a finite horizon) and initiatives (i.e., ongoing effort) might foster long-term positive culture change?

2.2.2   Work Breakdown Structure (WBS)

Identify all of the major tasks, activities, and milestones for the evaluation. The WBS is often a good starting point for resource, schedule, and cost planning. Creating the WBS is usually a process of progressive elaboration, starting at a high level and working toward a level of greater detail.

2.2.3   Change Control

How will changes to the scope, schedule, and budget be managed? Who has the authority to make changes? How and when will those changes be documented and communicated to stakeholders?

2.2.4   Schedule

Sufficient time is critical and often underestimated, especially if evaluation instruments and protocols are not already developed. Appendix C offers an example of a safety culture evaluation schedule.

2.2.5   Resources

Identify all of the resources needed to perform the tasks and activities in the WBS, which may include personnel (e.g., workforce participation, evaluation team, administrative support, management support, security personnel, technical editors, consultants, communications specialists, and report production personnel), computers, software, transportation, office space for the team, meeting rooms, etc.

2.2.6   Costs

Defining the cost of the evaluation at the level of detail required by each organization is a crucial step. Costs for safety culture evaluations in the DOE enterprise have varied widely depending on the scope of the evaluation and size of the organization be evaluated. A detailed estimate should consider the following cost factors:

1. **Will existing evaluation tools be used or will new ones be developed?** Developing new tools like a valid and reliable survey instrument, focus groups protocol, and interview protocol can add substantial cost.

2. **How many organizations will be assessed?** If there are multiple organizations, costs will increase. There is some economy of scale when assessing more than one organization at the same time, probably a 20−25% savings compared to the cost if the organizations were assessed independently.

3. **How many team members are needed?** This will vary with the size and scope of the evaluation and typically ranges from 4−15 people; however, with more team members, the evaluation can usually be completed faster.

4. **What is the labor mix for the evaluation?** A team may include a project manager, 1−4 SMEs, 2−4 senior technical specialists, 2−4 junior technical specialists, and 2−3 administrative support personnel.

5. **How will the work be assigned?** To help contain costs, tasks should be assigned to the lowest-cost person competent to do the job. For example, it is ineffective to have a Ph.D. level professional doing the scheduling for focus groups and serving as a scribe. A mix of personnel should be used, leveraging the time of the more expensive team members.

6. **Where will the team members originate?** Do the necessary skills and expertise exist in house? Are resources available from a sister site? Will one or more consultants be used? If using resources from other organizations or consultants, allow sufficient time for contracting/ procurement.

7. **Will there be travel costs?** If yes, government travel regulations usually apply. Planning should be done to minimize the number of trips and total travel days. The travel expenses for a 1-week trip are typically about $2,000 (depending on location and cost of airfare).

8. **Will there be other direct costs?** Additional costs can include items such as statistical software packages, online survey management software, and reproduction costs for surveys and reports.

9. **Will a web-based or hard-copy survey be used?** How will the data from completed hard-copy surveys be entered? Will a data entry clerk be used or will the results be scanned into a database using scanning software?

10. **How many focus groups and interviews will be conducted?** The greater the number of personnel used for focus groups and interviews, the higher the cost. Consider the cost to analyze the data collected in these sessions, which is often more than the cost of conducting the session itself.

11. **Consider the burden on the organization being assessed.** While this issue may not be a direct charge to the evaluation, there is significant labor cost when 3,000 people complete a 10-minute survey. If 30 additional questions increase the survey time to 30 minutes, is the value of those extra questions worth the cost?

2.2.7   Quality Management

Some questions to consider when evaluating quality include the following: How will the evaluation conform to the organization's quality management system requirements? How will quality records be maintained? Will quality surveillances be incorporated into the evaluation? How will data quality be assured?

2.2.8   Training

The evaluation team must have experience/training to the specific data collection methods developed for the evaluation. Some team members will have more experience than others. Once the team members and evaluation methods are identified, the Team Leader and safety culture SME can use Appendix D to verify skills, abilities, and experience and to identify gaps and training needed for each team member. Sufficient time should be allowed so that team members can practice techniques and obtain feedback from an experienced evaluator. Applicable team training should be identified and incorporated into the schedule, as needed. Mentoring opportunities should be created as much as possible.

It is important to train team members to ensure that they are proficient in the evaluation methodology to capture data and the approach of the analyses for their respective roles. Team members need to have the experience and training to ensure they have sufficient working knowledge of the following:

* safety culture, including DOE Guide 450.4-1C (DOE 2011) Attachment 10
* team roles and responsibilities
* evaluation methods and techniques to be used for data collection
* descriptive and normative approaches to capturing and working with cultural information
* recording methods to capture sufficient detail for the analysis phase.

In addition to any training on evaluation data collection methods, all team members should receive a site specific briefing. As applicable, the site specific briefing should include an overview of their specific site organization, geography, history of the site assessed, legacy issues, and current events (e.g., union negotiations), and key elements of the Evaluation Plan (e.g., scope, schedule, security, confidentiality).

2.2.9   Communications

A safety culture evaluation requires diligent communication to realize the greatest benefit from the effort. Communication before, during, and after the evaluation is critical. As such, it is important to develop and implement a communications plan to include a communication matrix that provides contact information for

all team members, key site personnel, and other stakeholders; see Appendix C for a communication plan template and refer to section 4.1 for the role of the communication point of contact for the evaluation team.

Internal team communications through daily meetings are an effective way to maintain communication with the evaluation team. The agenda should feature current activities, upcoming activities, problem identification and resolution, risk identification and mitigation, and new action items. These meetings need not be long (10−60 minutes), and not everyone needs to attend every meeting. However, there are many moving parts to a safety culture evaluation, and routine communication among the team members helps keep things on schedule and within budget while avoiding re-work.

2.2.10   Security

The following security measures should be considered when planning the evaluation.

- How will security requirements be maintained? Do protocols need to be reviewed and approved by Safeguards and Security?
- Are team members appropriately badged and have site access?
- Will the evaluation include observations in limited areas?
- Will notes and other work products need to be reviewed and stamped by a derivative classifier?
- Will some members of the evaluation team require security clearances?
- Will the final report need to be reviewed and approved by the Technical Information Office/Public Affairs?

2.2.11   Confidentiality

Measures should be taken to protect the identity of individuals who choose to participate to ensure that people feel comfortable engaging in the evaluation. Considerations include securing records, keeping participation as confidential as possible, destroying records of interviews upon completion, and de-identifying responses. These measures help alleviate fear of negative consequences and encourage honest answers. It is essential to describe to participants how confidentiality will be maintained, which can also be enhanced with the use of a third-party independent evaluation team/consultant. See Appendix B for more considerations.

2.2.12   Safety and Health

Field observations provide an important data source for safety culture evaluations (work-as-done or artifacts and behaviors of the workforce from Figure 2) and as such, every attempt should be made to obtain direct work observations. Before doing so the following questions should be asked and answered: What measures need to be taken to protect the health and safety of the evaluation team? Are there site-specific safety requirements that must be followed? Is safety training required before evaluation team members can enter certain areas? Will personal protective equipment be required for team members conducting observations in the field?

2.2.13   Data Collection

It is helpful to define the data collection methods that will be used (i.e., interviews, focus groups, survey, direct observations, document reviews) as well as a data collection protocol for each method (see Appendices B, E, F and G for more information). The protocol provides detailed instructions about how

the data will be collected, as data collection protocols are essential for maintaining consistency and reducing bias. Extra time should be allowed for field testing of protocols, and every individual involved in data collection must be trained to the protocol(s). Team members should not deviate from the protocol without specific approval from the team leader

2.2.14   Data Management

Specific considerations about how data will be managed will ensure the integrity, quality, and confidentiality of the data and include answers to the following questions:

- Will an existing database be used?
- Will hard-copy survey results be entered manually or scanned?
- How will qualitative data be managed?
- How will confidentiality be maintained during handling of data?
- How will data be secured and backed up?
- How will the quality of the data be assured?

2.2.15   Data Analysis

Plan for the analysis of both quantitative and qualitative data. Quantitative data (numerical values) lends itself to statistical analysis. The statistical methods that will be used should be described, in addition to answering the following questions:

- What software will be used to calculate the statistical tests?
- Is a statistician required to help determine the most appropriate statistical tests and perform the calculations?
- What tables and figures will be generated in the analysis?

Qualitative data (words/text) lends itself to thematic analysis:

- What methods will be used to analyze qualitative data?
- Will software tools be used?
- Who will analyze the data?
- How will qualitative data be compared to quantitative data?
- Who will interpret the results?
- How will their interpretations be vetted?

2.3   Evaluation Risk Management

There are many risks that can prevent the evaluation from being successful. Risk mitigation should be incorporated into the evaluation plan, and Table 1 describes risks that may occur during the phases of a safety culture evaluation.

Table 1. Risk Management Considerations for a Safety Culture Evaluation

Phase	Risk
Planning	• Management indifference or disengagement from the process • Management failure to understand the purpose of the evaluation • Underestimating the amount of work and/or not allocating sufficient resources • Underestimating the time required to complete the evaluation • Inappropriate timing for the evaluation • Poorly designed approach • Insufficient credibility, training, or competencies of the evaluation team
Data Collection & Analysis	• Applying an audit mind-set rather than an exploratory approach • Inappropriate weight assigned to one finding or theme • Violation of participant confidentiality commitments • Rushing the data analysis and interpretation to make up for schedule slippage • Failure to have an independent review of the report • Allowing excessive bias or failing to recognize bias
Reporting & Continuous Improvement	• Not communicating the results of the evaluation to the workforce • Management failure to follow up with recommendations from the evaluation • Assigning too many corrective actions for the organization to deal with effectively • Failure to take meaningful corrective measures • Seeking to assign blame for unfavorable results • Rationalizing results and/or responding defensively, especially if there are surprises • Management failure to accept ownership and accountability for the results • Using the results for comparison with other organizations rather than reflecting inward

3.0   EVALUATION TEAM

The composition of the evaluation team has a direct impact on the quality of the evaluation. Information in Nuclear Energy Institute (NEI) document NEI-09-07, *Fostering a Strong Nuclear Safety Culture* (NEI 2009), was adapted to develop guidance pertaining to team composition for evaluations to be performed at DOE sites. A typical team should be comprised of a team leader, a team executive, a safety culture SME, team members, organized labor (where appropriate), and administrative support. All personnel conducting the evaluation should be knowledgeable of the principles associated with safety culture. This may occur through training after selection to the team.

The number of team members depends on the scope of the evaluation and size or the organization. At least one team member should not be from the organization(s) being assessed. For large evaluations teams, additional independent members may be added. For smaller organizations, the core team should be comprised of the team lead and team executive, if all attributes of the safety culture SME are met. A typical team for an organization with 4,000 people would be 6−12 members.

An evaluation team needs to have a broad range of competencies and experience. Composition should reflect a balance of functional areas, knowledge and experience with safety culture evaluations, and understanding of the organization. The team size is critical to ensure that sufficient resources are available to conduct the evaluation within the allotted time. The team should be able to relate to various organizational levels and functions.

It is important to select a team with a diversity of thinking styles ranging from critical/analytical to theoretical/strategic. An appropriate balance will ensure both divergent and convergent thinking. Additional attributes to consider for evaluation team members include:

- the ability to maintain impartiality and minimize bias (i.e., the absence of specific issues that a team member feels compelled to pursue)

- community consciousness (i.e., awareness of the influences that impact an organization's collective behaviors)

- high ethical standards, including the ability to maintain confidentiality and the trust of their peers

- experience in site activities/jobs.

The safety culture evaluation team may have a mix of experienced and inexperienced assessors. It is recommended that some of the evaluation team has prior experience conducting and interpreting safety culture evaluations, at the site level. The organization is encouraged to involve less experienced people to provide them with a learning experience and mentoring. If this is done, it is recommended that each junior person is assigned to an experienced mentor to ensure the results of the evaluation are of sufficient quality.

3.1   Team Leader

The team leader should be a strong manager/leader with training in evaluation methods and previous experience evaluating safety culture. The team leader has overall responsibility for preparing and conducting the evaluation and producing a compelling story for action for the site

> The team leader must have full control of the team and the process; if the workforce perceives interference from an external party (managers, unions, etc.) then the results of the evaluation may not be accepted by the organization.

management team based on the outcome of the evaluation. To engage line management personally in evaluating the effectiveness of programs and processes for establishing and maintaining a healthy safety culture, the team leader is usually from the organization being assessed. The team leader ensures that the team is adequately staffed to achieve the objectives of the evaluation. The team leader also ensures that team members have sufficient safety culture expertise to assess assigned focus areas and provide training when needed. He/she must have the interpersonal and project management skills necessary to execute the evaluation.

The team leader provides leadership to the team in completing the following planning activities:

- ensuring that a senior executive from the organization being assessed is identified as a champion for the evaluation

- developing an evaluation plan that documents a thorough scope of work to guide an evaluation that incorporates this Guide

- as appropriate, consulting with the DOE field office regarding team membership and independence; and ensuring that no team members have biases or predispositions against the organization being evaluated

- ensuring appropriate training is provided to team members

- facilitating daily discussions on emerging issues and candid yet professional vetting of perceived concerns

- directing the gathering of additional information, as necessary

- compelling site management to take proactive action on the recommendations for continued safety culture improvement from the evaluation

- escalating urgent safety issues to appropriate management

3.2   Team Executive

The team executive is a senior leader from another organization that works with and mentors the team by contributing an executive's viewpoint and personal experience. He/she may also conduct interviews with senior leaders to gain insight into management systems and perceptions. The team executive is not usually from the organization being evaluated, which provides a fresh look at the organization and minimizes biases that are inherent with personnel from within an organization. The team executive should bring objective senior management insight and independence to the team.

3.3   Safety Culture Subject Matter Expert

One cannot earn a graduate degree in safety culture, nor is there a certification exam for safety culture evaluators. Safety culture SMEs must have a combination of knowledge and skills that are obtained through a combination of academic training and professional experience. The safety culture SME should lead the selection of appropriate data collection methods and protocol design, analysis of the evaluation data, provide insight, interpret the results, draw conclusions, and make recommendations for management. The SME can help the team leader with advice when the team is being assembled and may serve as a mentor for less experienced team members. Smaller organizations that do not have this expertise in house may need to use resources from outside of their organization. Following are some guidelines for determining who might be considered a safety culture SME:

- academic coursework in the social and behavioral sciences such as organizational psychology, organizational development, human resources management, social psychology, educational psychology, anthropology, sociology, safety science, health behavior, and human performance

- graduate-level training in quantitative research methods, including research design, human subjects review boards, survey design and administration, data quality management, and statistics

- graduate-level training in qualitative research methods, including study design, interview methods, focus group facilitation, observational studies, and qualitative data analysis and interpretation

- experience conducting surveys of small and large populations using a variety of survey instruments and administration methods (e.g., written, web-based, interview, telephone)

- experience conducting small group and one-on-one interviews

- experience facilitating focus groups

- experience conducting observational research in the field or workplace

- experience communicating with executives and senior level managers

- experience working in organizations of varying size and complexity

- board certifications from related professional organizations (e.g., Society for Human Resources Management, Board of Certified Safety Professionals, American Society of Quality, Association for Talent Development, International Society for Performance Improvement).

3.4   Team Members

The team leader and safety culture SME should select additional team members based on the scope of the evaluation that include champions and participants from different levels and functions within the organization. Team members should be chosen for the competencies needed to make the team successful (e.g., interpersonal and communication skills, pattern recognition). Team members from outside the organization may provide a neutral third party for organizational staff members in which to confide when there is concern over retaliation or bias.

4.0 DATA COLLECTION

A combination of data collection methods should be used to develop a comprehensive picture of safety culture within the organization being evaluated. The evaluation techniques identified in this guide were originally described in the EFCOG document *Assessing Safety Culture in DOE Facilities* (EFCOG 2009). The suggested activities are not meant to be exclusive or prescriptive, as the evaluation team should determine the specific techniques to be used during the planning of the evaluation. Methods may include direct observation of behaviors in the workplace, written surveys, one-on-one interviews, focus group interviews, review of safety culture related processes and documents, performance indicator monitoring and trending, and results of related evaluations (e.g., Voluntary Protection Program [VPP] evaluations). The team should plan to apply the data collection methods in parallel and independently to provide multiple sources of information around the same topics of interest. This approach provides multiple data sources from which conclusions may be drawn about the organization's safety culture. When selecting methods, consideration should be given to the fact that some methods are more interactive and provide richer data and impressions but are more resource intensive.

Non-interactive methods

- Document reviews
- Written surveys
- Behavioral observations

Interactive methods

- Focus groups
- Interviews

Once planning for the evaluation has been completed, data collection can begin. The remainder of this section addresses communication, scheduling, and logistical issues associated with data collection. It also describes in detail the data collection methods typically employed on a safety culture evaluation.

4.1 Communication

There should a single point of contact (POC) with the organization being assessed whose primary function is to facilitate communication between the evaluation team and the organization being assessed. Contact with this person should be established during the planning phase. The POC's role is critical and the work somewhat demanding during the data collection phase. Once data collection is complete, the demand on their time is greatly reduced. Stakeholder communication is most important during planning and data collection because that is when the evaluation team is interacting directly with the organization and its workforce. A weekly meeting or conference call during the evaluation is good way to maintain stakeholder communication. Stakeholders should be kept informed about progress, identifying when and where their assistance is required and learning about potential problems when they are discovered. When the evaluation team is on site, daily briefings to management are an effective way to keep them apprised of progress and potential problems.

When communicating internally and with stakeholders, it is essential to maintain the confidentiality of participants. That means discussions among team members should be held in private. Information provided in confidence by participants must be de-identified before communicating important facts to the customer. The exception is when an imminent danger situation has been identified, which must be immediately communicated to the POC with sufficient detail so that the risk can be mitigated.

4.2   Logistics and Scheduling

Being prepared for the beginning of the evaluation and having the evaluation protocols and logistics arranged will make the team more efficient and effective. Depending on the specific requirements of the site, time will be spent on logistics such as obtaining badges, dosimeters, site-specific training, computer access, etc. It is also important to think through where the team will be going and what they will need so they have appropriate access to buildings, construction sites, laboratories, etc. Pre-arrangements for working space, computers, and printers and providing key documentation (e.g., evaluation plans, schedules, maps, and key documents) will improve the execution of the evaluation. Employees, line managers, union leaders, and representatives should be informed of the data collection activities that will affect them (e.g., survey, interviews, focus groups, etc.) and the evaluation schedule. An example checklist of items to consider in executing the evaluation protocols and logistics is provided in Appendix C.

The evaluation team will usually be required to complete some training and obtain visitor privileges prior to or immediately upon arriving on site. This activity may consume the first hour or two of the first day on site. After completion of those requirements, an in-briefing with management is customary, which provides an opportunity to discuss the work and to make any last-minute adjustments to the plan. Workspace for the evaluation team should have been arranged during the planning phase along with the reservation of conference rooms/meeting rooms for focus groups and interviews.

Scheduling data collection activities may be complicated and time consuming. It is best to have one schedule coordinator for the evaluation team and let him/her work with the POC to reserve meeting rooms and send invitations for interviews and focus groups. The majority of scheduling activities should be completed during the planning phase so that when the team is on site, the only changes are last-minute minor adjustments. When scheduling focus group participants, supervisor approval is usually necessary, so the schedule coordinator must be notified before staff members are invited to participate in a focus group. It is usually wise to confirm attendance for the group and interview participants the day prior to the session. Some sessions may need to be scheduled to accommodate staff members who work a later shift.

4.3   Observations

People may say they do one thing but in practice do something different. There is a large body of scientific literature documenting this disparity. Given the frequency of this very human inconsistency, observation can be a powerful validation of what people report about themselves during interviews and focus groups (Mack et al. 2005).

Direct observations of work place behavior (work-as-done) provide objective and subjective information regarding the effectiveness of existing management systems and management philosophy (e.g. training, management effectiveness, accountability, and behavior expectations, etc. or work-as-planned). Observed management behaviors may indicate whether supervisors are receptive to concerns and support and recognize employees for raising concerns. Direct observation of employees in the work environment can provide valuable insights into staff members' buy-in to the ISMS, their questioning attitude, and their willingness to challenge perceived unsafe behavior.

Several points should be considered when conducting observations as part of a safety culture evaluation:

1. **What will be observed?** There are numerous types of work that can be observed: maintenance, research, construction, waste management, production, office meetings, etc. Generally, the choice is between either a cross-section or specific types of work. Conducting observations in the best

performing parts of the organization as well as those that struggle is the most effective approach, which provides the opportunity to balance the positive and negative observed behaviors.

2. **Where will the observations be done?** Consider conducting observations in a variety of work locations within the organization. Are there multiple job sites for the evaluation or is it a single work location? The number of observations based on the distribution of the workforce may be weighed; for example, if 25% of the work force resides in Facilities and Maintenance, 25% of the observations would be made where maintenance activities are being conducted.

3. **Who will be observed?** Consider observing managers, supervisors, and line workers as they perform work, observing teams, individuals, or both.

4. **How many observations will be conducted?** Resources, evaluation schedule, size of the organization, accessibility to area, travel time, and the duration of the evolution (or work) being observed should be considered.

5. **When will the observations be conducted?** To obtain a representative sample of the organization, efforts must be made to conduct observations on all shifts. Some activities may only occur once a day or once a week. Are there second-shift activities that should be observed? It is advisable to establish points of contact in the organizations where observations will be performed, providing a day or two advance notification of the observations in their organization.

6. **Who will perform the observations?** What members of the evaluation team are best qualified to perform the observations? Are they familiar with the type of work being observed? An effective approach would be pairing the observers to the types of work with which they are most familiar, as an work area SME will have a very different perspective of work than someone with little knowledge of the work being observed. Is the observer internal or external to the organization? An external observer will most likely need an internal escort to observe some types of work. Another effective consideration is using a pair of observers to get two perspectives on the same work observed.

7. **How will the observation be documented?** Appendix E provides guidance on observing verbal and nonverbal behaviors and examples of observation checklists that may be used to document the observation. Observers should document their observations as brief notes during the activity. The initial notes should be converted into more elaborate field notes as soon as possible after the observation. The field notes should contain more detail including a description of the observation context and the people involved, including their behavior and nonverbal communication and should include thoughts, impressions, and explanations on the part of the assessor (DeWalt and DeWalt 2011).

When conducting the observations, the group under observation should be informed that it will be observed and why; team member evaluations should not be a surprise. While performing observations, it is wise to be as unobtrusive as possible, as the intent is not to guide or alter the normal work behaviors. The group being observed must be given reassurance that their names and actions will remain anonymous as this is not a compliance inspection. The observer may develop questions during the observation process regarding the meaning behind observed behaviors. If questions arise, it is advisable to wait until after the observation to ask them.

Observations provide new information on cultural phenomena, but they should not be quantified and used for statistical purposes. Additionally, care must be taken so as not to over-generalize from too few observations. Beware of bias that may be introduced into the observations including observer and selection bias. Also recognize that the presence of an observer can have an effect on the behavior of those being observed, sometimes called the Hawthorne Effect. Individuals may modify or improve their

behavior when they know they are being observed. These are all limitations that must be considered when conducting observations as part of the safety culture evaluation.

4.4   Surveys

Surveys can be useful and complement other methods used to assess safety culture. The extent of such surveys will vary depending on the evaluation design, which considers organization size and structure. Safety culture surveys should be based on lines of inquiry from the three focus areas of Leadership, Employee/Worker Engagement, and Organizational Learning and their associated attributes. Survey results may reflect the beliefs, attitudes, engagement, and satisfaction of the workforce and suggest ways to improve the work environment so as to strengthen the safety culture. To produce valid and reliable results, surveys should be designed by a safety culture SME with prior survey development experience. Appendix B contains guidance for developing and using safety culture questionnaires.

> Survey response rates less than 50% are reason to evaluate non-response bias. Why did so many people choose not to participate?

A safety culture survey is often conducted over a 1- or 2-week time period. It may be administered electronically (i.e., web-based method), with physical copies (i.e., pen-and-paper method), or using a combination of the two methods. An electronic survey is usually the most efficient method from a data collection standpoint, but the pen-and-paper method is often necessary to reach members of the workforce that do not have routine access to a computer at work.

The greatest benefits of a web-based survey are that it removes the distribution and collection of pen-and-paper copies and eliminates the need for data entry. The greatest problem is that it can create mistrust with participants who feel that by completing a survey online, they are forgoing confidentiality. To administer an electronic survey, a survey software application is recommended. There are a multitude of commercial off-the-shelf applications that can be streamlined to send survey invitations/reminders and can provide real-time statistics on response rates. They also provide convenient methods for exporting the data to statistical software applications for analysis.

The greatest benefit of the pen-and-paper method is that it potentially allows the greatest number of people to participate. The greatest problems with the pen-and-paper method are that it can be complicated and time consuming to hand out and collect surveys, and then enter completed surveys into a database prior to analysis. Safety culture evaluations of large organizations often rely on a combination of the two survey administration methods.

Response rates are best addressed during the design and data collection phases of research. This can be done by pre-testing the survey and invitation on the medium that your potential respondents might use, increasing the data collection period and sending reminders throughout the data collection period. While the survey is being conducted, it is advisable to monitor response rates. Survey research expert Babbie (2007, p. 262) asserts that "a response rate of at least 50 percent is considered adequate for analysis and reporting. A response of 60 percent is good; a response rate of 70 percent is very good." Many experts agree that below 50% the data should be evaluated for nonresponse bias (Babbie 2007; Bailey 2008). Nonresponse bias is the bias that results when respondents differ in meaningful ways from non-respondents. There are many variables that could affect non-responders. For example, groups of people who fail to respond in the study could be reluctant to respond, too busy to respond, or have negative beliefs about how the organization handles survey data. Substantial differences between respondents and

non-respondents make it difficult to assume representativeness across the entire population (Dillman 1999). One method to check for nonresponse bias is to compare response rates across key sub-groups of the target population (Groves 2006). This may point to subgroups that could be underrepresented or justify the representativeness of the responses across the surveyed population.

It is recommended that if the response rate is below 50%, an effort should be made to understand and document why the response rate may have been low evaluating the previous mentioned aspects of design and collection, including the questions: Were administration methods flawed? Did everyone have the opportunity to participate? Were there other organizational factors that caused people to not participate? Was the survey too long and complicated? Were key subgroups represented? Regardless of the response rate, the assessors must be able to draw a conclusion about whether the survey participants are representative of the workforce.

4.5   Interviews

One-on-one interviews play a significant role in a safety culture evaluation. The individual interview gives the chance to learn about the employees on a more personal level. It also offers the opportunity to ask staff members questions, clarify points of interest, and elaborate on their specific comments.

> Low participation in interviews may be an indication of a lack of management championship of the evaluation process.

Individual interviews can be used to supplement surveys and other data collection methods. The interviews typically occur after a safety culture survey has been conducted and provides an opportunity to probe for details, examples, and deeper reasons behind the survey data.

Interviews can be executed in many ways. Organizational evaluation teams typically use semi-structured interviews in which the main questions to be discussed are defined based on the lines of inquiry. A predefined structure helps to direct the discussion so that all important aspects are covered. It is also important to make interview situations natural and easy for the interviewee. It is then also easy to ask additional questions to clarify how the interviewee sees things.

An advantage of the interview is that the respondent can use his/her own words and expressions. It allows for greater flexibility in questioning with the possibility for follow-up questions, making it easier to get to the deeper meanings and clarify ambiguities in meaning. For example, face-to-face interviews could be an effective means for determining whether employees are aware of how to use processes such as the Differing Professional Opinions and Employee Concern Program processes, whether they trust or believe in their effectiveness, and whether line management is aware of how to use those processes.

A difficulty with interviews is that they are not directly comparable with one another. They are also relatively time consuming, and the collective results are usually based on a limited sample. This scenario can make it difficult to generalize results for the whole organization.

Interviewees need to be considered carefully. It is ideal to interview representatives from all organizational groups and levels, but targeting certain pre-defined groups may also have merit. Organizational groups should be selected based on the objectives and scope of the evaluation. To gain a broad view of the organization, interviewees should represent different working experiences and educational backgrounds. A less sociable personality or critical attitude toward the work should not be exclusion criteria when interviews are designed. In many cases, persons with critical viewpoints have thought carefully about the work and organizational issues, and they can provide valuable information.

It is recommended that two evaluation team members participate in the interview: one as primary interviewer and the other as scribe. The scribe may participate in the interview, but his/her primary objective is focusing attention on what the interviewee says, the tone of voice, body language, and note taking.

It is key to develop trust in the interview by assuring the interviewee that any comment made will not be attributed to them by name in the report. It is advisable to review the interview results with the interviewee to validate the information and provide added assurance that information is non-attributed. Appendix F outlines the interview protocol, thoughts on establishing a neutral interview location that provides for anonymity and comfort, an opening script, active listening techniques, and sample face-to-face interview questions.

4.6   Focus Group Interviews

Focus group interviews involve small groups of employees sharing their point of view about safety culture within the organization. The number of participants in a focus group may range from 3−10 people; greater than 10 participants may be unwieldy to manage. For example, it may be a small group of first level supervisors or mechanics. Focus groups rely on interaction within the group to produce insights that otherwise may not be available. As such, focus groups provide a method to collect testimonies and narratives (Denzin and Lincoln 2000). It is preferred that a neutral facilitator be selected to lead the focus group sessions. Consideration should be given as to how well the focus group participants know each other and whether the level of familiarity will impair feedback. It is advisable to not mix employees with managers and at very least, great care should be taken to ensure there are no managers in the employee's chain-of-command that may stiffle honest feedback.

> Low participation in focus groups may be an indication of mistrust or fear of repercussions. It may also be a result of management's failure to support the evaluation process. Judgments may have to be made by the team and the safety culture SME, based on other data sources, about why participation is low.

Focus group sessions are typically scheduled for 60−90 minutes in duration and consist of 4−5 questions. Prior to the session, ground rules for the discussion should be established. When developing the line of questioning, consider a funnel approach that goes from less structure to a more structured discussion of specific questions that will encourage detailed descriptions of experiences (Morgan 1998). The questions may also be used to explore aspects that have emerged from survey data, if relevant. Guidance for conducting focus groups and example focus group interview questions are provided in Appendix G.

Focus groups or group interviews are conducted in accordance with the protocol that was developed in the planning phase. The protocol describes the facility requirements (e.g., comfortable space in a neutral location), specifies how data will be collected (i.e., collaboration between facilitator and scribe), and lists the questions that will be asked by the facilitator. There are three factors that determine the success or failure of focus groups: skill of the facilitator; robustness of notes collected during the focus group; and participants being selected in a manner that does not bias the results.

A skilled facilitator makes people feel safe and comfortable in the group setting. S/he does not allow one person to dominate the conversation, drawing out the opinions and feelings of less vocal people. S/he keeps the discussion on-topic and knows when to ask follow-up questions that probe deeper into a participant's feelings and experience. S/he understands when to be quiet and wait to allow for a participant to elaborate on a response. In addition, s/he understands body language, both his/her own and

those in the group; it is a learned skill. Often, a person new to facilitation can work with a skilled facilitator to gain on-the-job training.

The facilitator cannot be effective if s/he is expected to take notes at the same time. It is simply not possible to listen effectively and take detailed notes; therefore, a scribe is needed. The scribe is responsible for taking detailed notes, preferably on a laptop computer. The notes should be as detailed as possible and can disregard format, punctuation, or grammar. Information should be typed as much and as quickly as possible. Speakers should be identified only by number. After the focus group session, the scribe and the facilitator should discuss what was heard. The facilitator should dictate to the scribe any notes that s/he felt were particularly important. After this collaboration, the scribe should clean up his/her notes and submit them to the facilitator for review and concurrence. This activity should be done as soon after the focus group as possible, preferably by the next day.

Selecting focus group participants is an art and science. Ideally, the assessors would randomly select participants, and 100% of those selected would participate. Unfortunately, it rarely works that way. A more practical way to select participants is a stratified random sampling method. Due to time and resource constraints, the number of focus groups will be limited. Start by selecting the sub-organizations in which conducting focus groups is desired. The number of focus groups should be weighted in accordance with the distribution of the workforce. For example, if 40% of the workforce is in production, then 40% of the focus groups should be in that organization. Next, select smaller groups within that organization. For example, if there are 10 production groups and 4 focus groups will be conducted, randomly select four groups. Obtain the roster for each of those groups, and then randomly select 12 people from each group: this becomes the invitation list. The ideal size of focus groups is about 8 people. Hopefully, if 12 invitations are sent, there will be at least eight willing participants.

4.7   Key Safety-Culture-Related Processes

Reviewing documentary evidence can reinforce information gained from a performance-based evaluation. For example, the review of safety culture-related processes may reveal whether employees feel free to identify issues using the various processes available to them, whether these processes are viewed as effective, and enable the development of insights about why those perceptions exist. Individual or small group, face-to-face interviews are both effective means for gathering this type of information.

The following safety culture-related processes are considered to be common to all organizations within the DOE community:

- raising concerns and providing feedback to worker regarding concerns (e.g., employee concerns program, ombudsman, differing professional opinion procedures)
- identifying and resolving problems (e.g., issue management, investigation and causal analysis processes, corrective action program)
- addressing disciplinary issues (e.g., Human Resources)
- performing independent evaluation and self-evaluations (e.g., management self-evaluations, quality surveillance, and audits)
- enabling worker participation in work planning and feedback (e.g., pre-job briefings, procedure reviews)
- involving employees in hazards recognition, evaluation, and control (e.g., job hazard analysis).

Full evaluation of all these processes would be an exhaustive undertaking; therefore, it is recommended that two to three processes per evaluation based on oversight, recent events, related evaluation, and scope of evaluations be completed. Consider including only those portions appropriate to the scope of the safety culture evaluation and graded for the size and complexity of the assessed organization.

4.8   Performance Indicators

Performance indicators provide continuous or periodic feedback on the health of the safety culture as opposed to evaluations, which represent snapshots of the culture at the time the evaluation is conducted. Example performance indicators can be found in DOE-HDBK-1028-2009 *DOE HPI Handbook Volume 1: Concepts and Principles* (DOE 2009). Care is required in selecting safety culture indicators to avoid over-emphasizing any particular aspect. The multilevel nature of safety culture means that a broad range of indicators, some of which may be more subjective in form than others, is necessary to gain useful information about the state of safety culture in an organization. The multilevel nature of culture and the tacit nature of some of the levels (basic assumptions) increase the difficulty of measurement. Monitoring trends in various characteristics of safety culture with performance indicators may provide insights into cultural strengths and weaknesses. The complexity and number of useful performance indicators may depend on the size and organizational structure of the contractor.

4.8.1   Revew of Performance Indicators

When reviewing organizational specific performance indicators consider the following (Health and Safety Executive 2011):

Is the relationship between the indicator and safety culture clear to the organization being assessed?

Can overemphasizing the indicator have a negative impact in another area?

Is the indicator unambiguous?

Is the indicator susceptible to manipulation?

Is the significance of the indicator to safety culture understood by the organization?

Can the accuracy of the data generated be subject to verification or quality control?

Have local action(s) been taken on the basis of indicators measured? Is action expected to be taken?

For example

If the organization measures the number of deferred capital improvements the assessor should question: Is the organization tracking all deferred capital improvements or specifically those with the greatest potential impact on safety?

If the organization measures the number and type of concerns raised to the employee concerns program the assessor should question: How can you determine the influence of the fear of reporting on the number and types of concerns/allegations raised?

If the organization measures the number of event-free days (number of days between events) and accident rates the assessor should question: Has overemphasis on reducing injury statistics inhibited reporting?

If measures related to reportable events indicate a decreasing trend in the number of reportable events per quarter but an increase in the significance of reported events the assessor should question if the metric

results represent a combination that warranted an additional investigation to understand the behavior and underlying causes associated with those trends? (Nuclear Regulatory Commission [NRC] 2005).

The organization's portfolio of indicators should strategically fit into a safety culture framework to meet the needs of the organization and portray an evolving picture of the organization's performance. The framework typically contains both leading and lagging indicators. These provide an early warning of declining performance or safety (the leading indicators) as well as a reflection of actual performance (the lagging indicators). Evaluation of the organization's suite of performance indicators may indicate the need to dig deeper on a particular topic or may result in recommendations for improvement including the type of performance indicators that should be used, how they should be selected, and the kind of actionable information they might be able to produce.

4.9   Internal and External Evaluations

It is strategic to consider recently performed internal and external evaluations that would provide insight into the organization's safety culture. Evaluations and action plans that are already in place should be used as one data source. For example, VPP evaluations are a source of information regarding the culture of an organization. The evaluations generally include a high level of worker participation that can provide a different perspective than typical evaluations. VPP evaluation criteria include certain cultural aspects

> Lack of action in response to previous evaluations may leave the workforce lacking confidence in management and the process. Team leaders should not begin until the response to the previous evaluation has been reviewed and found to indicate sufficient progress.

related to the team focus areas, such as employee involvement that could provide valuable insights into an organization's safety culture. Other evaluations on key safety culture-related processes can be used as indicators, including internal or external assessments on issue management, reporting, employee concerns, etc.

5.0 DATA ANALYSIS AND INTERPRETATION

The safety culture evaluation goes beyond just reporting the facts obtained through the data collection processes. The different data sources should be used to gain an understanding of the gaps between management's espoused beliefs and values and the organizational artifacts and why that misalignment exists with the ultimate goal of identifying the organization's basic underlying assumptions. This is accomplished through qualitative and quantitative data analyses and interpretation of the results.

5.1 Qualitative Data Analysis

It has been said that statistics represent the collective experiences of people with all emotion removed. Using qualitative methods in a safety culture evaluation restores some of the emotion and brings the evaluation results to life. Collecting and analyzing qualitative data (i.e., words and text) enables a deeper and richer understanding of an organization's safety culture than would be possible by relying solely on the quantitative results of a survey. The words spoken and written by managers and members of the workforce provide context and specific examples that complement the numerical results of a survey. Quantitative analysis uses statistical tools to analyze numbers while qualitative analysis of interviews, focus groups, and observations requires different tools to analyze words.

Qualitative analysis starts with close reading of the text and associating labels or tags with the text so that patterns, relationships, and themes can be recognized. This coding process has been greatly enhanced by software applications such as QDA Miner© (Provalis Research Corporation) and Nvivo© (QSR International). These and other tools are described in qualitative research methods publications such as Paulus, Lester, and Dempster (2014).

To facilitate sorting of text data, a coding manual contains labels or tags and can be "socially constructed" or developed "in vivo." Socially constructed means that the coding manual follows some structure that is common to society. For example, a coding manual that is structured according to the 10 traits of a healthy safety culture and their underlying attributes as defined by the NRC and INPO would be considered a socially-constructed coding manual. An example of an in vivo coding manual would be to use the words of the participants to describe the patterns. For example, if during a focus group participants said, "When managers talk to us they don't show respect for our experience and knowledge. They talk down to us and treat us like children." A code could be inserted called "treat us like children." Other passages that express similar sentiment would also be coded as "treat us like children." Either type of coding manual is acceptable. Refer to Glesne (2011) for more details about coding qualitative data.

The process of drawing conclusions begins early in the coding process. Even at the start of reviewing and coding data, there are immediate formulations about the important phenomena they indicate and propositions generated about these phenomena and the relationships between them (Braun and Clark 2006). Once all data streams have been coded, the evaluation team has sufficient information to build an overall picture of the organization. The team members should have an overview of the topics that were perceived positively or critically and whether any subgroups differed significantly from the others. At this point, the evaluation team has probably developed an impression of the organization's performance (Braun and Clark 2006) and can begin the search for themes.

Thematic analysis should go beyond identifying the general or norm. A strength of qualitative research is that it can help reveal underlying complexities, aware of where and why people vary from the norm and seek to understand the varying perspectives (Glesne 2011). It is also beneficial to search for themes by

collating, nesting, and separating codes; ideally, an overarching structure or framework for the data will emerge. The process of thematic analysis is iterative, interchanging between coding, analysis, and the safety culture evaluation criteria (Braun and Clark 2006; Boyatzis 1998). The focus should not be on *listing* themes but rather exploring *relationships* between them to form an overall story with the data.

A good practice is to gather together all of the text passages coded for a theme. Reading all of these passages together (while also referring back to their original contexts for accurate interpretation) will enable a better understanding of the theme. Often, it becomes clear that there is more than one theme captured by the code, and it must be partitioned. At other times after reading several themes, it is obvious that several should be combined or one subsumed within another. It is important to illustrate each of these theme summaries with quotes. By defining/naming themes and refining, the evaluation team develops an overall story (Braun and Clark 2006).

Using multiple methods (i.e., both qualitative and quantitative) for obtaining data also facilitates triangulation, the comparison of data from multiple sources to identify where there is agreement (i.e., convergence) and disagreement (i.e., divergence). This situation helps to define the varying perspectives that may exist within an organization. When the data from the different data sources converge, the evaluator may have greater confidence in the findings. When there is divergence, more evaluation may be needed to understand why the differences exist. Table 2 provides an example of how to triangulate data from a survey, focus group, and interviews.

Table 2. Example of Triangulation Using Safety Culture Data from Multiple Sources

Data source	Consistent and effective work planning	THEME Timely resolution of safety problems	Effective communication
Questionnaire	Two of the lowest scoring items were (question 38) "We plan, control, and execute work activities so that safety is the overriding priority;" and (question 40) "Up-to-date procedures are available to me."	The lowest scoring item was (question 33) "When a safety problem is found, we address the problem in a timely manner."	From the survey it was learned that (question 9) "I get timely information about decisions that affect my work" scored near the top as did (question 10) safety communication is a part of my daily work activity."
Management interviews	Management indicated that work planning processes were comprehensive and thorough but they seemed to struggle with the safe execution of more routine work. Some managers were concerned that there was too much "cut-and-paste" during work planning and that people were complacent in their analysis of hazards.	In interviews, managers reported that they encouraged people to report safety concerns and that it was their responsibility to address safety problems in a timely manner. They expressed frustration that issues that were due to aging infrastructure were not always resolved quickly.	In the management interviews participants consistently reported that safety communications occur at every plan-of-the-day meeting and that all meetings are begun with a safety minute. They also indicated they schedule and dedicated time to observe work in the field and communicate with the workforce.
Focus groups	Non-managers indicated that there was inconsistency in how potential safety issues were addressed in work planning. Work planning for complex and highly hazardous work was rigorous and detailed but that applying that same rigor was overkill on simpler, more routine work. Some indicated that procedures did not always reflect how the work was actually done.	Participants indicated that they were encouraged to report safety problems and they were not hesitant to do that. However, some indicated they did not receive feedback about whether the problem was corrected. They indicated that simple problems get fixed quickly but complicated problems or problems that cost a lot of money get reported and then go into a "black hole."	Participants were consistently positive about the frequency, timeliness, and relevance of safety communications. They provided multiple examples of how the organization communicated safety topics to them. They also provided examples of how safety was communicated within their work groups.

5.2   Quantitative Data Analysis

If a survey is part of the evaluation, statistical analysis can aid in the interpretation of the data. The statistical methods will be dictated in large part by the survey instrument that was used. Therefore, the statistical analyses should have been determined when the instrument was selected and before the data were collected. The statistical methods can range from simple to sophisticated. If the plan is to perform basic statistical tests a statistician may not be needed. Someone that has completed graduate statistics coursework and has available statistics reference books may be able to perform the calculations and interpret the results, with the more sophisticated statistical tests best done by a statistician. The strengths of a professional statistician will include a person not only able to do the calculations but also knowledge about which tests are most appropriate and how to interpret the results.

There is one fundamental question that must be answered: are the participants in the survey (i.e., the sample) representative of the population from which the sample was drawn? This question is probably best answered by the safety culture SME in conjunction with a statistician. If the answer is yes, then it is appropriate to proceed with statistical analysis. If no, then analysis should be limited to only descriptive statistics. It would be inappropriate to make inferences about the population if the sample that was drawn from that population was not representative. Calculating the response rate and demographic statistics will help answer this fundamental question.

5.2.1   Response Rate

The purpose of calculating the response rate is to determine if sufficient people participated in the survey for the sample to be considered representative and the results to be statistically significant. Calculating response rates at the sub-group level helps to detect differences in participation in the sub-groups. Strong response rates (usually >50% in a safety culture survey) help answer that question while low response rates (<50%) require more explanation. An example of how to present response rate statistics is provided in Appendix B.

5.2.2   Demographic Analysis

The second step should be to calculate demographic statistics. Demographic questions are typically a combination of standard features (e.g., age, gender, education, years of service) and organization specific features (e.g., employer, location, division). The purpose of this analysis is to compare the demographic profile of survey participants to the total workforce population to answer this question: Does the demographic profile of the survey participants appear similar to that of the entire workforce? If the answer is yes, that is further evidence that the sample population is representative of the workforce as a whole. If the answer is no, there may be some systematic bias and the sample may not be representative of the population. An example of how to present demographic data is provided in Appendix B.

5.2.3   Descriptive Statistics

The next step is to calculate some basic descriptive statistics. If the survey contains Likert-type scales, the categorical responses on the Likert-type scale can be converted to numeric values: for example, strongly agree = 5, agree = 4, neither agree nor disagree = 3, disagree = 2, strongly disagree = 1. The mean, upper and lower confidence limits, and standard error of the mean can then be calculated, providing the measure of central tendency and dispersion of data for each survey item that can be placed in rank order to gain understanding of which items scored higher and lower than others.

Sometimes descriptive statistics can smooth-over important underlying facts in which case it is also useful to examine the frequency distribution of responses for each survey item, which provides a sense of how many people agreed and disagreed with a statement and is complimentary to the descriptive statistics. For some items, for example questions about retaliation, the number of people that strongly disagree with a statement may be more informative than a mean value.

It is helpful to compare results between groups within the organization to form an understanding of sub-cultures that may exist. An example of how to present descriptive statistics is provided in Appendix B.
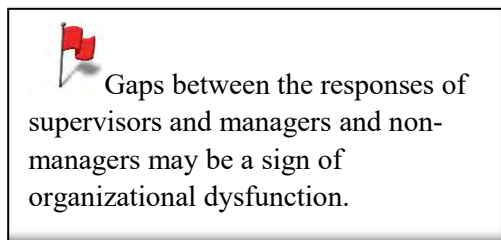
5.2.4   Inferential Statistics

Sometimes survey questions can be combined to create subscales. For example, all data from questions related to a particular safety culture trait, such as effective safety communication, can be combined and the "mean of the means" calculated. This is a technique for consolidating data and facilitating comparison between organizations. Student's t-test can be used to compare the mean scores between two groups and analysis of variance (ANOVA) can be used to compare the mean score between multiple groups.

There are other advanced statistical techniques that may be considered when analyzing data from a safety culture survey such as exploratory factor analysis, confirmatory common factor analysis, and structural equation modeling. Those methods are complex and best left to a professional statistician.

5.3   Data Interpretation

The safety culture interpretation process requires that evaluation team members compare the quantitative and qualitative evidence to the safety culture attributes to understand basic underlying assumptions (Figure 2). Interpretation of the evidence should consider the context of the organization. For example, survey results for contract incentives are neutral; however, a significant portion of the workforce is unionized and do not get involved in contract incentives. At this point, the team will discuss individual analysis and develop consensus of results. The data should be objectively analyzed and integrated to develop a comprehensive understanding before reaching a conclusion.

> Gaps between the responses of supervisors and managers and non-managers may be a sign of organizational dysfunction.

Contradictory issues do not necessarily indicate that the methods or analysis are invalid. While it is important to illustrate the way people in the organization construct their view of safety and risks differently, organizational evaluations should be able to look at the entire picture and conclude which of the issues, opinions, and observations characterize the organization as an entity. In some instances differences in comments of the team may result from misunderstandings. These are resolved in the team discussion. In other cases, however, the differences of opinion between the team may reflect their different experiences in interviews and observations. Team discussion must seek understanding of the reasons for these deviations. These are opportunities for the team to develop a deeper grasp of the safety-related values and attitudes in the organization. If it is not possible to reach an agreement the team leader and safety culture SME decide on the approach to resolve issues of disagreement in the team. The resolution may be deferred until after interviews with senior management and then discussed with the team again or additional data gathering may be initiated (International Atomic Energy Agency [IAEA] 2008).

Organizations are not always culturally homogeneous, and it is important to consider subcultures when assessing safety culture. The characteristics of these subcultures will likely differ, and the evaluation should consider these differences (e.g., maintenance, technical support, etc.).

An effort should be made to provide the evaluated organization with a small set of manageable recommendations versus an exhaustive list that will inundate the organization. Examples of challenges in interpreting results may include the following:

- Interviewees have conflicting opinions.

- Interviewees base responses on a single event that happened more than 10 years ago.

- Managers and official documents describe safety goals and practices convincingly; however, personnel do not mention them, and survey results indicate a negative perception of the quality of safety management.

- One person brings up an apparently severe safety related challenge, but there is no other evidence.

Interviewees do not mention problems with certain organizational practices, although other data (e.g., documents on event investigations or observation data) suggest there are major deficiencies. Oedwold, Pietikäinen, and Reiman (2011) provided useful guidance for evaluation team members to consider during data analysis and interpretation:

1. Review generic observations, questions, and hypothesis formed during data collection. Are these ideas in line with the observations by the other evaluation team members?

2. Has there been systematically gathered findings from documents, interviews, observations, or statistical analysis on tables or forms to be consulted after the conclusion of the evaluation later on?

3. Is there an overview on the general practicality of the findings? It would be wise to analyze whether the employees' opinions and perceptions differ with respect to the organizational subunits, roles, or other demographics.

4. Are organizational leaders ready to accept critical or surprising findings? What is the climate of discussion around the findings? Which themes are difficult to communicate to the organization?

5. Review the goals of the evaluation. What are the questions requiring answers?

6. Does the evaluation team have a shared feel for prioritizing findings?

7. Are the judgments based on iteration from multiple data sources and not just single observations?

6.0 SAFETY CULTURE IMPROVEMENT

6.1 Communicating Evaluation Results for Action

When the safety culture evaluation is concluded, the evaluation team probably has the best perspective of the health of the organization's culture and specific insight as to areas in the work environment that need to be improved to strengthen the culture. The team has matured in the realm of safety culture and how important a healthy safety culture is to the organization as a result of their training, mentoring, and discussions. As such, the team should develop a compelling story for change and make actionable recommendations to management as to things within the work environment that need improving based upon the insight they have gained through the safety culture evaluation process.

This compelling story for action needs to be delivered to key management across the organization and the discussion facilitated until an appropriate level of commitment to change, commensurate with the results of the evaluation, is achieved. Communicating evaluation results typically occurs in several stages as the evaluation is conducted.

Stage I: Communicating with senior leadership. This is typically in the form of a meeting for action led by the Evaluation Team Leader. The information may be presented by the team leader or by individual team members. A key aspect is to facilitate management dialogue rather than present the results in an audit-like fashion. An essential result of this communication with senior management is their commitment and specific actions to address the work environment issues that may be causing undesired effects on the organization's culture.

Stage II: Communicating with customers and union representatives. To form a powerful guiding coalition team to maintain momentum for positive culture change other important stakeholders need to be aware of the safety culture evaluation and recommendations for improvement. If the organization has one or more collective bargaining units, the leadership of those labor unions should be engaged so that they understand the purpose of the evaluation and understand the rationale for the recommendations so that they can have input. The local DOE managers must also be informed and given the opportunity to provide input.

Stage III: Communicating with the organization. To enroll the employees into the change vision, the organization needs to have the opportunity to understand the safety culture evaluation and understand the need for change. This is typically led by management supported by the Evaluation Team Leader and team members, as required. This may be supplemented by usual communication methods, such as bulletins, intranet, etc., but the primary method is to focus on face-to-face meetings led by management together with the evaluation team members. After completing this initial phase, leadership should engage the entire organization in the outcome of the self-evaluation, preferably through seminars or workshops to receive feedback and maximize organizational learning.

When summarizing and communicating the results of the evaluation to stakeholders, the approach should be focused on maximizing the learning value to the organization, which may include the following:

- creating graphical representations, taking care to avoid misleading pictures.
- using a variety of communication vehicles to communicate to management and personnel.
- including context to avoid misinterpretation.
- requesting feedback as a reality check and to confirm the messages have been understood as intended.

Efforts should be taken to make sure content of the communication conveys that data remains confidential and management genuinely cares about results collected and will act on the findings to improve the organization's work environment to strengthen the safety culture. In all stages, staff members should be encouraged to be honest and open when responding to questions.

6.2   Evaluation Report Format

To provide a substantive basis for the reason for change and to document the result of the safety culture evaluation, a report on the results of the safety culture evaluation is needed. The following describes a recommended final report format and provides a brief discussion of the material to be included in each section.

Title and Signature Page(s) – The final report should include a cover and title page that states the subject and the date of the evaluation. Team member signatures or a signature from the team leader that signifies the team's agreement as to the report content and conclusions should be included within the final report.

Executive Summary – This summary is the compelling story for change supported by a synopsis of the review, strengths, and weaknesses identified, and conclusions drawn. The executive summary should introduce information and direct the reader to those portions of the report that provide more detail concerning the information. Suggested points for the executive summary include:

- a compelling story for change based on a brief synopsis of the evaluation that provides information concerning the team's evaluation

- a discussion of noteworthy practices and recommendations for improvement

- a conclusion regarding the effectiveness of safety culture-related processes and whether noted opportunities for improvement indicate a need for a further, more in-depth evaluation of safety culture

- any team recommendations for corrective actions.

Introduction – The introduction should provide information related to the team composition, use of the lines of inquiry, and a summary of the review process and methodologies used in the evaluation.

Methods – This section should describe the techniques used for the evaluation in sufficient detail that a third party could replicate the evaluation. While this rarely occurs, it is a standard approach when describing research methods.

Evaluation Results – Results should correlate/crosswalk observations and themes back to the related ISM safety culture focus areas/attributes. This activity should be done at a summary level in the body of the report, reserving more detailed comments in an appendix. The recommended standard terminology for results is:

- **Strength** – A consistently identifiable culture-related action or process that demonstrates the organization's values meet or exceed the attribute of excellence as established in DOE Guide 450.4-1C (DOE 2011) Attachment 10.

- **Positive Observation** – Narrowly focused positive behavior or attribute that is displayed in some areas of the organization, but may have the opportunity to be infused throughout the organization to improve safety culture.

- **Area For Improvement** – A consistently demonstrated belief, action, or process of organizational values or behaviors that does not meet the attribute of excellence as established in DOE Guide 450.4-1C (DOE 2011) Attachment 10 and requires aggressive management attention and correction.

- **Potential Vulnerability** – A narrowly focused item that is confined to a small sample of the population (i.e., a specific workgroup or level in the organization), that may represent a leading indicator of future culture degradation. Organizations are not always culturally homogeneous and it is important to consider subcultures when assessing safety culture. The characteristics of the different subcultures may differ and the evaluation should consider these differences (e.g., maintenance, technical support, etc.).

- **General Observation** – Issues may appear to represent principle or attribute trends overall, but lack themes of commonality when reviewed by the team, and/or the team may not have had the ability to validate the principle.

Conclusions – This section summarizes the team's overall interpretation of the evaluation results. It should include a discussion concerning the effectiveness of safety-culture-related processes. This section should also include an overview of areas for improvement and the team's conclusion regarding the level of safety culture maturity. The report should be presented to leadership for review and action. The team should try to achieve a manageable list of issues based on underlying issues rather than an exhaustive list of minor issues.

Recommendations – When the safety culture evaluation is concluded, the team probably has the best perspective of the health of the organization's culture and specific insight as to areas in the work environment that need to be improved to strengthen the culture. The team has probably matured greatly in the realm of safety culture and how important a healthy safety culture is to the organization as a result of the training, mentoring, and discussions they have undergone to conduct the evaluation. As such, the team should make actionable recommendations to management as to things within the work environment that need improving based upon the insight they have gained through the safety culture evaluation process.

Appendices – Tables and figures may be located in the appendices to improve the flow of the report.

7.0 FEEDBACK AND IMPROVEMENT

Seeking feedback and improvement on the evaluation process will enable the organization to learn and improve. Once the evaluation has been completed, the process used should be reviewed. The *Plus/Delta Tool* is one of the easiest tools to use in the Lean Six Sigma tool belt.

There are two methods that demonstrate how the *Plus/Delta Tool* works. The preferred method uses a facilitator or team lead to frame the area being evaluated. The facilitator asks, "What are the plusses?" These are elements, activities, actions, or ideas that are "positive" and that we want to repeat or do more of. The facilitator then captures, in list fashion, the various ideas that are plusses. Next, the facilitator addresses the flipside—the deltas. These are not negatives or bad things, but "deltas," referring to the Greek symbol often used to connote change. These are things we would like to "change" or "do better" the next time around.

The second method is to request each participant to write down two plusses and deltas. The lists should not be exhaustive, but concentrated on substantive issues. For both methods, the team lead is responsible for collating the responses into a final product. If there are a lot of deltas, they are then prioritized by the group.

With prioritized list in hand, some discipline can be overlaid to the Plus/Delta list. "WHO does WHAT by WHEN?" For each prioritized delta, the question was posed, "WHO is the best person to own getting the delta completed?" The WHAT means describing the specific action, improvement, or decision to be made with respect to the delta. The WHEN involves the next key piece—the deadline by which that delta needs to be either completed, or in the case of some pretty complex ones, at least given status.

Table 3 is an example of what the combined Plus/Delta + WHO WHAT WHEN tables look like. The example used is a safety culture evaluation conducted at a project. For the purposes of this example, feedback and improvement Plus/Delta comments are entered for the topical area of scope only.

Table 3. Example of Plus/Delta Tool Applied to Evaluation Scope

Plus	Delta	Who	What	When
Well defined	Prepared too close to the evaluation	Tom Davis	Establish schedule that provides ample time for definition and review.	3 months prior to next evaluation
Peer reviewed	Left off a key contributor	Fred Brown	Identify stakeholders for team concurrence.	3 months prior to next evaluation
Vetted with management	Was not vetted with the entire team	Tom Davis	Ensure project review aligns with stakeholders identified and the schedule.	3 months prior to next evaluation
*	*	Sally Jones	Contact the project self-evaluation procedure owner to request revisions of the procedure to reflect the lessons learned from this evaluation.	Within 90 days
* Not all data fields need to be annotated.				

A common question is whether or not there is a one-to-one relationship between the "plus" and the "delta." There can be, but typically there is not, for two reasons. First, there is not always a 1:1 correspondence thematically for every single item. Second, the focus falls more and more on the delta and what can be done to improve it. Once the delta is identified, then it naturally follows that the WHO, WHAT, WHEN corresponds directly to each respective delta.

With the Plus/Delta and resulting action plan, you have a simple way of following up on the action items, driving accountability, and making sure items are addressed in a timely way. Consider the following:

- It is important that all team members have input mechanisms to the Plus/Delta process

- The evaluators should not be shackled to the process

- You can conduct the feedback and improvement analysis however works best for the group (e.g., sticky notes, emails, brainstorming session, one-on-one)

- Consideration should be given to an entire team Plus/Delta and/or individual sub-team Plus/Deltas

- The plusses should be evaluated for best practices and shared with others

At a minimum, the evaluation areas listed below should be evaluated using the Plus/Delta tool, as these are high-level topical areas. The Plus/Delta process should consider lower level elements for each topic, as deemed appropriate.

- Evaluation Plan
- Scope of Evaluation
- Schedule and Logistics
- Team Composition and Training
- Evaluation Protocols

- Data Collection
- Data Analysis and Interpretation
- Communication
- Reporting

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Appendix A
Safety Culture Attribute Expectations of Excellence

ATTACHMENT 10. Safety Culture Focus Areas and Associated Attributes (adapted from the U.S. Department of Energy [DOE] Guide 450.4-1C [DOE 2011])

Experience from the commercial nuclear industry, including the Institute for Nuclear Power Operations, has been reviewed for relevant lessons. An analysis of this experience and research over the past decade has identified supplemental safety culture elements that may be helpful to focus attention and action in the right areas to create the desired Integrated Safety Management (ISM) environments. These elements also promote a shift from mere compliance toward excellence. They emphasize continuous improvement and long-term performance, and they are entirely consistent with the original intents of ISM.

DOE and the Energy Facility Contractors Group (EFCOG) have collaborated to develop guidance for achieving a strong safety culture. They identified the following three safety culture focus areas and several attributes associated with each one, that they felt offered the greatest potential for achieving excellence in both safety and production performance.

- Leadership

    – Demonstrated safety leadership

    – Risk-informed, conservative decision making

    – Management engagement and time in field

    – Staff recruitment, selection, retention, and development

    – Open communication and fostering an environment free from retribution

    – Clear expectations and accountability

- Employee/Worker Engagement

    – Personal commitment to everyone's safety

    – Teamwork and mutual respect

    – Participation in work planning and improvement

    – Mindful of hazards and controls

- Organizational Learning

    – Credibility, trust and reporting errors and problems

    – Effective resolution of reported problems

    – Performance monitoring through multiple means

    – Use of operational experience

    – Questioning attitude

LEADERSHIP

Demonstrated Safety Leadership

- Line managers (from the Secretary to the DOE Cognizant Secretarial Officer to the DOE Field Office Manager, and from the contractor senior manager, to the front-line employee) understand and accept their safety responsibilities as integral to mission accomplishment.

- Line managers enhance work activities, procedures and process with safety practices and policies.

- Leaders acknowledge and address external influences that may impose changes that could result in safety concerns.

- Line managers clearly understand their work activities and performance objectives, and how to safely conduct their work activities to accomplish their performance objectives.

- Line managers demonstrate their commitment to safety through their actions and behaviors, and support the organization in successfully implementing safety culture attributes, by conducting walk-throughs, personal visits, and verifying that their expectations are met.

- The organizational mission and operational goals clearly identify that production and safety goals are intertwined, demonstrating commitments consistent with highly reliable organizations.

Risk-Informed, Conservative Decision Making

- Line managers support and reinforce conservative decisions based on available information and risks. Managers and employees are systematic and rigorous in making informed decisions that support safe, reliable operations. Employees are expected, authorized, and supported by managers to take conservative actions when faced with unexpected or uncertain conditions.

- Managers and employees are intolerant of conditions or behaviors that have the potential to reduce operating or design margins. Anomalies are thoroughly investigated, promptly mitigated, and periodically analyzed. The bias is set on proving that work activities are safe before proceeding, rather than proving them unsafe before halting. Personnel do not proceed and do not allow others to proceed when safety is uncertain and management is supportive of these decisions.

Management Engagement and Time in Field

- Maintaining operational awareness is a priority. Line managers are in close contact with the front-line employees. Line managers listen and act on real-time operational information. Line managers identify critical performance elements and monitor them closely.

- Line managers spend time on the floor and in employee work areas. Line managers practice visible leadership by placing "eyes on the work," asking questions, coaching, mentoring, and reinforcing standards and positive behaviors. Deviations from expectations are corrected promptly and, when appropriate, collectively analyzed to understand why the behaviors occurred.

- Managers set an example for safety through their personal commitment to continuous learning and by direct involvement in high-quality training that consistently reinforces expected employee behaviors.

Staff Recruitment, Selection, Retention, and Development

- People and their professional capabilities, experiences, and values are regarded as the organization's most valuable assets. Organizational leaders place a high personal priority and time commitment on recruiting, selecting, and retaining an excellent technical staff.

- The organization maintains a highly knowledgeable workforce to support a broad spectrum of operational and technical decisions. Technical and safety expertise is embedded in the organization. Outside expertise is employed when necessary.

- The organization is able to build and sustain a flexible, resilient, robust technical staff and staffing capacity. Staffing is sufficient to ensure adequate resources exist to ensure redundancy in coverage as well as cope with and respond to unexpected changes in a timely manner.

- The organization values and practices continuous learning. Professional and technical growth is formally supported and tracked to build organizational capability. Employees are required to improve knowledge, skills, and abilities by participating in recurrent and relevant training and strongly encouraged to pursue educational opportunities.

- Line managers encourage and make training available to broaden individual skills and improve organizational performance. Training should include the ability to appreciate the potential for unexpected conditions; to recognize and respond to a variety of problems and anomalies; to understand complex technologies and capabilities to respond to complex events; to develop flexibility at applying existing knowledge and skills in new situations; to improve communications; and to learn from significant industry and DOE events.

Open Communication and Fostering an Environment Free from Retribution

- A high level of trust is established in the organization.

- Reporting individual errors is encouraged and valued. Individuals feel safe from reprisal when reporting errors and incidents.

- Individuals at all levels of the organization promptly report errors and incidents and offer suggestions for improvements.

- A variety of methods are available for personnel to raise safety issues and line managers promptly and effectively respond to personnel who raise safety issues.

- Leaders proactively detect situations that could result in retaliation and take effective action to prevent a chilling effect.

- The organization addresses disciplinary actions in a consistent manner; disciplinary actions are reviewed to ensure fair and consistent treatment of employees at all levels of the organization.

Clear Expectations and Accountability

- Line managers provide ongoing performance reviews of assigned roles and responsibilities reinforcing expectations and ensuring key safety responsibilities and expectations are being met.

- Personnel at all organizational levels are held accountable for standards and expectations. Accountability is demonstrated both by recognizing excellent performance as well as identifying less-than-adequate performance. Accountability considers intent and organizational factors that may contribute to undesirable outcomes.

- Willful violations of requirements and performance norms are rare. Individuals and organizations are held accountable in the context of a just culture. Unintended failures to follow requirements are promptly reported, and personnel and organizations are acknowledged for self-identification and reporting errors.

EMPLOYEE/WORKER ENGAGEMENT

Personal Commitment to Everyone's Safety

- Responsibility and authority for safety are well defined and clearly understood as an integral part of performing work.

- The line of authority and responsibility for safety is defined from the Secretary and contractor senior manager to the individual contributor. Roles and responsibilities, authorities and accountabilities are clearly defined in writing and are understood by each individual.

- Individuals understand and demonstrate responsibility for safety. Safety and its ownership are apparent in everyone's actions and deeds.

- Individuals outside of the organization (including subcontractors, temporary employees, visiting researchers, vendor representatives, etc.) understand their safety responsibilities.

- The organization knows the expertise of its personnel. Line managers defer to qualified individuals with relevant expertise during operational upset conditions. Qualified and capable people closest to operational upsets are empowered to make important decisions, and are held accountable justly.

Teamwork and Mutual Respect

- Open communications and teamwork are the norm.

- Individuals at all levels of the organization listen to each other and effectively engage in crucial conversations to ensure meaning, intent and viewpoints are understood; and that differing points of view are acknowledged.

- Discussion on issues focus on problem solving rather than on individuals.

- Good news and bad news are both valued and shared.

Participation in Work Planning and Improvement

- Individuals are actively involved in identification, planning, and improvement of work and work practices.

- Individuals follow approved work practices and procedures.

- Individuals at all levels can stop unsafe work or work during unexpected conditions.

- Design, analysis and continuous improvement of work practices and processes are valued as core organizational competencies; expertise in these competencies is evaluated and rewarded.

Mindful of Hazards and Controls

- Organizational safety responsibilities are sufficiently comprehensive to address the work activities and hazards involved.

- Work hazards are identified and controlled to prevent or mitigate accidents, with particular attention to high consequence events with unacceptable consequences.

- Individuals understand and proactively identify hazards and controls before beginning work activities.

- Individuals are mindful of the potential impact of equipment and process failures, demonstrate constructive skepticism and are sensitive to the potential of faulty assumptions and errors. They appreciate that mindfulness requires effort.

ORGANIZATIONAL LEARNING

Credibility, Trust and Reporting Errors and Problems

- Credibility and trust are present and continuously nurtured so that a high level of trust is established in the organization.

- Organizations, managers and line supervisors provide accurate, relevant, and timely information to employees. Line managers are skilled in responding to employee questions in an open, honest manner.

- Reporting individual errors is encouraged and valued. Individuals are recognized and rewarded for self-identification of errors.

- Line managers encourage and appreciate safety issue and error reporting.

- Managers and line supervisors demonstrate integrity and adhere to ethical values and practices to foster trust.

- Managers and line supervisors demonstrate consistency in approach and a commitment to the vision, mission, values, and success of the organization as well as the individuals (people).

- Mistakes are used for opportunities to learn rather than blame.

- Individuals are recognized and rewarded for demonstrating behaviors consistent with the safety culture principles.

Effective Resolution of Reported Problems

- Vigorous corrective and improvement action programs are established and effectively implemented, providing both transparency and traceability of all corrective actions. Corrective action programs effectively prioritize issues, enabling rapid response to imminent problems while closing minor issues in a timely manner to prevent them from escalating into major issues.

- Results from performance assurance activities are effectively integrated into the performance improvement processes, such that they receive adequate and timely attention. Linkages with other performance monitoring inputs are examined, high-quality causal analyses are conducted, as needed, and corrective actions are tracked to closure with effectiveness verified to prevent future occurrences.

- Processes identify, examine and communicate latent organizational weaknesses that can aggravate relatively minor events if not corrected. Organizational trends are examined and communicated.

- Organizational systems and processes are designed to provide layers of defenses, recognizing that people are fallible. Lessons learned are shared frequently; prevention and mitigation measures are used to preclude errors from occurring or propagating. Error-likely situations are sought out and corrected, and recurrent errors are carefully examined as indicators of latent organizational weaknesses.

- Incident reviews are conducted promptly after an incident to ensure data quality and to identify improvement opportunities. Causal analysis expertise is applied effectively to examine events and improve safe work performance. High-quality causal analysis using multi-discipline analytical perspectives is the norm. Causal analysis is performed on a graded approach for major and minor incidents, and near-misses, to identify causes and follow-up actions. Even small failures are viewed as windows into the system that can spur learning.

- Performance improvement processes require direct worker participation. Individuals are encouraged, recognized and rewarded for offering innovative ideas to improve performance and to solve problems.

Performance Monitoring Through Multiple Means

- Line managers maintain a strong focus on the safe conduct of work activities. They maintain awareness of key performance indicators related to safe work accomplishment, watch carefully for adverse trends or indications, and take prompt action to understand adverse trends and anomalies. Management employs processes and special expertise to be vigilant for organizational drift.

- Performance assurance consists of robust, frequent, and independent oversight conducted at all levels of the organization. Performance assurance includes independent evaluation of performance indicators and trend analysis.

- Line managers throughout the organization set an example for safety through their direct involvement in oversight activities and associated performance improvement.

- The organization actively and systematically monitors performance through multiple means, including leader walkarounds, issue reporting, performance indicators, trend analysis, benchmarking, industry experience reviews, self-assessments, peer reviews, and performance assessments.

- The organization demonstrates continuous improvement by integrating the information obtained from performance monitoring to improve systems, structures, processes, and procedures.

- Line managers are actively involved in all phases of performance monitoring, problem analysis, solution planning, and solution implementation to resolve safety issues.

- The organization maintains an awareness of its safety culture maturity. It actively and formally monitors and assesses its safety culture on a periodic basis.

Use of Operational Experience

- Operating experience is highly valued and the capacity to learn from experience is well developed. The organization regularly examines and learns from operating experiences, both internal and in related industries.

- Organization members convene to swiftly uncover lessons and learn from mistakes and successes.

- The organization embraces feedback from peer reviews, independent oversight, and other external sources.

- The organization documents and shares operating experiences (lessons learned and best practices) within the organization and with industry.

Questioning Attitude

- Line managers encourage a vigorous questioning attitude toward safety, and foster constructive dialogues and discussions on safety matters.

- Individuals cultivate a constructive, questioning attitude and healthy skepticism when it comes to safety. Individuals question deviations, and avoid complacency or arrogance based on past successes. Team members support one another through both awareness of each other's actions and constructive feedback when necessary.

- Individuals pay keen attention to current operations and focus on identifying situations where conditions and/or actions are diverging from what was assumed, expected, or planned. Individuals and leaders act to resolve these deviations early before issues escalate and consequences become large.

Appendix B

Developing and Using Safety Culture Questionnaires

Safety Culture Questionnaires

Various measurement protocols, including questionnaires, interviews, focus groups, and observations of performance, can be used by organizations to measure safety culture indirectly. The focus of this Appendix is to provide guidance for developing and using safety culture questionnaires.

Instrument Development

Self-report questionnaires are often used to collect data about employees' perceptions since such instruments are generally cost effective, can be scored easily, and are typically less resource intensive than some other modes. There are some proprietary instruments commercially available and an organization may choose to engage a consultant and use their proprietary questionnaire to measure perceptions of safety culture. Other organizations may elect to develop their own instrument, tailored to their specific needs. Either way, it is important to understand the reliability and validity of the instrument to be used.

Because safety culture cannot be directly measured, we often measure it indirectly by surveying the workforce to understand their perceptions of safety culture. Perceptions are the way people organize and interpret their sensory input, or what they see and hear, and call it reality. Perceptions give meaning to a person's environment and make sense of the world. Perceptions are important because people's behaviors are based on their perception of reality. Therefore, employees' perceptions of their organizations become the basis on which they behave while at work (Erickson 2013).

Generally, the first steps to constructing a questionnaire (i.e., a measurement instrument) are to identify behaviors that represent the construct using theoretical rationales and then determining the set of operations that will isolate the attribute of interest and display it (Crocker and Algina 1986). A construct is an "unobservable or latent concept that the researcher can define in conceptual terms but cannot be directly measured…or measured without error. A construct can be defined in varying degrees of specificity, ranging from quite narrow concepts to more complex or abstract concepts, such as intelligence or emotions" (Hair et al. 2006). Many psychological and organizational traits, such as safety culture, are not directly observable or directly measurable and must be measured indirectly through a number of observable (indicator) items (Pedhauzer and Schmelkin 1991).

Despite increased attention to safety culture as a construct, a common definition of safety culture has not yet been established (Cole, Stevens-Adams, and Wenner 2013). In addition, there is no consensus to the number of factors comprising an organization's safety culture (Wiegmann et al. 2004; Mkrtchyan and Turcanu 2012). Due to the lack of agreement in defining and operationalizing safety culture across industries and even within some industries, a standardized measure for safety culture has not been established. However, a few safety culture questionnaires have been developed with a focus on obtaining employees' perceptions (and changes in perception) of an organization's safety culture (Cole, Stevens-Adams, and Wenner 2013). Of these available questionnaires, little research has been conducted to understand the validity and reliability of the instrument and scales.

Developing a valid and reliable questionnaire requires professional judgment that is based on knowledge of safety culture as it relates to an organization as well as an understanding of psychometrics. Psychometrics is the field of study concerned with the theory and technique of psychological measurement. The field of psychometrics includes the processes of: a) constructing measurement tools, b) employing mathematical methods to assist with construction, validation of interpretations, and

investigation of psychological measures, c) assessing the level of reliability of interpretations based on the scores from an instrument, and d) assessing the level of validity with which we can make inferences from the measurement tool (Nunnally 1970).

Reliability and validity measurements provide evidence for whether a scale or instrument provides acceptable psychometric properties and meaningful construct interpretations. During instrument development, researchers report reliability and validity data to facilitate the decision of other researchers to use their instrument. Test reliability, often considered a measure for the accuracy of a measurement procedure, refers to the consistency and reproducibility of scores on the measurement procedure (Nunnally 1978; Thorndike 2005; Crocker and Algina 1986). Scores on an instrument must demonstrate acceptable levels of reliability before validity, the degree in which scores provide meaningful interpretations for a construct of interest, can be verified (Nunnally 1978; Pedhauzer and Schmelkin 1991; Crocker and Algina 1986). Those considering developing a safety culture questionnaire are referred to Gibbons, von Thaden, and Wiegmann (2006) as an example of an approach.

Reliability

Research-based measurement relies on accurate and dependable scores; hence, the reliability of measurement is a major concern (Cronbach 1951). Sometimes referred to as precision, reliability is a matter of whether a particular technique, applied repeatedly to the same object, would yield the same result each time (Babbie 1998). Reliability is a necessary condition of validity (Pedhauzer and Schmelkin 1991).

A reliability coefficient is a unitless index that falls between zero and one. Reliability estimates at zero represent complete random error in measurement while coefficients near one indicate no random errors of measurement (Pedhauzer and Schmelkin 1991; Guilford 1954). The level of acceptability for any reliability coefficient is generally determined by the type of decisions made on the basis of scores and the possible consequences of these decisions. On a continuum, it is generally agreed that lower levels of reliability are acceptable in the initial stages of research, higher reliabilities are required to determine differences between groups, and high reliabilities needed for inferential decisions (Nunnally 1978; Pedhauzer and Schmelkin 1991; Thorndike 1951). Debate over what values represent these lower, higher, and high reliabilities is ongoing.

True-score reliability, in which a respondent's observed score for a measurement is assumed to be a function of the person's true score plus some error of measurement, is most commonly used to estimate the reliability of self-report measures (Pedhauzer and Schmelkin 1991; Lord and Novick 1968; Crocker and Algina 1986). To estimate the degree of stability of a measurement, researchers would need to collect data from the following ways: a repeated test or measure (test-retest), two equivalent forms of a test (parallel or alternative test forms), or a single administration in which the test can be subdivided into two or more equivalent fractions.

Administering a single test form is often preferable and economically feasible for many researchers and provides evidence of internal consistency. The most common reported index of internal consistency reliability is Cronbach's alpha, which is computed by splitting a scale into as many parts as it has items, calculating the correlation between each sub-pair, and taking the average of all correlations (Cronbach 1951). However, measurements of internal consistency only give evidence of the precision in which a researcher appraises a person at a specific moment, do not account for independence of survey items, and do not distinguish if items might measure multiple traits (Thorndike 2005).

Reliability coefficients provide a basis for comparing the precision of measurement across survey instruments. Instruments will have a number of different acceptable coefficients of reliability, depending on what major sources of measurement error are to be considered in the calculation of a reliability coefficient. Speaking of the reliability of a test offers evidence for the amount of measurement error that could be expected when using the instrument (Nunnally 1978). Thorndike (2005) suggests when the dimensions of multiple tests are similar (e.g., the quality of test items, the traits measured by those items, length, and the nature of the examinees) tests that yielded higher reliability coefficients should be preferred.

Validity

Validity refers to the extent to which an instrument measures what it is supposed to measure and, consequently permits appropriate interpretation of data (Gay, Mills, and Airasian 2009). It is the most fundamental consideration in developing and evaluating tests (Standards for Educational and Psychological Testing 1999). Validation is an ongoing process which is highly dependent on the nature and quality of accumulated evidence gathered for the construct under study (Pedhauzer and Schmelkin 1991).

Validity is "an integrated evaluative judgment of the degree to which empirical evidence and theoretical rationales support the adequacy and appropriateness of inferences and actions based on test scores or other modes of assessment" (Messick 1989). Within the field of psychometrics, the frameworks for assessing the validity of a measurement through different types of accumulated evidence continue to be advanced (AERA, APA, and NCME 1966; Anastasi 1954; Cronbach 1949; Messick 1989; Messick 1995). In 1995, Messick proposed a unitary concept of validity in which he asserts that different forms of validity are subsidiary elements of construct validity and highlights these six interdependent and complementary aspects described below.

Construct validity refers to the utility of the instrument to measure the unobservable trait or behavior of interest. Construct validity seeks evidence for support of the interpretation and meanings deduced from scores (Messick 1989). Instruments that presumably measure safety culture need to demonstrate that items assess the multiple dimensions of an organization that reflect its safety culture (Wiegmann et al. 2004). Construct validity is the most important form of validity because it asks the fundamental question: What is this test really measuring (Gay, Mills, and Airasian 2009)?

Content validity refers to the degree in which an instrument measures an intended content area (e.g., the domain of safety culture). Content validity is determined by evaluating items used to measure a construct in light of the theoretical basis for the construct (Brualdi 1999; Messick 1995) and is assessed through expert evaluation of the representativeness, relevance, and technical quality of the sample of items included on a measurement and how the items relate to the intended content domain in which conclusions are made.

Substantive validity refers to both the appropriateness of the sampling domain processes and the consistency and regularity of responses to the domain processes. The validity of a total score is predicted by the strength with which the comprised items measure the same thing and is generally referred to as the reliability of a scale or measure. Reliability is a necessary condition for validity, but validity is not guaranteed even if a test or scale is reliable. In addition to reliability, the methods used to select study participants, collect data, and analyze the data also influence the validity in making inferences about the target population.

Structural validity considers the structure or interrelations between items on the instrument and the construct (Messick 1995). Structural aspects of validity refer to the relationship of scores to "structural" relations innate to the construct. This aspect to validity considers theories for guiding selection of content items, as well as the scoring criteria for these items. Theoretically, there exists an unbounded universe of potential items to represent a construct of interest, and test developers must determine a finite pool of sample items appropriate to represent aspects of the attribute under study.

An aspect of structural validity is to confirm that sets of items intended to represent the construct relate together in varying degrees (Strainer 2003). Historically, test developers have employed mathematical and statistical methods to explore how well items fit together through techniques intended to identify the underlying and interdependent structure among items/variables in an analysis. These mathematical methods can provide evidence to researchers for which items appropriately measure the latent construct and which items should be eliminated, attesting to the quality of the instrument as a measurement tool (Hair et al. 2006).

Generalizability validity refers to the appropriateness of score interpretations across different tasks, different samples, different settings, and so forth (Messick 1995). Generalizability judgments (the degree research findings can be inferred from a sample population to a more general population) should consider contextual, cultural, and other mediating factors that may influence subjects' responses.

External validity incorporates both convergent and discriminant forms of evidence to assess the extent to which scores relate to similar assessments of the same construct, where the evidence either strengthens or discounts hypotheses of interest. When measures of constructs theoretically should relate to each other and do relate to each other, this provides evidence of convergent validity (as it shows a convergence between similar constructs). Conversely, when measures of constructs that theoretically should not relate to each other do not relate to each other, this provides evidence of discriminant validity (as it shows an ability to discriminate between dissimilar constructs).

Consequential validity considers the value implications of score interpretations, especially with respect to issues of bias, fairness, and social justice. The major aim for assessing consequential validity is to assess the intended and unintended consequences of interpretation use in hopes of preventing negative impacts on persons or groups which might result from test invalidity (Gay, Mills, and Airasian 2009; Messick 1995).

Bias

Bias results in the distortion of research data that renders the data suspect or invalid and may occur due to characteristics of the researcher, the respondent, or the research design itself (Gay, Mills, and Airasian 2009). Sackett (1979) cataloged 35 different types of bias in analytic research. Some of the more relevant types of bias are listed and defined to help raise awareness of biases that can afflict a safety culture assessment. Two general categories of bias are cognitive and statistical.

Cognitive biases are human tendencies to think in certain ways as we make judgments and decisions. There are dozens of theories in the behavioral sciences that define and explain these types of biases (MacCoun 1998). Some of the decision-making and judgment biases that should be considered when conducting a safety culture assessment include:

- **Experimenter bias** is errors in a research study due to the predisposed notions or beliefs of the experimenter (Grinnell 2008). The tendency is for experimenters to believe, certify, and publish data that agree with their expectations for the outcome of an experiment, and to disbelieve, discard, or downgrade the corresponding weighting for data that appear to conflict with those expectations.

- **Observer bias** is the phenomenon whereby an observer does not observe objectively and accurately, thus producing invalid observations (Gay, Mills, and Airasian 2009).

- **Recall (memory) bias** is systematic error due to differences in accuracy or completeness of recall to memory of past events or experiences (Porta 2008).

- **Social desirability bias** is the tendency to over-report socially desirable characteristics or behaviors in one self and under-report socially undesirable characteristics or behaviors (Podsakoff, MacKenzie, and Lee 2003).

Statistical biases are errors made in such a way that the result is systematically different from the population parameter of interest. Some statistical biases that should be considered in a safety culture assessment include:

- **Non-response bias** results when respondents differ in meaningful ways from non-respondents. This can occur when individuals chosen for the sample are unwilling or unable to participate in the survey (Stat Trek 2014).

- **Response bias** refers to systematic error due to differences in characteristics between those who choose or volunteer to take part in a study and those who do not (Porta 2008).

- **Reporting bias** refers to the selective revealing or suppression of information by subjects (Porta 2008).

- **Sampling bias** refers to systematic error due to the methods or procedures used to sample or select the study subjects, including errors due to the study of a nonrandom sample of a population (Porta 2008).

- **Selection bias** refers to distortions that result from procedures used to select subjects and from factors that influence participation in the study (Porta 2008).

- **Self-selection bias** is the problem that very often results when survey respondents are allowed to decide entirely for themselves whether or not they want to participate in a survey. In most instances, self-selection will lead to biased data, as the respondents who choose to participate will not well represent the entire target population (Lavrakas 2008).

In a safety culture assessment, the goal is to recognize and control biases to prevent skewing the results in an unfair or inaccurate way, resulting in a distortion of the truth. It is not possible to eliminate bias entirely in an assessment.

Survey Items

Individual questions in a survey are referred to as "items." Developers of a safety culture questionnaire could employ a combination of different types of item formats including open-ended, closed-ended with ordered response choices, close-ended with unordered response choices, or partially closed-ended. Table B.1 provides an example of each type of item.

A Likert-type scale is a commonly used type of closed-ended question with ordered response choices. A Likert scale requires individuals to respond to a series of statements by indicating whether he or she strongly agrees, agrees, is undecided, disagrees, or strongly disagrees (Gay, Mills, and Airasian 2009). Likert scales have the advantage that they do not expect a simple yes/no answer from the respondent but allow for degrees of opinion, and even no opinion at all. Therefore, quantitative data is obtained, which means that the data can be analyzed with relative ease. However, like all surveys, the validity of Likert scale attitude measurement can be compromised due to social desirability. This situation means that individuals may lie to put themselves in a positive light. For example, if a Likert scale was measuring discrimination, who would admit to being racist (McLeod 2008)?

Each type of survey item has its advantages and disadvantages. For example, responses to closed-end questions yield numerical values that can be easily scored and analyzed while responses to open-ended questions often provide additional context or understanding of a phenomenon, but are typically more difficult and time-consuming to analyze. The designer of the questionnaire must consider these facts.

Following are some general considerations when creating survey items and response scales (Birdie 1986; Covert and Colton 2007):

Questions/Survey Items

- Provide brief and clear instructions for completing the survey/questionnaire.

- Word questions as simply as possible using language that is familiar and appropriate to the population for whom the questions are intended.

- Do not write loaded questions that suggest respondents to answer a specific way.

- Avoid questions that assume a certain state of affairs or imply something about the respondent.

- Avoid double questions that ask for more than one piece of information per question.

- Use caution with use of adverbs such as several, significant number of, most, and usually. Definitive statements preferred.

- Avoid words with multiple meanings or with vaguely defined meanings.

- Avoid using double negatives.

- Avoid using words that are loaded with possible emotional overtones that may affect responses.

- Be careful with the use of abbreviations. If abbreviations are used, be sure to introduce and define the term first.

- Avoid sensitive questions that solicit information that is personal or makes the respondent uncomfortable or embarrassed.

- A controversial guideline is that items should all be written in the same direction. Proponents for this guideline advocate that unidirectional survey items minimize confusion and the chance that respondents would mix the order of response sets or item meaning. Opponents against this guideline feel unidirectional survey items are more likely to result in patterned responses.

Responses

- State responses clearly.

- Make certain one response category is listed for every conceivable answer. Omitting an option forces people to either answer in a way that does not accurately reflect reality or no answer at all.

- Keep response options mutually exclusive.

- With scales, balance response options. When including a midpoint, label the meaning to scale intention (e.g., neutral v. undecided).

- A scale must be appropriate for an item's purpose.

- When deciding the number of response categories, consider the trait being rated, extent in which individual categories can be identified, and the ability of respondents to discriminate between response choices.

- Order response options logically.

- Be sensitive to response audiences when requesting demographic characteristics. Are all characteristics included? Could "other" be included as a category to capture characteristics not specifically provided? Are there subgroups in your population in which their identity and confidentiality of responses cannot be protected when indicating their demographic characteristics?

Study Population

The study population is the group selected for study (Porta 2008) and must be clearly defined before the questionnaire is administered. They are generally a collection of well-defined individuals known to have similar characteristics (e.g., they all work for at the same location or for the same company). However, due to the large sizes of populations, researchers often cannot test every individual in the population because it is too expensive and time-consuming, which is why they rely on sampling techniques (Research Population 2009).

A sample is simply a subset of the study population. The sample must be representative of the population from which it was drawn and it must have good size to warrant statistical analysis. The main function of the sample is to allow the researchers to conduct the study with individuals from the population so that the results of their study can be used to derive conclusions that will apply to the entire population (Research Population 2009).

Some key decisions about the study population include:

- Who will be included in the survey? The entire company? The entire worksite? Multiple worksites?

- Who will be excluded from the survey? Will contractors be included?

- What is the total number of people that will be eligible to participate? They represent the denominator for calculating the response rate.

- What is the demographic profile of the study population? Their characteristics must be known to determine if the respondents are representative of the study population.

- If you are going to sample the study population, how will you select that sample? Non-random sampling can introduce selection bias and violate an assumption for inferential statistics.

Voluntary Participation

During the survey design, a decision must be made about whether workforce participation in the survey will be voluntary. Requiring participation may seem attractive because feedback will be obtained from a greater proportion of the workforce than if the survey were voluntary. However, the workforce may resent "forced" participation and may perceive it as management coercion. This may result in increased reporting bias (i.e., participants providing the answers that they believe management is seeking). It is for these reasons that the preponderance of safety culture surveys allow for voluntary participation.

While management can encourage participation, there must not be negative consequences for those that choose not to participate. If there are negative consequences, they may affect consequential validity, as discussed above. Measures must be taken to prevent intended or unintended consequences for persons who elect to participate or not participate in the survey. One of the most common preventive measures is identity protection or confidentiality.

Confidentiality

There is a difference between maintaining confidentiality and anonymous participation. Completely anonymous participation is neither practical nor desirable. If anonymous individuals are allowed to participate in the survey, it would be impossible to accurately judge whether the participants were actually members of the study population.

What is desirable to take measures to assure individuals that if they participate, their identity will be protected, no one will attempt to obtain their identity, and their responses will not be associated with their identity. This helps alleviate fear of negative consequences and encourages honest answers. It is essential to describe to participants how confidentiality will be maintained. This should be done in the invitation to the survey and again on the instruction page. Following are some examples:

- Do not require names, employee numbers, or any personal identifiers on the survey form.
- Do not pre-number the survey forms.
- Make some demographic questions optional, like age and gender.
- Use the "blind copy" function when sending emails to a distribution list of participants.
- Aggregate several small groups of workers into a larger group for statistical analysis.
- Restrict access to employee rosters that may be used to calculate denominators.
- Maintain completed hard-copy questionnaires under lock and key.
- Have the survey conducted by an independent organization.
- Provide a hotline phone number to answer any questions from participants.
- Have the survey protocol reviewed by an Institutional Review Board.
- Do not require User ID and passwords when participants logon for an online survey.

Ultimately, members of the workforce will have to weigh the evidence and determine if they trust that their confidentiality will be maintained. Low participation rates are often a result of mistrust between management and the workforce.

Another key concept for protecting human subjects is the subjects' right to withdraw. Research subjects always have the right to withdraw from research at any time and for any reason without penalty or loss of benefits to which they would otherwise be entitled. Subjects are not obliged to explain their reasons for withdrawing from research, and they are not required to complete an exit interview or cooperate with follow-up activities (DOE 2012).

Survey Administration

Consider the study population when determining the methods for administering a questionnaire. There are several options that can be tailored to the study population and often a combination of methods can be used to reach the greatest proportion of the study population. Each method has advantages and disadvantages. Frequently employed delivery methods include the following:

Interviews – A questionnaire administrator meets with each participant, reads the questions to them and records their responses on a form. Personal meetings allow researchers to clarify questions a respondent may have, but may be prohibitively expensive (Dillman 1978).

Mailed Survey – Questionnaires can be sent to participants via the U.S. Postal Service or Company mail system. Participants complete the questionnaire and mail it back to the administrator. Mail surveys may be cost-effective when sample size is small, but can be difficult in obtaining representative response rates and mailing times could be problematic (Dillman 1978).

Telephone Survey – A questionnaire administrator calls participants, asks them the questions over the telephone, and records the responses. Using a telephone can be beneficial in answering respondents' questions and being able to obtain comprehensive responses, but you are limited to respondents who have appropriate phone service (Dillman 1978).

Group Survey – Questionnaires are distributed to a group of people in a staff meeting (or similar) and are asked to complete the survey at that time. The administrator collects the completed surveys as they are completed.

Computer-based survey – E-mail allows almost instant dissemination of a survey, but is limited to respondents who have e-mail capability. Respondents may also be hesitant to open attachments from unfamiliar sources and may delete messages without completing the survey (Covert and Colton 2007).

Data Analysis

Decisions about the most appropriate data analysis methods should be made in the planning process. These decisions can impact construction of the instrument, selection of participants, and other elements of the survey. When using questionnaires to collect participant responses, both quantitative and qualitative items can be used, resulting in a mixed-method analysis approach. Most questionnaires include close-ended responses in which mathematical operations can be utilized to describe participants' responses.

Close-ended items are used to collect quantitative data (numerical measures along a continuum in which numbers are assigned to indicate how much of a variable is possessed) and/or qualitative data (category of membership) and are classified as nominal, ordinal, interval or ratio in nature. Understanding the measurement level provides an understanding of the amount of information conveyed (e.g., ratio scales provide more information than interval scales) and the appropriate mathematical operations for describing different data types (Fraenkel and Wallen 2006). The characteristics of each scale are outlined below:

Nominal level of measurement is the simplest form of measurement in which cases are placed into distinct, mutually exclusive categories (e.g., gender, ethnicity, and employer). The occurrence of cases across categories can be counted.

Ordinal level of measurement considers the ordering or rank of categories but does not provide for equal magnitude of differences between levels (e.g., socioeconomic status, categories for salary ranges). The occurrence of cases across categories can be counted.

Interval scale is an ordinal level of measurement in which the magnitude of differences between levels is equal (e.g., achievement testing, temperature). The degree of differences can be compared but not the ratio of differences.

Ratio scales are interval scales with a true zero point (e.g., age, income). An estimation of the degree of differences and the ratio between magnitudes is possible.

There are numerous mathematical procedures used to organize and interpret data. These procedures are generally classified into two broad categories: descriptive and inferential statistics. Descriptive statistics includes procedures used to summarize, organize, and simplify data (e.g., graphical techniques, measures of central tendency and dispersion, correlation coefficients) while inferential statistics refer to techniques that utilize samples to make generalizations about the populations from which they were selected (e.g., t-tests, ANOVA, Chi-square, regression, repeated measures, multivariate statistics).

A main advantage for using statistical procedures is the ability to condense large quantities of information into simpler facts or figures (Gravetter and Wallnau 2013). In addition, there are a number of available statistical software packages available to compute simple and complex statistical procedures (e.g., Excel®, SAS®, SPSS®). The knowledge and skill required to analyze data can be substantial. In general, descriptive statistics and some of the basic inferential statistical methods can be calculated by individuals with some academic training in statistics. Some of the more advanced inferential methods such as multivariate analyses are best left to statisticians. When in doubt about which methods to use, how to perform a test, or how to interpret a result, consult with a trained statistician.

Interpret Results

A safety culture survey is a data product and the challenge is to turn the data product into actionable information so that the organization can change and improve their safety culture. A good data product provides actionable information without exposing decision makers to the underlying data or analytics (The Field Guide to Data Science 2013). The interpretation of the results is the opportunity to turn safety culture data into useful information.

Interpretation of safety culture data requires subject matter expertise and professional judgment. Collaboration with a team of people brings different viewpoints to the effort and helps generate alternate explanations. It is valuable to include people from within and outside the organization being surveyed. Insiders may have knowledge that an outsider might never uncover in the evaluation. However, caution must be exercised to make sure that insiders do not interject their personal biases into the interpretation.

The evaluation team should consider whether the survey answers are similar across organizational units, personnel or age groups to identify shared cultural features. Numeric values from surveys represent the respondent perceptions and it should be remembered that they are not objective facts about the organizational reality.

For example, given the survey statement "Management puts safety first" employees are asked to judge the statement on a 6-point scale from 1 (Strongly disagree) to 6 (Strongly agree). If the mean score of a group of respondents is 5.2, it would be inappropriate to conclude that the management actually emphasizes safety as a first priority in its decision-making. Similarly it is not appropriate to conclude that the organization holds safety as a higher priority than in an organization that scores 3.3. A mean score of 5.2 only implies that with respect to its expectations and knowledge, the employee's perception of the management's safety priorities is, on average, very positive. This may actually tell us more about the employee's expectations than the management's behavior. This is why it is important to include additional information on the possible explanations of the issues rather than rely on survey analysis alone.

Reporting

The report should be sufficiently detailed so that the reader obtains a complete picture of how the survey was conducted and theoretically could replicate the survey with the information provided. Provide context and describe the organizational climate during the time within which the survey was conducted. It is not necessary to include raw data or show all statistical calculations. Use a style guide so that formatting is consistent. If a corporate style guide is not available, The Chicago Manual of Style is a good option (The Chicago Manual of Style 2003).

Tables and figures are used to visually organize and summarize data so that a reader or audience can easily and more quickly understand characteristics of the data. Tables allow researchers to summarize and identify important characteristics of the data, present trends, as well as provide data that can be used by other researchers (Nicol and Pexman 2010). Figure B.1 provides an example table of contents and Figures B.2 and B.3 and Tables B.2 and B.3 provide examples of how to present safety culture survey information.

Summary

Safety culture questionnaires can be a valuable component of a comprehensive safety culture evaluation. They are most effective when used in combination with other evaluation modes like interviews, focus groups, and observation of work performance. The value of a questionnaire survey is dependent on the reliability and validity of the instrument, the methods of administration, data management techniques, statistical analysis methods, skill in interpreting the results, and reporting effectiveness. Questionnaire surveys should be conducted as a project where the scope of work is clearly defined, the work breakdown structure (i.e., activities) delineated, a comprehensive project plan developed, the activities executed, the work monitored and controlled, and the project closed out. This systematic methodology improves the likelihood of success. When well executed, the results can be enlightening and help determine the actions that an organization can take to achieve a healthy safety culture.

TableB.1. Examples of Question Formats (adapted from Dillman 1978)

Type of Question	Example
Open-end	Who would you like to see elected Governor in this year's election?
Closed-end with ordered response choices	How well do you think each of these candidates would perform if elected Governor? 1. Gaden ------- Poor Fair Good Excellent 2. Hartley ------- Poor Fair Good Excellent 3. Caldwell---- Poor Fair Good Excellent 4. McDonald--- Poor Fair Good Excellent
Closed-end with unordered response choices	Which of these four candidates would you most like to see elected Governor? (Circle Number of Your Answer) 1. Gaden 2. Hartley 3. Caldwell 4. McDonald
Partially closed-end	Who would you like to see elected Governor? (Circle Number of Your Answer) 1. Gaden 2. Hartley 3. Caldwell 4. McDonald 5. Other (please specify)_____
Likert scale:	1. If the election were held today, I would vote to re-elect Governor Gaden. ___Strongly Agree ___ Agree ___ Undecided ___ Disagree ___ Strongly Disagree

CONTENTS

Figure B.1. Example Table of Contents

Table B.2. Response Rates by Organization: Example Table for a Safety Culture Survey Report

Organization	Survey Participants	Estimated Population	Response Rate (%)
Business Operations (BUSOPS)	94	133	70.7
Health Communication and Technical Training (HCTT)	57	73	78.1
Human Resources (HR)	26	30	86.7
Independent Environmental Assessment and Verification (IEAV)	40	67	59.7
Information Technology Services (ITS)	49	62	79.0
National Security and Emergency Management Programs (NSEMP)	83	171	48.5
Occupational Exposure and Worker Health (OEWH)	71	81	87.7
Other	33	NA	NA
President's Office (PRES)	44	57	77.2
Science Education Program (SEP)	101	105	96.2
Scientific and Technical Resource Integration (STRI)	41	42	97.6
Total	**639**	**821**	**77.8**
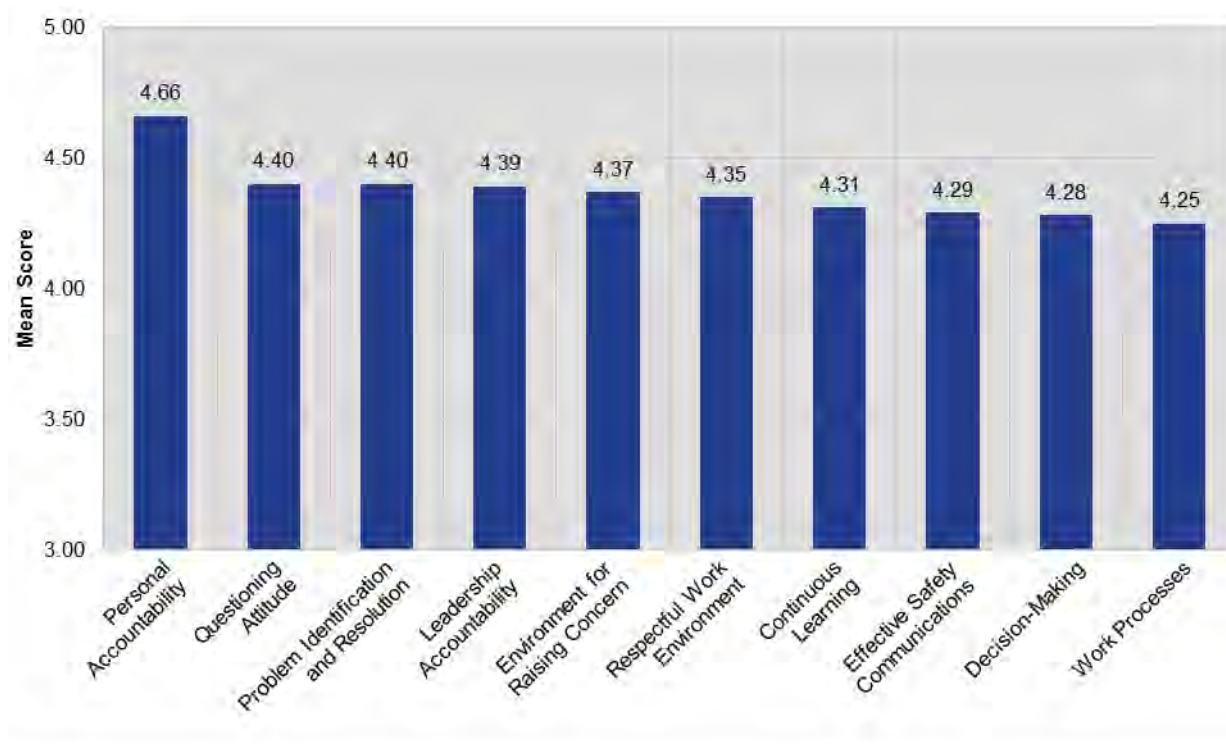
Figure B.2. Mean Score by Safety Culture Trait: Example Bar Graph

Table B.3. Frequency Distribution of Responses and Overall Mean for Question 11: Example of Frequency Distribution Table

Question 11: Our leaders' communications reflect safety as a core value.		
Overall Mean	**4.49**	
Answer	**Frequency**	**Percent**
Strongly Agree	413	64.6
Agree	175	27.4
Neither Agree nor Disagree	23	3.6
Disagree	6	0.9
Strongly Disagree	22	3.4
Total	639	100.0
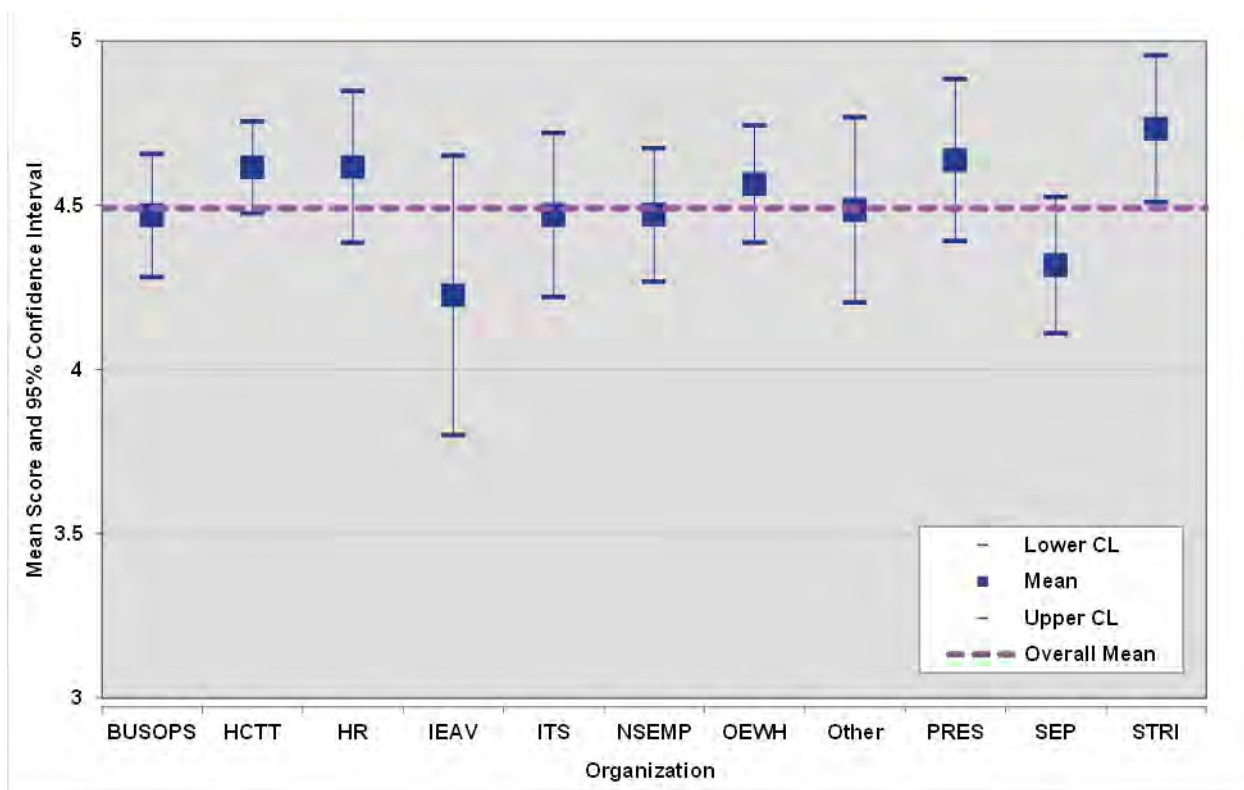
Figure B.3. Mean Score and Confidence Interval for Question 11 by Organization: Example of Box-and-Whisker Graph

Appendix C

Safety Culture Evaluation Tools and Checklists

❖ **Safety Culture Evaluation Generic Schedule**

❖ **Safety Culture Evaluation Planning Checklist**

❖ **Example Safety Culture Evaluation Communications Plan**

❖ **Evaluation Protocols and Logistics Checklist**

Safety Culture Evaluation Generic Schedule

ID	Task Name	Duration	Start	Finish	December 11/23	12/7	12/21	January 1/4	1/18	February 2/1	2/15	March 3/1	3/15	April 3/29	4/12	May 4/26	5/10
1	**Safety Culture Assessment**	**87 days**	**1/2/15**	**5/4/15**													
2	Project initiation	5 days	1/2/15	1/8/15													
3	**Assessment Planning**	**20 days**	**1/9/15**	**2/5/15**													
4	Develop project charter and work plan	5 days	1/9/15	1/15/15													
5	Adapt assessment methods	5 days	1/16/15	1/22/15													
6	Train and mobilize	10 days	1/23/15	2/5/15													
7	**Data Collection and Analysis**	**60 days**	**1/16/15**	**4/9/15**													
8	**Survey**	**10 days**	**1/16/15**	**1/29/15**													
9	Conduct, gather data	10 days	1/16/15	1/29/15													
10	**Interviews**	**40 days**	**1/16/15**	**3/12/15**													
11	Conduct, gather data	40 days	1/16/15	3/12/15													
12	**Focus Groups**	**40 days**	**1/16/15**	**3/12/15**													
13	Conduct, gather data	40 days	1/16/15	3/12/15													
14	**Behavioral Observations**	**40 days**	**1/16/15**	**3/12/15**													
15	Conduct, gather data	40 days	1/16/15	3/12/15													
16	**Performance Indicators**	**40 days**	**1/16/15**	**3/12/15**													
17	Gather data	40 days	1/16/15	3/12/15													
18	**Data analysis**	**20 days**	**3/13/15**	**4/9/15**													
19	Quantitative data analysis	10 days	3/13/15	3/26/15													
20	Qualitative data analysis	10 days	3/27/15	4/9/15													
21	**Final Reporting**	**10 days**	**4/10/15**	**4/23/15**													
22	Write, peer review, submit	10 days	4/10/15	4/23/15													
23	**Closeout**	**7 days**	**4/24/15**	**5/4/15**													
24	Feedback and improvement	5 days	4/24/15	4/30/15													
25	Close Procurement resources	1 day	5/1/15	5/1/15													
26	Archive records	1 day	5/4/15	5/4/15													
27	Project complete	0 days	5/4/15	5/4/15													

Gantt bar labels (reading order along timeline):
- Safety Culture Assessment
- Project initiation
- Assessment Planning
- Develop project charter and work plan
- Adapt assessment methods
- Train and mobilize
- Data Collection and Analysis
- Survey
- Conduct, gather data
- Interviews
- Conduct, gather data
- Focus Groups
- Conduct, gather data
- Behavioral Observations
- Conduct, gather data
- Performance Indicators
- Gather data
- Data analysis
- Quantitative data analysis
- Qualitative data analysis
- Final Reporting
- Write, peer review, submit
- Closeout
- Feedback and improvement
- Close Procurement resources
- Archive records
- 5/4

Safety Culture Evaluation Planning Checklist

Complete	Evaluation Plan Element
	1. Has the scope of the evaluation been defined and documented as part of the evaluation plan?
	2. Has a change control management process been defined and documented as part of the evaluation plan?
	3. Has the evaluation work breakdown structure been defined and included as part of the evaluation plan?
	4. Has the evaluation schedule been defined and included in the evaluation plan?
	5. Have the required resources been defined and documented as part of the evaluation plan?
	6. Has the evaluation cost/budget been defined and documented as part of the evaluation plan?
	7. Have the quality specifications been defined, outlined, and documented as part of the evaluation plan?
	8. Has a training plan for the evaluation team been defined and included in the evaluation plan?
	9. Has a communication plan been defined, outlined, and documented as part of the evaluation plan?
	10. Has a risk management plan been defined, outlined, and documented as part of the evaluation plan?
	11. Has a security plan been defined and documented as part of the evaluation plan?
	12. Has confidentiality of results been defined and documented?
	13. Have site-specific health and safety requirements been defined and documented in the evaluation plan?
	14. Have data collection protocols been written and included in the evaluation plan?
	15. Have data management methods been defined and included in the evaluation plan?
	16. Have data analysis methods been determined and described in the evaluation plan?
	17. Have reporting requirements been defined and included in the evaluation plan?

Example Safety Culture Evaluation Communications Plan

When	Who is Responsible (Support from)	What	Target Audience	How (media)
1. Safety culture evaluation				
	Contractor CEO (Team Leader; Communications Specialist)	A self- evaluation of safety culture will be conducted; state goals and objectives; an evaluation team has been chartered (identify team leader).	Employees Line Managers Union Leaders DOE	Email Letter Newsletter Meetings
2. Survey of employee perceptions of safety culture				
	Contractor CEO (Communications Specialist)	Announce the safety culture survey will be starting; voluntary participation; encourage participation; stress importance to the organization.	Employees Line Managers Union Leaders DOE	Email Letter Newsletter Meetings
	Communications Specialist (Team Leader)	Additional messaging to support CEO message; communicate start date	Employees Line Managers Union Leaders DOE	Print and electronic media (e.g., posters, intranet)
	Communications Specialist (Team Leader)	Reminder to people to participate and that survey will be closing soon; may be repeated 2−3 times until satisfactory response rate is achieved	Employees Managers	Print and electronic media
3. Other data collection activities				
	Communications Specialist (Team Leader)	One-on-one interviews will be conducted; describe purpose, schedule, and location	Affected employees Supervisors Union representatives	Print and electronic media
	Communications Specialist (Team Leader)	Focus group interviews will be conducted; describe purpose, schedule, and location	Affected employees Supervisors Union representatives	Print and electronic media
	Communications Specialist (Team Leader)	Behavior observations will be conducted; describe purpose, schedule, and location	Affected employees Supervisors Union representatives	Print and electronic media
	Communications Specialist (Team Leader)	Letter/email from contractor CEO to interview, focus group, observation participants thanking them for participation	Affected employees Supervisors Union representatives	Email Letter
4. Periodic progress reports				
	Communications Specialist (Team Leader)	Data collection activities completed; starting data analysis	Senior managers Union representatives DOE	Email Letter
	Communications Specialist (Team Leader)	Data analysis completed; team is interpreting data, formulating conclusions and recommendations, and preparing evaluation report.	Senior managers Union representatives DOE	Email Letter
	Communication Specialist (Team Leader)	Evaluation report draft is complete; review cycle has started.	Senior managers Union representatives DOE	Email Letter
	Communications Specialist (Team Leader)	Review cycle has been completed; senior management has approved the report; describe next steps: Action Team to review results, make recommendations, and develop/prioritize actions; briefings will be conducted to provide evaluation results and next steps.	Senior managers Union representatives DOE	Email Letter

When	Who is Responsible (Support from)	What	Target Audience	How (media)
5. Communicate results				
	Team Leader (Communications Specialist)	Prepare self-evaluation results briefing, including next steps: e.g., Action Team to review results, recommendations and develop/prioritize actions	Contractor CEO, Sr. Managers, Managers, Team Leaders	Print and electronic media
	Team leaders	Present results to employee teams and direct reports	Employees	Print and electronic media Meetings
	Contractor CEO (Team Leader)	Provide results briefings	Union representatives DOE	Print and electronic media Meetings
6. Feedback and lessons learned				
	Team Leader	Ask for feedback from evaluation team members, managers, sub-team leaders, employees, Union Representatives, DOE	Employees Line managers Evaluation team members Union representatives DOE	Email Meetings
	Team Leader (Lessons Learned Coordinator)	Prepare and distribute lessons learned; consider institutionalizing lessons learned	Organization DOE Lessons Learned database	Print and electronic media Meetings
7. Communicate follow-up actions				
	Action Team Leader (Communications Specialist)	Prepare action briefing; Contractor CEO reviews briefing and approves.	Sub-team leaders	Print and electronic media Meetings
	Sub-team Leaders	Meetings to provide Action Briefing	Employees	Print and electronic media Meetings
	Contractor CEO (Action Team Leader; Evaluation Team Leader)	Action Briefings	Union representatives DOE	Print and electronic media Meetings
	Action Team Leader (Communications Specialist)	Periodic communication of action status; continues until last action is completed	Employees Line managers Union representatives DOE	Print and electronic media Meetings
	Contractor CEO (Communications Specialist)	Announces completion of Actions and value to organization	Employees Line managers Union representatives DOE	Print and electronic media Meetings

Evaluation Protocols and Logistics Checklist

Complete	Protocol and Logistics Element
	1. Obtain badging or other site access for evaluation team.
	2. Assign site access training to evaluation team.
	3. Obtain computer access to evaluation team as needed to access documents and performance data (e.g., intranet, reports). Determine if team can use own computers or provide computers. Obtain rules on visitor network availability and rules if applicable.
	4. Determine approach for team to work on evaluation report (e.g., SharePoint).
	5. Provide visitors site specific information such as site map, directions from airport, hotels, restaurants, etc.
	6. Reserve working space for team to meet and work from (e.g., conference room). Have access to office supplies, printer, and copier.
	7. Schedule daily debrief time to allow team discussions.
	8. Prepare for focus groups by having introduction presentation, flip charts, note cards, etc. Assign note taker for all sessions.
	9. Assign escorts as needed for visitors.
	10. Arrange for administrative support for team during evaluation to assist with badging, computer access, printing, etc.
	11. Ensure that team has proper training and follows rules for site (e.g., dosimeter, safety glasses, steel toed boots).
	12. Have interviews/focus groups/observations scheduled with participants per evaluation plan.
	13. Make arrangements to meet visitors prior to arrival day.
	14. Provide key documents to evaluation team (e.g., evaluation plan, schedule, interview forms, observation forms, documents to be reviewed per evaluation plan).
	15. Review schedules, escorts, and make final schedule changes to determine who will be going where.
	16. Conduct safety briefings per site requirements.
	17. Conduct evaluation team in-brief per evaluation plan to review evaluation plan and team expectations including safety, security, quality, confidentiality, documentation, etc.

Appendix D

Evaluation Team Knowledge, Skills and Abilities

Knowledge, Skills, and Abilities	Role-Specific			Method-Specific				
	Team Leader	Executive	Subject Matter Expert	Focus Group	Interview	Observation	Survey	Performance/ Processes
Project management background (e.g., PMI/PMP)	X							
General understanding of safety culture	X	X	X	X	X	X	X	X
Background in conducting evaluations	X		X					X
Knowledge of site-specific environment (union negotiations, layoffs)	X							
Objective/unbiased	X	X	X	X	X	X	X	X
Communication skills	X	X	X	X	X	X	X	X
Strong interpersonal skills	X	X	X	X	X	X	X	X
Active listening skills (all team members)	X	X	X	X	X	X	X	X
Open to input and feedback from team members	X		X					
Questioning attitude	X	X	X	X	X	X		X
Experience in safety culture evaluation methods			X					
Provide support to the team via mentoring, coaching, training as needed	X		X					
Apply working knowledge of safety culture by education or experience			X					
Understand environment, develop and administer valid and reliable survey and summarize results				X			X	
Ability to recognize safety culture relevant behaviors (verbal, physical)	X	X	X	X	X	X	X	X
Conversant in data collection methods being used (e.g., interviews, focus group, surveys, observations)				X	X	X	X	X
Ability to analyze and integrate data results (triangulation of data; tailor lines of inquiry for interviews and focus groups)				X				
Objectively collect, analyze, and integrate information to reach conclusions for the method being used				X	X	X	X	
Understanding management systems compliance and implementation, flow-down and configuration management, organizational performance. Interfaces between management systems	X	X	X					X
Experience conducting one-on-one interviews to gather desired information without bias. • Understand and implement techniques to establish rapport and trust with interviewees. • Ability to listen and elicit response on lines of inquiry and obtain enough information to develop understanding of cultural attribute by pulling the thread through follow-up questions. • Understand and implement techniques to elicit responses from hesitant or nervous or difficult interviewees.					X			
Facilitation skills to administer effective focus group • Listening skills • Handle dominant • Stay on task • Alternative ways to obtain information • "Herding" skill set				X				
Scribe – ability to document without bias or names; hear, understand, and determine key points from discussions; interpretation skills				X				
Knowledge of work control methods, and roles and responsibilities in the process observed; knowledge of context and environment of work being conducted.						X		

Appendix E

Guidance and Example Participant Observation Checklists

Participant Observation Guidance

The following table provides general guidance on observing verbal and nonverbal behaviors (Mack et al. 2005).

Category	Includes	Researchers should note
Verbal behavior and interactions	Who speaks to whom and for how long, who initiates interaction, languages or dialects spoken, tone of voice	Gender, age, ethnicity, profession
Physical behavior and gestures	What people do, who does what, who interacts with whom, who is not interacting	How people use their bodies and voices to communicate different emotions, what people's behaviors indicate about their feelings toward one another, their social rank, or their profession
Personal space	How close people stand to one another	What people's preferences concerning personal space suggest about their relationships
Human traffic	How and how many people enter, leave, and spend time at the observation site	Where people enter and exit, how long they stay, who they are (ethnicity, age, gender), whether they are alone or accompanied
People who stand out	Identification of people who receive a lot of attention from others	These people's characteristics, what differentiates them from others, whether people consult them or they approach other people, whether they seem to be strangers or well-known by others present. Note that these individuals could be good people to approach for an informal interview or to serve as key informants.

Participant Observation Checklist

Assessor_____   Date: _____

Process/Activity_____

Procedure_____

Focus Area	Observation*			Comments
	Y Yes	**N** No	**NE** Not evaluated	
Leadership				
Demonstrated safety leadership - Tools, procedures, resources materials, equipment are available to support work				
Management engagement and time in field - Encourage personnel to challenge unsafe behavior and unsafe conditions - Discuss observations in detail and provide useful feedback and how to improve performance				
Open communication/fostering environment - Candid discussion at all levels of organization - Take steps to avoid unintended or conflicting messages				
Clear expectations and accountability - Workers understand the objectives, roles, and responsibilities				
Employee/Worker Engagement				
Teamwork and mutual respect - Opinions valued - Collaboration between work groups				
Participation in work planning and improvement - Work is effectively planned and executed by incorporating risk insights, site conditions and coordination with different groups or activities				
Mindful of hazards and controls - Workers are aware of the facility status, working conditions, and associated hazards				
Organizational Learning				
Credibility, trust, and reporting errors and problems - Free to raise safety concerns without fear of retribution, with confidence that the concerns will be addressed				
Questioning attitude - Identification, resolution, or stop when unexpected conditions occur				
Operating experience - Adequately trained to ensure competency for work performed - Use/discussion of lessons learned				

Personnel Contacted	Organization	Title

Participant Observation Checklist (Meeting)

Meeting Name: _____

Key Participants Present: _____

Meeting Descriptors	Yes (Y) – No (N) – Not Applicable (NA) Circle only one	Comments
Content		
Was there an agenda for the meeting?	Y N NA	
Were agenda items prioritized and assigned approximate time?	Y N NA	
Were safety aspects discussed, if applicable?	Y N NA	
Was the purposed of the meeting clear?	Y N NA	
Was any material used in the meeting provided in advance?	Y N NA	
Leader Behaviors		
Did the leader generally maintain focus and efficient use of time?	Y N NA	
• Did the meeting start on time?	Y N NA	
• Did the meeting end on time?	Y N NA	
• Were there distracting side-bar conversations?	Y N NA	
• Were inappropriate behaviors challenged?	Y N NA	
Did the leader behaviors contribute to candid discussions?	Y N NA	
Did the leader seek out differing points of view?	Y N NA	
Did the leader draw out less active participants?	Y N NA	
Were actionable items assigned by name and with a due date?	Y N NA	
Participant Behaviors		
Did attendees appear to be prepared and knowledgeable?	Y N NA	
If there were "stand-ins," did they actively participate?	Y N NA	
Did all attendees participate in discussions?	Y N NA	
Did all attendees have access to handouts?	Y N NA	
Did participants meet obligations from prior meeting?	Y N NA	
Other:	Y N NA	

Appendix F

Interview Protocol and Sample Questions

PURPOSE

This Appendix provides the basic structure for establishing a common protocol for performing safety culture interviews. The guidance contained in this Appendix can be tailored as appropriate for performing safety culture interviews. A base set of safety culture questions (examples) are provided at the end of this Appendix.

<u>**Interview Setup**</u>

- Interview Room Environment

    – The interview room should be accessible, in a location that ensures privacy, void of windows, neutral (not a personal office), and free from distractions.

    – The room setup should be non-defensive and relaxed.

    – The interviewee and interviewer should be at the same level physically.

- Two assessment team members should participate: one as the primary interviewer and the other as note taker. You may want to change positions during the interview, if necessary. Interviewer is the *active* listener.

- Individual interviews may allow for more personal environment and possibly increased candor (<60 minutes).

- Begin with a *brief* self-profile that establishes trust and ask individual if they have any questions on your profiles.

Opening *<u>Script</u>*

- Introduce yourself and team member – name, location, background

- Describe the purpose of the interview: Safety Culture Assessment of _____. [use the standard statement provided by the team lead]

- Interviewees were randomly selected; the team is interviewing approximately _____ people.

- The responses you provide will be captured in a manner that provides anonymity ; no names will be shared with management or in the report

- We will be taking notes to ensure the information you provide is captured from your perspective (not ours). Our notes will be destroyed at the end of the assessment (after data is compiled).

- Please limit responses to the questions based on your experience within the last 2 years. Your perceptions are important.

- As stated above, this interview is intended for the purpose of assessing the safety culture at _____. As such, please DO NOT discuss safeguards or classified information; the team does not have a "need to know" or raise associated concerns (e.g., environment, safety, security, quality, health). Internal processes are encouraged to be used for such concerns.

- There are no right or wrong answers to the questions we ask; please share your opinions, observations, and experiences, as they are a valuable part of the process.

- When possible, provide specific examples and timeframes to provide clarity; descriptive responses are preferred.

- Any questions before we begin?

The Interview

- Obtain a brief interviewee profile and interact with a short follow up for interest and establishment of trust.

- Discuss the *script* before beginning the interview. As appropriate, discuss the following items:

  – Organizational reporting conflicts should be addressed (i.e., management and leadership should NOT be present during the interviews). The expectation is the interviewee is the only person in the room. Management can possibly create an environment where the interviewee may not feel comfortable or even chilled.

  – Conflict of interest (with interviewers, setting, others in room).

- Recommend that you take approximate 45 minutes and attempt to get quality responses.

- The final 5 minutes of the interview should be used for open-ended questions such as "have we missed anything?"

- Let the interview flow and remain focused. Continue to treat the interviewee with dignity and respect while maintaining control of the interview.

- Document comments and examples; capture the quotes provided by the interviewee (these are very helpful later when preparing summaries and conclusions). Redact and sanitize for anonymity.

- Take at least 10 minutes after the interview to caucus with your partner on responses, fill out data input form including the rating: positive (+), neutral (0), or negative (–). Verify with partner that the information provided by the interviewee is captured correctly.

Active Listening Tips for Interviewers

- Turn off cell phone, close doors, and do whatever else may be required to minimize interruptions or distractions from the environment.

- Look directly at the interviewee – position yourself in a non-threatening manner.

- Focus on the interviewee completely – minimize personal distractions. Don't spend time preparing a further comment or clarification while the interviewee is speaking.

- "Check in" with interviewee by summarizing what you have heard in different words; lead by saying, "If I understand you correctly" or summarize and ask "did I understand that correctly?" Obtain clarification when necessary. NOTE: It is encouraged not to "parrot" the feedback (repeating back every word), but summarize what you heard in different words.

- Use the occasional head nod or use of "Hmmm…oh" (not agreement) to obtain more clarification. Use statements such as "that's interesting…tell me more" or "what does that look like/feel like from your perspective?"

- Demonstrate positive body language by smiling and use other encouraging facial expressions.

- Be attentive of your posture, and make sure it is open and inviting (no crossed arms or table separating you from the interviewee).

- Pay attention to the interviewee's body language to gauge receptivity to questions. Acknowledge emotions to pull out more information, when needed (e.g., "you seem very passionate about….").

Interview Structure

Two interview structures are provided: the "bottoms-up" Individual Contributor and the "top down" Senior Leadership. The two structures are discussed below.

Beginning the interviews with individual contributors and moving up to senior management allows identification of issues with analysis of management awareness/systems after interviews. (Preferred)

At times, with a bottoms-up interview structure, a brief interview or meeting (15 minutes) with the Senior Leadership for "where they think they are?" is helpful before the interviews to validate agreement and alignment from the bottom up. The approach will be dependent upon the team lead based on his/her prior experiences encountered as well as the culture of the organization.

Beginning the interviews with Senior Leadership and moving down through individual contributors provides insight of management awareness/engagement early but may predispose interview. If an interview with Senior Leadership is conducted first, it is recommended that the questions/interview focus on what they (the senior leader[s]) communicated regarding expectations (e.g., safety culture or safety conscious work environment [SCWE]), what the senior leader may expect in responses, and what the senior leader may need from the team following the self-assessment.

Types of Interview Questions

Open-ended

Open-ended questions are an invitation to the respondent to talk at length about a general subject. THEY ARE PREFERRED for safety culture assessments. They ask for general information and allow the interviewee to structure the response. The interviewee can determine the amount and type of information that s/he will give. Open-ended questions are good for drawing out information that is unknown, as the respondent can share stories, experiences, and examples. Traditionally, open questions may require follow-on questions to get to the "why" associated with the feeling or perception expressed. NOTE: Pay attention to the line of questions that you are asking…ensure that you are not "leading" the interviewee to a specific conclusion (e.g., check your bias at the door).

Examples:

"How would you go about raising a safety concern?"

"Tell me about your Stop Work Policy"

"Can you tell me about a recent safety decision that management made and how it was communicated?"

The disadvantage to open-ended questioning is the increased time to conduct the interview and making note taking difficult. Additionally, the interviewee may dwell on information that you may not want or need, resulting in not as much control.

Closed-Ended

Close-ended questions provide the interviewer with a clear, unambiguous answer. They can save time by getting specific information. Close-ended questions are effective for controlling the direction and pace of the interview and are more appropriate when limited or specific information is required. The drawback to closed questions is that they do not promote further information sharing by the interviewee. NOTE: Pay attention to the line of questions that you are asking…ensure that you are not "leading" the interviewee to a specific conclusion (e.g., check your bias at the door).

<u>**The Role of the Interviewer and Handling Situations During Interviews**</u>

Immediate safety issue. These should always be handled by the assessed organization. NOTE: Anonymity may not be assured. Notify the team leader when such an issue is identified; the team leader will bring the issue to the attention of appropriate management. If a safety issue (potential imminent harm to self or other) is identified during a walk-through or an observation, it is important to <u>stop work</u> consistent with the site protocols.

Non-cooperative interviewee. Always a tough situation to encounter. Tell the interviewee the interview is not mandatory and if you want to leave that is fine. However, let the interviewee know how important their contribution is to understanding the organizations safety culture. Always be courteous and don't become defensive. Encourage trust/openness by acknowledging the interviewee's experience/expertise and demonstrating an ability to empathy their point of view. Don't try to force an answer; instead be courteous and transition to another question.

Wandering discussions. Sometimes it is necessary to redirect the discussion to get it back onto the subject of the prepared questions. To complete the interview successfully, a fair amount of discipline is required to remain on topic. *Use a closed-ended question to end the discussion* or phrasing like "That's interesting. Can you give me an example?" Try to avoid leaving the impression you are not interested in what they have to say.

Maintaining neutrality/Impartiality. Avoid agreeing with the interviewee's point. The most you should do is say, "If I understand you correctly, you think/believe…" or say, "that's interesting…," and then move on. Avoid emotional reactions to responses.

Missing important cues. It is easy to miss what is being said – or not said. Pay attention to more than the words, such as body language, as well as changes in pitch, tone, and volume, which can mean many different things. Both verbal and nonverbal cues are important. Body language makes up 55% or more of communication!

Signaling desired answers (leading questions). Avoid asking leading questions or any question in a manner that may pre-dispose the response to support your "take" on the issue or solicit what you (as an interviewer) may want to hear.

Sample safety culture questions that may be used during an interview are listed below:

LEADERSHIP QUESTIONS

Attribute: Demonstrated Safety Leadership

1. What is your safety philosophy?

    a. How do you communicate your expectations throughout your organization?

    b. How often and by what means do you reinforce those expectations?

2. Does anyone besides your immediate supervisor provide you direction? If so, who are they and have they provided expectations related to safe performance of work to you? If so, what are those expectations and how have they imparted them to you?

3. What is your expectation regarding workforce actions when they determine:

    a. They cannot perform the activity consistent with governing procedures?

    b. They encounter conditions during the performance of work that were not expected?

4. When subcontractors perform work within your area of responsibility:

    a. How do you establish the flow down of requirements and associated roles, responsibilities, accountabilities, and authorities (R2A2) to subcontractor personnel?

    b. How have you assured yourself that subcontractor management, supervision and/or staff are competent to fulfill their R2A2?

    c. What actions have you taken that demonstrate your commitment to safety? Examples?

5. How do you ensure that work is performed safely **and** on schedule?"

6. Give some examples how you demonstrate that work must be performed safely and completed on time?

7. How effectively and clearly does senior management give direction? Examples? Please explain.

8. How does senior management communicate current safety issues and safety improvement focus areas? Examples? Please explain.

9. Has safety leadership improved at your facility/site during the past 2 years? Examples? Please explain.

10. What do you think your biggest issue is regarding performing work safely?

Attribute: Management Engagement and Time in Field

1. How much time do you spend and how often are you in the field monitoring work performance and reinforcing expectations? Is this enough to effectively monitor expectations? Provide an example of where your observations and intervention resulted in a positive change that affects the safe performance of work?

2. Do you see managers above you in the field enough to effectively monitor work performance and reinforce expectations?

3. Do you know enough of what goes on around the workgroup levels at the plant? Examples? Please explain.

4. How do managers and supervisors provide coaching, mentoring, and feedback for their field observations with the group they observed? Examples? Please explain.

5. What are the organization's expectations or requirements for management spending time in the field? Do you feel this expectation is being met? Do you have an example of a work activity improvement that happened as a result of your management time in the field?

Attribute: Open Communication and Fostering an Environment Free from Retribution

1. When a safety concern is raised, what happens?

2. What are some reasons you might not raise a safety issue, other than fear of retaliation?

3. What are some forms that retaliation might take in your organization? Are there subtle forms that outsiders might not see or understand?

4. What is the level of trust in your organization, up the line, down the line, and in your peer group? Why did you answer the way you did?

5. Do you have an example of when a safety concern was raised? Who was it raised to? How long did it take to address the issue? How was it documented?

6. Have you ever had to deal with an issue that involved retaliation to the worker that raised an issue?

7. Do you have an example of where disciplinary action was imposed on a worker that was previously involved with raising a safety issue?

8. Do you have an example of something you do to detect the presence of retaliation in the workplace?

9. Do you have an example where a worker in your group used an alternate method of raising an issue? Did that bother you that they used this method?

10. Describe your organization's process and methods for reporting issues, errors, and problems. Do you have any examples where a worker documented an issue formally in the problem reporting system? How did you feel about this?

11. Have expectations for raising issues without reprisal been communicated to your employees? How was this accomplished? How often are they communicated?

12. What sort of backlog do you have for problem reports, and what is the typical response time to address an issue?

Attribute: Clear Expectations and Accountability

1. What are your R2A2s for the safe performance of work? Are these documented? How are you held accountable to these?

2. How do managers and supervisors recognize excellent performance?

3. How do managers hold personnel accountable for less-than-adequate performance? Examples? Please explain.

4. How does your supervisor reinforce his/her expectations for the safe performance of work? Examples? Please explain.

5. Is safety a part of your performance review?

6. How do your subordinates react to their peers bringing forward a safety issue? Has any inappropriate behavior been addressed?

7. How do you know that your disciplinary process is fair? Does it consider how the organization may have contributed to the action? Does it consider the possibility of retaliation for raising safety issues? What do you do to make sure actions taken are perceived as fair by the workforce?

EMPLOYEE/WORKER ENGAGEMENT

Attribute: Teamwork and Mutual Respect

1. How do individuals and teams that work across workgroup boundary lines maintain a focus on doing work safely? Examples? Please explain.

2. Do you have any examples where bullying or humiliating behaviors were demonstrated by peers or management? Examples? Please explain. Were they addressed and how?

3. Does your peer group tolerate bullying or humiliating behavior? Can you give examples?

4. When disagreements about safety are brought up, what happens?

5. Can you identify a situation where an employee was recognized for bringing up an issue by management?

6. Can you identify a situation where an employee issue seemed to interfere with addressing a problem the employee raised with management?

ORGANIZATIONAL LEARNING

Attribute: Credibility, Trust, and Reporting Errors and Problems

1. Describe the most important safety related issue or concern that is on your mind. Have you taken any actions to resolve it?

2. Do you have an example where an employee was encouraged to offer innovative ideas, concerns, suggestions, differing opinions, and questions to help identify and solve problems? Examples? Please explain.

3. Do you have an example where employees openly discuss factors in a mistake they were involved with? Are employees concerned about potential personal consequences when discussing a mistake? How are mistakes viewed by the organization? Examples? Please explain.

4. Typically, is there open sharing of information on important facility/organization issues and changes that are expected? Examples? Please explain.

5. Do you have an example of an employee who was encouraged and/or who was shown appreciation for raising safety issue and error reporting? Please explain.

6. Do you have any examples where your manager made a decision regarding safety that you had to implement? How did this affect your trust level in the manager?

7. Do you have an example of someone who made an honest mistake and how they were dealt with by management? What happened to that person? Have you noticed any difference in how mistakes that affect production are handled to compare to mistakes that affected safety?

Attribute: Effective Resolution of Reported Problems

1. How does your corrective action program communicate feedback and closure to individuals who have identified issues related to safety?

2. Does your corrective action process take steps to determine if the corrective actions taken are effective? How does it work?

3. How are problem reports viewed by management?

4. How timely are issues addressed?

5. Are workers contacted to discuss their issues in the process? If so, when does the communication occur?

6. Are there performance indicators that are available to show the health of the corrective action management system? Who looks at them? Has any action resulted from the principle investigators (PIs)?

7. Do you have an example of using a lessons learned in your organization?

8. How often do workers bring up issues? In what way or with what system? How do you know that this approach is effective?

9. Do you have an example of a worker(s) being encouraged to raise issues?

10. Do you have an example where the cause of an issue was focused on the individual alone?

11. Do you have an example where you identified the cause of an issue within the organization such as poor communication, or poor procedures?

Attribute: Performance Monitoring Through Multiple Means

1. Is safety information discussed with the workforce? Do you have any examples of recent safety performance items shared/discussed by you?

2. Is safety performance measured?

3. Do you have an example of safety performance information that was used to improve overall performance?

4. Are near-misses routinely reported? When they are reported, does management take them seriously and learn from them?

Attribute: Questioning Attitude

1. Do you have an example of your staff stopping a job to question work in progress? Examples? Please explain.

2. Do you have an example of any dialogue and debate regarding evaluating issues related to safe production? Examples? Please explain.

3. Do you have an example of different approaches being discussed with the workforce before work is performed? What are some examples?

4. How would you rate the questioning attitude of your organization? Is questioning the "status quo" a valued and expected practice or discouraged? Is this practice routine or the exception?

5. Do you have an example of a discussion being held, either formally or informally, about how tasks can be improved?

6. Is there time given to communicate improvements/ideas?

LEADERSHIP

Attribute: Demonstrated Safety Leadership

1. Are you aware of the safety-related expectations of your supervisor; if so, can you describe them? How does your supervisor communicate his/her safety expectations to you?

2. Do you believe that the organization views safety more important than schedule? Examples? Please explain.

3. How does management communicate current safety issues and safety improvement focus areas? Examples? Please explain.

4. Has safety leadership improved at your facility/site during the past 2 years? Examples? Please explain.

5. How does your supervisor support senior management policies and direction? Examples? Please explain.

6. How do your line managers' actions demonstrate their commitment to safety? Examples? Please explain.

7. What do you think the organization's biggest issue is regarding performing work safely?

Attribute: Management Engagement and Time in Field

1. How often do you see supervisors/managers in the field monitoring work performance and reinforcing expectations? Can you provide examples of where their observations and intervention resulted in either a positive or negative change affecting the safe performance of work?

2. Does management really know what goes on around the workgroup levels at the plant? Examples? Please explain.

3. Typically, do the managers and supervisors provide feedback on their field observations? Examples? Please explain.

4. When out in the field, do leaders typically reinforce safety standards and display behaviors that reflect safety as an overriding priority? Examples? Please explain.

5. Do changes happen as a result of management time in field?

Attribute: Open Communication and Fostering an Environment Free from Retribution

1. What are some reasons you might not raise a safety issue, other than fear of retaliation?

2. What are some forms that retaliation might take in your organization? Are there subtle forms that outsiders might not see or understand?

3. What is the level of trust in your organization, up the line, down the line, and in your peer group? Why did you answer the way you did?

4. How do managers and supervisors respond to employee questions and concerns? Examples? Please explain.

5. When management resolves conflicts, are the outcomes typically fair and reasonable? Examples? Please explain.

6. Do you feel comfortable to go to your supervisor, employee control program, or (if a contractor) DOE to report problems? Examples? Please explain.

7. When peers raise a safety concern, what happens?

Attribute: Clear Expectations and Accountability

1. What are your roles, responsibilities, authorities, and accountabilities for safe performance of work? Where are these documented? How are you held accountable to these?

2. Is safety a part of your performance review?

3. If a procedure or activity is incorrect, do you feel comfortable stopping work to resolve the problem? Examples? Please explain.

4. How does your supervisor reinforce his/her expectations for the safe performance of work? Examples? Please explain.

5. Is your disciplinary process is fair? Does it consider how the organization may have contributed to the action? Does it consider the possibility of retaliation for raising safety issues?

EMPLOYEE/WORKER ENGAGEMENT

Attribute: Teamwork and Mutual Respect

1. Is it common for work teams to discuss safety during pre-job briefs, work planning walk-downs, or team meetings? Examples? Please explain.

2. How collaborative and cooperative are the different work groups associated with project and operational activities? Examples? Please explain.

3. Are bullying or humiliating behaviors clearly not tolerated or demonstrated by leaders, either formally or informally? Examples? Please explain.

4. How often do safety conversations with your peers and your supervisor occur? Examples? Please explain.

5. When disagreements about safety are brought up, what happens? How do individuals and teams work across workgroup boundary lines maintain a focus on doing work safely? Examples? Please explain.

6. Does your peer group tolerate bullying or humiliating behavior? Can you give examples?

7. When disagreements about safety are raised, what happens?

ORGANIZATIONAL LEARNING

Attribute: Credibility, Trust and Reporting Errors and Problems

1. Are managers, supervisors and other leaders willing to accept performance and change their behavior? Examples? Please explain.

2. Do you trust your supervisor to make good decisions in regards to your safety?

3. When someone makes an honest mistake that affects safety, what happens to that person? What about mistakes that affect production?

4. Do managers respond in a timely manner to issues that are brought to their attention? Describe the most important safety related issue or concern that is on your mind. Have you taken any actions to resolve it?

5. Do you have an example where an employee was encouraged to offer innovative ideas, concerns, suggestions, differing opinions, and questions to help identify and solve problems? Examples? Please explain.

6. Do you have an example where employees openly discuss factors in a mistake they were involved with? Are employees concerned about potential personal consequences when discussing a mistake? How are mistakes viewed by the organization? Examples? Please explain.

7. Typically, is there open sharing of information on important facility/organization issues and changes that are expected? Examples? Please explain

8. Do you have an example of an employee who was encouraged and/or who was shown appreciation for raising safety issue and error reporting? Please explain.

Attribute: Effective Resolution of Reported Problems

1. How well are you informed about corrective actions taken (including results) to correct problems that affect your workgroup?

2. Are you encouraged to solve problems or invited to participate in performance improvement processes? Examples? Please explain.

3. How does your corrective action program communicate feedback and closure to individuals who have identified issues related to safety?

4. Typically how effective are corrective actions taken to resolve workplace safety concerns?

Attribute: Performance Monitoring Through Multiple Means

1. How do supervisors share safety or other information?

2. Do you have an example of safety performance information shared by your supervision?

Attribute: Questioning Attitude

1. Do you have an example of stopping a job to question work in progress? Examples? Please explain.

2. How would you rate the questioning attitude of your organization? Is questioning "status quo" a valued and expected practice or discouraged? Is this practice routine or the exception?

3. Is there time given to communicate improvements/ideas? Do you have an example of discussions about how tasks can be improved?

LEADERSHIP

Attribute: Demonstrated Safety Leadership

1. What is your safety philosophy?

    a. How do you communicate your expectations throughout your organization?

    b. How often and by what means do you reinforce those expectations?

2. How do you and your subordinate managers integrate safety responsibilities when establishing mission and operational goals?

3. How do you and your subordinate managers establish safety expectations, communicate their expectations to employees, and verify that their performance expectations are being met?

4. Do you have examples of situations where external factors could have impacted the safe performance of work and actions that were taken by the organization?

5. How do you and your subordinate managers encourage (and cultivate the use of) a questioning attitude?

6. How is the contract incentivized to achieve a reasonable balance between cost/schedule and safety pressures? For example, what incentives are in place to prevent budget or schedule pressures from impairing the effectiveness of formal processes for identifying, documenting, and resolving safety, quality, and technical concerns and issues raised by employees and for managing complex technical issues? If not so incentivized, how do you assure you are not critically diminishing the effectiveness of important Safety Management Programs, specifically including those associated with issue identification and corrective action management, when faced with undue budget and schedule pressures?

7. How do you link safety to strategic issues like budget, production, workforce planning, equipment reliability, backlog work-downs, etc.? Examples? Please explain.

8. Has safety leadership improved at your facility/site during the past 2 years? Examples? Please explain.

9. How have you assured your subordinate management, supervision and/or staff are competent to fulfill their responsibilities?

Attribute: Management Engagement and Time in Field

1. What are the organizations expectations or requirements for management spending time in the field?
2. What are management's expectations for observing field activities?
3. Do changes happen as a result of management time in field?
4. What is the value of management field presence?

Attribute: Open Communication and Fostering an Environment Free from Retribution

1. What are some forms that retaliation might take in your organization? Are there subtle forms that outsiders might not see or understand?

2. What is the level of trust in your organization, up the line, down the line, and in your peer group? Why did you answer the way you did?

3. Do you have an example of something the organization does to detect the presence of retaliation in the workplace?

Attribute: Clear Expectations and Accountability

1. How do employees know what standards of behavior and work performance are expected of them in the conduct of work? Examples? Please explain.

2. What are your responsibilities, authorities, and accountabilities for safe performance of work? Are these documented? How are you held accountable to these?

3. What gives you confidence that your disciplinary process is fair? Does it consider how the organization may have contributed to the action? Does it consider possible retaliation for raising safety issues? What do you do to make sure actions taken are perceived as fair by the workforce?

EMPLOYEE/WORKER ENGAGEMENT

Attribute: Teamwork and Mutual Respect

1. Do you have any examples where bullying or humiliating behaviors were demonstrated by peers of management? Examples? Please explain. Were they addressed and how?

ORGANIZATIONAL LEARNING

Attribute: Credibility, Trust and Reporting Errors and Problems

1. How are employees encouraged to offer innovative ideas, concerns, suggestions, differing opinions, and questions to help identify and solve problems? Examples? Please explain.

2. Describe the most important safety related issue or concern that is on your mind. Have you taken any actions to resolve it?

3. How is information shared on important facility/organization issues and significant changes? Examples? Please explain.

Attribute: Effective Resolution of Reported Problems

1. How does your corrective action program communicate feedback and closure to individuals who have identified issues related to safety?

2. Are there performance indicators that are available to show the health of the corrective action management system? Who looks at them? Has any action resulted from the PIs?

Attribute: Performance Monitoring Through Multiple Means

1. What methods does the organization use to understand operational performance and manage risk? How does the organization integrate safety into the indicators? Examples? Please explain.

2. How does the organization communicate the results of safety indicator trending to staff? Examples? Please explain.

Attribute: Questioning Attitude

1. How is dialogue and debate encouraged – as well as modeled by management – when evaluating issues related to safety? Examples? Please explain.

2. How would you rate the questioning attitude of your organization? Is questioning "status quo" a valued and expected practice or discouraged? Is this practice routine or the exception?

Appendix G

Guidance for Conducting Focus Groups

Purpose

Focus group interviews are forensic tools used to delve more deeply into issues previously identified through initial and broadly scoped data collection methods such as surveys, interviews and observations. They assist in developing an in-depth understanding of all aspects of issues. The data are analyzed, along with results from other data sources to develop a set of actionable items, and will be used to create a continuous improvement path-forward to address identified issues.

Based on the overall safety culture assessment plan, focus groups may also be used as part of a broader approach to understand how the organization is performing with respect to the safety culture focus areas and attributes.

Planning Phase

Facilitator Selection

The Assessment Team Lead selects experienced neutral facilitator(s) who make people feel safe and comfortable in the group setting. See Appendix D for training requirements or recommendations. Demonstrated facilitator skills include the following:

- Ability to listen actively.

- Drawing out the opinions and feelings of less vocal people, not allowing one person to dominate the conversation. Keep the discussion on-topic and know when to ask follow-up questions that probe deeper into a participant's feelings and experience.

- Understand when to be quiet and wait to allow for a participant to elaborate on a response.

- Ability to understand body language, both theirs and of those in the group, and the impact it has on the effectiveness of the session.

NOTE: Facilitation is a learned skill. Often, a person who is new to facilitation can work with a skilled facilitator to gain on-the-job training. Not everyone can be a facilitator.

Scribe Selection

The Assessment Team Lead selects individual(s) to fill the scribe roll who have demonstrated the ability to capture information, conversations, and data quickly and maintain a high degree of confidentiality. Scribes must be neutral and not affected by the issues being addressed. Scribe responsibilities and attributes include the following:

- responsible for taking detailed and complete notes, preferably on a laptop computer.

- capturing the conversation as quickly as possible without needing to interrupt the conversation for clarification.

- using correct format, punctuation, or grammar after the sessions.

- preserving focus group participant anonymity; i.e., identify speakers only by number.

- capturing all of the responses and clarifying comments provided.

Lines of Inquiry (LOI) Determination

Once a facilitator is selected, that person interfaces with the team lead to determine what issues are to be addressed through focus groups. Criteria include the following:

- Specific questions should align with identified issues and impacted workgroups.

- Questions should be limited to 4−6 primary total per session; recommend developing 1−2 follow-up questions to use if time allows.

- Questions should be open ended without the ability to answer with a "yes" or "no," to encourage open group discussion.

- Develop the questioning approach based on the overall safety culture assessment strategy or plan (funnel based or broader approach).

Selection of Focus Group Participants

In general, selecting focus group participants is an art and science. Ideally, the assessors would randomly select participants and 100% of those selected would participate. Unfortunately, it rarely works that way. A more practical way to select participants is a stratified random sampling method. From time and resource constraints, the number of focus groups will be limited. In a small organization (<1,000), the number of focus groups may be 10−12; in a large (>5,000) organization, as many as 30−40 focus groups may be conducted. Start by selecting sub-organizations in which you wish to conduct focus groups. The number of groups should be weighted according to workforce distribution. For example, if 40% of the workforce is in Production, then 40% of the focus groups should be in that organization. Next, select smaller groups within that organization. For example, if there are 10 Production groups and you will be conducting 4 focus groups, randomly select 4 groups.

Participants should be selected from the identified group(s) associated with the issue to be evaluated, ensuring the following are considered:

- Group size should be limited to 6−10 individuals (invite 12 individuals with the thought that 8 will show up).

- If possible, selection should be random based on the size and makeup of the organization.

- Knowledge of or affected by the issues.

- Confidentiality of selected individuals must be maintained.

- Do not exclude individuals known to be less vocal or have critical attitudes.

- Consider the organizational relationships to one another and whether or not that will impair their feedback; being conscious of not creating a chilled environment.

Selection and Qualities of the Venue

Consider the following:

- The location should be neutral to the regular workplace to maintain participant confidentiality.

- It should be comfortable and non-intimidating for participants (not in the management conference room or in a room that is highly visible to the work force).

- Minimal distractions in the area.

- Schedule the room to allow for 30 minutes prior to and after the session for set-up, take-down, participant confidentiality, and summary discussion with facilitator and scribe.

Focus Group Protocol

The following steps provide a general outline for the conduct of focus groups:

1. Schedule the focus group at least 1 week in advance (recommend centralizing planning for survey, interview, observations and focus group logistics).

2. Refer to Appendix B for additional information on conducting interviews.

3. Supervisors should be notified to ensure personal accountability

4. Focus groups normally meet for 60–90 minutes.

5. Materials to consider for the focus group session include:

    - LOIs
    - Laptop and projector
    - Flipchart
    - Pens and sticky notes

6. Focus group leader and scribe arrives 30 minutes early to secure the room and ensure that the computer equipment works.

7. Key documentation (i.e., photographs, procedures, announcements) should be available in the meeting room or prior to the focus group session.

8. Facilitator and scribe meet immediately after each focus group session to capture a summary of the focus group discussion..

Focus Group Execution

It is recommended that the focus group session be conducted in the following order:

1. Introduce self and the role of the facilitator and scribe as well as intended outcome.

2. Review meeting ground rules to include maintaining confidentiality (cell phones off, one person talking at a time, etc.).

3. Proceed with initial LOIs.

4. Follow-up questions designed to understand viewpoints more thoroughly should be open-ended or fill-in-the-blanks:

    - Tell me more about that….
    - Help me understand…..
    - Can you tell me when that last occurred… (ensures information is recent and firsthand knowledge)
    - Describe the frequency…

5. Solicit solutions or recommendations for improvement of issues

6. Avoid group think by engaging all participants

7. Document outside issues to address in a different venue (extraneous to focal issues)

8. For participants that may not be comfortable speaking freely in a group setting, offer the option of scheduling a one-on-one interview or provide the facilitator's contact information to promote a post-session dialogue.

9. Feedback to the interviewees what was heard to ensure comments provided were accurately captured.

10. Consider prioritizing themes (anonymous or as a group).

11. Conduct a discussion at the end of the session to solicit feedback regarding what went well and what could have been improved

12. Conclusion – thank participants and share next steps if known

NOTE: Remember, in your role as a facilitator, you are not a participant and must practice active listening and maintain a neutral position. Do not share facilitator biases or lead conversations with words or non-verbals.

Post Focus Group Execution

Scribe finalizes notes and shares with facilitator; together they analyze the data and document the focus group session in a report. Individual focus group reports will be compiled to develop a summary of findings to be included in the overall culture survey results. Report should include the following:

• a brief overview of the issue addressed

• represented groups

• the number of sessions conducted and number of participants

• a summary of the results prioritization exercises (step 10)

• general impressions, insights, and suggestions based on the feedback

• who prepared the report and contact information.

Other Items

• Provide Team Lead or Management with the issues captured and parked during the focus group sessions which did not pertain to the targeted focus area for further evaluation, action and closure.

• Debrief remaining assessment team members on focus group results.