U.S. Department of Transportation

Federal Railroad Administration

A Job Analysis Design for the Rail Industry: Description and Model Analysis of the Job of Freight Conductor

Office of Research
and Development
Washington, DC 20590

DOT/FRA/ORD-13/38

Final Report
October 2013

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	October 2013	Final Report

4. TITLE AND SUBTITLE
A Job Analysis Design for the Rail Industry: Description and Model Analysis of the Job of Freight Conductor

5. FUNDING NUMBERS
DTFR53-07-G-00007

6. AUTHOR(S) and FRA COTR
Benjamin Walsh, Leslie Golay, Janet Barnes-Farrell, and Stephanie Morrow

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
U.S. DOT/RITA/John A. Volpe National Transportation Systems Center,
55 Broadway, Cambridge, MA 02142-1093

University of Connecticut Industrial Psychology Applications Center,
406 Babbidge Road, Storrs, CT 06269-1020

8. PERFORMING ORGANIZATION REPORT NUMBER
IPAC TR-2010-01

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
U.S. Department of Transportation
Federal Railroad Administration
Office of Research and Development
Washington, DC 20590

10. SPONSORING/MONITORING AGENCY REPORT NUMBER
DOT/FRA/ORD – 13/38

11. SUPPLEMENTARY NOTES
Program Manager: Michael Coplen, Federal Railroad Administration

12a. DISTRIBUTION/AVAILABILITY STATEMENT
This document is available to the public through the FRA Web site at http://www.fra.dot.gov/eLib/Find or by calling (202) 493-1300.

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)
This document provides a step-by-step description of the design and execution of a strategic job analysis, using the position of Freight Conductor as an example. This document was created to be useful for many different needs, and can be used as an example of how to conduct similar job analyses for other positions. The job analysis process is described in detail; sample meeting agendas, survey questionnaires, and suggestions on how to create and finalize a list of job tasks and KSAOs for the position of interest are provided. While analyzing the position of Freight Conductor, key aspects of the position were identified, including main tasks and KSAOs required to complete the job successfully. Conclusions report the specific results of the job analysis, including information from SME focus group discussions regarding demands and strains of the job. Implications for training and development are also discussed.

14. SUBJECT TERMS
Job analysis, job tasks, training assessment, freight conductor, safety-sensitive positions, knowledge, skills, abilities, and other characteristics.

15. NUMBER OF PAGES
138

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	

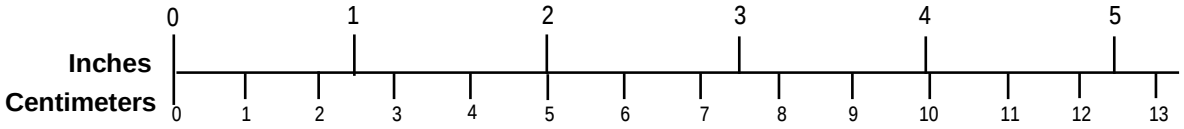
NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18
298-102

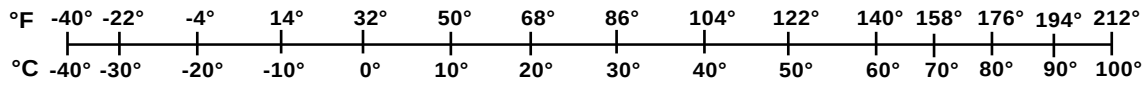
METRIC/ENGLISH CONVERSION FACTORS

ENGLISH TO METRIC	METRIC TO ENGLISH
LENGTH (APPROXIMATE)	**LENGTH (APPROXIMATE)**
1 inch (in) = 2.5 centimeters (cm)	1 millimeter (mm) = 0.04 inch (in)
1 foot (ft) = 30 centimeters (cm)	1 centimeter (cm) = 0.4 inch (in)
1 yard (yd) = 0.9 meter (m)	1 meter (m) = 3.3 feet (ft)
1 mile (mi) = 1.6 kilometers (km)	1 meter (m) = 1.1 yards (yd)
	1 kilometer (km) = 0.6 mile (mi)
AREA (APPROXIMATE)	**AREA (APPROXIMATE)**
1 square inch (sq in, in^2) = 6.5 square centimeters (cm^2)	1 square centimeter (cm^2) = 0.16 square inch (sq in, in^2)
1 square foot (sq ft, ft^2) = 0.09 square meter (m^2)	1 square meter (m^2) = 1.2 square yards (sq yd, yd^2)
1 square yard (sq yd, yd^2) = 0.8 square meter (m^2)	1 square kilometer (km^2) = 0.4 square mile (sq mi, mi^2)
1 square mile (sq mi, mi^2) = 2.6 square kilometers (km^2)	10,000 square meters (m^2) = 1 hectare (ha) = 2.5 acres
1 acre = 0.4 hectare (he) = 4,000 square meters (m^2)	
MASS - WEIGHT (APPROXIMATE)	**MASS - WEIGHT (APPROXIMATE)**
1 ounce (oz) = 28 grams (gm)	1 gram (gm) = 0.036 ounce (oz)
1 pound (lb) = 0.45 kilogram (kg)	1 kilogram (kg) = 2.2 pounds (lb)
1 short ton = 2,000 pounds (lb) = 0.9 tonne (t)	1 tonne (t) = 1,000 kilograms (kg)
	= 1.1 short tons
VOLUME (APPROXIMATE)	**VOLUME (APPROXIMATE)**
1 teaspoon (tsp) = 5 milliliters (ml)	1 milliliter (ml) = 0.03 fluid ounce (fl oz)
1 tablespoon (tbsp) = 15 milliliters (ml)	1 liter (l) = 2.1 pints (pt)
1 fluid ounce (fl oz) = 30 milliliters (ml)	1 liter (l) = 1.06 quarts (qt)
1 cup (c) = 0.24 liter (l)	1 liter (l) = 0.26 gallon (gal)
1 pint (pt) = 0.47 liter (l)	
1 quart (qt) = 0.96 liter (l)	
1 gallon (gal) = 3.8 liters (l)	
1 cubic foot (cu ft, ft^3) = 0.03 cubic meter (m^3)	1 cubic meter (m^3) = 36 cubic feet (cu ft, ft^3)
1 cubic yard (cu yd, yd^3) = 0.76 cubic meter (m^3)	1 cubic meter (m^3) = 1.3 cubic yards (cu yd, yd^3)
TEMPERATURE (EXACT)	**TEMPERATURE (EXACT)**
[(x-32)(5/9)] °F = y °C	[(9/5) y + 32] °C = x °F

QUICK INCH - CENTIMETER LENGTH CONVERSION



QUICK FAHRENHEIT - CELSIUS TEMPERATURE CONVERSIO



For more exact and or other conversion factors, see NIST Miscellaneous Publication 286, Units of Weights and Measures. Price $2.50 SD Catalog No. C13 10286

Updated 6/17/98

Contents

Executive Summary

This document outlines a framework for conducting systematic job analyses of safety sensitive positions in the railroad industry. In addition, it describes a model analysis of the job of freight conductor. A thorough job analysis is a fundamental step toward building systems within the organization to deliver appropriate and effective job training, performance appraisals, and personnel selection procedures. The core objective of a job analysis is to identify the knowledge, skills, abilities, and other characteristics (KSAOs) required for effective performance of a particular job or set of jobs. Once completed, the results of a job analysis can be utilized to build (a) training programs that address relevant and measurable KSAOs, (b) performance appraisal systems that are legally defensible and evaluate employees based on KSAOs that have been identified as related to the respective job, and (c) personnel selection procedures that are legally defensible and measure critical, job-related skills to ensure that the organization appropriately screens new talent.

The job analysis design described here is grounded in the Combination Job Analysis Method (C-JAM; Brannick, Levine, & Morgeson, 2007; Levine, 1983). C-JAM is a type of hybrid job analysis that uses multiple methodologies to acquire information about job requirements, as well as worker requirements. C-JAM focuses on developing task statements about the job, identifying the knowledge, skills, abilities, and other characteristics (KSAOs) needed to perform the job, and then rating both based on their importance for job performance and other factors (Brannick et al., 2007; Levine, 1983). In addition, the design outlined here allows for additional information about the job to be captured, including the job context, personal and physical demands on incumbents, and tools and equipment used on the job. Slight differences in the methodology will exist across job analyses depending on the objectives of the analysis.

C-JAM has many strengths and advantages relative to other job analysis methods. One of the primary advantages of C-JAM is its flexibility; C-JAM allows for collection of information about the work done on the job (i.e., tasks) and the characteristics needed by workers to carry out that work (i.e., KSAOs), whereas other methods tend to focus on one or the other. Second, C-JAM is fairly inexpensive relative to many other methods because there is no need to purchase tools (e.g., surveys) to carry out the analysis; all materials are developed by the job analyst. Third, job analyses based on C-JAM can be accomplished with small teams of experts (e.g., incumbents, supervisors) who provide input on the job, whereas other methods require input from dozens of employees. Finally, an analysis grounded in C-JAM was chosen because the purpose of the analysis was to gather information that could be used to determine training needs and/or develop selection procedures. These practical advantages make C-JAM a viable job analysis method for the rail industry.

The model analysis presented in this report resulted in a comprehensive assessment of the job of freight conductor. Freight conductors carry out a host of tasks that are clustered around five functional categories: (a) crew communication, (b) crew supervision, (c) form and record management, (d) train inspection, troubleshooting, and repair, and (e) train makeup and handling. Freight conductors need a wide variety of KSAOs to perform job tasks successfully. These KSAOs include different types of knowledge (e.g., knowledge of operating and safety rules), skills (e.g., skill in working on and about moving equipment), abilities (e.g., judgment and

decisionmaking ability), and other characteristics (e.g., a passion for safety). Conductors use a number of different tools and types of equipment and work with a variety of railroad personnel such as locomotive engineers, dispatchers, and foremen. The job is physically and psychologically demanding for workers—demands associated with fatigue being among the most prominent.

In the interest of providing a thorough description of C-JAM and potential issues that analysts may encounter, we have included considerably more detail about the procedure than would typically be included in a job analysis report. This document provides enough detail about the job analysis design for the reader to carry out the analysis on his/her own, assuming some background knowledge in job analysis methodology. Several appendices are attached that include materials (e.g., example agendas, meeting activities, surveys) that can be modified for use in a job analysis. In addition, the results of the model job analysis of freight conductors should be a useful reference for users to follow when conducting their own job analyses.

1. Introduction

The purpose of this investigation was to conduct a systematic analysis and provide a model application that can be used to analyze safety-sensitive positions in the railroad industry. This document outlines a framework for conducting systematic analyses of the freight conductor job; it also describes a model analysis for that position. This project used a job analysis method grounded in the Combination Job Analysis Method (C-JAM; Brannick, Levine, & Morgeson, 2007; Levine, 1983), which uses multiple methodologies and sources to acquire information about the position.

For the job of freight conductor, a variety of types of KSAOs are required. In order to fully understand the extent of these characteristics, we conducted a thorough job analysis, gathering information from a number of subject matter experts (SMEs). This analysis shows the results of that analysis and provides a step-by-step description of how the analysis was conducted.

2. The Job Analysis Design

The job analysis design described in this report is derived from C-JAM and relies on panels of SMEs to: (a) generate task statements for tasks performed on the job, (b) identify KSAOs needed to perform the job effectively, and (c) link the two sets of information. Linking the KSAOs to the tasks is necessary to demonstrate that the KSAOs are job related (i.e., needed to successfully perform the job; Uniform Guidelines, 1978). In addition, the design allows for additional information to be collected about the job; for instance, the machines, tools, and equipment used; physical and psychological demands; and the job context. A checklist which outlines the major activities that need to be accomplished as part of this analysis is presented in Appendix A. For additional information on topics described in this design or on job analysis in general, consult Brannick et al. (2007). Barnes-Farrell (2006) also provides a brief but comprehensive discussion of job analysis and descriptions of several other job analysis resources.

2.1 Preliminary Activities

The first step in the job analysis is to identify the job for which an analysis is needed and the purpose for the job analysis. Data derived from systematic job analyses serve as the basis for almost all human resource functions—recruitment, selection, training and development, and performance assessment (Barnes-Farrell, 2006; Morgeson & Campion, 1997; Schippmann, 1999; Society for Industrial and Organizational Psychology, 2003). Understanding the purpose of the job analysis will help guide decisionmaking regarding the kinds of data collected. Because C-JAM is, by definition, a method which allows for the collection of information about tasks performed on the job, worker characteristics, and additional information, it can be used for a number of purposes. However, it is best suited to situations in which the job analysis data will be used for selection or training purposes (Brannick et al., 2007; Levine, 1983).

Once the job has been identified and the purpose has been clarified, an important preliminary step in the job analysis is to gather all available information about the job in order to develop an understanding of the general nature and purpose of the job. Such information can be derived from the following sources:

- Previous job analyses
- Job descriptions
- The Occupational Information Network (O*NET; http://online.onetcenter.org/)
- Organization charts
- Training materials

If possible, we recommend observing one or more workers while they perform the targeted job. Before the observation, prepare a list of questions that may have arisen as a result of inspecting the sources of information outlined above, and bring paper and pencil so that detailed notes about the job can be taken (e.g., on tasks completed). During the observation, ask the worker(s) to describe the work that they do on a typical day. The job may also have a regular cycle of assignments, and having the worker walk you through the cycle can be very beneficial for understanding the tasks done on the job.

The job analyst can use the information derived from the aforementioned sources and preliminary observations to develop draft lists of task statements and KSAOs. Although they are not necessary, preliminary task statements and KSAOs can help facilitate the development of tasks and KSAOs in meetings with panels of experts. These expert meetings are the primary source of information in C-JAM.

Brannick et al. (2007) offer some very helpful guidelines for constructing task statements. Ensuring the appropriate level of specificity is one of the primary challenges of constructing task statements. Tasks can be thought of as activities that are carried out to achieve specific job objectives; they have a clear beginning and end. Brannick et al. (2007) suggest that a good rule of thumb to use in constructing task statements is to consider whether the task can be broken down into meaningful components without referring to specific movements; if further editing of a task statement would result in describing specific movements then the task statement should not be edited further. Task statements should be constructed in the following manner (Brannick et al., 2007):

- There is an implied subject that is plural (i.e., workers, employees, or managers).
- There is a verb that tells what the workers are performing.
- The object of the verb may be any number of things (e.g., data, people, machines, tools, equipment).
- There may be a qualifying phrase starting with the word "to" or the words "in order to" that outlines the purpose of the workers' activity. This phrase can be left out if it is obvious.

Example task statements for freight conductors based on this structure are as follows:

Freight conductors…

- Update required rule books and bulletins for all territories that are operated on.
- Call out signals as they are encountered when operating in signal territory and as job activities change.
- Determine whether to move, repair, or set out rail equipment with defects in accordance with applicable rules.

A final preliminary activity entails identifying key contacts to ensure the involvement of personnel critical to the job analysis. The primary focus will be on identifying experienced incumbents and supervisors and getting their agreement to serve as members on one or more expert panels. Prospective workers or supervisors should be told the purpose of the job analysis and what their role would be as members of the expert panel. Details on expert panels and desired characteristics of panel members are described below.

2.2 Subject Matter Expert Panels

SMEs are individuals thoroughly familiar with the nature of the job as it currently stands and how the job is expected to operate in the future (Singh, 2008). SMEs can include job incumbents, managers, and consultants, among others, who are familiar with the job. It can be valuable to have different kinds of SMEs, so multiple perspectives can be gathered about a

particular job. The key is that the experts used in a job analysis have a thorough understanding of the job being analyzed.

Several researchers have recommended the use of SME panels in job analysis. For example, Brannick and Levine (2002) recommend using expert panels because they "provide information quickly and relatively cheaply compared to large samples responding to task inventories or other structured questionnaires" (p. 317). Sanchez (1994) recommends several strategies for improving the validity of future-oriented job analyses, including using teams of SMEs to adequately capture heterogeneity in views about future job tasks and needed KSAOs. Likewise, Schneider and Konz (1989) recommend the use of SME panels to identify future job changes and worker requirements.

SME panels should be comprised of approximately 5 to 7 workers and 2 to 3 supervisors who have ample experience with and understanding of the job in question. To be effective participants, individuals chosen to serve on the SME panel should have good oral and written communication skills. Likewise, SME panels should be demographically diverse to ensure that men and women and individuals of different ethnic backgrounds are involved in task and KSAO generation. It is also valuable to have representation on the SME panel from incumbents working on different shifts and from different geographic locations. Every attempt should be made to put together SME panels that provide a representative view of the job in question.

One or more panels of SMEs may be used during the job analysis, depending on time and availability of personnel. For example, one panel may be used to generate and rate the task statements, and another panel may be needed to generate and rate the KSAOs, or the same panel may be assembled twice. Regardless of whether one or multiple SME panels are used, it is important to document the characteristics—job title, sex, ethnicity, age, education, and job tenure—of members of the SME panel(s).

2.3 SME Panel Meeting 1: Discussion of Job Context and Task Statement Development

The goals of the first expert panel meeting are to (1) collect information about the job context, equipment used, and psychological and physical demands, and (2) generate a list of job tasks organized by functional category. A functional category refers to a collection of related tasks. The meeting will likely last an entire day and should be held at a location other than the workplace. Resources to bring to the meeting include, at a minimum, an audio recorder or scribe to ensure that the panel discussion is being captured accurately, pens and notebooks for the meeting coordinator and SMEs, a flip chart for the meeting coordinator, and refreshments as appropriate for the length of the meeting. Access to a computer and a printer/copier may also be helpful when editing task statements during the meeting so that panel members have updated copies during the task generation process.

A sample agenda for the first SME panel meeting is presented in Appendix A. The first activity involves a discussion of the job context, demands, and equipment used. This activity should help get SMEs oriented to thinking broadly about the job prior to generating task statements. Tell SMEs to think generally about the job rather than about their own jobs in particular. Then, to

facilitate discussion, pose questions to them about the context, demands, and equipment used on the job. Example questions that can be used in this phase are presented in Appendix A.

The second set of activities is designed to generate approximately 30 to 100 task statements organized into functional categories for the job in question (Brannick et al., 2007). If draft task statements have already been developed from existing documents about the job (e.g., previous job analyses) and/or through observation, the SMEs can instead begin by editing the draft list. Starting with a list of draft task statements can help the meeting move along in an efficient fashion that makes good use of the SMEs' time.

An example task generation activity handout is shown in Appendix A. During this portion of the meeting, provide the definition of a task that was outlined earlier and cover several examples of task statements. Also, review the appropriate structure for task statements, then allow SMEs to generate task statements (or edit the draft list) either individually or in small groups. Following this initial task generation, provide the SMEs with a short break period. During the break the meeting coordinator should gather all task lists from the panel, make copies of all task lists, and then redistribute the lists to the SMEs.

The second activity involves editing the task statements. Ask SMEs to work individually or in groups to scan the list of task statements and flag those that are redundant or poorly phrased. The entire group will then review the flagged statements to edit wording and eliminate redundancies; the result of this combined effort will be a numbered list of task statements. Ask the group to consider whether all tasks are represented on the list and add any tasks that have been missed. At this point, it may be helpful to ask the experts about tasks that are not done regularly or that would only occur at particular times (e.g., seasonal tasks, emergency-related tasks). At the end of this activity, the task list should be accurate and complete.

The third activity involves grouping the task statements by functional category. Allow the SMEs, either as individuals or in small groups, to develop the functional categories and group the tasks accordingly. Following the initial grouping of tasks, lead the SMEs in a discussion of the functional categories, with the goal of reaching consensus on a single list of task statements organized by functional category. The meeting is finished once the final task list is developed. Before concluding the meeting, ask the SMEs if they can be contacted in the future to rate the task statements to determine their importance. The next section describes the process of rating the task statements.

2.4 Task Statement Ratings

The next step in the job analysis is to capture ratings of the task statements with a survey completed by at least 5 to 7 SMEs. The same group of SMEs who generated the tasks may rate the tasks, or a new group of SMEs may be used.

The scales used to rate the tasks may vary depending on the purpose of the job analysis and the uses of the data derived from the job analysis. Consult Brannick et al. (2007) for suggestions on the kinds of ratings that should be captured depending on the job analysis purpose. At a minimum, ratings of the importance of each task should be made, and it may also be useful to capture ratings of the time spent on each task (Uniform Guidelines, 1978). With respect to task

importance, Brannick et al. (2007) suggest that ratings be made based on two characteristics: *consequences of error* and *task difficulty*. A composite task importance value is then computed from the sum of the difficulty and criticality ratings. In addition to task ratings, demographic information about the SMEs making the task ratings should be captured so that it can be described in the job analysis report. SME characteristics include job title, sex, ethnicity, age, education, and job tenure. See Appendix A for an example task rating survey.

Because the task generation meeting is expected to last an entire day, ratings of tasks will most likely be done at a different time. If possible, we recommend distributing the task rating survey to the SMEs in person. Response rates will likely be highest if the task rating survey is completed while on the job and with other SMEs. In addition, by having SMEs complete the ratings in person, the job analyst can ensure that there is a standardized process for determining ratings and shared understanding of the meaning of the ratings (e.g., the meaning of "somewhat important"). However, this is not always feasible. If SMEs have access to computers on the job, an online web-based survey is another good means of collecting task ratings. If access to computers is limited, a paper-and-pencil survey may be the only option; SMEs can complete the survey in groups, as suggested above, or on their own (surveys can be mailed to individual SMEs). If the surveys are mailed, it is important to provide detailed instructions on the questions and ratings scales, as well as contact information for the job analyst, in case the participants have questions about the survey.

2.5 Analysis of Meeting 1 Discussion Feedback and Task Ratings

Analyses of data derived from meeting 1 will include a quantitative analysis of the task ratings, as well as a qualitative analysis of information discussed by SMEs about the job context, demands, and tools used.

The audio recording of the SME discussion about job context, demands, and tools should be transcribed, and any notes taken during the process should be summarized. All responses to the questions should be described in their entirety. Themes in the SME responses can be developed for each discussion topic (i.e., context, demands, tools) in order to produce a description of the work environment for the job, the psychological and physical demands, and a list of the equipment and tools used (as well as a description of their purpose). Themes may be generated directly from the audio in lieu of transcription. The job analyst should be objective in analyzing the qualitative data and make every effort to ensure that themes accurately represent the input from SMEs.

Task ratings should be entered into a computer program that can calculate basic descriptive statistics, such as averages and standard deviations (e.g., Microsoft Excel). Task importance values are computed for each task by first adding together the ratings of consequences of error and task difficulty made by each expert (i.e., Task Importance = Consequences of Error + Task Difficulty). This results in a task importance value for each expert on all of the tasks. Then, an overall task importance value is computed for each task by calculating the average across all raters (e.g., sum the Task Importance ratings for Task 1 across raters and divide by the number of raters). To present the data, the tasks should be grouped into corresponding categories, with the categories organized either alphabetically or chronologically, and the tasks organized from high to low overall importance. A table presenting this information should be included in the job

analysis report. A measure of the variability—for example, the standard deviation—in the task importance values should be reported. Individual ratings of consequence of error and task difficulty should also be reported. Finally, demographic information for the SMEs who rated the tasks should be summarized and included in the job analysis report.

2.6 SME Panel Meeting 2: KSAO Development

The goal of the second SME panel meeting is to generate the KSAOs needed to perform all of the tasks within each functional category. The meeting should last approximately half a day if generating the KSAOs is the only activity, but if ratings on the KSAOs are also captured, then the meeting may last the entire day. Supplies to bring to the meeting are similar to those required for meeting 1 (i.e., pens or pencils and notebooks, flip chart for meeting coordinator, refreshments, computer and printer); an audio recorder is optional for meeting 2 because group discussions will be minimal.

A sample agenda for the meeting and a sample handout for SMEs describing the KSAO generation activity are presented in Appendix B. Following introductions and a discussion of the purpose of the meeting, present the SMEs with lists of the functional categories and tasks (i.e., the final product of meeting 1). Ask the SMEs to review the functional categories and tasks to determine whether any editing is needed, and also ask SMEs whether the list is complete and accurate. Any changes that are made should be documented by the meeting coordinator. Then, form groups of 2 to 3 experts and review the definitions and examples of KSAOs with them, answering any questions they have.

Assign each subgroup 2 to 4 of the functional categories and have them generate KSAOs that are needed to perform tasks within those categories. This process ensures that the requisite KSAOs are linked to a corresponding cluster of tasks. This is a critical step in the job analysis process because it demonstrates that the identified KSAOs are job related and necessary for effective performance (Uniform Guidelines, 1978). Up to 100 KSAOs may be generated across all categories (Brannick et al., 2007).

Once each subgroup is confident that all KSAOs have been generated for their assigned categories, reconvene and review the KSAOs under each category with the entire panel. Additions, deletions, and edits to the KSAOs should be made at this time based on the input from panel members. The meeting is complete once the SMEs agree that the list of KSAOs is accurate and complete. Before concluding the meeting, ask the SMEs if they can be contacted in the future to rate the KSAOs on various scales. The next section describes the process of rating the KSAOs.

2.7 KSAO Ratings

The next step in the job analysis is to collect quantitative ratings of the KSAOs using a survey completed by at least 5 to 7 SMEs. The same group of SMEs who generated the tasks and/or KSAOs may rate the KSAOs, or a new group of SMEs may be used.

As with the task ratings, the scales used to rate the KSAOs may vary depending on the purpose of the job analysis and the planned use(s) of data derived from the job analysis. Because C-JAM

is best suited to situations in which the data from the job analysis will be used for selection and/or training, Brannick et al. (2007) suggest that KSAOs be rated on four scales: (a) whether the KSAO is necessary for newly hired employees, (b) whether the KSAO is practical to expect in the labor market, (c) the extent to which problems are likely if the KSAO is ignored in employee selection, and (d) the extent to which the KSAO distinguishes the superior from the average worker. In addition to KSAO ratings, information about the SMEs making the ratings should be gathered so that characteristics of the SMEs can be described in the job analysis report. Again, SME characteristics to capture include job title, sex, ethnicity, age, education, and job tenure. See Appendix B for an example KSAO rating survey.

2.8 Analysis of KSAO Ratings

The analysis of the KSAO ratings is relatively straightforward. Calculate frequencies for all SMEs on the ratings of the 'Necessary for new employees' and 'Practical to expect in the labor market' questions. These questions have a "yes" or "no" response and should be calculated so that you have the percentage of SMEs who responded "yes" to the question. Next, calculate means and standard deviations for each of the tasks on the remaining two questions: the extent to which problems are likely if the KSAO is ignored in employee selection, and the extent to which the KSAO distinguishes the superior from the average worker. These two questions are rated on a scale ranging from 1–5. The final product of the analysis of KSAO ratings is a list of KSAOs with frequencies for responses to the yes/no questions and means and standard deviations for the remaining questions.

The data from these analyses can then be assessed to determine which KSAOs should be used in selection and training. For a particular KSAO to be used in selection, three conditions must be met: the KSAO must be rated as necessary for new hires by a clear majority of the SMEs; a clear majority of the SMEs must have also indicated that the KSAO is practical to expect in the labor market; and the mean rating on 'Problems likely' must be at least 1.5 (Brannick et al., 2007).

To determine which KSAOs should be used in training, two conditions must be met: the KSAO should be rated as not necessary for new hires by a clear majority of the SMEs, and the mean rating on 'Distinguish superior from average worker' must be at least 1.5. The KSAOs can be ranked in terms of importance for training based on the 'Distinguish superior from average worker' scale, with higher values on the scale indicating greater importance for training.

2.9 Job Analysis Report: Summarizing the Findings

The results of the job analysis should be formally documented, and the report should describe all activities that were done during the analysis, as well as all data that were gathered. Begin with an introduction that outlines the purpose of the job analysis and any other relevant background information. Also discuss any preliminary activities that were done (e.g., observation, development of draft task statements). Then, describe all job analysis activities that were carried out and the data derived from the activities. Include appendices, such as those included in this document, to ensure that all information about the job analysis procedure and collected data are made available to readers. Finally, a cleaned data set should be prepared, from which information that identifies individual SMEs has been removed. The data set, which should

include all quantitative information (i.e., task and KSAO ratings and created variables) gathered during the job analysis, should accompany the final report.

3. Application of the Job Analysis Design to the Job of Freight Conductor

An analysis of the job of freight conductor was carried out using the methodology described in previous sections of this report. The purpose of this model job analysis was to demonstrate the application of the design, identify challenges in conducting the job analysis, and describe how those challenges can be resolved.

3.1 Overview

The analysis of the job of freight conductor was carried out between June 2009 and August 2010. The analysts began by reviewing available materials describing the freight conductor job and developing preliminary lists of task statements and KSAOs. Following development of the lists, six face-to-face meetings ranging from 1 to 3 hours in length were held with SMEs to (a) edit the task and KSAOs lists, (b) link the KSAOs to task categories, and (c) obtain information regarding the job context, demands, and tools used. In addition, two Web-based surveys were administered to SMEs to collect ratings on the tasks and KSAOs.

The analysis resulted in a comprehensive assessment of the job of freight conductor. Freight conductors carry out tasks that are clustered around five functional categories: (a) crew communication, (b) crew supervision, (c) form and record management, (d) train inspection, troubleshooting, and repair, and (e) train makeup and handling. Freight conductors need a wide variety of KSAOs to perform job tasks successfully. These KSAOs include different types of knowledge (e.g., knowledge of operating and safety rules), skills (e.g., skill in working on and around moving equipment), abilities (e.g., judgment and decisionmaking ability), and other characteristics (e.g., a passion for safety). Conductors use a number of different tools and types of equipment and work with a variety of railroad personnel such as locomotive engineers, dispatchers, and foremen. The job is physically and psychologically demanding for workers, with demands associated with fatigue being among the most prominent. Findings from the analysis of the job of freight conductor are described in more detail below.

3.2 Preliminary Work

Preliminary research was carried out between June and September 2009 to develop draft lists of task statements and KSAOs for freight conductors. The following sources were reviewed for relevant information:

- The O*NET report for railroad conductors and yardmasters (O*Net, 2009)
- An existing task analysis of conductors (Sanders, Jankovich, & Goodpaster, 1974)
- A cognitive task analysis of locomotive engineers which included a discussion of the roles and responsibilities of freight conductors (Roth & Multer, 2009)
- The fifth edition of the General Code of Operating Rules (2005)
- The eighth edition of the operating rules of the Northeast Operating Rules Advisory Committee (2003)

- Conversations with rail experts from the United Transportation Union (UTU), the Federal Railroad Administration, and the John A. Volpe National Transportation Systems Center (Volpe)

Draft lists of task statements and KSAOs were developed based on information from the aforementioned sources. The draft lists were then reviewed by two SMEs with railroad experience. Appendix C presents information on these SMEs and SMEs who participated in subsequent panel meetings.

The preliminary lists of tasks and KSAOs are presented in Appendix D. The preliminary task list was categorized by main tasks and sub tasks. A similar strategy was used by Morrow, Walsh, and Barnes-Farrell (2009) in their strategic job analysis of work schedule managers. However, clustering the task statements into main tasks proved problematic in SME Panel Meeting 1, and a strategy of clustering by functional category was employed instead. Details on the issues stemming from the initial clustering of main and sub tasks are outlined below.

3.3 SME Panel Meeting 1: Task and KSAO List Editing

The first SME Panel Meeting was held in October 2009 in Kansas with four managers of conductor field training for a Class I railroad. The experts had worked as managers of field training for a mean of 7.6 years and had an average of 21.3 years of experience working in various railroad positions (e.g., conductor, engineer) for their respective organizations (see Appendix C). This meeting was held during a site visit at which representatives from Volpe who were conducting a cognitive task analysis of the job of freight conductor were present. The meeting lasted for 3 hours, during which time the initial review of the task and KSAO lists by SMEs was carried out. The first author was present and guided the activities during this first meeting.

The first half of the meeting was devoted to reviewing and editing the preliminary task list. Following an introduction to the project, the SMEs were presented with the Task Activity handout shown in Appendix E. After a review of the chosen method for putting together task statements, the SMEs worked as a group for approximately 1.5 hours to edit the preliminary task list. A number of edits were made to the task list during this time; tasks were added, task wording was revised, and several tasks were deleted. Changes made to the task list during SME Panel Meeting 1 are summarized in Appendix E. Italics is used to denote added or revised text; strikethrough indicates deleted text.

The second half of the meeting was dedicated to editing the list of freight conductor KSAOs. To begin the editing, the SMEs were presented with the KSAO Activity handout shown in Appendix E. The first author reviewed definitions of KSAOs and ensured that all SMEs understood the definitions. Then, the SMEs worked as a group to edit the KSAO list. The edits to the KSAO list were relatively minor and primarily included revisions to wording. The changes made to the KSAO list during SME Panel Meeting 1 are summarized in Appendix E. Following the KSAO work, the SMEs completed an Expert Demographics Form (see Appendix E) and were thanked for their participation. Corrected task and KSAO lists following SME Panel Meeting 1 are presented in Appendix E.

There are two additional notes worth mentioning about SME Panel Meeting 1. First, after editing the KSAO list, SMEs also began linking the KSAOs to the main tasks, as outlined in the KSAO Activity handout. However, the results of the linking are not presented here because the linking was premature. That is, the task list required additional edits, given that only 1.5 hours had been spent editing it. Second, the main tasks outlined during preliminary task development were too vague and did not contribute valuable information to the analysis. Thus, the main tasks were removed from the task list and functional categories were used to cluster tasks after the list of task statements was nearly finalized.

Following a review of meeting notes from SME Panel Meeting 1 and a review of a conductor trainee evaluation form provided to the first author by the SMEs, the first author made several modifications to the task and KSAO lists. These changes are presented in Appendix F and primarily include modifications to the task list. After those changes were made, the task list was reordered and examined for clarity. Several of the tasks were identified as problematic because they did not appear to be at an appropriate level of specificity, and/or they needed a different verb. This reorganized task list is shown in Appendix G, and it served as the basis for the editing carried out in SME Panel Meeting 2. Given the minimal changes made to the KSAO list during and following SME Panel Meeting 1, no additional changes were subsequently required.

3.4 SME Panel Meeting 2: Further Editing of the Task List

SME Panel Meeting 2 was held in November 2009 in Massachusetts with five conductors, one of whom was also a locomotive engineer. The SMEs had worked in their current positions for a mean of 5.1 years, and the mean organizational tenure was 5 years (see Appendix C). The purpose of this meeting, which lasted for approximately 1.5 hours, was to continue editing the task list. The first and second authors were present at SME Panel Meeting 2, with the first author leading the meeting activities.

Following a brief introduction to the project, SMEs were given copies of the reorganized task list and the Task Activity handout (see Appendix G). The first author reviewed the method for constructing task statements and the example task statements with all group members. Next, the SMEs were given 45 minutes for individual review of the task list. SMEs were instructed to make any edits to the task list that they felt were necessary, and to pay extra attention to the tasks that had been identified as problematic. Following this individual review, the SMEs reconvened as a group for approximately 40 minutes and were instructed to come to a consensus about the edits to the task list. All edits suggested by the SMEs were recorded by the first author on a computer during the meeting, and the list was projected on a screen so that all SMEs could view the changes. At the end of the meeting, the SMEs completed the Expert Demographics Form (see Appendix E) and were thanked for their participation.

Changes made to the task list during SME Panel Meeting 2, as well as a corrected task list, are shown in Appendix G. Following the meeting, the first author reviewed the task list to identify sets of tasks that appeared to share a similar function. Five functional categories were created and tasks were clustered under the appropriate one. The draft task list with functional categories is presented in Appendix H. This list was edited in SME Panel Meeting 3.

3.5 SME Panel Meeting 3: Final Edits to the Task List

The group of SMEs in Panel Meeting 2 also participated in SME Panel Meeting 3. The only exception was that a new SME substituted for a conductor who was unavailable for the third meeting. The mean job and organizational tenure for this group of SMEs was 4.4 years (see Appendix C). The meeting lasted for approximately 1 hour, and the goal was to finalize the list of tasks and functional categories for freight conductors. Again, the first and second authors were present at the meeting, and the first author led the activities.

Because four of the five SMEs had participated in the previous meeting, no handouts were given to SMEs. Instead, the task list in Appendix H was presented using a computer and projector, and the following questions were posed to the SMEs:

1. Are the categories meaningful?
2. Are additional categories needed?
3. Are the tasks situated under the appropriate category?
4. Are there any rare tasks that would not necessarily be done regularly but might be done during a particular week or month, or at certain times of the year?
5. Are there any critical emergency-related tasks that are missing?
6. Is the task list complete and accurate?

The discussion focused on the aforementioned questions. The reader will note that an explicit attempt was made to have SMEs consider tasks that were not done frequently but would possibly need to be carried out in emergency situations. During the meeting only a limited number of changes were made to the task list. Appendix H includes a list that shows the changes made during SME Panel Meeting 3, as well as a final list of freight conductor tasks organized by functional category (in alphabetical order).

3.5.1 Functional Categories of Tasks

The 42 tasks are arranged in five functional categories that represent the general duties of freight conductors. The functional categories include the following:

- *Crew Communication* – tasks related to communication with the train crew and other personnel.
    - Example task: Freight conductors call out signals as they are encountered when operating in signal territory and as job activities change.

- *Crew Supervision* – tasks associated with oversight of railroad personnel.
    - Example task: Freight conductors job brief with train crew members regarding work to be done, movements to be made, and any safety hazards.

- *Form and Record Management* – tasks having to do with the organization and management of forms and records.
    - Example task: Freight conductors update the signal awareness form.

- *Train Inspection, Troubleshooting, and Repair* – tasks related to train inspection and maintenance.

- Example task: Freight conductors locate, inspect, and report defects identified by a defect detector.

- *Train Makeup and Handling* – tasks pertaining to preparing the train for a trip and general handling of the train.
  - Example task: Freight conductors inspect and line switches as required.

After finalizing the list, the task list was sent to three participants from SME Panel Meeting 1 for their review as an additional check to ensure that the list was complete and accurate. A copy of the email is included in Appendix H. No changes to the task list were suggested by the SMEs.

3.6 Online Task Rating Survey and Analysis

An online task rating survey was completed by SMEs so that the relative importance of the tasks could be determined. As suggested by C-JAM (Brannick et al., 2007), SMEs evaluated each task on two scales, consequences of error and task difficulty, that were slightly modified from the exact C-JAM wording. The scales are as follows:

- *Consequences of Error* – How important (i.e., significant) are the consequences of performing the task incorrectly?
  1 – Consequences of error are not at all important

  2 – Consequences of error are somewhat important

  3 – Consequences of error are moderately important

  4 – Consequences of error are very important

  5 – Consequences of error are extremely important

- *Task Difficulty* – How easy or difficult is it to complete the task correctly relative to all other tasks?
  1 – Very easy

  2 – Somewhat easy

  3 – Not easy or difficult

  4 – Somewhat difficult

  5 – Very difficult

A UTU representative sent email invitations to 24 conductors asking them to participate in the survey. A copy of this invitation email is presented in Appendix I. We specified that we were seeking responses from freight conductors who had a minimum of 5 years of experience on the job. To ensure that the sample included some demographic diversity, email invitations were also sent to female conductors. The online survey was available for two weeks until April 1, 2010, and all participants received a reminder email one week into survey administration. A copy of the task rating survey is provided in Appendix I.

Responses were received from 17 freight conductors from across the United States (71 percent response rate). Demographic characteristics of the respondents are shown in Appendix I. Respondents had a mean job tenure of 17.5 years and a mean organizational tenure of 24.1 years. The mean length of time in which respondents had worked as freight conductors was 21.9 years.

Task importance was calculated as suggested by Brannick et al. (2007). Specifically, ratings on consequences of error and task difficulty made by each respondent were summed for each task. Then, the mean task importance value was calculated for each task across all SMEs. Appendix I presents the task list with the mean ratings of consequences of error, difficulty, and importance. We note that all but three tasks had mean consequences of error ratings greater than or equal to four, thus verifying that the list includes critically important tasks. The greatest variability across SMEs was observed for the ratings of task difficulty.

3.7 SME Panel Meetings 4 and 5: KSAO Linkages to Functional Categories

SME Panel Meeting 4 was held in June 2010 in New York with eight current and former conductors and locomotive engineers. SME Panel Meeting 5 was held one month later in July 2010 with four of the same experts. SMEs in Panel Meeting 4 had a mean job tenure of 11.3 years, mean organizational tenure of 16.2 years, and mean freight conductor job experience of 14.6 years (see Appendix C). The experts in Panel Meeting 5 had worked in their current jobs for a mean of 7.0 years, their organizations for 10.5 years, and had 8.3 years of experience, on average, working as freight conductors. Each meeting was approximately 1.5 hours long. Both the first and second authors were present at each meeting.

The purpose of the meetings was to link KSAOs to the functional categories. In Panel Meeting 4, SMEs were handed copies of the task list with importance values. Each SME reviewed the list individually, and SMEs were told that the goal of the meeting was to determine the KSAOs needed to perform the tasks in each category. Next, definitions and examples of KSAOs were reviewed with all SMEs. The SMEs were divided into two groups of four. Group 1 (SMEs 13, 14, 15, and 16) was asked to link KSAOs to the *Train Inspection, Troubleshooting, and Repair* category, and Group 2 (SMEs 17, 28, 19, and 20) was tasked with linking KSAOs to the functional category *Train Makeup and Handling*. Once the SME groups had separate work spaces, they were handed copies of the task list which included only their specific functional category, associated tasks, and importance values. Each group was also given one copy of the up-to-date KSAO list, which had been reorganized to facilitate the linking process (see Appendix J). One SME in each group was charged with being the scribe who would document on the KSAO list the KSAOs needed to perform the tasks in the category. This was done by simply checking off the relevant KSAOs. The SMEs were encouraged to discuss the KSAOs amongst themselves and only to assign the KSAO to the functional category if there was a consensus that the KSAO was needed to perform the tasks.

SME Panel Meeting 5 was structured in similar fashion. However, because each SME had already participated in the prior meeting, no introductions were necessary. The four participating SMEs were split into two groups. Group 1 (SMEs 13 and 18) linked KSAOS to the tasks in functional categories *Crew Communication* and *Form and Record Management*, and Group 2 (SMEs 17 and 20) linked KSAOs to the tasks in the *Crew Supervision* functional category.

Results of the linking are presented in Appendix J. All KSAOs were linked to at least one of the functional categories and many generalize across multiple categories. For example, skill in performing switching activities was identified as needed to perform tasks in each of the five functional categories.

3.8 Online KSAO Rating Survey and Analysis

An online KSAO rating survey was completed by SMEs to determine (a) the relative importance of the KSAOs, and (b) whether the KSAOs should be utilized in employee training or selection, consistent with C-JAM (Brannick et al., 2007). Whereas a separate sample of SMEs was recruited to complete the task rating survey, the KSAO rating survey sample was obtained from OR provided by individuals who had already participated in the SME panel meetings. Specifically, the 15 experts who provided their email address on the Expert Demographics Form were asked to participate in the online survey. An initial email was sent to the experts in July 2010 to inform them of the upcoming survey, and the invitation was sent several days later (see Appendix K). The online survey was available for two weeks until August 9, 2010, and all participants received a reminder email one week into survey administration.

Participants were asked to rate all KSAOs on two scales rather than the four scales suggested by C-JAM (Brannick et al., 2007). This was because the list of KSAOs was quite long, and it was determined that having the respondents complete the four rating scales may have led to fatigue, which could result in incomplete data. These scales included KSAO importance and KSAO trainability (see below). Similar scales have been used in previous job analyses (e.g., Morrow et al., 2009). A copy of the KSAO rating survey is presented in Appendix K.

- *KSAO Importance* – How important is it that Freight Conductors possess this KSAO?
  1 – Not at all important
  2 – Somewhat important
  3 – Moderately important
  4 – Very important
  5 – Extremely important

- *KSAO Trainability* – Can this KSAO be taught using a formal training program (e.g., classroom training, simulation training, field training)?
  0 – No
  1 – Yes

Responses to the KSAO rating survey were received from 8 of the 15 experts (53 percent response rate). Demographic characteristics of the sample are shown in Appendix K. Participants had a mean job tenure of 11.6 years, mean organizational tenure of 14.9 years, and a mean tenure of 11.1 years working as freight conductors.

Results from the analysis of the KSAO rating survey data are presented in Appendix K. The percentage of SMEs who indicated that the KSAO was trainable was used to evaluate whether the KSAO should be utilized in training or in selection. If more than 50 percent of SMEs reported that they felt the KSAO was trainable, then the KSAO was considered a candidate for training. Conversely, KSAOs that did not meet this criterion were judged to be useful for

purposes of employee selection. Importance ratings aid in prioritizing which KSAOs should be emphasized for each purpose; priority should be given to the more important KSAOs.

The majority of the KSAOs are trainable, but 10 of them are best suited to employee selection, given their lack of trainability. We note that the trainability percentages for several of the KSAOs (i.e., recognize and distinguish between the colors of railroad signs and signals, situational awareness) were relatively low, but still more than 50 percent. It may be that those KSAOs could also be used effectively for selection rather than training. The lists of trainable KSAOs and KSAOs to be utilized in employee selection are shown in Appendix K.

3.9 SME Panel Meetings 6: Job Context, Tools, Demands, and Experiences to Acquire KSAOs

A final meeting was held in August 2010 with SMEs to discuss additional information regarding job context, tools used, and demands of the job. Questions were also posed to SMEs about the experience needed to obtain the minimum acceptable level on two important KSAOs. Three SMEs participated in the final meeting (see Appendix C for participant characteristics) which lasted for approximately 45 minutes. The first author asked several questions (see Appendix L) and moderated the discussion with the SMEs. Responses to the questions are summarized below.

3.9.1 Job Context

A single question was posed to the SMEs regarding the people that freight conductors work with to perform the job successfully. The SMEs indicated that freight conductors work with a range of personnel to perform job tasks successfully. The personnel mentioned include the following:

- Brakemen
- Dispatchers
- Engineers
- Maintainers
- Other emergency response personnel
- Railroad police
- Track foremen
- Trainmasters
- Yardmasters

These findings correlate with results presented earlier regarding the KSAOs needed to perform the job. This is because a number of the KSAOs pertained, in one way or another, to interpersonal interactions. For example, skill in giving and interpreting communications signals with or without signaling equipment, the ability to communicate information orally and in writing, and the ability to actively listen were each identified as very important KSAOs. These KSAOs facilitate work-related interactions with personnel that conductors are required to interact with on the job.

Freight conductors have the potential to be exposed to hazardous materials on the job. SMEs acknowledged that freight conductors may be exposed to a variety of hazardous materials and substances depending on the nature of the freight being transported. Such exposure may be the result of problems, such as a broken hose or a leaking valve, arising en route. SMEs also mentioned that conductors may be exposed to chemicals besides those being transported, such as

chemicals applied to minimize weeds. Thus, it is no surprise that KSAOs pertaining to hazardous substances (e.g., Knowledge of hazardous material placards, markings, and regulations; Skill in inspecting hazardous material cars) are some of the most important KSAOs a conductor needs to perform the job.

3.9.2 Tools Used

The SMEs were asked to identify examples of the kinds of tools and equipment used on the job. The discussion revealed that freight conductors utilize a number of tools and types of equipment. This finding is in line with results from the analysis of conductor tasks reported earlier because one of the primary categories of freight conductor tasks are those related to train inspection, troubleshooting, and repair (see Appendix H). Types of tools and equipment utilized by freight conductors include the following:

- Brake sticks
- Derails
- End-of-train devices
- Flags
- Fusees/Flares
- Hand and power tools (e.g., wrenches, hammers)
- Hand switches
- Lanterns
- Laptop computers
- Personal protective equipment (e.g., hard hats, safety glasses)
- Radio communication devices

3.9.3 Physical and Psychological Demands

Several questions focused on the demands, physical and psychological, of the freight conductor job. Physical demands identified by SMEs include the following:

- Climbing
- Lifting knuckles
- Maneuvering over steep terrain
- Sleep deprivation/Fatigue
- Throwing switches
- Walking
- Working in different climates

Fatigue was identified as the biggest physical demand that freight conductors face on the job. The Volpe Center and FRA, in collaboration with the Division of Sleep Medicine at Harvard Medical School, created a Web site dedicated to improving railroader sleep health practice, thereby helping combat fatigue. They considered the various factors also identified in this report that affect railroaders' sleep patterns. Freight conductors often work nontraditional schedules that include night and weekend work, and conductors are subject to working on-call as well. The SMEs indicated that they believe inconsistent and irregular work schedules are a primary cause of fatigue on the job. Moreover, SMEs remarked that conductors have a lack of control over their work scheduling, and the ambiguity associated with work scheduling is problematic. Work scheduling was also identified as a driver of additional demands beyond fatigue, including restricted time to meet personal and family obligations. Indeed, the SMEs noted that adjusting to the varying work schedules takes time. However, this observation should be considered in light of ratings on one KSAO in particular. The ability to work nontraditional schedules (e.g., night shifts, on-call, long hours) was identified as a very important KSAO, but was also seen as not trainable. It is probable that some personnel will not be able to adapt to the demands of working such nontraditional schedules. See Raslear, Gertler, and DiFiore (2013) for additional findings on work schedules and fatigue-related accidents in the U.S. railroad industry.

SMEs were also asked to describe the psychological demands associated with the job. The discussion of psychological demands primarily concerned the possibility of inadvertently hitting and/or killing bystanders while the train is in operation. For example, one SME mentioned that he had hit and killed someone while on a trip. Another SME briefly discussed how a bystander appeared to be making an attempt to commit suicide by standing on the track, but changed his mind and moved away from the track before the train passed. SMEs noted that they feel helpless on the train in these and similar situations due to a lack of control. Gist's (2011) research offers intervention strategies for mitigating the effects on train crews of such potentially traumatic incidents. Finally, the experts also noted that the job can be psychologically demanding because of the nature of the work schedules (e.g., inability to maintain social networks due to irregular work schedules).

3.9.4 Experience Needed to Acquire KSAOs

An additional set of questions was used to investigate SME perceptions of the amount and type of on-the-job training (OJT) needed to acquire the minimum acceptable level on two KSAOs: 1) knowledge of the physical characteristics of the territory over which the conductor operates, and 2) ability to coordinate and plan various movements safely and efficiently. These KSAOs were drawn from preliminary ratings on the KSAO rating survey which suggested they were very important for freight conductors. SMEs remarked that the first KSAO, knowledge of the physical characteristics of the territory over which the conductor operates, required approximately 3 to 6 months of OJT, depending on the person and the number of trips. The SMEs stated that current training time is shorter than what is needed, and trainees are told "the engineer will take care of you," even if they do not feel comfortable with the work. The experts suggested that the OJT be supervised and that the supervision be reduced over time as the knowledge is acquired.

The second important KSAO discussed was the ability to coordinate and plan various movements safely and efficiently. Again the SMEs were in agreement that OJT is needed to acquire the ability. Specifically, the SMEs noted that approximately 3 months of supervised OJT is needed to acquire the minimum acceptable level of the ability. SMEs emphasized that the experience needs to be supervised experience such that the trainee is close to the trainer throughout.

4. Challenges in Implementing the Job Analysis

A number of challenges were faced in the model analysis of the job of freight conductor described in previous sections. It is likely that the same, or similar, challenges will occur in the analysis of other safety-sensitive railroad jobs. Below, we describe the challenges faced in the present analysis and offer strategies for minimizing those problems.

4.1 Difficulty Recruiting Experts

The biggest challenge in the present analysis of freight conductors involved targeting and recruiting experts to participate in the analysis. Experts agreed to participate on their own time and with no immediate benefits in return for participation. To identify SMEs, we explored several avenues, including company and union contacts at multiple railroad carriers. Our persistence paid off, but there are several clear ways to avoid these recruiting difficulties. If the job analysis is carried out within a single organization, SMEs should be provided time to participate on-the-clock at their regular rate of pay to increase the likelihood that they will be willing to contribute. It may also be helpful to offer a small gift or bonus payment in exchange for their assistance.

4.2 Experts Unable to Participate for Long Periods of Time

An additional challenge faced in the model analysis of the job of freight conductor was a direct result of the nontraditional scheduling that characterizes the job. Freight conductors in particular are needed for train operations 24 hours a day, 7 days a week, so it was very difficult to get multiple conductors in a room together, and it was impossible to schedule a meeting lasting more than a couple of hours. Similar problems are likely to arise for comparable railroad jobs that operate around the clock and entail irregular work schedules. C-JAM accommodates this sort of situation; instead of holding two long meetings, it may be preferable to hold a series of shorter meetings (e.g., 1–2 hours). This strategy was utilized here and proved effective. The shorter meetings can also be held with fewer experts (e.g., 1–2 instead of 5–7). If such a strategy is chosen, the job analyst needs to ensure that a total of at least 5 to 7 experts are utilized at some point in each stage of the analysis (i.e., task development and KSAO linking). Likewise, care must be taken to ensure that the progress made in each meeting is well documented.

4.3 Limited Time or Other Resources Needed to Carry Out the Analysis

Time and/or resources may be limited when conducting the job analysis. If time is limited, it may be necessary to avoid spending time on the first part of the analysis, which includes the job demands, context, and tools/equipment used. In the present study, a limited number of possible questions were asked during the analysis to minimize the amount of time spent on the open-ended questions. The key components of the analysis (i.e., task statements and KSAO development and linking) are essential and were therefore the focus of the majority of meetings. In addition, conducting a thorough review of the job during the preliminary stages of the analysis can facilitate the activities required in later stages and potentially alleviate the time burden required of SMEs. A comprehensive review of existing materials related to the job will allow the job analyst to prepare draft task and KSAO lists before meeting with SMEs. The preliminary

lists of freight conductor tasks and KSAOs developed in the present study were beneficial for this very reason. However, it is important to note that a job analysis can take time. To ensure that activities are carried out systematically and completely, it is in the best interest of the job analyst to avoid rushing the process. A job analysis provides fundamental information about a job. As such, it is important to devote sufficient time to the process in order to make certain that no central features of the job are overlooked during the data collection process.

4.4 Writing Task Statements at the Appropriate Length of Specificity

Another challenge faced during this job analysis was guiding SMEs to develop task statements at the appropriate level of specificity. Although developing preliminary task lists can facilitate group work, be aware that it may also hinder progress if the tasks are not at the appropriate level of specificity. In particular, lists that are developed by analysts who do not have personal experience with the particular job under consideration may be overly vague unless additional steps are taken to increase the specificity of those task statements. We found that reviewing with the SMEs the definition of a task, as defined by Brannick et al. (2007), reviewing task statement examples, and emphasizing to the SMEs that they (not the analysts) are the experts were effective strategies for getting the SMEs to critically evaluate the task statements. It is critical to spend time with experts reviewing these basics in order to encourage the progress of the analysis.

4.5 Keeping SMEs Focused on the Task at Hand

The final challenge during the meetings involved keeping the SMEs focused on the task at hand. With several SMEs in a room at once, the conversation can quickly evolve from productive to unproductive. On several occasions, the discussion veered away from the focal topic to casual conversation among the SMEs. It is important that the meeting coordinator recognize immediately when this is occurring and redirect the conversation back to the topic at hand. The meeting coordinator must feel comfortable politely interrupting an SME if discussion moves off topic and directly soliciting input from SMEs who are not contributing. Likewise, some experts will attempt to dominate the conversation. Acknowledge their input because productive input is what is needed, but also emphasize that the opinion of each and every SME is needed.

5. Conclusion

The purpose of this investigation was to conduct a systematic analysis of the job of freight conductor in order to provide a model application of the design outlined in previous sections. Findings from the analysis indicate that freight conductors carry out tasks involving (a) crew communication, (b) crew supervision, (c) form and record management, (d) train inspection, troubleshooting, and repair, and (e) train makeup and handling. A host of KSAOs are needed by freight conductors to effectively perform these tasks. Examples of important KSAOs needed by freight conductors include the following: knowledge of the proper procedures for handling and reporting emergency situations, skill in identifying block signal aspects, judgment and decisionmaking ability, and a passion for safety (other characteristic). Results suggest that many of the KSAOs are trainable (e.g., knowledge of operating and safety rules); such KSAOs can and should be the focus of employee education in formal training programs. Conversely, other KSAOs (e.g., ability to work nontraditional schedules) should be considered when selecting new hires because such KSAOs were perceived as not trainable by SMEs.

Furthermore, conductors use a variety of tools and equipment on the job (e.g., personal protective equipment and radio communication devices). Conductors also work with a variety of railroad personnel, including locomotive engineers, dispatchers, and foremen. The job is physically and psychologically demanding for workers, with demands associated with fatigue being among the most prominent.

Finally, several challenges were faced when carrying out the analysis of the job of freight conductor, including difficulty recruiting SMEs, relatively brief meetings with SMEs, insuring that task statements were at their appropriate level of specificity, and keeping the meetings on task. We expect that several of these challenges (e.g., difficulty recruiting experts) will be minimized if the analysis is carried out within a single organization. Our hope is that this model analysis will provide a framework for future job analyses for many different types of positions within the railroad industry. Furthermore, it is important to note that although the initiative for creating this framework for job analyses was specifically aimed at assisting in the development of effective training programs, the results of job analyses can be applied toward the development of other organizational infrastructures such as performance appraisals and personnel selection systems.

6. References

Barnes-Farrell, J. (2006). *Roadmap for work analysis of RCL operators*. (IPAC TR-2006-03). Prepared for the Volpe National Transportation Systems Research Center. Storrs, CT: University of Connecticut, Industrial Psychology Applications Center.

Brannick, M. T., & Levine, E. L. (2002). Job analysis: Methods, research, and applications for human resource management in the new millennium. Thousand Oaks, CA: Sage.

Brannick, M. T., Levine, E. L., & Morgeson, F. P. (2007). Job and work analysis: Methods, research, and applications for human resource management (2nd Ed.). Thousand Oaks, CA: Sage.

General Code of Operating Rules (2005). GCOR: General code of operating rules (5th edition).

Gist, Richard. (2011). Proposed Key Elements of Critical Incident Intervention Program for Reducing the Effects of Potentially Traumatic Exposure on Train Crews to Grade Crossing and Trespass Incidents. U.S. Department of Transportation. Federal Railroad Administration.

John A. Volpe National Transportation Systems Center, Harvard Medical School Division of Sleep Medicine, and WGBH Educational Foundation, under sponsorship of the Federal Railroad Administration, U.S. Department of Transportation. *Railroaders' Guide to Healthy Sleep: Steps to improve your sleep and make a real difference in your life.* Retrieved from http://railroadersleep.org/

Levine, E. L. (1983). *Everything you always wanted to know about job analysis*. Tampa, FL: Mariner.

Morgeson, F. P., & Campion, M. A. (1997). Social and cognitive sources of potential inaccuracy in job analysis. *Journal of Applied Psychology, 82*, 627–655.

Morrow, S., Walsh, B., & Barnes-Farrell, J. (2009). *Shiftwork schedule management gap analysis: Assessing the future training needs of shiftwork schedule managers using a strategic job analysis approach*. IPAC TR-2009-03. Prepared for the Federal Railroad Administration and the Volpe National Transportation Research Center. Storrs, CT: University of Connecticut, Industrial Psychology Applications Center.

Northeast Operating Rules Advisory Committee. (2003). NORAC operating rules (8th edition).

O*Net (2009). Summary report for 53-4031.00 Railroad conductors and yardmasters. Retrieved from http://online.onetcenter.org/link/summary/53-4031.00 on July 1, 2009.

Raslear, T., Gertler, J., and DiFiore, A. (2013). Work schedules, sleep, fatigue, and accidents in the US railroad industry. *Fatigue: Biomedicine, Health & Behavior,* 1: 1–2, 99–115.

Roth, E., & Multer, J. (2009). Technology implications of a cognitive task analysis for locomotive engineers. DOT/FRA/ORD-09/03. U.S. Department of Transportation, Federal Railroad Administration.

Sanchez, J. (1994). From documentation to innovation: Reshaping job analysis to meet emerging business needs. *Human Resource Management Review, 4*, 51−74. RDTR No. 263. Naval Ammunition Depot, Crane, IN.

Sanders, M. S., Jankovich, J. J., & Goodpaster, P. R. (1974). Task analysis for the jobs of freight train conductor and brakeman.

Schippmann, J. S. (1999). *Strategic job modeling*. Mahwah, NJ: Lawrence Erlbaum Associates.

Schneider, B., & Konz, A. (1989). Strategic job analysis. *Human Resource Management, 28*, 51−63.

Singh, P. (2008). Job analysis for a changing workplace. *Human Resource Management Review, 18*, 7–99.

Society for Industrial and Organizational Psychology, Inc. (2003). *Principles for the validation and use of personnel selection procedures* (4th ed.). Bowling Green, OH: Society of Industrial and Organizational Psychology.

Uniform Guidelines on Employee Selection Procedures. (1978). 43 FR 38295 (August 25, 1978).

Appendix A.

JOB ANALYSIS CHECKLIST

EXAMPLE AGENDA: SME PANEL MEETING 1

EXAMPLE MEETING 1 PANEL DISCUSSION QUESTIONS

EXAMPLE TASK GENERATION ACTIVITIES

EXAMPLE TASK SURVEY

Job Analysis Checklist

Below is a summary list of the major activities that need to be accomplished during the job analysis.

	**Activity**
	Preliminary Work: Carry out preliminary research (e.g., review existing documents, observe an incumbent performing the job) to learn as much as you can about the job. At this time, preliminary lists of tasks and KSAOs may also be developed.
	SME Discussion: Meet with SMEs to discuss the job context, tools used, and physical/psychological demands.
	Create Task List: Meet with SMEs to develop a complete and accurate list of tasks organized by functional category.
	Task Rating Survey and Analysis: Have SMEs rate the tasks on various scales (e.g., consequences of error, difficulty) to determine their relative importance.
	Create KSAO List: Meet with SMEs to compile a list of all KSAOs needed to carry out the job tasks.
	Link KSAOs to the Functional Categories: Have SMEs link the KSAOs to functional categories that are needed to perform the corresponding tasks.
	KSAO Rating Survey and Analysis: Have SMEs rate the KSAOs on several scales (e.g., importance, trainability) to determine their relative importance and decide which KSAOs are candidates for use in selection versus training.
	Final Report: Describe the findings from the analysis in a detailed report.

Example Agenda: SME Panel Meeting 1

(*Location*)

(*Date*)

Time	Topic
8:45 AM	**Arrive at Meeting Venue**
9:00 AM	**Welcome and Panel Introductions**
9:15 AM	**Introduction to the Project**
9:30 AM	**Panel Discussion of Job Context, Demands, and Equipment Used**
10:45 AM	***Mid-Morning Break***
11:00 AM	**Task Generation Activity 1** Develop initial task statements
12:00 PM	***Lunch***
12:30 PM	**Task Generation Activity 2** Edit task statements
2:30 PM	***Mid-Afternoon Break***
2:45 PM	**Task Generation Activity 3** Group task statements into functional categories
3:45 PM	**End of Meeting**

Example Meeting 1 Panel Discussion Questions

(Introduction by Meeting Coordinator): Before we focus on developing the tasks that are done on the job, I first want to get everyone thinking broadly about the job by talking about the context in which work is done, the kinds of demands faced by workers, and the kinds of equipment and tools used by workers. I have several questions that I'll pose to the group for discussion on each of these topics.

Job Context

- What are the characteristics of the location(s) where tasks are carried out (e.g., inside or outside some facility, dangerous or safe setting, hot or cold temperature)?
- To perform job tasks successfully, do workers need to coordinate and/or work with other personnel? If so, what are the positions of said personnel and what is the purpose of the coordination among personnel?
- Does the job entail use of or exposure to any hazardous materials or substances? If so, describe these materials.
- Can you think of any other features of the work environment/work context that you would like to mention?

Physical and Psychological Demands

- Is the job physically demanding in any way? If so, what are the physical demands associated with the job (e.g., fatigue, extended periods of crouching, lifting heavy objects)?
- Is the job psychologically demanding in any way? If so, what are the psychological demands associated with the job (e.g., highly stressful, high pressure, monotonous)?
- Describe the work schedules for the job. Are nontraditional schedules (e.g., night work, weekend work, rotating shifts) common in this job? Do you feel that the work schedules cause additional physical and/or psychological demands?
- Can you think of any other demands associated with the job (e.g., travel)?

Equipment and Tools Used

- What kinds of equipment, tools, or machines are used on the job?
- For each tool or type of equipment used, describe what it is, and how and why it is used.
- Are there any other tools, equipment, or materials that have not been mentioned?

Example Task Generation Activities

Instructions

One objective of today's meeting is to generate a list of tasks (30 to 100) organized into functional categories for the job of (*insert job title*). *Tasks* refer to activities that are directed toward the achievement of specific job objectives and they have a definite beginning and end. A good task statement, then, should refer to activities that are followed to accomplish a goal.

The level of specificity is an important consideration in writing task statements. A good rule of thumb to use is to consider whether the task can be broken down into meaningful components without referring to specific movements; if any further editing of a task statement would result in describing specific movements then the task statement should not be edited further.

Method for constructing task statements

- There is an implied subject of the task sentence (i.e., workers, employees, or managers). The implied subject is plural, not singular.
- There is a verb that tells what function the workers are performing.
- The object of the verb may be various things, for example, data, people, machines, tools, or equipment.
- There is a phrase starting with the word *to* or the words *in order to* that gives the purpose of the workers' activity. The 'purpose' phrase may be left out if it is obvious.

Example task statements

- **Auto mechanics:**
  - Inspect equipment to determine whether repair or replacement is necessary.
  - Modify equipment to improve its efficiency of operation and safety.
- **Pharmacy technicians:**
  - Receive and prioritize medication orders according to how soon they need to be filled.
  - Call nurse or physician to verify prescription information or to complete partial information.

Activity 1

In groups of 2–3 panel participants, develop task statements for the job of (insert) following the structure outlined above. Keep in mind that we are only listing tasks at this point. We are not listing what knowledge, skills, or abilities would be required of a worker; rather, we are listing the activities that a worker would have to engage in to successfully perform the job.

Activity 2

(Instructions for the Meeting Coordinator: Compile the list of task statements across all groups of experts during lunch and make copies of the list of all task statements for the experts).

In your groups, inspect all the task statements and flag statements that appear redundant or are poorly worded and in need of revision. When finished, we will reconvene as a group to inspect each task statement to remove redundant statements and edit accordingly.

Activity 3

Work within your groups to cluster task statements into functional categories. Tasks that are grouped together should all pertain to the same general category of activities. For example, for the job Pharmacy Technician, several tasks would be grouped under the functional category "Dispensing and Compounding Drugs." When finished, we will reconvene as a group to discuss the categories until a final list of tasks organized by functional category is created.

Example Task Survey

Welcome to the (*insert job title*) Task Survey

The next few pages contain questions regarding the job tasks for the job of (*insert job title*). We compiled the list of job tasks based on input from experts including current workers and supervisors. Your responses to this survey will provide us with important information regarding the relative importance of the job tasks that have been identified.

Participation in this survey is voluntary, and we will be happy to answer any questions you have concerning the study. If you have further questions about this project, you may contact (*name of contact person*).

The survey should take approximately (*insert time*) minutes to complete. Thank you for taking the time to participate in this study.

Job Tasks

Below is a list of the various tasks that define the job of (*insert job title*). Some tasks may be more difficult than others, and some may result in more negative consequences if not done properly. For each task and using the rating scales presented below, indicate (a) how important (i.e., significant) are the consequences of performing the task incorrectly, and (b) how easy or difficult it is to complete the task correctly relative to all other tasks. Please answer the following questions based on the job in general, not just on your own job.

Consequences of Error: How important (i.e., significant) are the consequences of performing the task incorrectly?

1 – Consequences of error are not at all important
2 – Consequences of error are somewhat important
3 – Consequences of error are moderately important
4 – Consequences of error are very important
5 – Consequences of error are extremely important

Task Difficulty: How easy or difficult is it to complete the task correctly relative to all other tasks?

1 – Very easy
2 – Somewhat easy
3 – Not easy or difficult
4 – Somewhat difficult
5 – Very difficult

Task	Consequences of Error					Task Difficulty				
1.	1	2	3	4	5	1	2	3	4	5
2.	1	2	3	4	5	1	2	3	4	5
3.	1	2	3	4	5	1	2	3	4	5
4.	1	2	3	4	5	1	2	3	4	5
5.	1	2	3	4	5	1	2	3	4	5

Demographics and Comments

What is your age in years? _____

What is your sex?

- ☐ Male
- ☐ Female

What is your ethnic background?

- ☐ European American/White
- ☐ African American
- ☐ Latino/Hispanic
- ☐ Asian American
- ☐ Native American/American Indian
- ☐ Biracial/Multiracial
- ☐ Other (please specify): _____

What is the highest level of education you have completed?

- ☐ High school graduate/GED
- ☐ Some college or university
- ☐ College or university graduate
- ☐ Master's degree (e.g, MBA, MA)
- ☐ Doctoral degree (e.g., PhD)
- ☐ Other (please specify):_____

What is your current job title? _____

How long (in years) have you been working with your present organization? _____

How long (in years) have you been working in your present job? _____

Please describe any other information about yourself that is relevant to your qualification as an expert (e.g., prior job experience, length of prior job experience).

_____

_____

_____

_____

_____

Please list any TASKS that were not included above but you believe should be included.

_____

_____

_____

_____

_____

Do you have any additional comments regarding the listed TASKS, or the survey in general?

Appendix B.

EXAMPLE AGENDA: SME PANEL MEETING 2

EXAMPLE KSAO GENERATION ACTIVITY

EXAMPLE KSAO SURVEY

Example Agenda: SME Panel Meeting 2

(Location)

(Date)

Time	Topic
8:45 AM	**Arrive at Meeting Venue**
9:00 AM	**Welcome and Panel Introductions**
9:15 AM	**Introduction to the Project**
9:30 AM	**KSAO Generation Activity** Generate KSAOs
10:45 AM	***Mid-Morning Break***
11:00 AM	**KSAO Generation Activity (continued)** Continue generating and begin editing KSAOs
12:00 PM	***Lunch***
12:30 PM	**KSAO Generation Activity (continued)** Finish editing KSAOs
1:00 PM	**End of Meeting**

Example KSAO Generation Activity

Instructions

We have compiled a list of job tasks and organized related tasks into functional categories for the job of (*insert job title*). Using the categories and tasks as a guide, brainstorm the knowledge, skills, abilities, and other characteristics (KSAOs) needed to effectively perform the job.

Definitions and examples of KSAOs are listed below. Please refer to these definitions as you complete the activity.

Definitions

Knowledge – the degree to which employees have mastered a technical body of material directly involved in the performance of a job

Skill – the capacity to perform tasks requiring the use of tools, equipment, and machinery

Ability – the capacity to carry out physical and mental acts required by a job's tasks where the involvement of tools, equipment, and machinery is not a dominant factor

Other characteristic – interests, values, temperaments, and personality traits suggesting what an employee is likely to do rather than how well an employee can do at peak performance

Examples

Industrial Engineers:

- *Knowledge* of the practical application of engineering science and technology
- *Skill* in judgment and decisionmaking; considering the relative costs and benefits of potential actions to choose the most appropriate one
- *Ability* to tell when something is wrong or is likely to go wrong

First-Line Supervisors of Production Workers:

- *Knowledge* of techniques for maximizing the effective manufacture and distribution of goods
- *Skill* in motivating, developing, and directing people as they work
- *Ability* to communicate information and ideas in writing so others will understand

Activity

Please list the KSAOs that are needed to perform the tasks under the categories outlined below. Only list KSAOs if they are needed by personnel to perform the tasks in each category. Develop KSAOs only for the functional categories that have been assigned to your group.

---

1. **Functional Category:** (*insert the category here*)
   - **Tasks:** (*insert corresponding tasks here*)

   KNOWLEDGE:

   SKILLS:

   ABILITIES:

   OTHER CHARACTERISTICS:

2. **Functional Category:**
   - **Tasks:**

   KNOWLEDGE:

   SKILLS:

   ABILITIES:

   OTHER CHARACTERISTICS:

Example KSAO Survey

Welcome to the (*insert job title*) KSAO Survey

The next few pages contain questions regarding the knowledge, skills, abilities, and other characteristics (KSAOs) needed to successfully perform the tasks for the job of (*insert job title*). We compiled the list of KSAOs based on input from experts including current workers and supervisors. Your responses to this survey will provide us with important information regarding the KSAOs that have been identified.

Participation in this survey is voluntary, and we will be happy to answer any questions you have concerning the study. If you have further questions about this project, you may contact (*name of contact person*).

The survey should take approximately (*insert time*) minutes to complete. Thank you for taking the time to participate in this study.

KSAOs

Below are the various KSAOs needed to successfully perform the job of (*insert job title*). For each KSAO and using the rating scales presented below, indicate (a) whether the KSAO is necessary for newly hired employees, (b) whether the KSAO is practical to expect in the labor market, (c) the extent to which problems are likely to occur if the KSAO is ignored in selection, and (d) the extent to which different levels of the KSAO distinguish the superior from the average worker.

Please answer the following questions based on the job in general, not just on your own job.

Necessary for Newly Hired Employees: Is the KSAO necessary for newly hired employees?

1 – Yes 0 – No

Practical to Expect in the Labor Market: Is the KSAO practical to expect in the labor market?

1 – Yes 0 – No

Problems Likely if Ignored in Selection: To what extent are problems likely if the KSAO is ignored in selection (compared with the other KSAOs)?

1 – Very little or none
2 – To some extent
3 – To a great extent
4 – To a very great extent
5 – To an extremely great extent

Distinguishing Ability of the KSAO: To what extent do different levels of the KSAO distinguish the superior from the average worker (compared with the other KSAOs)?

1 – Very little or none

2 – To some extent

3 – To a great extent

4 – To a very great extent

5 – To an extremely great extent

KSAO	Necessary		Practical		Problems Likely					Distinguishing Ability				
1.	Y	N	Y	N	1	2	3	4	5	1	2	3	4	5
2.	Y	N	Y	N	1	2	3	4	5	1	2	3	4	5
3.	Y	N	Y	N	1	2	3	4	5	1	2	3	4	5
4.	Y	N	Y	N	1	2	3	4	5	1	2	3	4	5
5.	Y	N	Y	N	1	2	3	4	5	1	2	3	4	5

Demographics and Comments

What is your age in years? _____

What is your sex?

- ☐ Male
- ☐ Female

What is the highest level of education you have completed?

- ☐ High school graduate/GED
- ☐ Some college or university
- ☐ College or university graduate
- ☐ Master's degree (e.g, MBA, MA)
- ☐ Doctoral degree (e.g., PhD)

What is your ethnic background?

- ☐ European American/White
- ☐ African American
- ☐ Latino/Hispanic
- ☐ Asian American
- ☐ Native American/American Indian
- ☐ Biracial/Multiracial
- ☐ Other (please specify): _____

☐ Other (please specify):_____

What is your current job title? _____

How long (in years) have you been working with your present organization? _____

How long (in years) have you been working in your present job? _____

Please describe any other information about yourself that is relevant to your qualification as an expert (e.g., prior job experience, length of prior job experience).

_____

_____

_____

Please list any KSAOs that were not included above but you believe should be included.

_____

_____

_____

Do you have any additional comments regarding the listed KSAOs, or the survey in general?

_____

_____

_____

Appendix C.

SUBJECT MATTER EXPERT DEMOGRAPHIC CHARACTERISTICS FROM PRELIMINARY WORK AND PANEL MEETINGS

Subject Matter Expert Demographic Characteristics

ID	Pre-Work	SME Panel 1	SME Panel 2	SME Panel 3	SME Panel 4	SME Panel 5	SME Panel 6	Job Title	Job Tenure	Org. Tenure	Freight Conductor Experience	Age	Sex	Ethnicity	Education
1	X							Manager, Locomotive Engineer Certification	15	18	--	61	M	European American/White	Some college
2	X							Regional Administrator	1	26	--	58	M	European American/White	Master's Degree
3		X						Manager of Field Training	5.5	14	--	36	M	Latino/Hispanic	Some college
4		X						Manager of Field Training	1	7	--	29	M	European American/White	Some college
5		X						Manager of Field Training	13	32	--	56	M	European American/White	High School graduate/GED
6		X						Manager of Field Training	11	32	--	59	M	European American/White	College graduate
7			X	X				Conductor	6	6	--	43	M	Biracial-Multiracial	Some college
8			X	X				Conductor	2	2	--	38	M	European American/White	Some college
9			X	X				Conductor	5	5	--	46	M	European American/White	High School graduate/GED
10			X	X				Conductor	7	7	--	43	M	European American/White	Some college
11			X					Conductor/ Engineer	5.5		--	44	M	European American/White	Some college
12				X				Conductor	2	2		35	M	European American/White	High School graduate/GED

Note. Job tenure, organizational tenure, freight conductor experience, and age are reported in years. M = male. The Freight Conductor Experience question was not added to the demographic questionnaire until SME Panel Meeting 4.

ID	Pre-Work	SME Panel 1	SME Panel 2	SME Panel 3	SME Panel 4	SME Panel 5	SME Panel 6	Job Title	Job Tenure	Org. Tenure	Freight Conductor Experience	Age	Sex	Ethnicity	Education
13					X	X	X	Engineer	4	11	7	35	M	European American/White	High School graduate/GED
14					X			Engineer	11	11	7	37	M	European American/White	High School graduate/GED
15					X			Retired	2	30	30	64	M	European American/White	College graduate
16					X	X		Engineer	5	12	7	29	M	European American/White	Some college
17					X	X	X	Conductor	15	15	15	41	M	European American/White	College graduate
18					X			Conductor	41	41	41	59	M	European American/White	College graduate
19					X			Conductor	8	5.5	5.5	25	M	European American/White	High School graduate/GED
20					X	X		Conductor	4	4	4	40	M	European American/White	College graduate
21							X	Trainman	12	12	12	46	M	European American/White	High School graduate/GED

Note. Job tenure, organizational tenure, freight conductor experience, and age are reported in years. M = male. The Freight Conductor Experience question was not added to the demographic questionnaire until SME Panel Meeting 4.

Appendix D.

PRELIMINARY TASK LIST FOR FREIGHT CONDUCTORS

PRELIMINARY KSAO LIST FOR FREIGHT CONDUCTORS

Preliminary Task List for Freight Conductors

Main Task 1: Communicate with and backup the locomotive engineer.

Sub Tasks:

- Inform the engineer to begin train runs, stop trains, and change speeds using telecommunications equipment or hand signals.
- Remind the engineer that the train is approaching an area restricted by limits of authority, track warrants, track bulletins, or radio speed restriction.
- Remind the engineer of the content of any temporary restrictions at the last station stop prior to each restriction.
- Advise the engineer of any restrictions placed on equipment being handled.
- Notify the engineer when test weight cars are in their train.
- Confer with the engineer regarding movements to be made.
- Direct the engineer to move cars to fit planned train configurations.
- Ensure the engineer complies with applicable rules, special instructions, signals, and track authority.

Main Task 2: Supervise the operation and conduct of the train.

Sub Tasks:

- Ensure that train cars are added or removed at proper points on routes.
- Ensure that brake applications have been made.
- Confirm that brakes have been applied and released on each piece of equipment.
- Inspect equipment to ensure safe and efficient operation of the train.
- Troubleshoot and repair basic equipment problems as needed.
- Find and examine defects identified by a defect detector.
- Judge whether to move, repair, or set out rail equipment with defects in accordance with applicable rules.
- Conduct and participate in job briefings.
- Give permission to utility employees (if assigned) and notify each crew member of the presence and identity of the utility employee(s).
- Ensure that all switches used by the crew are locked in normal position before a Form D is cancelled.
- Remove all equipment such as markers, lamps, and flag cases when leaving trains and deliver the equipment to the designated location.
- Ensure that each work equipment unit has been supplied with a backup hose as part of standard equipment.
- Place hazardous material cards in train and switching movements and apply hazardous material rules.
- Perform coupling and uncoupling of train cars.
- Change track switch positions.
- Supervise other crew members during switching or train operations.

- Instruct workers to set warning signals in front and at rear of trains during emergency stops.
- Review schedules, switching orders, way bills, and shipping records to obtain cargo loading and unloading information and to plan work.
- Determine the method of operation and authority for movement on main and other types of tracks by use of the timetable and operating rules.
- Observe yard traffic to determine tracks available to accommodate inbound and outbound traffic.

Main Task 3: Complete and maintain required records and forms.

Sub Tasks:

- Deliver all track warrants, bulletins, and instructions to the relieving conductor.
- Ensure that freight is delivered to its destination or terminals with any accompanying documents.
- Report car defects on the prescribed form.
- Examine shipping papers (for shipments with accompanying personnel) to see that the persons who accompany the shipments are entitled to be carried.
- Update train consist information including contents and destinations of each train car.
- Complete the delay report for each trip noting all delays, including red blocks, switch time, tie up time, etc.
- Maintain signal awareness forms.
- Complete the wheel report to report any cars picked up and kept or set out in route.
- Complete and maintain the conductor's trip record.
- Complete a defective car report if a car needs or needed repair.
- Complete a blind siding report if a car is picked up or set out at a siding at which no agent is present.
- Complete a work train report if the train was involved in track and right-of-way maintenance.
- Complete the tie up sheet.

Main Task 4: Transmit and receive railroad communications with railroad personnel (other than the locomotive engineer).

Sub Tasks:

- Advise the dispatcher of any restriction placed on equipment being handled.
- Report 'clear' when a train clears a block at a hand-operated switch or crossover and the switch has been restored to normal position.
- Determine the cause of a delayed train and inform the dispatcher or operator.
- Ensure that the dispatcher has been notified that the train carrying hazardous material or equipment of excessive weight or dimensions will enter a main track, siding, or running track.

- Contact the track foreman or point conductor (where designated) to determine limits of out-of-service tracks, the location of barricades and derails, authority to move work equipment within the out-of-service track, and any other restrictions.
- Receive, copy, repeat, and comply with mandatory directives issued verbally by train dispatchers or control stations that authorize or restrict train movement.
- Receive information regarding train or rail problems from dispatchers or electronic monitoring devices.
- Communicate with dispatchers and other personnel regarding movement authorities and/or track restrictions, train routes, timetables, and cargoes.

6.1 Preliminary KSAO List for Freight Conductors

Knowledge:

- Purpose and function of a rail yard
- Function of track components and rail equipment
- Operation of classification yards
- General railroad terminology
- Terminology used in the classifying, blocking, and switching of rail cars
- Terminology and rules associated with restricted equipment
- Basic duties of other railroad personnel that freight conductors interact with during normal performance of duties
- Various types of rolling stock
- Operating and safety rules
- Rules and procedures for switching of rail cars and equipment
- Proper procedures for handling and reporting emergency situations
- The types and functions of defect detectors
- Temporary and permanent speed restrictions
- Timetable information and special instructions, bulletin orders, and train orders
- Consist information (e.g., placement of hazardous materials, equipment restrictions)
- Classes and characteristics of hazardous materials
- Hazardous material rules
- Procedures for reporting and protecting a release of hazardous materials
- The physical characteristics of the territory over which the conductor operates (e.g., tracks, signals, interlockings, yards, speeds, methods of operation, grade crossings)
- Reporting forms and records (e.g., delay report, wheel report, conductor trip record, defective car report, blind siding report, work train report, tie up sheet)
- The types of track authority required for the movement of a train on controlled tracks
- The rule authority for movement of trains on tracks other than controlled tracks

Skills:

- Determining train and engine speeds
- Identifying speed restrictions using timetables, wayside signs, bulletins, train messages, and the Operating Rules Manual
- Identifying block signal types
- Identifying horn or whistle signals
- Troubleshooting basic malfunctions in equipment
- Testing and inspecting equipment
- Situational awareness around moving equipment
- Working on and about moving equipment
- Securing trains and equipment
- Removing and installing air hoses
- Removing and installing knuckles
- Cutting out air brakes
- Securing dragging equipment
- Applying a runaround hose
- Applying and releasing hand brakes
- Performing switching activities (classification of rail cars within a yard, industry switching, set off and pickup of rail equipment)
- Operating the various kinds of switches (e.g., hand operated, power switches)
- Determining the position of switch ports
- Operating the various kinds of derails
- Installing and removing an end-of-train device
- Coupling and uncoupling air hoses
- Using a defect detector
- Making up trains
- Giving and interpreting communications signals (e.g., hand, flag) with or without signaling equipment
- Interpreting the signal indication conveyed by the aspect(s) displayed by a signal
- Interpreting and using timetable information
- Using telecommunication devices
- Inspecting hazardous material cars
- Locating information in the North American Emergency Response Guide
- Locating equipment restrictions in Timetable Special Instructions (TTSI)

Abilities:

- Active listening
- Judgment and decisionmaking
- Comply with operating and safety rules while performing job tasks
- Ascend and descend ladders when necessary
- Use proper lifting techniques while performing service
- Lift heavy objects (e.g., 75 pounds or more)
- Communicate information orally and in writing
- Accurately judge car counts and distances when switching, shoving, or coupling
- See details accurately from a distance
- Recognize and distinguish between the colors of railroad signs and signals
- Hearing/auditory acuity
- Sense and resolve problems as they arise
- Coordinate and plan various movements safely and efficiently (e.g., setting off and picking up cars en route, placing cars at various industrial plants, classifying cars)
- Carry out tasks in harsh environmental conditions
- Work nontraditional schedules (e.g., night shifts, on-call, long hours)

Other Characteristics:

- Passion for safety
- Conscientiousness
- Dependability
- Cooperation

Appendix E.

SME PANEL MEETING 1 TASK ACTIVITY

SME PANEL MEETING 1 EDITS TO TASK LIST FOR FREIGHT CONDUCTORS

SME PANEL MEETING 1 KSAO ACTIVITY

SME PANEL MEETING 1 EDITS TO KSAO LIST FOR FREIGHT CONDUCTORS

EXPERT DEMOGRAPHICS FORM

CORRECTED TASK LIST FOR FREIGHT CONDUCTORS FOLLOWING SME PANEL MEETING 1

CORRECTED KSAO LIST FOR FREIGHT CONDUCTORS FOLLOWING SME PANEL MEETING 1

SME Panel Meeting 1 Task Activity

Instructions

We have compiled a list of job tasks (main tasks, sub tasks) that Freight Conductors (in yard and road operations) do on the job based on previous job analyses, other relevant documents, and by speaking with railroad personnel. *Tasks* refer to activities that are directed toward the achievement of specific job objectives and they have a definite beginning and end.

The first objective of today's meeting is to make any needed edits to the accompanying list of task statements (both main and sub tasks). This list is a work-in-progress, and your expert assistance is needed to ensure that the list is accurate and complete.

After we review the method for writing task statements and the examples below, you will work as a group to complete the following activities:

1. Review the main tasks to get a sense of whether any changes need to be made (e.g., add main tasks, remove main tasks).
2. Consider the first main task and make any needed edits (e.g., edit the phrasing of main task, remove the main task).
3. Review the sub tasks under the first main task. Make any edits to the sub tasks that you feel are needed (e.g., add sub tasks, remove redundant/irrelevant sub tasks, edit the phrasing of sub tasks).
4. Review the remaining main tasks and sub tasks and make edits as described in Steps 2 and 3.

The level of specificity is an important consideration in writing sub task statements. A good rule of thumb to use is to consider whether the sub task can be broken down into meaningful components without referring to specific movements; if any further editing of a sub task statement would result in describing specific movements, then the statement should not be edited further.

Method for constructing task statements

- There is an implied subject of the task statement (i.e., workers, employees, or managers). The implied subject is plural, not singular.
- There is a verb that tells what function the workers are performing.
- The object of the verb may be various things, for example, data, people, machines, tools, or equipment.
- There is a phrase starting with the word *to* or the words *in order to* that gives the purpose of the workers' activity. The 'purpose' phrase may be left out if it is obvious.

Example task statements

- **Auto mechanics:**
  - Inspect equipment to determine whether repair or replacement is necessary.
  - Modify equipment to improve its efficiency of operation and safety.
- **Pharmacy technicians:**
  - Receive and prioritize medication orders according to how soon they need to be filled.
  - Call nurses or physicians to verify prescription information or to complete partial information.

SME Panel Meeting 1 Edits to Task List for Freight Conductors

Main Task 1: ~~Communicate with and backup the locomotive engineer.~~ *Communicate with and support other train crew members*. (Revised task)

- ~~Inform the engineer to begin train runs, stop trains, and change speeds using telecommunications equipment or hand signals.~~ **(Deleted task)**
- Remind the engineer that the train is approaching an area restricted by limits of authority, track warrants, track bulletins, or radio speed restriction.
- ~~Remind the engineer of the content of any temporary restrictions at the last station stop prior to each restriction.~~ **(Deleted task)**
- Advise the engineer of any restrictions placed on equipment being handled.
- ~~Notify the engineer when test weight cars are in their train.~~ **(Deleted task)**
- ~~Confer with the engineer regarding movements to be made.~~ *Job brief with train crew members regarding movements to be made.* **(Revised task)**
- ~~Direct the engineer to move cars to fit planned train configurations.~~ *Comply with train makeup instructions.* **(Revised task)**
- ~~Ensure the engineer complies with applicable rules, special instructions, signals, and track authority.~~ **(Deleted task)**
- *Participate in job briefings*. **(Added task)**

Main Task 2: Supervise the *safe* operation ~~and conduct~~ of the train. (Revised task)

- *Ensure crew members comply with applicable rules, special instructions, signals, and track authority*. **(Added task)**
- Ensure that train cars are *properly* ~~added or removed at proper points on routes~~ *switched in accordance with work order instructions*. **(Revised task)**
- *Ensure that required air brake tests have been performed*. **(Added task)**
- ~~Ensure that brake applications have been made~~. **(Deleted task)**
- ~~Confirm that brakes have been applied and released on each piece of equipment.~~ **(Deleted task)**
- Inspect *cars/*equipment *when required* to ensure safe and efficient operation of the train. **(Revised task)**
- Troubleshoot and repair basic equipment problems as needed.
- ~~Find~~ *Locate* and examine defects identified by a defect detector. **(Revised task)**
- *Perform visual inspections (e.g., others' train, own train) en route as required*. **(Added task)**
- ~~Judge~~ *Determine* whether to move, repair, or set out rail equipment with defects in accordance with applicable rules. **(Revised task)**
- ~~Conduct and participate in job briefings.~~ **(Deleted task)**
- ~~Give permission to utility employees (if assigned) and notify each crew member of the presence and identity of the utility employee(s).~~ **(Deleted task)**
- ~~Ensure that all main track switches used by the crew are lined and locked in normal position.~~ **(Deleted task)**
- ~~Remove all equipment such as markers, lamps, and flag cases when leaving trains and deliver the equipment to the designated location.~~ **(Deleted task)**
- ~~Ensure that each work equipment unit has been supplied with a back-up hose as part of standard equipment.~~ **(Deleted task)**

- ~~Place hazardous material cards in train and switching movements and apply hazardous material rules.~~ *Ensure hazardous material cars are properly placed in train or switching movement*. **(Revised task)**
- Perform coupling and uncoupling of train cars.
- ~~Change track~~ *Inspect and line* ~~switch~~ *switches* ~~positions~~ *as required*. **(Revised task)**
- Supervise other crew members during switching or train operations.
- ~~Instruct workers to set warning signals in front and at rear of trains during emergency stops.~~ *Provide protection as required during emergency brake application*. **(Revised task)**
- ~~Review schedules, switching orders, way bills, and shipping records to obtain cargo loading and unloading information and to plan work.~~ **(Deleted task)**
- Determine the method of operation and authority for movement on main and other types of tracks by use of the timetable and operating rules.
- ~~Observe yard traffic to determine tracks available to accommodate inbound and outbound traffic.~~ **(Deleted task)**

Main Task 3: Complete and maintain required *paperwork* ~~records and forms~~. (Revised task)

- Deliver all ~~track warrants, bulletins, and instructions~~ *appropriate paperwork* to the relieving conductor *as required*. **(Revised task)**
- Ensure that freight is delivered to its destination or terminals with any accompanying documents.
- Report car defects ~~on the prescribed form~~ *as needed*. **(Revised task)**
- ~~Examine shipping papers (for shipments with accompanying personnel) to see that the persons who accompany the shipments are entitled to be carried.~~ **(Deleted task)**
- Update train ~~consist~~ *list* information *when necessary* ~~including contents and destinations of each train car~~. **(Revised task)**
- Complete the delay report for each trip noting ~~all~~ *any* delays.~~, including red blocks, switch time, tie up time, etc.~~ **(Revised task)**
- Maintain signal awareness forms.
- ~~Complete the wheel report to report any cars picked up and kept or set out in route.~~ (Deleted task)
- ~~Complete and maintain the conductor's trip record.~~ **(Deleted task)**
- ~~Complete a defective car report if a car needs or needed repair.~~ **(Deleted task)**
- ~~Complete a blind siding report if a car is picked up or set out at a siding at which no agent is present.~~ **(Deleted task)**
- Complete a work train report ~~if the train was involved in track and right-of-way maintenance~~ *when called for work train service*. **(Revised task)**
- ~~Complete the tie up sheet~~ Complete tie up procedures (trip ticket). **(Revised task)**

Main Task 4: Transmit and receive railroad communications with *appropriate* railroad personnel ~~(other than the locomotive engineer)~~. (Revised task)

- Advise the dispatcher of any restriction placed on equipment being handled.
- ~~Report 'clear'~~ *Advise the dispatcher* when ~~a~~ *the* train clears *the* ~~a block~~ *main track*. ~~at a hand-operated switch or crossover and the switch has been restored to normal position.~~ **(Revised task)**
- ~~Determine the cause of a delayed train and inform the dispatcher or operator.~~ **(Deleted task)**
- ~~Ensure that the dispatcher has been notified that the train carrying hazardous material or equipment of excessive weight or dimensions will enter a main track, siding, or running track.~~ **(Deleted task)**

- Contact the track foreman or point conductor (where designated) to determine limits of out-of-service tracks, the location of barricades and derails, authority to move work equipment within the out-of-service track, and any other restrictions.
- Receive, copy, repeat, and comply with mandatory directives issued ~~verbally~~ by train dispatchers or control ~~stations~~ *operators*. ~~that authorize or restrict train movement.~~ **(Revised task)**
- ~~Receive information regarding train or rail problems from dispatchers or electronic monitoring devices.~~ **(Deleted task)**
- ~~Communicate with dispatchers and other personnel regarding movement authorities and/or track restrictions, train routes, timetables, and cargoes.~~ **(Deleted task)**

SME Panel Meeting 1 KSAO Activity

Instructions

We have compiled a list of the knowledge, skills, abilities, and other characteristics (KSAOs) needed by Freight Conductors to effectively perform the job. The list of KSAOs was developed based on previous job analyses, other relevant documents, and by speaking with railroad personnel.

This list is a work-in-progress, and your expert assistance is needed to ensure that the list is accurate and complete. Specifically, we need your assistance in linking the various KSAOs to each of the main tasks – this is important to demonstrate the relevance of each KSAO to the job. After we review the definitions and examples of KSAOs below, you will work as a group to complete the following activities:

1. Review the list of KSAOs and make basic edits that are needed (e.g., phrasing edits, remove redundant/irrelevant KSAOs).
2. Assign KSAOs to the first main task if they are needed by freight conductors to perform the first main task and the corresponding sub tasks. Remember that KSAOs can be assigned to more than one main task.
3. Assign KSAOs to the remaining main tasks.
4. Review the KSAOs assigned to each main task. Add any KSAOs that appear to be missing and are needed to perform the main task and sub tasks.

Definitions and examples of KSAOs are listed below. Please consider these definitions as you complete the activity.

Definitions

Knowledge – the degree to which employees have mastered a technical body of material directly involved in the performance of a job.

Skill – the capacity to perform tasks requiring the use of tools, equipment, and machinery.

Ability – the capacity to carry out physical and mental acts required by a job's tasks where the involvement of tools, equipment, and machinery is not a dominant factor.

Other characteristic – interests, values, temperaments, and personality traits suggesting what an employee is likely to do rather than how well an employee can do at peak performance.

Examples

Freight Conductors:

- *Knowledge of* the purpose and function of a rail yard
- *Knowledge of* operating and safety rules
- *Skill in* determining train and engine speeds
- *Skill in* troubleshooting basic malfunctions in equipment
- *Ability in* active listening
- *Ability to* ascend and descend ladders when necessary
- *Other characteristic* – conscientiousness
- *Other characteristic* – dependability

SME Panel Meeting 1 Edits to KSAO List for Freight Conductors

Knowledge:

- Purpose and function of a rail yard
- Function of track components and rail equipment
- Operation of classification yards
- General railroad terminology
- Terminology used in the classifying, blocking, and switching of rail cars
- Terminology and rules associated with restricted equipment
- Basic duties of other railroad personnel that freight conductors interact with during normal performance of duties
- Various types of rolling stock
- Operating and safety rules
- Rules and procedures for switching of rail cars and equipment
- Proper procedures for handling and reporting emergency situations
- The types and functions of defect detectors
- Temporary and permanent speed restrictions
- Timetable information ~~and~~, special instructions, *and* ~~bulletin~~ *track bulletins*. ~~orders, and train orders~~ **(Revised KSAO)**
- Consist information (e.g., placement of hazardous materials, equipment restrictions)
- ~~Classes and characteristics of hazardous materials.~~ **(Deleted KSAO)**
- Hazardous material ~~rules~~ regulations **(Revised KSAO)**
- ~~Procedures for reporting and protecting a release of hazardous materials.~~ **(Deleted KSAO)**
- The physical characteristics of the territory over which the conductor operates (e.g., tracks, signals, interlockings, yards, speeds, methods of operation, grade crossings)
- Reporting forms and records (e.g., delay report, wheel report, ~~conductor trip record,~~ defective car report, ~~blind siding report,~~ work train report, tie up sheet) **(Revised KSAO)**
- The types of track authority required for the movement of a train on ~~controlled~~ *main* tracks **(Revised KSAO)**
- The rule ~~authority~~ for movement of trains on tracks other than ~~controlled~~ *main* tracks **(Revised KSAO)**

Skills:

- Determining *qualifying* train and engine speeds **(Revised KSAO)**
- Identifying speed restrictions using timetables, ~~wayside~~ *roadway* signs, bulletins, train messages, and the Operating Rules Manual **(Revised KSAO)**
- Identifying block signal ~~types~~ *aspects* **(Revised KSAO)**
- Identifying ~~horn or~~ whistle signals **(Revised KSAO)**
- Troubleshooting basic malfunctions in equipment
- Testing and inspecting equipment
- ~~Situational awareness around moving equipment.~~ **(Deleted KSAO)**
- Working on and about moving equipment
- Securing trains and equipment
- Removing and installing air hoses
- Removing and installing knuckles
- Cutting out air ~~breaks~~ *brakes* **(Revised KSAO)**
- Securing dragging equipment

- ~~Applying a run around hose.~~ **(Deleted KSAO)**
- Applying and releasing hand brakes
- Performing switching activities (classification of rail cars within a yard, industry switching, set off and pick up of rail equipment)
- Operating the various kinds of switches (e.g., hand operated, power switches)
- Determining the position of switch ~~ports~~ *points* **(Revised KSAO)**
- Operating the various kinds of derails
- Installing and removing an end-of-train device
- Coupling and uncoupling air hoses
- ~~Using~~ *Understanding* ~~a~~ defect detector *messages*. **(Revised KSAO)**
- Making up trains
- Giving and interpreting communications signals (e.g., hand, flag) with or without signaling equipment
- Interpreting the *block* signal indication conveyed by the aspect(s) displayed by *the* ~~a~~ signal. **(Revised KSAO)**
- Interpreting and using timetable information
- Using telecommunication devices
- Inspecting hazardous material cars
- Locating information in the North American Emergency Response Guide
- Locating equipment restrictions in ~~Timetable s~~Special *i*~~I~~nstructions ~~(TTSI)~~ **(Revised KSAO)**

Abilities:

- *Situational awareness* **(Added KSAO)**
- Active listening
- Judgment and decisionmaking
- Comply with operating and safety rules while performing job tasks
- Ascend and descend ladders when necessary
- ~~Use proper lifting techniques while performing service.~~ **(Deleted KSAO)**
- Lift heavy objects (e.g., 75 pounds or more)
- Communicate information orally and in writing
- Accurately judge car counts and distances when switching, shoving, or coupling
- See details accurately from a distance
- Recognize and distinguish between the colors of railroad signs and signals
- Hearing/auditory acuity
- Sense and resolve problems as they arise
- Coordinate and plan various movements safely and efficiently (e.g., ~~setting off~~ *setting out* and picking up cars en route, placing cars at various industrial plants, classifying cars) **(Revised KSAO)**
- Carry out tasks in harsh environmental conditions
- Work nontraditional schedules (e.g., night shifts, on-call, long hours)

Other Characteristics:

- Passion for safety
- Conscientiousness
- Dependability
- Cooperation

Expert Demographics Form

What is your age in years? _____

What is your sex?

- ☐ Male
- ☐ Female

What is your ethnic background?

- ☐ European American/White
- ☐ African American
- ☐ Latino/Hispanic
- ☐ Asian American
- ☐ Native American/American Indian
- ☐ Biracial/Multiracial
- ☐ Other (please specify): _____

What is the highest level of education you have completed?

- ☐ High school graduate/GED
- ☐ Some college or university
- ☐ College or university graduate
- ☐ Master's degree (e.g, MBA, MA)
- ☐ Doctoral degree (e.g., PhD)
- ☐ Other (please specify): _____

What is your current job title? _____

How long (in years) have you been working with your present organization? _____

How long (in years) have you been working in your present job? _____

Please describe any other information about yourself that is relevant to your qualification as an expert on Freight Conductors (e.g., prior job experience, length of prior job experience).

_____

_____

_____

Do you have any additional comments regarding the listed TASKS or KSAOs?

May we contact you again in the future (e.g., to complete an online survey)?

☐ Yes – Please provide name and email address:

☐ No

Corrected Task List for Freight Conductors following SME Panel Meeting 1

Main Task 1: Communicate with and support other train crew members.

Sub Tasks:

- Remind the engineer that the train is approaching an area restricted by limits of authority, track warrants, track bulletins, or radio speed restriction.
- Advise the engineer of any restrictions placed on equipment being handled.
- Job brief with train crew members regarding movements to be made.
- Comply with train makeup instructions.
- Participate in job briefings.

Main Task 2: Supervise the safe operation of the train.

- Ensure crew members comply with applicable rules, special instructions, signals, and track authority.
- Ensure that train cars are properly switched in accordance with work order instructions.
- Ensure that required air brake tests have been properly performed.
- Inspect cars/equipment when required to ensure safe and efficient operation of the train.
- Troubleshoot and repair basic equipment problems as needed.
- Locate and examine defects identified by a defect detector.
- Perform visual inspections (e.g., others' train, own train) en route as required.
- Determine whether to move, repair, or set out rail equipment with defects in accordance with applicable rules.
- Ensure hazardous material cars are properly placed in train or switching movement.
- Perform coupling and uncoupling of train cars.
- Inspect and line switches as required.
- Supervise other crew members during switching or train operations.
- Provide protection as required during emergency brake application.
- Determine the method of operation and authority for movement on main and other types of tracks by use of the timetable and operating rules.

Main Task 3: Complete and maintain required paperwork.

Sub Tasks:

- Deliver all appropriate paperwork to the relieving conductor as required.
- Ensure that freight is delivered to its destination or terminals with any accompanying documents.
- Report car defects as needed.
- Update train list information when necessary.
- Complete the delay report for each trip noting any delays.
- Maintain signal awareness forms.
- Complete a work train report when called for work train service.
- Complete tie up procedures (trip ticket).

Main Task 4: Transmit and receive railroad communications with appropriate railroad personnel (other than train crew members).

Sub Tasks:

- Advise the dispatcher of any restriction placed on equipment being handled.
- Advise the dispatcher when the train clears the main track.
- Communicate with employee in charge (EIC) concerning train movements on tracks affected (e.g., track bulletin Form B movements, out-of-service tracks).
- Receive, copy, repeat, and comply with mandatory directives issued by train dispatchers or control operators.

Corrected KSAO List for Freight Conductors following SME Panel Meeting 1

Knowledge:

- Purpose and function of a rail yard
- Function of track components and rail equipment
- Operation of classification yards
- General railroad terminology
- Terminology used in the classifying, blocking, and switching of rail cars
- Terminology and rules associated with restricted equipment
- Basic duties of other railroad personnel that freight conductors interact with during normal performance of duties
- Various types of rolling stock
- Operating and safety rules
- Rules and procedures for switching of rail cars and equipment
- Proper procedures for handling and reporting emergency situations
- The types and functions of defect detectors
- Temporary and permanent speed restrictions
- Timetable information, special instructions, and track bulletins
- Consist information (e.g., placement of hazardous materials, equipment restrictions)
- Hazardous material regulations
- The physical characteristics of the territory over which the conductor operates (e.g., tracks, signals, interlockings, yards, speeds, methods of operation, grade crossings)
- Reporting forms and records (e.g., delay report, wheel report, defective car report, work train report, tie up sheet)
- The types of track authority required for the movement of a train on main tracks
- The rule for movement of trains on tracks other than main tracks

Skills:

- Determining qualifying train and engine speeds
- Identifying speed restrictions using timetables, roadway signs, bulletins, train messages, and the Operating Rules Manual
- Identifying block signal aspects
- Identifying whistle signals
- Troubleshooting basic malfunctions in equipment
- Testing and inspecting equipment
- Working on and about moving equipment
- Securing trains and equipment
- Removing and installing air hoses
- Removing and installing knuckles
- Cutting out air brakes
- Securing dragging equipment
- Applying and releasing hand brakes
- Performing switching activities (classification of rail cars within a yard, industry switching, set off and pickup of rail equipment)

- Operating the various kinds of switches (e.g., hand operated, power switches)
- Determining the position of switch points
- Operating the various kinds of derails
- Installing and removing an end-of-train device
- Coupling and uncoupling air hoses
- Understanding defect detector messages
- Making up trains
- Giving and interpreting communications signals (e.g., hand, flag) with or without signaling equipment
- Interpreting the block signal indication conveyed by the aspect(s) displayed by the signal
- Interpreting and using timetable information
- Using telecommunication devices
- Inspecting hazardous material cars
- Locating information in the North American Emergency Response Guide
- Locating equipment restrictions in special instructions

Abilities:

- Situational awareness
- Active listening
- Judgment and decisionmaking
- Comply with operating and safety rules while performing job tasks
- Ascend and descend ladders when necessary
- Lift heavy objects (e.g., 75 pounds or more)
- Communicate information orally and in writing
- Accurately judge car counts and distances when switching, shoving, or coupling
- See details accurately from a distance
- Recognize and distinguish between the colors of railroad signs and signals
- Hearing/auditory acuity
- Sense and resolve problems as they arise
- Coordinate and plan various movements safely and efficiently (e.g., setting out and picking up cars en route, placing cars at various industrial plants, classifying cars)
- Carry out tasks in harsh environmental conditions
- Work nontraditional schedules (e.g., night shifts, on-call, long hours)

Other Characteristics:

- Passion for safety
- Conscientiousness
- Dependability
- Cooperation

Appendix F.

JOB ANALYST EDITS TO TASK LIST FOR FREIGHT CONDUCTORS FOLLOWING SME PANEL MEETING 1

JOB ANALYST EDITS TO KSAO LIST FOR FREIGHT CONDUCTORS FOLLOWING SME PANEL MEETING 1

Job Analyst Edits to Task List for Freight Conductors Following SME Panel Meeting 1

~~Main Task 1: Communicate with and support other train crew members.~~ (Deleted main tasks)

- Remind the engineer that the train is approaching an area restricted by limits of authority, track warrants, track bulletins, or radio speed restriction.
- Advise the engineer of any restrictions placed on equipment being handled.
- *Call out signals as they are encountered when operating in signal territory*. **(Added task)**
- Job brief with train crew members regarding *work to be done*, movements to be made, *and any safety hazards*. **(Revised task)**
- ~~Comply with train makeup instructions.~~ **(Deleted task)**
- ~~Participate in job briefings held by other train crew members.~~ *Conduct pre-trip planning briefings with train crew members*. **(Revised task)**

~~Main Task 2: Supervise the safe operation of the train.~~ (Deleted main tasks)

- Ensure crew members comply with applicable rules, special instructions, signals, and track authority.
- Ensure that train cars are properly switched in accordance with work order instructions.
- Ensure that required air brake tests have been properly performed.
- Inspect cars/equipment *en route and when stopped* ~~when required~~ to ensure *the* safe and efficient operation of the train. **(Revised task)**
- *Inspect other trains en route (i.e., roll by inspection).* **(Added task)**
- ~~Troubleshoot and repair basic equipment problems as needed.~~ **(Deleted task)**
- *Replace faulty air hoses when necessary*. **(Added task)**
- *Replace broken knuckles when necessary*. **(Added task)**
- *Secure dragging equipment when necessary*. **(Added task)**
- *Install and remove end-of-train devices*. **(Added task)**
- Locate and ~~examine~~ *inspect* defects identified by a defect detector. **(Revised task)**
- Perform visual inspections (e.g., others' train, our train) en route as required.
- Determine whether to move, repair, or set out rail equipment with defects in accordance with applicable rules.
- Ensure hazardous material cars are properly placed in train or switching movement.
- ~~Perform coupling~~ *Couple* and ~~uncoupling~~ *uncouple* ~~of~~ train cars. **(Revised task)**
- Inspect and line switches as required.
- Supervise other crew members during switching or train operations.
- Provide protection as required during emergency brake application *and when shoving cars*. **(Revised task)**
- Determine the method of operation and authority for movement on main and other types of tracks by use of the timetable and operating rules.

~~Main Task 3: Complete and maintain required paperwork.~~ (Deleted main tasks)

- Deliver all appropriate paperwork *(e.g., train list, general track bulletins)* to the relieving conductor as required. **(Revised task)**
- Ensure that freight is delivered to its destination or terminals with any accompanying documents.

- Report car defects as needed.
- *Verify the accuracy of the train list prior to the start of a trip*. **(Added task)**
- Update train list information when necessary.
- Complete ~~the~~ delay ~~reports~~ *reports* for each trip noting any delays. **(Revised task)**
- Maintain signal awareness forms.
- Complete a work train report when called for work train service.
- Complete tie up procedures (trip ticket).

~~Main Task 4: Transmit and receive railroad communications with appropriate railroad personnel (other than train crew members).~~ (Deleted main tasks)

- Advise the dispatcher of any restriction placed on equipment being handled.
- Advise the dispatcher when the train clears the main track.
- Communicate with employee in charge (EIC) concerning train movements on tracks affected (e.g., track bulletin Form B movements, out-of-service tracks).
- Receive, copy, repeat, and comply with mandatory directives issued by train dispatchers or control operators *(e.g., track warrants, track bulletins)*.

Job Analyst Edits to KSAO List for Freight Conductors following SME Panel Meeting 1

Knowledge:

- Purpose and function of a rail yard
- Function of track components and rail equipment
- Operation of classification yards
- General railroad terminology
- Terminology used in the classifying, blocking, and switching of rail cars
- Terminology and rules associated with restricted equipment
- Basic duties of other railroad personnel that freight conductors interact with during normal performance of duties
- Various types of rolling stock
- Operating and safety rules
- Rules and procedures for switching of rail cars and equipment
- Proper procedures for handling and reporting emergency situations
- The types and functions of defect detectors
- Temporary and permanent speed restrictions
- Timetable information, special instructions, and track bulletins
- *Switch lists, track lists, and work orders* **(Added KSAO)**
- Consist information (e.g., placement of hazardous materials, equipment restrictions)
- Hazardous material *placards, markings, and* regulations **(Revised KSAO)**
- The physical characteristics of the territory over which the conductor operates (e.g., tracks, signals, interlockings, yards, speeds, methods of operation, grade crossings)
- Reporting forms and records (e.g., delay report, wheel report, defective car report, work train report, tie up sheet)
- The types of track authority required for the movement of a train on main tracks
- The rule for movement of trains on tracks other than main tracks
- *Required air brake tests and when they apply* **(Added KSAO)**

Skills:

- Determining qualifying train and engine speeds
- Identifying speed restrictions using timetables, roadway signs, bulletins, train messages, and the Operating Rules Manual
- Identifying block signal aspects
- Identifying whistle signals
- Troubleshooting basic malfunctions in equipment
- Testing and inspecting equipment
- Working on and about moving equipment
- Securing trains and equipment
- Removing and installing air hoses
- Removing and installing knuckles
- Cutting out air brakes
- Securing dragging equipment
- Applying and releasing hand brakes

- Performing switching activities (classification of rail cars within a yard, industry switching, set off and pickup of rail equipment)
- Operating the various kinds of switches (e.g., hand operated, power switches)
- Determining the position of switch points
- Operating the various kinds of derails
- Installing and removing an end-of-train device
- Coupling and uncoupling air hoses
- Understanding defect detector messages
- *Aligning drawbars* **(Added KSAO)**
- Making up trains
- Giving and interpreting communications signals (e.g., hand, flag) with or without signaling equipment
- Interpreting the block signal indication conveyed by the aspect(s) displayed by the signal
- Interpreting and using timetable information
- Using telecommunication devices
- Inspecting hazardous material cars
- Locating information in the North American Emergency Response Guide
- Locating equipment restrictions in special instructions

Abilities:

- Situational awareness
- Active listening
- Judgment and decisionmaking
- Comply with operating and safety rules while performing job tasks
- Ascend and descend ladders when necessary
- Lift heavy objects (e.g., 75 pounds or more)
- Communicate information orally and in writing
- Accurately judge car counts and distances when switching, shoving, or coupling
- See details accurately from a distance
- Recognize and distinguish between the colors of railroad signs and signals
- Hearing/auditory acuity
- Sense and resolve problems as they arise
- *Identifying potential hazards* **(Added KSAO)**
- Coordinate and plan various movements safely and efficiently (e.g., setting out and picking up cars en route, placing cars at various industrial plants, classifying cars)
- Carry out tasks in harsh environmental conditions
- Work nontraditional schedules (e.g., night shifts, on-call, long hours)

Other Characteristics:

- Passion for safety
- ~~Conscientiousness~~ Conscientious **(Revised KSAO)**
- ~~Dependability~~ Dependable **(Revised KSAO)**
- ~~Cooperation~~ Cooperative **(Revised KSAO)**

Appendix G.

REORGANIZED TASK LIST FOR FREIGHT CONDUCTORS FOR SME PANEL MEETING 2

SME PANEL MEETING 2 TASK ACTIVITY

SME PANEL MEETING 2 EDITS TO TASK LIST FOR FREIGHT CONDUCTORS

CORRECTED TASK LIST FOR FREIGHT CONDUCTORS FOLLOWING SME PANEL MEETING 2

Reorganized Task List for Freight Conductors for SME Panel Meeting 2

*** = Task Statement May Be Problematic (e.g., vague, not specific, different verb needed)**

- Verify the accuracy of the train list prior to the start of a trip.
- Conduct pre-trip planning briefings with train crew members.
- Advise the engineer of any restrictions placed on equipment being handled.
- Advise the dispatcher of any restriction placed on equipment being handled.
- Advise the dispatcher when the train clears the main track.
- Remind the engineer that the train is approaching an area restricted by limits of authority, track warrants, track bulletins, or radio speed restriction.
- Call out signals as they are encountered when operating in signal territory.
- Job brief with train crew members regarding work to be done, movements to be made, and any safety hazards.
- Inspect cars/equipment en route and when stopped to ensure the safe and efficient operation of the train.
- Inspect other trains en route (i.e., roll by inspection).
- Locate and inspect defects identified by a defect detector.
- Replace faulty air hoses when necessary.
- Replace broken knuckles when necessary.
- Secure dragging equipment when necessary.
- Install and remove end-of-train devices.
- Determine whether to move, repair, or set out rail equipment with defects in accordance with applicable rules.
- Couple and uncouple train cars.
- Inspect and line switches as required.
- Deliver all appropriate paperwork (e.g., train list, general track bulletins) to the relieving conductor as required.
- Report car defects as needed.
- Update train list information when necessary.
- Complete delay reports for each trip noting any delays.
- Complete a work train report when called for work train service.
- Receive, copy, repeat, and comply with mandatory directives issued by train dispatchers or control operators (e.g., track warrants, track bulletins).
- *Ensure crew members comply with applicable rules, special instructions, signals, and track authority.
- *Ensure that train cars are properly switched in accordance with work order instructions.
- *Ensure that required air brake tests have been properly performed.
- *Ensure hazardous material cars are properly placed in train or switching movement.
- *Supervise other crew members during switching or train operations.
- *Provide protection as required during emergency brake application and when shoving cars.
- *Determine the method of operation and authority for movement on main and other types of tracks by use of the timetable and operating rules.

- *Ensure that freight is delivered to its destination or terminals with any accompanying documents.
- *Maintain signal awareness forms.
- *Complete tie up procedures (trip ticket).
- *Communicate with employee in charge (EIC) concerning train movements on tracks affected (e.g., track bulletin Form B movements, out-of-service tracks).

SME Panel Meeting 2 Task Activity

Instructions

We have compiled a list of job tasks that Freight Conductors (in yard and road operations) do on the job based on previous job analyses, other relevant documents, and by speaking with railroad personnel. *Tasks* refer to activities that are directed toward the achievement of specific job objectives and they have a definite beginning and an end. A good task statement, then, should refer to activities that are followed to accomplish a goal.

The first objective of today's meeting is to make any needed edits to the accompanying list of task statements. This list is a work-in-progress and your expert assistance is needed to ensure that the list is accurate and complete.

After we review the method for writing task statements and the examples below you will work both individually and as a group to complete the following activities:

1. *Individual Work*
    - Make any edits to the task statements that you feel are necessary (e.g., edit the phrasing of a task, remove the task, break a task up into two or more tasks, add tasks). Pay particular attention to the task statements that have an asterisk (*) as these may be problematic.
2. *Group Work*
    - Discuss one another's edits to the task list and come to agreement on the final editing/phrasing of each task statement.

The level of specificity is an important consideration in writing task statements. A good rule of thumb to use is to consider whether the task can be broken down into meaningful components without referring to specific movements; if any further editing of a task statement would result in describing specific movements, then the statement should not be edited further.

Method for constructing task statements

- There is an implied subject of the task statement (i.e., workers, employees, or managers). The implied subject is plural, not singular.
- There is a verb that tells what function the workers are performing.
- The object of the verb may be various things, for example, data, people, machines, tools, or equipment.
- There is a phrase starting with the word *to* or the words *in order to* that gives the purpose of the workers' activity. The 'purpose' phrase may be left out if it is obvious.

Example task statements

- **Auto mechanics:**
    - Inspect equipment to determine whether repair or replacement is necessary.
    - Modify equipment to improve its efficiency of operation and safety.
- **Pharmacy technicians:**
    - Receive and prioritize medication orders according to how soon they need to be filled.
    - Call nurses or physicians to verify prescription information or to complete partial information.

SME Panel Meeting 2 Edits to Task List for Freight Conductors

- *Update required rule books and bulletins for all territories that are operated on.* **(Added task)**
- Verify the accuracy of the train list*, dispatcher bulletins, and train orders (i.e., authority for movement)* prior to the start of a trip. **(Revised task)**
- Conduct pre-trip planning briefings with train crew members*, yard master, and other authorities*. **(Revised task)**
- Advise the engineer of any restrictions placed on equipment being handled.
- Advise the dispatcher of any restriction placed on equipment being handled.
- Advise the ~~dispatcher~~ *proper authority* when the train clears the main track *or territory*. **(Revised task)**
- Remind the engineer that the train is approaching an area restricted by limits of authority, track warrants, track bulletins, or radio speed restriction.
- Call out signals as they are encountered when operating in signal territory *and as job activities change*. **(Revised task)**
- Job brief with train crew members regarding work to be done, movements to be made, and any safety hazards.
- Inspect cars/equipment en route and when stopped to ensure the safe and efficient operation of the train.
- Inspect other trains en route (i.e., roll by inspection).
- Locate, ~~and~~ inspect, *and report* defects identified by a defect detector. **(Revised task)**
- *Join air hoses during train makeup*. **(Added task)**
- Replace faulty air hoses when necessary.
- Replace broken knuckles when necessary.
- Secure dragging equipment when necessary.
- Install and remove end-of-train devices.
- Determine whether to move, repair, or set out rail equipment with defects in accordance with applicable rules.
- Couple and uncouple train cars.
- *Remove and replace derailing equipment as needed*. **(Added task)**
- Inspect and line switches as required.
- Deliver all appropriate paperwork (e.g., train list, general track bulletins, *air slips*) to the relieving conductor as required. **(Revised task)**
- Report car defects ~~as needed~~. **(Revised task)**
- Update train list information *per operating rules* ~~when necessary~~. **(Revised task)**
- Complete delay reports for each trip noting any delays.
- Complete a work train report, *if applicable,* when called for work train service. **(Revised task)**
- Receive, copy, repeat, and comply with mandatory directives issued by train dispatchers or control operators (e.g., track warrants, track bulletins).
- Ensure crew members comply with applicable rules, special instructions, signals, and track authority.
- ~~*Ensure that train cars are properly switched~~ *Switch train cars* in accordance with work order instructions. **(Revised task)**
- ~~*Ensure that~~ *Perform* required air brake tests *or verify that they* have been properly performed. **(Revised task)**
- ~~*Ensure~~ *Verify that* hazardous material cars are properly placed in train or switching movement *and have all required documentation*. **(Revised task)**

- ~~*Supervise~~ *Direct* other crew members during switching or train operations. **(Revised task)**
- ~~*~~Provide protection ~~as required during emergency brake application and~~ when shoving cars. **(Revised task)**
- *Provide protection to other trains in accordance with rules during emergency brake application.* **(Added task)**
- ~~*Determine the method of operation and authority for movement on main and other types of tracks by use of the timetable and operating rules.~~ **(Deleted task)**
- ~~*Ensure that freight is delivered to its destination or terminals with any accompanying documents.~~ **(Deleted task)**
- ~~*Maintain~~ *Update the* signal awareness form. **(Revised task)**
- ~~*~~Complete *required Federal Railroad Administration (FRA)* tie up ~~procedures~~ *documentation.* ~~(trip ticket).~~ **(Revised task)**
- ~~*Communicate with~~ *Contact the* employee in charge (EIC) concerning train movements on ~~tracks affected~~ *the affected tracks (e.g., track bulletin, out-of-service tracks, work areas).*

Corrected Task List for Freight Conductors Following SME Panel Meeting 2

- Update required rule books and bulletins for all territories that are operated on.
- Verify the accuracy of the train list, dispatcher bulletins, and train orders (i.e., authority for movement) prior to the start of a trip.
- Conduct pre-trip planning briefings with train crew members, yard master, and other authorities.
- Advise the engineer of any restrictions placed on equipment being handled.
- Advise the dispatcher of any restrictions placed on equipment being handled.
- Advise the proper authority when the train clears the main track or territory.
- Remind the engineer that the train is approaching an area restricted by limits of authority, track warrants, track bulletins, or radio speed restriction.
- Call out signals as they are encountered when operating in signal territory and as job activities change.
- Job brief with train crew members regarding work to be done, movements to be made, and any safety hazards.
- Inspect cars/equipment en route and when stopped to ensure the safe and efficient operation of the train.
- Inspect other trains en route (i.e., roll by inspection).
- Locate, inspect, and report defects identified by a defect detector.
- Join air hoses during train makeup.
- Replace faulty air hoses when necessary.
- Replace broken knuckles when necessary.
- Secure dragging equipment when necessary.
- Install and remove end-of-train devices.
- Determine whether to move, repair, or set out rail equipment with defects in accordance with applicable rules.
- Couple and uncouple train cars.
- Remove and replace derailing equipment as needed.
- Inspect and line switches as required.
- Deliver all appropriate paperwork (e.g., train list, general track bulletins, air slips) to the relieving conductor as required.
- Report car defects.
- Update train list information per operating rules.
- Complete delay reports for each trip noting any delays.
- Complete a work train report, if applicable, when called for work train service.
- Receive, copy, repeat, and comply with mandatory directives issued by train dispatchers or control operators (e.g., track warrants, track bulletins).
- Ensure crew members comply with applicable rules, special instructions, signals, and track authority.
- Switch train cars in accordance with work order instructions.
- Perform required air brake tests or verify that they have been properly performed.
- Verify that hazardous material cars are properly placed in train or switching movement and have all required documentation.
- Direct other crew members during switching or train operations.
- Provide protection when shoving cars.
- Provide protection to other trains in accordance with rules during emergency brake application.

- Update the signal awareness form.
- Complete required Federal Railroad Administration (FRA) tie up documentation.

Contact the employee in charge (EIC) concerning train movements on the affected tracks (e.g., track bulletin, out-of-service tracks, work areas).

Appendix H.

TASK LIST FOR FREIGHT CONDUCTORS WITH FUNCTIONAL CATEGORIES FOR SME PANEL MEETING 3

SME PANEL MEETING 3 EDITS TO TASK LIST FOR FREIGHT CONDUCTORS

FINAL TASK LIST FOR FREIGHT CONDUCTORS

EMAIL TO SMEs IN PANEL MEETING 1 TO REVIEW FINAL TASK LIST

Task List for Freight Conductors with Functional Categories for SME Panel Meeting 3

Train Inspection, Troubleshooting, and Repair

- Verify that hazardous material cars are properly placed in train or switching movement and have all required documentation.
- Perform required air brake tests or verify that they have been properly performed.
- Inspect cars/equipment en route and when stopped to ensure the safe and efficient operation of the train.
- Inspect other trains en route (i.e., roll by inspection).
- Locate, inspect, and report defects identified by a defect detector.
- Determine whether to move, repair, or set out rail equipment with defects in accordance with applicable rules.
- Replace faulty air hoses when necessary.
- Replace broken knuckles when necessary.
- Secure dragging equipment when necessary.

Train Car Makeup and Handling

- Join air hoses during train makeup.
- Couple and uncouple train cars.
- Remove and replace derailing equipment as needed.
- Inspect and line switches as required.
- Switch train cars in accordance with work order instructions.
- Install and remove end-of-train devices.
- Provide protection when shoving cars.
- Provide protection to other trains in accordance with rules during emergency brake application.

Form and Record Management

- Update required rule books and bulletins for all territories that are operated on.
- Verify the accuracy of the train list, dispatcher bulletins, and train orders (i.e., authority for movement) prior to the start of a trip.
- Update the signal awareness form.
- Report car defects.
- Update train list information per operating rules.
- Complete delay reports for each trip noting any delays.
- Complete a work train report, if applicable, when called for work train service.
- Deliver all appropriate paperwork (e.g., train list, general track bulletins, air slips) to the relieving conductor as required.
- Complete required Federal Railroad Administration (FRA) tie up documentation.

Trip Communication

- Advise the engineer of any restrictions placed on equipment being handled.
- Advise the dispatcher of any restrictions placed on equipment being handled.

- Advise the proper authority when the train clears the main track or territory.
- Remind the engineer that the train is approaching an area restricted by limits of authority, track warrants, track bulletins, or radio speed restriction.
- Call out signals as they are encountered when operating in signal territory and as job activities change.
- Contact the employee in charge (EIC) concerning train movements on the affected tracks (e.g., track bulletin, out-of-service tracks, work areas).
- Receive, copy, repeat, and comply with mandatory directives issued by train dispatchers or control operators (e.g., track warrants, track bulletins).

Crew Supervision

- Conduct pre-trip planning briefings with train crew members, yard master, and other authorities.
- Job brief with train crew members regarding work to be done, movements to be made, and any safety hazards.
- Ensure crew members comply with applicable rules, special instructions, signals, and track authority.
- Direct other crew members during switching or train operations.

SME Panel Meeting 3 Edits to Task List for Freight Conductors

Train Inspection, Troubleshooting, and Repair

- Verify that hazardous material cars are properly placed in train or switching movement ~~and have all required documentation~~. **(Revised task)**
- Perform required air brake tests or verify that they have been properly performed.
- ~~•~~ Inspect cars/equipment en route and when stopped to ensure the safe and efficient operation of the train.
- Inspect other trains en route (i.e., roll by inspection).
- Locate, inspect and report defects identified by a defect detector.
- Determine whether to move, repair, or set out rail equipment with defects in accordance with applicable rules.
- Replace faulty air hoses when necessary.
- Replace broken knuckles when necessary.
- Secure dragging equipment when necessary.

Train ~~Car~~ Makeup and Handling (Revised category)

- Join air hoses during train makeup.
- Couple and uncouple train cars.
- Remove and replace derailing equipment as needed.
- Inspect and line switches as required.
- Switch train cars in accordance with work order instructions.
- Install and remove end-of-train devices.
- Provide protection when shoving cars.
- Provide protection to other trains in accordance with rules during emergency brake application.
- *Apply the emergency brake to stop the train in extreme circumstances*. **(Added task)**

Form and Record Management

- Update required rule books and bulletins for all territories that are operated on.
- Verify the accuracy of the train list, dispatcher bulletins, and train orders (i.e., authority for movement) prior to the start of a trip.
- *Verify that all hazardous material cars have all required documentation*. **(Added task)**
- Update the signal awareness form.
- Report car defects.
- ~~•~~ Update train list information per operating rules.
- Complete delay reports for each trip noting any delays.
- Complete a work train report, if applicable, when called for work train service.
- Deliver all appropriate paperwork (e.g., train list, general track bulletins, air slips) to the relieving conductor as required.
- Complete required Federal Railroad Administration (FRA) tie up documentation.
- *Record train times when trains are given permission to enter the work area when assigned as flagmen*. **(Added task)**
- *Provide emergency responders with hazardous material documentation in an emergency*. **(Added task)**

~~Trip~~ *Crew* Communication (Revised category)

- Advise the engineer of any restrictions placed on equipment being handled.
- Advise the dispatcher of any restrictions placed on equipment being handled.
- Advise the proper authority when the train clears the main track or territory.
- Remind the engineer that the train is approaching an area restricted by limits of authority, track warrants, track bulletins, or ~~radio~~ speed restriction. **(Revised task)**
- Call out signals as they are encountered when operating in signal territory and as job activities change.
- Contact the employee in charge (EIC) concerning train movements on the affected tracks (e.g., track bulletin, out-of-service tracks, work areas).
- Receive, copy, repeat, and comply with mandatory directives issued by train dispatchers or control operators (e.g., track warrants, track bulletins).
- *Call for and release foul time as requested by workmen (e.g., foremen, contractors) when assigned as flagmen.* **(Added task)**

Crew Supervision

- Conduct pre-trip planning briefings with train crew members, yard master, and other authorities.
- Job brief with train crew members regarding work to be done, movements to be made, and any safety hazards.
- Ensure crew members comply with applicable rules, special instructions, signals, and track authority.
- Direct other crew members during switching or train operations.

Final Task List for Freight Conductors

Crew Communication (8 tasks)

- Advise the engineer of any restrictions placed on equipment being handled.
- Advise the dispatcher of any restrictions placed on equipment being handled.
- Advise the proper authority when the train clears the main track or territory.
- Remind the engineer that the train is approaching an area restricted by limits of authority, track warrants, track bulletins, or speed restriction.
- Call out signals as they are encountered when operating in signal territory and as job activities change.
- Contact the employee in charge (EIC) concerning train movements on the affected tracks (e.g., track bulletin, out-of-service tracks, work areas).
- Receive, copy, repeat, and comply with mandatory directives issued by train dispatchers or control operators (e.g., track warrants, track bulletins).
- Call for and release foul time as requested by workmen (e.g., foremen, contractors) when assigned as flagmen.

Crew Supervision (4 tasks)

- Conduct pre-trip planning briefings with train crew members, yard master, and other authorities.
- Job brief with train crew members regarding work to be done, movements to be made, and any safety hazards.
- Ensure crew members comply with applicable rules, special instructions, signals, and track authority.
- Direct other crew members during switching or train operations.

Form and Record Management (12 tasks)

- Update required rule books and bulletins for all territories that are operated on.
- Verify the accuracy of the train list, dispatcher bulletins, and train orders (i.e., authority for movement) prior to the start of a trip.
- Verify that all hazardous material cars have all required documentation.
- Update the signal awareness form.
- Report car defects.
- Update train list information per operating rules.
- Complete delay reports for each trip noting any delays.
- Complete a work train report, if applicable, when called for work train service.
- Deliver all appropriate paperwork (e.g., train list, general track bulletins, air slips) to the relieving conductor as required.
- Complete required Federal Railroad Administration (FRA) tie up documentation.
- Record train times when trains are given permission to enter the work area when assigned as flagmen.
- Provide emergency responders with hazardous material documentation in an emergency.

Train Inspection, Troubleshooting, and Repair (9 tasks)

- Verify that hazardous material cars are properly placed in train or switching movement.
- Perform required air brake tests or verify that they have been properly performed.
- Inspect cars/equipment en route and when stopped to ensure the safe and efficient operation of the train.
- Inspect other trains en route (i.e., roll by inspection).
- Locate, inspect, and report defects identified by a defect detector.
- Determine whether to move, repair, or set out rail equipment with defects in accordance with applicable rules.
- Replace faulty air hoses when necessary.
- Replace broken knuckles when necessary.
- Secure dragging equipment when necessary.

Train Makeup and Handling (9 tasks)

- Join air hoses during train makeup.
- Couple and uncouple train cars.
- Remove and replace derailing equipment as needed.
- Inspect and line switches as required.
- Switch train cars in accordance with work order instructions.
- Install and remove end-of-train devices.
- Provide protection when shoving cars.
- Provide protection to other trains in accordance with rules during emergency brake application.
- Apply the emergency brake to stop the train in extreme circumstances.

Email to SMEs in Panel Meeting 1 to Review Final Task List

SUBJECT: UConn Freight Conductor Job Analysis - Task Review

Hi (NAME):

This is Ben Walsh from the University of Connecticut; we met back in early October when I visited (location) along with several members from the Volpe Center.

If you remember back to our meeting, we spent some time working on a task list. We've had a couple more meetings with freight conductors since then and the task list has changed some. We now have 42 tasks organized within 5 categories (groups of related tasks), and we feel it is complete (see attached task list). However, as a final check we would like you to take a few minutes to review the list and let us know if any final changes are needed to the tasks and/or categories. Is the list accurate and complete? You can send me a reply email if there is anything in the list that you suggest changing.

Thank you for your continued assistance with this project and happy holidays!

Regards,

Ben

Appendix I.

INVITATION TO PARTICIPATE IN TASK RATING SURVEY

ONLINE TASK RATING SURVEY

TASK RATING SURVEY SME DEMOGRAPHIC CHARACTERISTICS

TASK LIST WITH MEAN RATINGS OF CONSEQUENCES OF ERROR, DIFFICULTY, AND IMPORTANCE

Invitation to Participate in Task Rating Survey

March 9, 2010

Memo to: UTU Freight Conductors

From: James Stem, UTU National Legislative Director

Re: Freight Conductor Job Analysis Survey

UTU is participating with the Federal Railroad Administration (FRA) in a job analysis of freight conductors. The University of Connecticut (UConn) is conducting this study for FRA. Other UTU freight conductors have provided the information contained in the attached survey materials to the researchers at UConn.

You have been recommended by your UTU General Chairman to participate in this survey. When I completed the survey it took me less than 15 minutes to complete. The survey will be available until April 1st. A reminder email will be sent in one week. Please consider this message as an encouragement to complete the survey in an honest and straightforward manner.

If you need more information concerning the survey, please call James Stem or John Risch with UTU at (202) 543-7714, or Ben Walsh with UConn at (319) 389-0187 or Benjamin.Walsh@UConn.edu.

Thank You for participating and completing the survey. Please click on this link to begin the survey: (survey link)

Online Task Rating Survey

Page 1: Introduction

Introduction

Thank you for your interest in participating in this research project. The University of Connecticut is conducting a job analysis on the job Freight Conductor to document the tasks done on the job and the knowledge, skills, abilities, and other characteristics (KSAOs) needed to perform the tasks. This research is funded by the Federal Railroad Administration (FRA).

Participation in the study is completely voluntary. You are free to decide not to participate in this study or to withdraw at any time without adversely affecting your relationship with your employer or the investigators.

Procedure

Your involvement will entail participation in a survey in which tasks carried out by Freight Conductors are rated on two scales so that we can determine their relative importance. The survey should take no more than 15 minutes to complete.

Confidentiality and Anonymity

All information derived from the survey will be held in strict confidentiality and will also be anonymous as no individual or organization names will be used in the reporting of results of this research.

Risks and Benefits

Participating in the survey will not create any risks or inconveniences for you other than the time required to participate.

For More Information

If you need more information or have questions, please contact the Principal Investigator, Dr. Janet Barnes-Farrell, at 860-486-5929 (janet.barnes-farrell@uconn.edu) or Ben Walsh, graduate student researcher (benjamin.walsh@uconn.edu). If you have any questions about your rights as a research subject that have not been answered by the investigators or to report any concerns about the study, you may contact the University of Connecticut, Institutional Review Board (IRB) at 860-486-8802. An IRB is a group of people that review research studies to make sure they are safe for participants.

Navigating the Survey

To navigate through individual pages of the survey, you can use the Tab and Page Up/Page Down keys on your keyboard or the scroll bar on the right hand side of the screen. When you are ready to move to the next page, use the NEXT button located at the bottom of each page of the survey. DO NOT use the Enter key on your keyboard to enter responses or navigate the survey.

Please begin when you are ready!

Page 2: Introduction Continued

On the following pages you will be presented with the various tasks done by Freight Conductors in both yard and road operations. These task statements were developed with the assistance of current and former Freight Conductors. Some tasks may be more difficult than others, and some may result in more negative consequences if not done properly.

For each task you will be asked to report:

(a) How important (i.e., significant) the consequences of performing the task incorrectly are (Consequences of Error);

(b) How easy or difficult the task is (Task Difficulty).

All tasks will first be rated in terms of Task Difficulty. You will then rate all tasks in terms of Consequences of Error. Make your ratings based on the job in general, not just on your own job.

Please familiarize yourself with the two rating scales presented below.

Consequences of Error

How important (i.e., significant) are the consequences of performing the task incorrectly?

1 – Consequences of error are not at all important
2 – Consequences of error are somewhat important
3 – Consequences of error are moderately important
4 – Consequences of error are very important
5 – Consequences of error are extremely important

Task Difficulty

How easy or difficult is it to complete the task correctly relative to all other tasks?

1 – Very easy
2 – Somewhat easy
3 – Not easy or difficult
4 – Somewhat difficult
5 – Very difficult

Please click the NEXT button to begin rating the tasks

Page 3: Task Difficulty Ratings – Form and Record Management Tasks

How easy or difficult is it to complete the task correctly relative to all other tasks?

1 – Very easy
2 – Somewhat easy
3 – Not easy or difficult
4 – Somewhat difficult
5 – Very difficult

- Update required rule books and bulletins for all territories that are operated on.
- Verify the accuracy of the train list, dispatcher bulletins, and train orders (i.e., authority for movement) prior to the start of a trip.
- Verify that all hazardous material cars have all required documentation.
- Update the signal awareness form.
- Report car defects.
- Update train list information per operating rules.
- Complete delay reports for each trip noting any delays.
- Complete a work train report, if applicable, when called for work train service.
- Deliver all appropriate paperwork (e.g., train list, general track bulletins, air slips) to the relieving conductor as required.
- Complete required Federal Railroad Administration (FRA) tie up documentation.
- Record train times when trains are given permission to enter the work area when assigned as flagmen.
- Provide emergency responders with hazardous material documentation in an emergency.

Page 4: Task Difficulty Ratings – Train Inspection, Troubleshooting, and Repair Tasks

How easy or difficult is it to complete the task correctly relative to all other tasks?

1 – Very easy
2 – Somewhat easy
3 – Not easy or difficult
4 – Somewhat difficult
5 – Very difficult

- Verify that hazardous material cars are properly placed in train or switching movement.
- Perform required air brake tests or verify that they have been properly performed.
- Inspect cars/equipment en route and when stopped to ensure the safe and efficient operation of the train.
- Inspect other trains en route (i.e., roll by inspection).
- Locate, inspect, and report defects identified by a defect detector.
- Determine whether to move, repair, or set out rail equipment with defects in accordance with applicable rules.
- Replace faulty air hoses when necessary.
- Replace broken knuckles when necessary.
- Secure dragging equipment when necessary.

Page 5: Task Difficulty Ratings – Train Makeup and Handling Tasks

How easy or difficult is it to complete the task correctly relative to all other tasks?

1 – Very easy
2 – Somewhat easy
3 – Not easy or difficult
4 – Somewhat difficult
5 – Very difficult

- Join air hoses during train makeup.
- Couple and uncouple train cars.
- Remove and replace derailing equipment as needed.
- Inspect and line switches as required.
- Switch train cars in accordance with work order instructions.
- Install and remove end-of-train devices.
- Provide protection when shoving cars.
- Provide protection to other trains in accordance with rules during emergency brake application.
- Apply the emergency brake to stop the train in extreme circumstances.

Page 6: Task Difficulty Ratings – Crew Communication Tasks

How easy or difficult is it to complete the task correctly relative to all other tasks?

1 – Very easy
2 – Somewhat easy
3 – Not easy or difficult
4 – Somewhat difficult
5 – Very difficult

- Advise the engineer of any restrictions placed on equipment being handled.
- Advise the dispatcher of any restrictions placed on equipment being handled.
- Advise the proper authority when the train clears the main track or territory.
- Remind the engineer that the train is approaching an area restricted by limits of authority, track warrants, track bulletins, or speed restriction.
- Call out signals as they are encountered when operating in signal territory and as job activities change.
- Contact the employee in charge (EIC) concerning train movements on the affected tracks (e.g., track bulletin, out-of-service tracks, work areas).
- Receive, copy, repeat, and comply with mandatory directives issued by train dispatchers or control operators (e.g., track warrants, track bulletins).
- Call for and release foul time as requested by workmen (e.g., foremen, contractors) when assigned as flagmen.

Page 7: Task Difficulty Ratings – Crew Supervision Tasks

How easy or difficult is it to complete the task correctly relative to all other tasks?

1 – Very easy
2 – Somewhat easy
3 – Not easy or difficult
4 – Somewhat difficult
5 – Very difficult

- Conduct pre-trip planning briefings with train crew members, yard master, and other authorities.
- Job brief with train crew members regarding work to be done, movements to be made, and any safety hazards.

- Ensure crew members comply with applicable rules, special instructions, signals, and track authority.
- Direct other crew members during switching or train operations.

Page 8: Transition to Consequences of Error Ratings

All ratings on Task Difficulty are now complete. Now you will be asked to rate each of the tasks on the Consequences of Error.

Again, please make your ratings based on the job in general, not just on your own job.

Consequences of Error

How important (i.e., significant) are the consequences of performing the task incorrectly?

1 – Consequences of error are not at all important
2 – Consequences of error are somewhat important
3 – Consequences of error are moderately important
4 – Consequences of error are very important
5 – Consequences of error are extremely important

Please click the NEXT button to continue rating the tasks

Page 9: Consequences of Error Ratings – Form and Record Management Tasks

How important (i.e., significant) are the consequences of performing the task incorrectly?

1 – Consequences of error are not at all important
2 – Consequences of error are somewhat important
3 – Consequences of error are moderately important
4 – Consequences of error are very important
5 – Consequences of error are extremely important

- Update required rule books and bulletins for all territories that are operated on.
- Verify the accuracy of the train list, dispatcher bulletins, and train orders (i.e., authority for movement) prior to the start of a trip.
- Verify that all hazardous material cars have all required documentation.
- Update the signal awareness form.
- Report car defects.
- Update train list information per operating rules.
- Complete delay reports for each trip noting any delays.
- Complete a work train report, if applicable, when called for work train service.
- Deliver all appropriate paperwork (e.g., train list, general track bulletins, air slips) to the relieving conductor as required.
- Complete required Federal Railroad Administration (FRA) tie up documentation.
- Record train times when trains are given permission to enter the work area when assigned as flagmen.
- Provide emergency responders with hazardous material documentation in an emergency.

Page 10: Consequences of Error Ratings – Train Inspection, Troubleshooting, and Repair Tasks

How important (i.e., significant) are the consequences of performing the task incorrectly?

1 – Consequences of error are not at all important
2 – Consequences of error are somewhat important
3 – Consequences of error are moderately important
4 – Consequences of error are very important
5 – Consequences of error are extremely important

- Verify that hazardous material cars are properly placed in train or switching movement.
- Perform required air brake tests or verify that they have been properly performed.
- Inspect cars/equipment en route and when stopped to ensure the safe and efficient operation of the train.
- Inspect other trains en route (i.e., roll by inspection).
- Locate, inspect and report defects identified by a defect detector.
- Determine whether to move, repair, or set out rail equipment with defects in accordance with applicable rules.
- Replace faulty air hoses when necessary.
- Replace broken knuckles when necessary.
- Secure dragging equipment when necessary.

Page 11: Consequences of Error Ratings – Train Makeup and Handling Tasks

How important (i.e., significant) are the consequences of performing the task incorrectly?

1 – Consequences of error are not at all important
2 – Consequences of error are somewhat important
3 – Consequences of error are moderately important
4 – Consequences of error are very important
5 – Consequences of error are extremely important

- Join air hoses during train makeup.
- Couple and uncouple train cars.
- Remove and replace derailing equipment as needed.
- Inspect and line switches as required.
- Switch train cars in accordance with work order instructions.
- Install and remove end-of-train devices.
- Provide protection when shoving cars.
- Provide protection to other trains in accordance with rules during emergency brake application.
- Apply the emergency brake to stop the train in extreme circumstances.

Page 12: Consequences of Error Ratings – Crew Communication Tasks

How important (i.e., significant) are the consequences of performing the task incorrectly?

1 – Consequences of error are not at all important
2 – Consequences of error are somewhat important
3 – Consequences of error are moderately important
4 – Consequences of error are very important
5 – Consequences of error are extremely important

- Advise the engineer of any restrictions placed on equipment being handled.
- Advise the dispatcher of any restrictions placed on equipment being handled.
- Advise the proper authority when the train clears the main track or territory.
- Remind the engineer that the train is approaching an area restricted by limits of authority, track warrants, track bulletins, or speed restriction.
- Call out signals as they are encountered when operating in signal territory and as job activities change.
- Contact the employee in charge (EIC) concerning train movements on the affected tracks (e.g., track bulletin, out-of-service tracks, work areas).
- Receive, copy, repeat, and comply with mandatory directives issued by train dispatchers or control operators (e.g., track warrants, track bulletins).
- Call for and release foul time as requested by workmen (e.g., foremen, contractors) when assigned as flagmen.

Page 13: Consequences of Error Ratings – Crew Supervision Tasks

How important (i.e., significant) are the consequences of performing the task incorrectly?

1 – Consequences of error are not at all important
2 – Consequences of error are somewhat important
3 – Consequences of error are moderately important
4 – Consequences of error are very important
5 – Consequences of error are extremely important

- Conduct pre-trip planning briefings with train crew members, yard master, and other authorities.
- Job brief with train crew members regarding work to be done, movements to be made, and any safety hazards.
- Ensure crew members comply with applicable rules, special instructions, signals, and track authority.
- Direct other crew members during switching or train operations.

Page 14: Demographics

What is your age in years? _____

What is your sex?
– Male
– Female

What is the highest level of education you have completed?
– High school/G.E.D.
– Some college or university
– College or university graduate
– Master's degree (e.g., M.B.A., M.A.)
– Doctoral degree (e.g., Ph.D.)
– Other

If you reported "Other" for education, please specify: _____

What is your ethnic background?
– European American/White
– African American/Black
– Latino/Hispanic
– Asian American
– Native American/American Indian
– Biracial/Multiracial
– Other

If you reported "Other" for your ethnic background, please specify: _____

Page 15: Demographics Continued

What is your current job title? _____

How long (in years) have you been working in your present job? _____

How long (in years) have you been working with your present organization? _____

Please report your total length of experience (in years) working as a Freight Conductor. _____

How long (in years) have you supervised Freight Conductors? (If you are not a supervisor, please write "not applicable.") _____

In what U.S. State do you primarily work? _____

In what class of railroad do you work? _____

Please describe any other information about yourself that is relevant to your qualification as an expert on Freight Conductors (e.g., prior job experience, length of prior job experience). _____

Do you have any additional comments regarding the tasks or the survey in general? _____

Thank you very much for taking the time to complete our survey. Your responses to the previous questions are valuable to us as researchers and will be useful to FRA. If you would like further information concerning the nature of the survey or if you have any questions for the researchers, please feel free to contact us:

Janet Barnes-Farrell, Ph.D.
I/O Psychology Professor
University of Connecticut
janet.barnes-farrell@uconn.edu

Ben Walsh, M.A.
Doctoral Candidate
University of Connecticut
benjamin.walsh@uconn.edu

Please click on the "Finish" button below to complete the survey.

Task Rating Survey SME Demographic Characteristics

ID	Job Title	Job Tenure (years)	Organizational Tenure (years)	Railroad Class	Freight Conductor Experience (years)	State Where Employed	Age (years)	Sex	Ethnicity	Education
1	Asst. General Chairman	3	24	I	35	Alabama	54	Male	European American/White	Some college
2	Switchman	41	41	I	1	Kansas	59	Male	European American/White	High School graduate/GED
3	Safety Coordinator	5	14	I	14	Alabama	46	Male	European American/White	Some college
4	Conductor	17	12	I	17	Missouri	42	Male	European American/White	Some college
5	Conductor	38	38	I	35	Illinois	57	Male	European American/White	High School graduate/GED
6	Conductor	36	36	I	34	Colorado	55	Male	European American/White	Some college
7	Conductor	32	37	I	32	Colorado	57	Male	European American/White	Some college
8	Yard Foreman	6	16	I	17	Florida	57	Female	European American/White	College graduate
9	Conductor	20	33	I	29	Illinois	57	Male	European American/White	High School graduate/GED
10	Conductor	2	39	I	33	Nebraska	59	Male	European American/White	Some college
11	Conductor	6	6	I	6	Georgia	36	Male	European American/White	Some college
12	Safety Coordinator	10	15	I	2	Michigan	43	Male	European American/White	College graduate
13	Conductor	39	17	I	39	Michigan	57	Male	European American/White	High School graduate/GED
14	Conductor	12	12	I	12	Nebraska	46	Male	European American/White	College graduate
15	Yard Utility	10	21	I	19	Nebraska	45	Female	European American/White	Some college
16	Vice General Chairperson	6	33	I	33	Florida	54	Male	European American/White	High School graduate/GED
17	Conductor	15	15	I	15	Illinois	39	Male	European American/White	Some college

Task List with Mean Ratings of Consequences of Error, Difficulty, and Importance

Train Inspection, Troubleshooting, and Repair	**Con**	**Dif**	**Imp**
Secure dragging equipment when necessary.	4.29	4.18	8.47
Replace broken knuckles when necessary.	4.47	4.00	8.47
Verify that hazardous material cars are properly placed in train or switching movement.	4.76	3.41	8.18
Determine whether to move, repair, or set out rail equipment with defects in accordance with applicable rules.	4.71	3.29	8.00
Locate, inspect, and report defects identified by a defect detector.	4.71	2.94	7.65
Perform required air brake tests or verify that they have been properly performed.	4.59	2.88	7.47
Inspect cars/equipment en route and when stopped to ensure the safe and efficient operation of the train.	4.41	2.88	7.29
Replace faulty air hoses when necessary.	3.96	3.23	7.19
Inspect other trains en route (i.e., roll by inspection).	4.00	2.18	6.18
Train Makeup and Handling	**Con**	**Dif**	**Imp**
Provide protection when shoving cars.	4.82	2.82	7.65
Provide protection to other trains in accordance with rules during emergency brake application.	4.82	2.53	7.35
Remove and replace derailing equipment as needed.	4.53	2.66	7.19
Apply the emergency brake to stop the train in extreme circumstances.	4.82	2.06	6.88
Inspect and line switches as required.	4.65	2.12	6.76
Join air hoses during train makeup.	4.12	2.59	6.71
Install and remove end-of-train devices.	4.00	2.35	6.35
Switch train cars in accordance with work order instructions.	4.00	2.18	6.18
Couple and uncouple train cars.	4.06	1.82	5.88
Crew Communication	**Con**	**Dif**	**Imp**
Receive, copy, repeat, and comply with mandatory directives issued by train dispatchers or control operators (e.g., track warrants, track bulletins).	4.76	2.24	7.00
Contact the employee in charge (EIC) concerning train movements on the affected tracks (e.g., track bulletin, out of service tracks, work areas).	4.76	2.18	6.94
Advise the engineer of any restrictions placed on equipment being handled.	4.59	2.12	6.71
Call for and release foul time as requested by workmen (e.g., foremen, contractors) when assigned as flagmen.	4.47	2.18	6.65
Advise the dispatcher of any restrictions placed on equipment being handled.	4.29	2.29	6.59
Advise the proper authority when the train clears the main track or territory.	4.47	2.00	6.47
Remind the engineer that the train is approaching an area restricted by limits of authority, track warrants, track bulletins, or speed restriction.	4.71	1.71	6.41
Call out signals as they are encountered when operating in signal territory and as job activities change.	4.24	1.59	5.82

Note. Con = Mean consequences of error ratings. Dif = Mean difficulty ratings. Imp = Mean importance ratings. Task Importance ranges from 1–10 with 10 corresponding to greatest task importance. It is the sum of ratings of *Consequences of Error* (1–5) and *Task Difficulty* (1–5).

Crew Supervision	**Imp**	**Dif**	**Con**
Ensure crew members comply with applicable rules, special instructions, signals, and track authority.	7.35	2.88	4.47
Direct other crew members during switching or train operations.	6.76	2.65	4.12
Job brief with train crew members regarding work to be done, movements to be made, and any safety hazards.	6.47	2.12	4.35
Conduct pre-trip planning briefings with train crew members, yard master, and other authorities.	6.18	2.18	4.00
Form and Record Management	**Imp**	**Dif**	**Con**
Verify that all hazardous material cars have all required documentation.	8.12	3.24	4.88
Provide emergency responders with hazardous material documentation in an emergency.	7.65	2.76	4.88
Update required rule books and bulletins for all territories that are operated on.	7.59	3.24	4.35
Verify the accuracy of the train list, dispatcher bulletins, and train orders (i.e., authority for movement) prior to the start of a trip.	7.35	2.71	4.65
Update train list information per operating rules.	7.18	2.82	4.35
Record train times when trains are given permission to enter the work area when assigned as flagmen.	7.00	2.53	4.47
Complete required Federal Railroad Administration (FRA) tie up documentation.	6.88	2.53	4.35
Report car defects.	6.76	2.47	4.29
Deliver all appropriate paperwork (e.g., train list, general track bulletins, air slips) to the relieving conductor as required.	6.47	2.18	4.29
Complete a work train report, if applicable, when called for work train service.	6.41	3.18	3.24
Update the signal awareness form.	5.82	2.18	3.65
Complete delay reports for each trip noting any delays.	5.00	3.18	2.81

Note. Con = Mean consequences of error ratings. Dif = Mean difficulty ratings. Imp = Mean importance ratings. Task Importance ranges from 1–10 with 10 corresponding to greatest task importance. It is the sum of ratings of *Consequences of Error* (1–5) and *Task Difficulty* (1–5).

Appendix J.

KSAO LIST FOR LINKING TO FUNCTIONAL CATEGORIES

KSAOs LINKED TO THE FUNCTIONAL CATEGORIES

6.2 KSAO List for Linking to Functional Categories

Which KSAOs are needed to perform the tasks in the functional category: (Category label)?

√ if YES	KNOWLEDGE
☐	Purpose and function of a rail yard
☐	Function of track components and rail equipment
☐	Operation of classification yards
☐	General railroad terminology
☐	Terminology used in the classifying, blocking, and switching of rail cars
☐	Terminology and rules associated with restricted equipment
☐	Basic duties of other railroad personnel that freight conductors interact with during normal performance of duties
☐	Various types of rolling stock
☐	Operating and safety rules
☐	Rules and procedures for switching of rail cars and equipment
☐	Proper procedures for handling and reporting emergency situations
☐	The types and functions of defect detectors
☐	Temporary and permanent speed restrictions
☐	Timetable information, special instructions, and track bulletins
☐	Switch lists, track lists, and work orders
☐	Consist information (e.g., placement of hazardous materials, equipment restrictions)
☐	Hazardous material placards, markings, and regulations
☐	The physical characteristics of the territory over which the conductor operates (e.g., tracks, signals, interlockings, yards, speeds, methods of operation, grade crossings)
☐	Reporting forms and records (e.g., delay report, wheel report, defective car report, work train report, tie up sheet)
☐	The types of track authority required for the movement of a train on main tracks
☐	The rule for movement of trains on tracks other than main tracks
☐	Required air brake tests and when they apply

Which KSAOs are needed to perform the tasks in the functional category: (Category label)?

√ if YES	SKILLS
☐	Determining qualifying train and engine speeds
☐	Identifying speed restrictions using timetables, roadway signs, bulletins, train messages, and the Operating Rules Manual
☐	Identifying block signal aspects
☐	Identifying whistle signals
☐	Troubleshooting basic malfunctions in equipment
☐	Testing and inspecting equipment
☐	Working on and about moving equipment
☐	Securing trains and equipment
☐	Removing and installing air hoses
☐	Removing and installing knuckles
☐	Cutting out air brakes
☐	Securing dragging equipment
☐	Applying and releasing hand brakes
☐	Performing switching activities (classification of rail cars within a yard, industry switching, set off and pick up of rail equipment)
☐	Operating the various kinds of switches (e.g., hand operated, power switches)
☐	Determining the position of switch points
☐	Operating the various kinds of derails
☐	Installing and removing an end-of-train device
☐	Coupling and uncoupling air hoses
☐	Understanding defect detector messages
☐	Aligning drawbars
☐	Making up trains
☐	Giving and interpreting communications signals (e.g., hand, flag) with or without signaling equipment
☐	Interpreting the block signal indication conveyed by the aspect(s) displayed by the signal
☐	Interpreting and using timetable information
☐	Using telecommunication devices
☐	Inspecting hazardous material cars
☐	Locating information in the North American Emergency Response Guide
☐	Locating equipment restrictions in special instructions

Which KSAOs are needed to perform the tasks in the functional category: (Category label)?

√ if YES	ABILITIES
☐	Situational awareness
☐	Active listening
☐	Judgment and decisionmaking
☐	Comply with operating and safety rules while performing job tasks
☐	Ascend and descend ladders when necessary
☐	Lift heavy objects (e.g., 75 pounds or more)
☐	Communicate information orally and in writing
☐	Accurately judge car counts and distances when switching, shoving, or coupling
☐	See details accurately from a distance
☐	Recognize and distinguish between the colors of railroad signs and signals
☐	Hearing/auditory acuity
☐	Sense and resolve problems as they arise
☐	Identifying potential hazards
☐	Coordinate and plan various movements safely and efficiently (e.g., setting out and picking up cars en route, placing cars at various industrial plants, classifying cars)
☐	Carry out tasks in harsh environmental conditions
☐	Work nontraditional schedules (e.g., night shifts, on-call, long hours)

Which KSAOs are needed to perform the tasks in the functional category: (Category label)?

√ if YES	OTHER CHARACTERISTICS
☐	Passion for safety
☐	Conscientious
☐	Dependable
☐	Cooperative

Are there any KSAOs missing from the list, but which are need to perform the tasks in the functional category: (Category label)?

6.3 KSAOs Linked to the Functional Categories

KNOWLEDGE	TITR	TMH	CC	CS	FRM
Purpose and function of a rail yard			X		X
Function of track components and rail equipment	X	X	X		X
Operation of classification yards			X	X	X
General railroad terminology	X	X	X		X
Terminology used in the classifying, blocking, and switching of rail car	X	X	X	X	X
Terminology and rules associated with restricted equipment.	X	X	X	X	X
Basic duties of other railroad personnel that freight conductors interact with during normal performance of duties	X		X	X	X
Various types of rolling stock	X	X	X	X	X
Operating and safety rules	X	X	X	X	X
Rules and procedures for switching of rail cars and equipment	X	X	X	X	
Proper procedures for handling and reporting emergency situations	X	X	X	X	X
The types and functions of defect detectors	X		X		
Temporary and permanent speed restrictions			X	X	X
Timetable information, special instructions, and track bulletins	X	X	X	X	X
Switch lists, track lists, and work orders	X	X	X	X	X
Consist information (e.g., placement of hazardous materials, equipment restrictions)	X	X	X	X	X
Hazardous material placards, markings, and regulations	X	X	X	X	X
The physical characteristics of the territory over which the conductor operates (e.g., tracks, signals, interlockings, yards, speeds, methods of operation, grade crossings)	X		X	X	X
Reporting forms and records (e.g., delay report, wheel report, defective car report, work train report, tie up sheet)	X		X		X
The types of track authority required for the movement of a train on main tracks			X	X	X
The rule for movement of trains on tracks other than main tracks	X		X	X	
Required air brake tests and when they apply	X	X	X	X	X

Note. X indicates that the KSAO was linked to the functional category. TITR = Train Inspection, Troubleshooting, and Repair. TMH = Train Makeup and Handling. CC = Crew Communication. CS = Crew Supervision. FRM = Form and Record Management.

SKILLS	TITR	TMH	CC	CS	FRM
Determining qualifying train and engine speeds			X	X	X
Identifying speed restrictions using timetables, roadway signs, bulletins, train messages, and the Operating Rules Manual			X	X	X
Identifying block signal aspects			X	X	X
Identifying whistle signals			X	X	
Troubleshooting basic malfunctions in equipment	X	X	X		X
Testing and inspecting equipment	X	X	X		X
Working on and about moving equipment	X	X	X		
Securing trains and equipment	X	X	X	X	
Removing and installing air hoses	X	X	X	X	
Removing and installing knuckles	X	X	X	X	
Cutting out air brakes	X	X	X	X	X
Securing dragging equipment	X	X	X		X
Applying and releasing hand brakes	X	X	X	X	
Performing switching activities (classification of rail cars within a yard, industry switching, set off and pick up of rail equipment)	X	X	X	X	X
Operating the various kinds of switches (e.g., hand operated, power switches)	X	X	X	X	
Determining the position of switch points	X	X	X	X	
Operating the various kinds of derails	X	X	X	X	
Installing and removing an end-of-train device	X	X	X	X	
Coupling and uncoupling air hoses	X	X	X	X	
Understanding defect detector messages	X		X		X
Aligning drawbars	X	X	X	X	
Making up trains	X	X	X	X	X
Giving and interpreting communications signals (e.g., hand, flag) with or without signaling equipment	X	X	X		

Interpreting the block signal indication conveyed by the aspect(s) displayed by the signal	X		X	X	X
Interpreting and using timetable information	X		X	X	
Using telecommunication devices	X	X	X	X	
Inspecting hazardous material cars	X		X		X
Locating information in the North American Emergency Response Guide	X		X		
Locating equipment restrictions in special instructions	X		X	X	

Note. X indicates that the KSAO was linked to the functional category. TITR = Train Inspection, Troubleshooting, and Repair. TMH = Train Makeup and Handling. CC = Crew Communication. CS = Crew Supervision. FRM = Form and Record Management.

ABILITIES	TITR	TMH	CC	CS	FRM
Situational awareness	X	X	X	X	X
Active listening	X	X	X	X	
Judgment and decisionmaking	X	X	X	X	
Comply with operating and safety rules while performing job tasks	X		X		
Ascend and descend ladders when necessary	X				
Lift heavy objects (e.g., 75 pounds or more)	X		X		
Communicate information orally and in writing	X	X	X	X	X
Accurately judge car counts and distances when switching, shoving, or coupling	X	X	X	X	
See details accurately from a distance	X	X	X	X	
Recognize and distinguish between the colors of railroad signs and signals	X		X	X	
Hearing/auditory acuity	X	X	X	X	X
Sense and resolve problems as they arise	X	X	X	X	X
Identifying potential hazards	X	X	X	X	
Coordinate and plan various movements safely and efficiently (e.g., setting out and picking up cars en route, placing cars at various industrial plants, classifying cars)	X	X	X	X	X
Carry out tasks in harsh environmental conditions	X	X	X	X	
Work nontraditional schedules (e.g., night shifts, on-call, long hours)	X	X	X	X	

Note. X indicates that the KSAO was linked to the functional category. TITR = Train Inspection, Troubleshooting, and Repair. TMH = Train Makeup and Handling. CC = Crew Communication. CS = Crew Supervision. FRM = Form and Record Management.

OTHER CHARACTERISTICS	TITR	TMH	CC	CS	FRM
Passion for safety	X	X	X	X	X
Conscientious	X	X	X	X	X
Dependable	X	X	X	X	X
Cooperative	X		X	X	X

Note. X indicates that the KSAO was linked to the functional category. TITR = Train Inspection, Troubleshooting, and Repair. TMH = Train Makeup and Handling. CC = Crew Communication. CS = Crew Supervision. FRM = Form and Record Management.

Appendix K.

KSAO RATING SURVEY INVITATION EMAILS

ONLINE KSAO RATING SURVEY

KSAO RATING SURVEY SME DEMOGRAPHIC CHARACTERISTICS

TRAINABLE KSAOs RANKED BY IMPORTANCE

KSAOs TO BE USED IN EMPLOYEE SELECTION RANKED BY IMPORTANCE

KSAO Rating Survey Invitation Emails

Email to SMEs about Upcoming KSAO Rating Survey

SUBJECT: UConn Freight Conductor Job Analysis - Upcoming KSAO Survey

Hi Everyone,

I want to thank everyone for your participation in our job analysis of Freight Conductors. We are close to finalizing the analysis, but we have one final piece of work.

The final component of our analysis is a brief online survey in which the knowledge, skills, abilities, and other characteristics (KSAOs) that were identified as needed by Freight Conductors will be rated on two scales. We are hopeful that you will choose to participate in the online survey because the quality of the analysis rests on your expert input.

We anticipate sending a link to the online survey within the next week, so please keep on the lookout for our message.

Kind regards,

Ben

Ben Walsh, M.A.
I/O Psychology Graduate Student
University of Connecticut

Email Invitation to Participate in KSAO Rating Survey

SUBJECT: UConn Freight Conductor Job Analysis - KSAO Survey Ready for Participation

Hello all,

I want to thank everyone for participating in various stages of UConn's job analysis of Freight Conductors. The analysis has been moving along over the past year and we have reached the final stages.

The final component of the analysis is a survey in which the knowledge, skills, abilities, and other characteristics (KSAOs) are each rated on two scales. If you have a few minutes, we would really appreciate your participation in this survey.

The online survey is accessible here: (survey link)

The survey will be available until August 9th. A reminder email will be sent in one week. If you have any questions, please do not hesitate to email me at benmikewalsh@gmail.com.

Thank you again for your participation in the analysis.

Regards,

Ben

Ben Walsh, M.A.
I/O Psychology Graduate Student
University of Connecticut

Online KSAO Rating Survey

Page 1: Introduction

Introduction

Thank you for your interest in participating in this research project. The University of Connecticut is conducting a job analysis on the job Freight Conductor to document the tasks done on the job and the knowledge, skills, abilities, and other characteristics (KSAOs) needed to perform the tasks. This research is funded by the Federal Railroad Administration (FRA). Participation in the study is completely voluntary. You are free to decide not to participate in this study or to withdraw at any time without adversely affecting your relationship with your employer or the investigators.

Procedure

You will complete a survey in which the KSAOs needed by Freight Conductors are rated on several scales. The survey should take no more than 20 minutes to complete.

Confidentiality and Anonymity
All information derived from the survey will be held in strict confidentiality and will also be anonymous as no individual or organization names will be used in the reporting of results of this research.

Risks and Benefits
Participating in the survey will not create any risks or inconveniences for you other than the time required to participate.

For More Information
If you need more information or have questions, please contact the Principal Investigator, Dr. Janet Barnes-Farrell, at 860-486-5929 (janet.barnes-farrell@uconn.edu) or Ben Walsh, graduate student researcher (benjamin.walsh@uconn.edu). If you have any questions about your rights as a research subject that have not been answered by the investigators or to report any concerns about the study, you may contact the University of Connecticut, Institutional Review Board (IRB) at 860-486-8802. An IRB is a group of people that review research studies to make sure they are safe for participants.

Page 2: Introduction Continued

On the following pages you will be presented with the various KSAOs needed by Freight Conductors in both yard and road operations. The list of KSAOs was developed with the assistance of current and former Freight Conductors.

For each KSAO you will be asked to report:

(a) How important it is that Freight Conductors possess the KSAO (Importance);

(b) Whether the KSAO can be taught using a formal training program (Training);

All KSAOs will first be rated on their importance. You will then evaluate whether each KSAO can be

taught using a formal training program. Make your ratings based on the job in general, not just on your own job. Please begin rating the KSAOs when you are ready.

Page 3: KSAO Importance Ratings – Knowledge

How important is it that Freight Conductors possess this KNOWLEDGE?

1 – Not at all important
2 – Somewhat important
3 – Moderately important
4 – Very important
5 – Extremely important

- Purpose and function of a rail yard
- Function of track components and rail equipment
- Operation of classification yards
- General railroad terminology
- Terminology used in the classifying, blocking, and switching of rail cars
- Terminology and rules associated with restricted equipment
- Basic duties of other railroad personnel that freight conductors interact with during normal performance of duties
- Various types of rolling stock
- Operating and safety rules
- Rules and procedures for switching of rail cars and equipment
- Proper procedures for handling and reporting emergency situations
- The types and functions of defect detectors
- Temporary and permanent speed restrictions
- Timetable information, special instructions, and track bulletins
- Switch lists, track lists, and work orders
- Consist information (e.g., placement of hazardous materials, equipment restrictions)
- Hazardous material placards, markings, and regulations
- The physical characteristics of the territory over which the conductor operates (e.g., tracks, signals, interlockings, yards, speeds, methods of operation, grade crossings)
- Reporting forms and records (e.g., delay report, wheel report, defective car report, work train report, tie up sheet)
- The types of track authority required for the movement of a train on main tracks
- The rule for movement of trains on tracks other than main tracks
- Required air brake tests and when they apply

Page 4: KSAO Importance Ratings – Skills

How important is it that Freight Conductors possess this SKILL?

1 – Not at all important
2 – Somewhat important
3 – Moderately important
4 – Very important
5 – Extremely important

- Determining qualifying train and engine speeds
- Identifying speed restrictions using timetables, roadway signs, bulletins, train messages, and the Operating Rules Manual
- Identifying block signal aspects
- Identifying whistle signals
- Troubleshooting basic malfunctions in equipment
- Testing and inspecting equipment
- Working on and about moving equipment
- Securing trains and equipment
- Removing and installing air hoses
- Removing and installing knuckles
- Cutting out air brakes
- Securing dragging equipment
- Applying and releasing hand brakes
- Performing switching activities (classification of rail cars within a yard, industry switching, set off and pick up of rail equipment)
- Operating the various kinds of switches (e.g., hand operated, power switches)
- Determining the position of switch points
- Operating the various kinds of derails
- Installing and removing an end-of-train device
- Coupling and uncoupling air hoses
- Understanding defect detector messages
- Aligning drawbars
- Making up trains
- Giving and interpreting communications signals (e.g., hand, flag) with or without signaling equipment
- Interpreting the block signal indication conveyed by the aspect(s) displayed by the signal
- Interpreting and using timetable information
- Using telecommunication devices
- Inspecting hazardous material cars
- Locating information in the North American Emergency Response Guide
- Locating equipment restrictions in special instructions

Page 5: KSAO Importance Ratings – Abilities

How important is it that Freight Conductors possess this ABILITY?

1 – Not at all important
2 – Somewhat important
3 – Moderately important
4 – Very important
5 – Extremely important

- Situational awareness
- Active listening
- Judgment and decisionmaking
- Comply with operating and safety rules while performing job tasks.
- Ascend and descend ladders when necessary.
- Lift heavy objects (e.g., 75 pounds or more).
- Communicate information orally and in writing.
- Accurately judge car counts and distances when switching, shoving, or coupling.
- See details accurately from a distance.
- Recognize and distinguish between the colors of railroad signs and signals.
- Hearing/auditory acuity
- Sense and resolve problems as they arise.
- Identifying potential hazards
- Coordinate and plan various movements safely and efficiently (e.g., setting out and picking up cars en route, placing cars at various industrial plants, classifying cars).
- Carry out tasks in harsh environmental conditions.
- Work nontraditional schedules (e.g., night shifts, on-call, long hours).

Page 6: KSAO Importance Ratings – Other Characteristics

How important is it that Freight Conductors possess this OTHER CHARACTERISTIC?
1 – Not at all important
2 – Somewhat important
3 – Moderately important
4 – Very important
5 – Extremely important

- Passion for safety
- Conscientious
- Dependable
- Cooperative

Page 7: KSAO Trainability Ratings – Knowledge

Can this KNOWLEDGE be taught using a formal training program (e.g., classroom training, simulation training, field training)?

0 – No
1 – Yes

- Purpose and function of a rail yard
- Function of track components and rail equipment
- Operation of classification yards
- General railroad terminology
- Terminology used in the classifying, blocking, and switching of rail cars
- Terminology and rules associated with restricted equipment
- Basic duties of other railroad personnel that freight conductors interact with during normal performance of duties
- Various types of rolling stock
- Operating and safety rules
- Rules and procedures for switching of rail cars and equipment
- Proper procedures for handling and reporting emergency situations
- The types and functions of defect detectors
- Temporary and permanent speed restrictions
- Timetable information, special instructions, and track bulletins
- Switch lists, track lists, and work orders
- Consist information (e.g., placement of hazardous materials, equipment restrictions)
- Hazardous material placards, markings, and regulations
- The physical characteristics of the territory over which the conductor operates (e.g., tracks, signals, interlockings, yards, speeds, methods of operation, grade crossings)
- Reporting forms and records (e.g., delay report, wheel report, defective car report, work train report, tie up sheet)
- The types of track authority required for the movement of a train on main tracks
- The rule for movement of trains on tracks other than main tracks
- Required air brake tests and when they apply

Page 8: KSAO Trainability Ratings – Skills

Can this SKILL be taught using a formal training program (e.g., classroom training, simulation training, field training)?

0 – No
1 – Yes

- Determining qualifying train and engine speeds
- Identifying speed restrictions using timetables, roadway signs, bulletins, train messages, and the Operating Rules Manual
- Identifying block signal aspects
- Identifying whistle signals
- Troubleshooting basic malfunctions in equipment
- Testing and inspecting equipment

- Working on and about moving equipment
- Securing trains and equipment
- Removing and installing air hoses
- Removing and installing knuckles
- Cutting out air brakes
- Securing dragging equipment
- Applying and releasing hand brakes
- Performing switching activities (classification of rail cars within a yard, industry switching, set off and pick up of rail equipment)
- Operating the various kinds of switches (e.g., hand operated, power switches)
- Determining the position of switch points
- Operating the various kinds of derails
- Installing and removing an end-of-train device
- Coupling and uncoupling air hoses
- Understanding defect detector messages
- Aligning drawbars
- Making up trains
- Giving and interpreting communications signals (e.g., hand, flag) with or without signaling equipment
- Interpreting the block signal indication conveyed by the aspect(s) displayed by the signal
- Interpreting and using timetable information
- Using telecommunication devices
- Inspecting hazardous material cars
- Locating information in the North American Emergency Response Guide
- Locating equipment restrictions in special instructions

Page 9: KSAO Trainability Ratings – Abilities

Can this ABILITY be taught using a formal training program (e.g., classroom training, simulation training, field training)?

0 – No
1 – Yes

- Situational awareness
- Active listening
- Judgment and decisionmaking
- Comply with operating and safety rules while performing job tasks.
- Ascend and descend ladders when necessary.
- Lift heavy objects (e.g., 75 pounds or more).
- Communicate information orally and in writing.
- Accurately judge car counts and distances when switching, shoving, or coupling.
- See details accurately from a distance.
- Recognize and distinguish between the colors of railroad signs and signals.
- Hearing/auditory acuity
- Sense and resolve problems as they arise.
- Identifying potential hazards

- Coordinate and plan various movements safely and efficiently (e.g., setting out and picking up cars en route, placing cars at various industrial plants, classifying cars).
- Carry out tasks in harsh environmental conditions.
- Work nontraditional schedules (e.g., night shifts, on-call, long hours).

Page 10: KSAO Trainability Ratings – Other Characteristics

Can this OTHER CHARACTERISTIC be taught using a formal training program (e.g., classroom training, simulation training, field training)?

0 – No
1 – Yes

- Passion for safety
- Conscientious
- Dependable
- Cooperative

Page 11: Demographics

What is your age in years? _____

What is your sex?

– Male

– Female

What is the highest level of education you have completed?

– High school/G.E.D.

– Some college or university

– College or university graduate

– Master's degree (e.g., M.B.A., M.A.)

– Doctoral degree (e.g., Ph.D.)

– Other

If you reported "Other" for education, please specify: _____

What is your ethnic background?

– European American/White

– African American/Black

– Latino/Hispanic

– Asian American

– Native American/American Indian

– Biracial/Multiracial

– Other

If you reported “Other” for your ethnic background, please specify: _____

Page 12: Demographics Continued

What is your current job title? _____

How long (in years) have you been working in your present job? _____

How long (in years) have you been working with your present organization? _____

Please report your total length of experience (in years) working as a Freight Conductor. _____

How long (in years) have you supervised Freight Conductors? (If you are not a supervisor, please write “not applicable.”) _____

In what U.S. State do you primarily work? _____

In what class of railroad do you work? _____

Please describe any other information about yourself that is relevant to your qualification as an expert on Freight Conductors (e.g., prior job experience, length of prior job experience). _____

Do you have any additional comments regarding the KSAOs or the survey in general? _____

Page 13: Thank You

Thank you very much for taking the time to complete our survey. Your responses to the previous questions are valuable to us as researchers and will be useful to FRA. If you would like further information concerning the nature of the survey or if you have any questions for the researchers, please feel free to contact us:

Janet Barnes-Farrell, Ph.D.
I/O Psychology Professor
University of Connecticut
janet.barnes-farrell@uconn.edu

Ben Walsh, M.A.
Doctoral Candidate
University of Connecticut
benjamin.walsh@uconn.edu

KSAO Rating Survey SME Demographic Characteristics

ID	Job Title	Job Tenure (years)	Organizational Tenure (years)	Railroad Class	Freight Conductor Experience (years)	State Where Employed	Age (years)	Sex	Ethnicity	Education
1	Retired engineer	3	30	I	5	New York	64	Male	European American/White	College graduate
2	Conductor	41	41	I	41	Massachusetts	59	Male	European American/White	College graduate
3	(not reported)	15	15	I	13	Kansas	37	Male	Latino/Hispanic	Some college
4	Conductor	16	10	I	16	New York	41	Male	European American/White	College graduate
5	Conductor	4	4	I	4	Massachusetts	38	Male	European American/White	Some college
6	Manager of Field Training	3	8	I	3	Kansas	30	Male	European American/White	Some college
7	Engineer	8	8	I	4	Massachusetts	43	Male	European American/White	Some college
8	Conductor	3	3	I	3	Massachusetts	35	Male	European American/White	High School graduate/GED

Trainable KSAOs Ranked by Importance

KSAO	Mean Imp.	SD Imp.	Trainable
Knowledge: Consist information (e.g., placement of hazardous materials, equipment restrictions)	5.00	0.00	100.00%
Knowledge: Proper procedures for handling and reporting emergency situations	5.00	0.00	100.00%
Knowledge: Hazardous material placards, markings, and regulations	4.88	0.35	100.00%
Skill: Identifying block signal aspects	4.88	0.35	100.00%
Knowledge: Operating and safety rules	4.88	0.35	100.00%
Knowledge: Required air brake tests and when they apply	4.75	0.46	100.00%
Knowledge: Temporary and permanent speed restrictions	4.75	0.46	100.00%
Knowledge: The types of track authority required for the movement of a train on main tracks	4.75	0.46	100.00%
Knowledge: Timetable information, special instructions, and track bulletins	4.75	0.46	100.00%
Skill: Working on and about moving equipment	4.75	0.46	87.50%
Other Characteristic: Passion for safety	4.75	0.46	75.00%
Skill: Securing trains and equipment	4.75	0.46	75.00%
Skill: Identifying speed restrictions using timetables, roadway signs, bulletins, train messages, and the Operating Rules Manual	4.63	0.52	100.00%
Knowledge: The rule for movement of trains on tracks other than main tracks	4.63	0.52	100.00%
Ability: Comply with operating and safety rules while performing job tasks	4.63	0.52	87.50%
Skill: Determining the position of switch points	4.63	0.74	100.00%
Skill: Interpreting and using timetable information	4.63	0.74	100.00%
Skill: Interpreting the block signal indication conveyed by the aspect(s) displayed by the signal	4.63	0.74	100.00%
Skill: Giving and interpreting communications signals (e.g., hand, flag) with or without signaling equipment	4.63	0.74	87.50%
Knowledge: The physical characteristics of the territory over which the conductor operates (e.g., tracks, signals, interlockings, yards, speeds, methods of operation, grade crossings)	4.50	0.53	87.50%
Ability: Coordinate and plan various movements safely and efficiently (e.g., setting out and picking up cars en route, placing cars at various industrial plants, classifying cars)	4.50	0.53	75.00%
Ability: Recognize and distinguish between the colors of railroad signs and signals	4.50	0.76	62.50%
Ability: Situational awareness	4.50	0.76	62.50%
Skill: Determining qualifying train and engine speeds	4.38	0.52	100.00%
Knowledge: General railroad terminology	4.38	0.52	100.00%

KSAO (cont'd)	Mean Imp.	SD Imp.	Trainable
Ability: Accurately judge car counts and distances when switching, shoving, or coupling	4.38	0.74	75.00%
Ability: Identifying potential hazards	4.38	0.74	75.00%
Knowledge: Rules and procedures for switching of rail cars and equipment	4.38	0.92	100.00%
Skill: Testing and inspecting equipment	4.38	0.92	100.00%
Knowledge: The types and functions of defect detector	4.25	0.46	100.00%
Ability: Communicate information orally and in writing.	4.25	0.71	100.00%
Skill: Locating equipment restrictions in special instructions	4.25	0.71	100.00%
Skill: Locating information in the North American Emergency Response Guide	4.25	0.89	100.00%
Skill: Understanding defect detector messages	4.25	0.89	100.00%
Skill: Inspecting hazardous material cars	4.25	0.89	75.00%
Knowledge: Terminology and rules associated with restricted equipment	4.25	1.04	100.00%
Skill: Operating the various kinds of derails	4.25	1.16	100.00%
Skill: Coupling and uncoupling air hoses	4.14	1.07	87.50%
Skill: Performing switching activities (classification of rail cars within a yard, industry switching, set off and pick up of rail equipment)	4.13	1.13	87.50%
Knowledge: Terminology used in the classifying, blocking, and switching of rail cars	4.00	0.53	100.00%
Ability: Ascend and descend ladders when necessary.	4.00	0.76	100.00%
Skill: Making up trains	4.00	0.76	87.50%
Skill: Aligning drawbars	4.00	0.82	87.50%
Skill: Identifying whistle signals	4.00	0.93	100.00%
Skill: Applying and releasing hand brakes	4.00	1.07	100.00%
Skill: Operating the various kinds of switches (e.g., hand operated, power switches)	4.00	1.07	100.00%
Skill: Troubleshooting basic malfunctions in equipment	3.88	0.64	100.00%
Knowledge: Switch lists, track lists, and work orders	3.88	0.64	75.00%
Skill: Installing and removing an end-of-train device	3.88	0.99	100.00%
Skill: Cutting out air brakes	3.75	1.04	100.00%
Skill: Securing dragging equipment	3.75	1.04	85.70%
Knowledge: Purpose and function of a rail yard	3.63	0.52	100.00%
Knowledge: Reporting forms and records (e.g., delay report, wheel report, defective car report, work train report, tie up sheet)	3.63	0.52	100.00%
Knowledge: Function of track components and rail equipment	3.63	1.06	100.00%
Skill: Using telecommunication devices	3.63	1.19	100.00%
Knowledge: Basic duties of other railroad personnel that freight conductors interact with during normal performance of duties	3.38	0.74	75.00%

Knowledge: Operation of classification yards	3.38	0.92	100.00%
Skill: Removing and installing air hoses	3.38	1.06	87.50%
Ability: Lift heavy objects (e.g., 75 pounds or more)	3.25	0.71	87.50%
Skill: Removing and installing knuckles	3.25	1.04	100.00%
Knowledge: Various types of rolling stock	3.25	1.04	87.50%

Note. Mean Imp. = Mean importance rating on a scale ranging from 1 (not at all important) to 5 (extremely important). SD Imp. = Standard deviation of importance ratings. Trainable = the percentage of SMEs who indicated the KSAO could be trained using a formal training program.

KSAOs to be Utilized in Employee Selection Ranked by Importance

KSAO	Mean Imp.	SD Imp.	Trainable
Ability: Judgment and decisionmaking	4.63	0.52	50.00%
Other Characteristic: Conscientious	4.50	0.53	25.00%
Ability: Carry out tasks in harsh environmental conditions.	4.38	0.74	50.00%
Other Characteristic: Dependable	4.38	0.74	25.00%
Ability: Work nontraditional schedules (e.g., night shifts, on-call, long hours).	4.38	0.92	37.50%
Ability: Sense and resolve problems as they arise.	4.13	0.83	50.00%
Ability: Active listening	4.00	0.76	50.00%
Ability: See details accurately from a distance.	3.88	0.64	37.50%
Ability: Hearing/auditory acuity	3.88	0.83	37.50%
Other Characteristic: Cooperative	3.75	1.16	37.50%

Note. Mean Imp. = Mean importance rating on a scale ranging from 1 (not at all important) to 5 (extremely important). SD Imp. = Standard deviation of importance ratings. Trainable = the percentage of SMEs who indicated the KSAO could be trained using a formal training program.

Appendix L.

6.4 DISCUSSION QUESTIONS IN SME PANEL MEETING 6

Discussion Questions in SME Panel Meeting 6

Job Context

1. To perform job tasks successfully, do Freight Conductors coordinate and/or work with other personnel? If so, what are the positions of the personnel that Freight Conductors work with?

Physical and Psychological Demands

2. What are the physical demands associated with the job (e.g., fatigue, extended periods of crouching, lifting heavy objects)?

3. What are the psychological demands associated with the job (e.g., highly stressful, high pressure, monotonous)?

4. Describe the work schedules for the job. Are nontraditional schedules (e.g., night work, weekend work, rotating shifts) common in this job? Do you feel that the work schedules cause additional physical and/or psychological demands, or are associated with demands that have already been mentioned?

5. Are there any other demands associated with the job that have not been discussed?

Equipment and Tools Used

6. What kinds of equipment, tools, or machines are used on the job?

7. Does the job entail use of or exposure to any hazardous materials or substances? If so, describe these materials.

KSAOs – Experience

We have preliminary ratings on the importance of several KSAOs that are need to do the job. We wanted to ask about whether on-the-job experience is needed to obtain the minimum acceptable level on several of these KSAOs.

KSAOs discussed:

Knowledge of the physical characteristics of the territory over which the conductor operates (e.g., tracks, signals, interlockings, yards, speeds, methods of operation, grade crossings).

Ability to coordinate and plan various movements safely and efficiently (e.g., setting out and picking up cars en route, placing cars at various industrial plants, classifying cars).

8. Is on-the-job experience needed to obtain the minimum acceptable level of the KSAO? If so, how much on-the-job experience?

9. Should this on-the-job experience be supervised or not supervised? If supervised experience is recommended, what should this supervised experience entail?