



U.S. Department
Of Transportation

**Federal Railroad
Administration**

Research Results

RR06-09
July 2006

Yardmasters and Yard Safety in the U.S. Railroad Industry: An Exploratory Study

SUMMARY

This report presents the results of an exploratory study of railroad yardmasters. The purpose was to identify issues and risks associated with yardmaster tasks and responsibilities that have the potential to compromise safety in railroad classification (switching) yards (see Figure 1). The Federal Railroad Administration (FRA) train accident and incident data for one year were analyzed to determine the involvement of yardmasters in train accidents and injuries, and focus groups were conducted with yardmasters to learn more about yardmaster tasks and responsibilities and determine yardmasters' role in yard switching safety. Analysis of the 2004 FRA train accident/incident data indicates that yardmasters contributed to less than one-fifth of 1 percent of reportable train accidents (7 out of 3,775) and one-fifth of 1 percent of all employee-on-duty injuries (13 out of 5,693). Fifty-six yardmasters participated in nine focus groups conducted in three U.S. cities. Focus groups addressed five topic groupings: training and experience; communications and information flow; stress, distractions, difficulties, and workload; fatigue, staffing, and work schedules; and best practices and lessons learned. Yardmasters discussed a number of issues related to each topic, and they identified numerous lessons learned and best practices. Lastly, several future studies are proposed to further enhance FRA's understanding of the yardmaster's role in railroad yard switching safety.



Figure 1. Railroad classification (switching) yard



BACKGROUND

The purpose of this exploratory research was to identify potential yard safety issues related to yardmaster tasks and responsibilities that may warrant further research and understanding by FRA and others, as well as to identify yardmaster-related lessons learned and best practices that can be shared across the railroad industry.

Analysis of FRA accident data for 2004 shows that the rate of yard accidents (22.46 yard accidents per million yard switching miles) is more than 5 times greater than the overall train accident rate (4.33 accidents per million train miles) and more than 10 times the rate of accidents on other-than-yard track (2.11 accidents per million train miles). Furthermore, while the other-than-yard track accident rate has declined over the last several years (down 9.2 percent from 2001 to 2004), the yard accident rate has actually increased over 22 percent from 2001 to 2004. Efforts to further improve railroad safety, therefore, must include reducing accidents and incidents in switching yards.

While some research has examined yard switch crews and yard safety, no research to date has explicitly focused on the yardmaster's role in yard safety. Yardmasters offer an additional and valuable perspective to yard safety because they manage the work flow in the yard. Furthermore, they are often responsible for making up trains that operate on the main track. Both of these responsibilities carry with them important safety and productivity consequences in yards, as well as on main track.

OBJECTIVES

Specific objectives of this exploratory research were to:

- Understand the role yardmasters play in contributing to yard accidents.
- Characterize the nature of yardmaster injuries.
- Identify yardmaster job-related issues and risks that have the potential to compromise yard switching safety.

METHODS

Quantitative and qualitative methods were used to examine the yardmaster's role in yard switching safety. One year of FRA train accident and incident (casualty) data were analyzed to determine the yardmaster's role in yard switching accidents and to characterize the nature of yardmaster injuries. Complete 2004 train accident and incident datasets were downloaded from FRA's web site for analysis. Accidents on all track types (yard, main, etc.) were included. Train accident data were filtered to include only those train accidents that contained yardmaster in the narrative since it was not otherwise possible to confirm whether or not a yardmaster contributed to a particular accident.

Separately, nine focus groups were conducted with yardmasters around the country to provide greater insight into potential yard safety issues related to yardmaster tasks and responsibilities. The United Transportation Union (UTU) and the United Supervisors Council of America (USCA), part of the Transportation Communications International Union, assisted in identifying three major cities in which to conduct focus groups and in recruiting participants. The UTU and the USCA represent a majority of yardmasters at U.S. Class I railroads. Union officials were provided with criteria to assist them in selecting cities and in recruiting participants. Participation in the focus groups was voluntary. Three focus groups were conducted in each of three different major cities across the United States. Each focus group lasted up to 2 hours and was led by a moderator and a moderator's assistant. A pre-established set of questions guided each focus group.

Focus group questions concentrated around five major topics:

- (1) Training and experience;
- (2) Communications and information flow;
- (3) Stress, distraction, and workload;
- (4) Fatigue, staffing, and work schedules;
- (5) Best practices and lessons learned.

No attempt was made to validate any statements made by yardmasters.



RESULTS

FRA Accident/Incident Analysis

There were 27 unique cases in 2004 where yardmaster appeared in the train accident narrative. Each of the 27 narratives was reviewed to determine whether or not a yardmaster contributed to the particular accident based on contextual information provided in the narrative. Yardmasters were identified as contributing to train accidents in less than one-fifth of 1 percent of the 2004 accidents (7 out of 3,775). In all seven accidents, the yardmaster provided incorrect information or instructions/permissions (directives), or failed to provide critical information, to the switch crew. The utility of the FRA accident database in identifying the contributory role of yardmasters in train accidents, however, may be limited since the FRA accident report form used to collect train accident data focuses on the collection of information on operators and others closest in time and space to the accident. Consequently, information on supervisory and organizational factors, including yardmaster involvement, may or may not be routinely collected.

Analysis of the 2004 FRA incident (casualty) database revealed that yardmasters incur few injuries: one-fifth of 1 percent of all 2004 employee-on-duty injuries (13 out of 5,693) occurred to yardmasters (or assistant yardmasters; both share the same job code). A majority of the injuries, 8 of 13 (or 62 percent), were sprains or strains. The top 2 bodily locations of the injuries were to yardmasters' arms or hands (5 of 13 injuries) and the torso (5 of 13 injuries).

Focus Groups

Fifty-six (56) yardmasters from five U.S. Class I railroads participated in nine focus groups conducted between August and December 2005. Of the 56 yardmasters, 3 were women. Participating yardmasters averaged 45 years old and had an average of 21 years of railroad industry experience and 13 years of yardmaster experience. Fifty-one of the 56 yardmasters (91 percent) reported working full time as a yardmaster. Ninety-three percent of participants worked another railroad craft before becoming a yardmaster; a majority had prior experience as switchmen (66%) and/or clerks (27%).

Key themes from the focus groups include the following:

- *Training to become a yardmaster has remained essentially unchanged and is primarily on the job.* Participant training primarily involved unstructured, informal on-the-job training (OJT). Some newer yardmasters also received classroom training on the mechanics of using the railroad's train management computer system. In the past, this approach was acceptable because experienced managers were available to field questions and provide direction. More recently, participants observe that local managers have little railroad and yard operations experience. Thus, while training has generally remained the same over time, the support structure has changed.
- *Previous experience as a switchman or clerk is helpful to the job.* Most participants worked as clerks or switchmen before becoming yardmasters, and they felt this experience prepared them for the job. Experience as a clerk provided an understanding of how trains are processed. Experience as a switchman helped participants learn the yard layout and how to switch cars, as well as enabled participants to get to know some of the crews that they were now supervising.
- *The yardmaster's job requires a combination of technical and managerial knowledge, skills, abilities, and other attributes.* Participants identified both technical skills, such as clerical and computer skills, and managerial qualities, such as the ability to supervise others and multitask, as important to the job.
- *Factors that contribute to effective communication and information flow include railroad experience, good communication skills, and minimal disruptions at work and while communicating with switch crews.*
- *Principal sources of stress include interactions with management, dispatchers, and crews; workload; and equipment problems.*
- *Difficult aspects of the job mirror sources of stress and include interactions with others,*



workload, and problems with equipment and resources.

- *Primary sources of distraction include events beyond the yardmaster's control or influence. Examples include incoming communications, changes to plans, malfunctioning equipment, and delays.*
- *The general consensus among participants was that too few yardmasters are available to work, resulting in forced overtime in the form of an extended work shift.*

Participants also identified a number of ways to improve working conditions. Some of their key suggestions include:

- *Enhancing yardmaster training through job skill and procedural improvements, such as improved computer and communication skills training, development of a more formal OJT qualification program, and use of tabletop simulations.*
- *Enhancing communications and information flow, for example, by improving radio equipment and FRA radio rules, reducing yardmaster responsibilities, increasing yardmasters' authority in yards, and streamlining communications to and from the yardmaster.*
- *Reducing stress, distraction, difficulties, and workload through improvements in personnel/staffing, interaction and communication with others, equipment and facilities, and practices and procedures.*
- *Reducing fatigue by changing work schedules and work schedule practices. Suggested improvements to work schedules include flexible work schedules, establishment of a maximum number of hours that can be worked in a shift (8-12 hours, maximum, was recommended), allow an overtime shift to be split, provide more than 8 hours rest after working overtime, and provision of a 20-minute meal/rest period. Another suggestion was to increase the number of yardmasters available to work.*

Finally, based on the accident/incident analysis and focus groups, several opportunities for future research were identified to further understand the yardmaster's role in railroad yard switching safety and to potentially increase railroad yard switching safety:

- Conduct a survey to characterize yardmaster work schedules and sleep patterns.
- Analyze FRA train accident data from 1991 to 2005.
- Develop a framework for revised FRA accident/incident databases.
- Conduct a task analysis and cognitive task analysis of a yardmaster's job.
- Develop yardmaster training objectives.

ACKNOWLEDGMENTS

Foster-Miller, Inc. performed this study under the direction of Dr. Thomas Raslear from the FRA's Office of Research and Development. The study would not have been possible without generous assistance from UTU and the United Supervisors Council of America.

CONTACT

Dr. Thomas Raslear
Federal Railroad Administration
Office of Research and Development
1120 Vermont Avenue NW – Mail Stop 20
Washington, DC 20590
Tel: (202) 493-6356
Fax: (202) 493-6333
Email: Thomas.Raslear@dot.gov