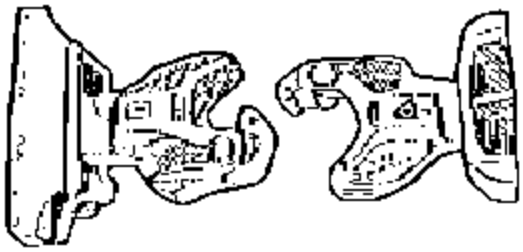
Switching **O**perations **F**atality **A**nalysis



Findings and Recommendations of the SOFA Working Group

August 2004 Update

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Dedication

The SOFA Working Group (SWG) wishes to dedicate this study to the memory of those whose lives were lost in switching operations. The SWG expresses its condolences to the families of those individuals. The families can take comfort in the assurance that the study of each event is handled with respect and dignity.

The SWG spent many hours studying these events to develop Recommendations to eliminate these tragedies in the future. The study of events leading up to these tragedies offers the opportunity to further improve safety and save lives of men and women working in the railroad industry. The families and friends who experienced these events can be assured that the lessons learned will save other families from the sorrow experienced during their agonizing loss.

"The SWG believes the goal of Zero Fatalities can be achieved only after the Operating Recommendations are accepted and become a constant work practice."

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The SOFA Working Group

May 2004

Danny Boyles
Georgia State Legislative Director
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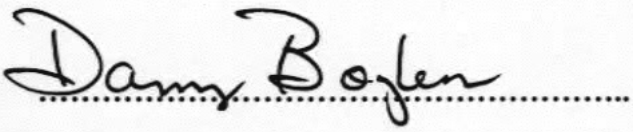

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Michigan State Legislative Director
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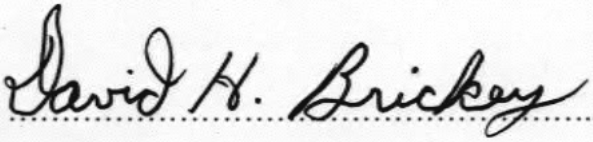

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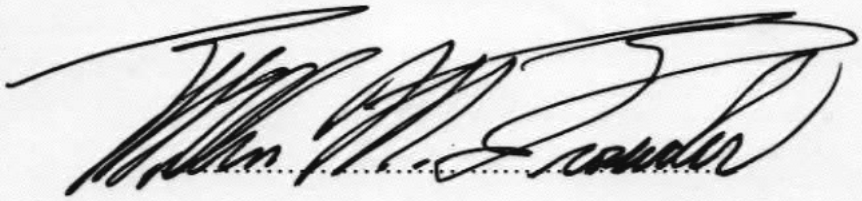

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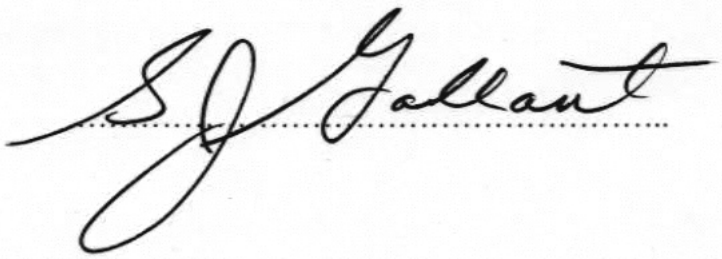

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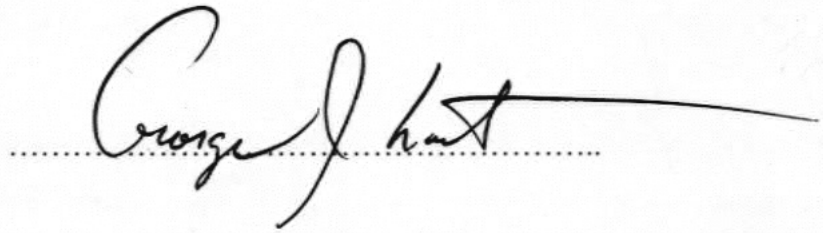

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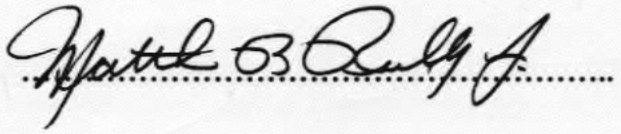

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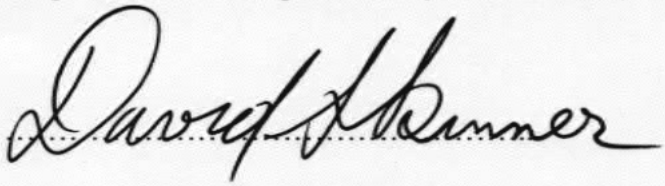

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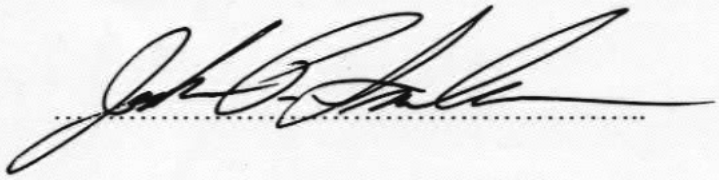

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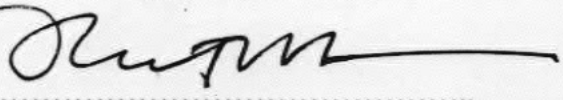

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Acknowledgments

The Switching Operations Fatality Analysis (SOFA) Working Group (SWG) greatly appreciates the ongoing support and encouragement it has received from Administrator Allan Rutter from the Federal Railroad Administration (FRA). The SWG thanks Dr. E. Donald Sussman, Chief of the Operator Performance and Safety Analysis Division of the John A. Volpe National Transportation Systems Center, USDOT/RSPA, for his support of the SOFA effort since its inception. The SWG acknowledges its debt to the following persons — and their organizations — for their continuing support and dedication:

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Don M. Hahs
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United Transportation Union (UTU)

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The present SWG expresses its appreciation to past SWG members for committing their talents and energies towards the goal of Zero Switching Fatalities:

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The SWG collectively wishes to express its gratitude to David Skinner of the Volpe National Transportation Systems Center, USDOT/RSPA, for his exceptional dedication to the efforts of the SWG. His untiring, unselfish work deserves our special recognition. His work in taking the complex and diverse data used to develop this report will effect the safety of railroad workers now and in the future.

Note: Brotherhood of Locomotive Engineers and Trainmen (BLET) was formerly the Brotherhood of Locomotive Engineers (BLE).

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EXECUTIVE SUMMARY

General

Since the release of the *SOFA Report: Findings and Recommendations of the SOFA Working Group* in October 1999, the SOFA Working Group (SWG) has undertaken activities directed toward the goal of Zero Switching Fatalities. SWG activities focus on:

- reviewing the 48 switching fatalities that occurred through December 2003, since the 76 fatalities upon which the *SOFA Report* was based;

- drawing the attention of those engaged in switching operations to the Five Operating Recommendations made in the *SOFA Report*;

- identifying 'Special Switching Hazards' such as close clearance, being struck by mainline trains, and shoving that resulted in switching fatalities that were not necessarily preventable by one or more Operating Recommendations;

- studying Severe Injuries, such as amputations, which cause harm to employees engaged in switching operations; and

- publicizing information about the number and types of switching fatalities and Severe Injuries.

Activities

This report describes SWG activities, provides updated information on the number and type of switching fatalities occurring since the release of the *SOFA Report*, and – importantly – discusses how fatalities occur and can be prevented. Below is a summary of SWG activities since October 1999.

- **Zero Switching Fatality Goal**. The SWG established a Zero Switching Fatality Goal with no tolerance for any other outcome. There were 6 switching fatalities in 2002, the lowest on record. SWG fatality records go back to 1975. The next lowest count was 7 in 1996. In 2003, there were 10 switching fatalities. In 2004 through June, there have been 4 fatalities.

  Because switching fatalities continue to occur, the SWG recognizes additional safety efforts are needed, including those based on the Five Operating Recommendations, to achieve the Zero Switching Fatality Goal.

- **Ongoing Review of Switching Fatalities**. Since July 1, 1998, the date of the 76th and last switching fatality upon which the *SOFA Report* was based, 48 fatalities occurred to employees engaged in switching operations through December 31, 2003. The SWG reviewed each of these fatalities and entered available information into its database, the 'SOFA Matrix,' already containing descriptions of the 76 fatalities. Review of each additional switching fatality remains a SWG priority. Maintaining the SOFA Matrix provides the SWG with a searchable

database of current and past switching fatalities going back through January 1, 1992. Searches are undertaken to answer railroad-community queries, provide fatality count updates, and undertake analyses.

- **Ongoing Evaluation of the Five Operating Recommendations**. Forty-one of the 76 switching fatalities in the *SOFA Report* period, January 1, 1992 through July 1, 1998, involved one or more of the Five Operating Recommendations – 54 percent. Originally, when the *SOFA Report* was released, 37 switching fatalities formed the basis of one or more of the Operating Recommendations. Upon subsequent review of the 76 fatalities, the SWG determined that 4 more of the 76 fatalities also involved one or more Operating Recommendations.

  When the *SOFA Report* was released in October 1999, an additional 10 fatalities occurred in the period July 2, 1998 through October 31, 1999. Six of these fatalities involved one or more Recommendations. Thus, from January 1, 1992 through October 31, 1999, 47 of the 86 switching fatalities involved Recommendations – 55 percent.

  Since October 31, 1999 (the post-report period), the SWG reviewed 38 switching fatalities, 17 involving one or more Operating Recommendations – 45 percent. While the 54 vs. 45 percent reduction is worth noting, the focus should remain on the fact that fatalities occur and are preventable by the Five Operating Recommendations; and switching fatalities still occur at the rate of 10.3 per year.

- **Special Switching Hazards**. In addition to the Five Operating Recommendations, the SWG wants to make those engaged in switching operations aware of Special Switching Hazards. In its review of each of the 124 fatalities, the SWG identified a number of fatalities involving close clearances (10 fatalities), being struck by mainline trains (8 fatalities), and occurring during shove movements (61 fatalities). The number of fatalities involving close clearance and being struck by mainline trains would be greater if those classified both as a Special Switching Hazard and an Operating Recommendation were included in these fatality counts.

- **Preventing Switching Fatalities**. The SWG has classified the 124 switching fatalities, occurring from January 1992 through 2003, as either involving an Operating Recommendation, or a Special Switching Hazard. In reality, fatality events are complex sequences of events occurring amidst a variety of background conditions. Some of the fatalities involving Operating Recommendations also involve Special Switching Hazards. <u>However, for prevention purposes, adherence to the Operating Recommendations and awareness of Special Switching Hazards will potentially prevent all switching fatalities.</u>

- **Periodic Safety Alerts**. The SWG uses the SOFA Matrix, containing the history of 124 fatalities, to identify trends, commonalities, and Special Switching Hazards among fatality events. When such patterns occur, the SWG informs those engaged in switching operations. When the SWG recognized recently that 13 fatalities resulted from employees being struck by mainline trains, it sent out an alert. Employees on the ground were struck by mainline trains while performing 'roll by' inspections, inspecting equipment, or getting on and off their equipment. The fatality events were described in detail in the alert.

Similarly, the SWG issued an alert in December 2003 calling attention to the 15 switching fatalities occurring in the 24-day period, December 22 through January 14, for the eleven years, 1992 through 2002. Only three years – 1992, 1996, and 2002 – in this period were switching-fatality free. Twelve of the 15 employees (80 percent) had 20 or more years of service; and thirteen of the 15 employees (87 percent) were over 40 years old.

In the alert, the SWG stressed that while this period is extremely risky, switching fatalities can occur at any time to anyone engaged in switching operations.

- **Appendix to *SOFA Report***. In August 2000, the SWG published an appendix to the *SOFA Report* entitled *Findings and Recommendations of the SOFA Working Group, Appendix – Volume II*. It contains SWG working papers, many in the form of figures and tables, used to analyze fatality events, search for commonalities, and develop the Five Operating Recommendations contained in the *SOFA Report*.

  This report is available electronically at the Federal Railroad Administration (FRA) Office of Safety Web site: http://www.fra.dot.gov/Content3.asp?P=102.

- ***Severe Injury Report***. In July 2001, the SWG published *Severe Injuries to Train and Engine Service Employees: Data Description and Injury Characteristics*. This report contains information developed from the review of 446 Severe Injuries occurring to employees from January 1, 1997 to March 31, 2000. 'Severe Injuries' are defined by the SWG as injuries (1) potentially life threatening; (2) having a high likelihood of permanent loss of function; (3) likely to result in significant work restrictions; and (4) caused by a high-energy impact to the human body. (The full definition of Severe Injuries is given in Section 5.) Since 1997, on average, 132.7 Severe Injuries have occurred each year.

  The SWG reviewed Severe Injuries because it felt the causes were similar to those of fatalities. However, the information necessary to determine that relationship does not exist. Severe Injuries are not normally investigated by the FRA, while fatalities to employees on duty are required to be investigated.

  The *Severe Injury Report* is available electronically at the FRA's Office of Safety Web site: http://www.fra.dot.gov/Content3.asp?P=102.

- **Best Practices Guidelines for Implementing Operating Recommendations**. In March 2000, George A. Gavalla, FRA's Associate Administrator for Safety, asked the SWG to develop guidelines — 'best practices' — for industry implementation of the Five Operating Recommendations. The developed guidelines, shown in Appendix A, emphasize education and a positive, judicious approach to implementation; and that the Recommendations should not be used as a basis for discipline.

- **SOFA Video.** The SWG developed a video describing results of the *SOFA Report* with emphasis on the Five Operating Recommendations, and the fatality cases upon which each of the Recommendations were based. The SOFA video addresses the needs of the employees at the ballast level for information explaining the Operating Recommendations.

- **Crew Resource Management (CRM).** The railroad industry took the lead in initiating a Task Force to implement an Additional Recommendation[1] made in the *SOFA Report*. The railroad industry Task Force created a generic program for train and engine employees. This CRM program provides a team-based framework through which to evaluate conditions, apply rules, and safely perform work tasks. Topics covered in the program include decision making, assertiveness, crew coordination, leadership, teamwork, situational awareness, and active practice and feedback.

- **Industry Leadership Conference Calls**. The SWG participates in periodic Leadership Conference Calls with representatives from the Association of American Railroads (AAR), the American Short Line and Regional Railroad Association (ASLRRA), the FRA, the Brotherhood of Locomotive Engineers and Trainmen (BLET)[2], and the United Transportation Union (UTU). These calls developed out of a Railroad Safety Advisory Committee (RSAC) declaration.

  The original purpose of these Leadership Conference Calls was a discussion by each representative of issues specific to their organizations' implementation of the SOFA Operating Recommendations and to report measurable results. The calls now include general discussions of SOFA-related issues. There have been eight calls to date.

- **The Five Lifesavers**. The SWG developed shortened versions of the Five Operating Recommendations. 'The Five Lifesavers' serve as reminders to employees engaged in switching operations of the Operating Recommendations that will reduce their risk - and that of crew members. The Five Lifesavers are not meant as substitutes for the more comprehensive Recommendations that represent a series of safe actions that employees can take in reducing their risks in switching operations.

The Five Lifesavers

1. Secure equipment before action is taken.

2. Protect employees against moving equipment.

3. Discuss safety at the beginning of a job or when a project changes.

4. Communicate before action is taken.

5. Mentor less experienced employees to perform service safely.

It should be noted that the Five Lifesavers and the Operating Recommendations are for all employees engaged in switching operations – not just yard employees. Switching fatalities

[1] These recommendations for the most part do not involve switching operations directly (unexpected train movement being the exception) which the SWG believes, nonetheless, will help reduce risk in switching operations and facilitate the collection of fatality information.

[2] Note: Brotherhood of Locomotive Engineers and Trainmen (BLET) was formerly the Brotherhood of Locomotive Engineers (BLE).

occur at all locations — yards, mainlines, industries, and sidings — wherever switching occurs, there are risks to employees.

- **SOFA Educational Material**. The SWG developed educational safety material: hats, pens, wallet-size cards, magnetic strips that can be applied to a refrigerator (allowing family members to be aware of safety efforts), stickers, and switch-list covers. Much of this material displays the Five Lifesavers. The intent is that this material will serve as a reminder to work safely when engaged in switching operations.

- **Speaking Publicly About Switching Fatalities**. The SWG speaks to its respective member organizations, and other groups involved in railroad safety. These discussions include reviews of the Five Operating Recommendations, SWG activities, and updates of switching fatalities and Severe Injuries. As an example, on February 10, 2003, the SWG spoke at the *2003 Winter Meeting of the American Association of Railroad Superintendents* (AARS) in Chicago, Illinois.

- **Ballast Level Safety Information**. The SWG periodically provides the railroad industry with updated counts of switching fatalities, Severe Injuries, and amputations (a type of Severe Injuries). It is the intent of the SWG that this information reaches those actively engaged in switching operations – employees and managers at the ballast level. The updates also include descriptions of the sequence of events leading to specific types of fatalities. It is hoped that by drawing attention to past fatalities, future fatalities can be prevented.

- **Examining Experimental Safety Proposals and Devices**. The SWG has examined several proposals and experimental devices that were developed to enhance safety in switching operations. These devices included methods for detection of rail equipment, reflectorization, warning alarms, and physical characteristics identification training. The SWG encourages the investigation of technologies holding promise for safer switching operations.

- **SOFA Safety Web Site**. The SWG maintains a Web page on the FRA's Office of Safety Web site containing safety information and access to electronic copies of SOFA reports and a PowerPoint presentation: http://www.fra.dot.gov/Content3.asp?P=102.

- **Review of Additional Recommendations**. In the *SOFA Report* of October 1999, the SWG made Additional Recommendations. These Additional Recommendations (listed in section 1.6) are for the most part recommendations not involving switching operations directly (unexpected train movement being the exception) that the SWG believes, nonetheless, will help reduce risk in switching operations and facilitate the collection of fatality information. As a result of these Additional Recommendations, the FRA updated investigational protocols and adopted a more consistent procedure for collecting, and analyzing switching fatality investigation reports.

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OVERVIEW OF SWITCHING FATALITIES AND SEVERE INJURIES[3]

Twelve-Year History of Switching Fatalities

A twelve-year switching fatality history, January 1992 through December 2003, is shown below. In those twelve years, there have been, on average, 10.3 fatalities a year.[4] Yearly fatality counts are essentially evenly distributed about this mean. The highest number of fatalities was 15 in 1993; the lowest, 6 in 2002. There were 10 switching fatalities in 2003. And there have been 4 fatalities through June 2004.

From 1991 back to 1983, switching fatalities were similar in number and distribution to those in the 1992-and-after period. Before 1983, fatalities were orders-of-magnitude higher. While SWG fatality counts go back to 1975, it is likely that the 6 fatalities in 2002 were the lowest ever since sizable switching activities developed in the mid-1800s.

Switching Fatalities
January 1992 through June 2004

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	totals	avg.
JAN	2	0	4	1	0	2	1	2	1	2	0	0	1	16	1.2
FEB	0	0	0	2	0	1	1	1	0	0	0	3	0	8	0.6
MAR	1	1	0	2	1	0	0	0	1	1	1	0	1	9	0.7
APR	1	1	1	1	0	0	0	2	1	1	0	1	0	9	0.7
MAY	0	1	0	1	0	0	1	1	2	0	1	0	2	9	0.7
JUN	4	2	0	0	1	3	2	1	0	0	1	1	0	15	1.3
JUL	3	1	1	1	1	1	1	0	3	1	1	0		14	1.2
AUG	0	3	0	0	0	1	0	0	1	0	1	1		7	0.6
SEP	0	1	1	0	1	0	0	1	1	0	1	3		9	0.8
OCT	2	1	1	1	1	1	1	0	1	1	0	0		10	0.8
NOV	1	2	2	0	0	0	0	1	0	0	0	0		6	0.5
DEC	0	2	2	2	2	2	1	0	2	2	0	1		16	1.3
totals	**14**	**15**	**12**	**11**	**7**	**11**	**8**	**9**	**13**	**8**	**6**	**10**		**128**	**10.4**

[3] The Severe Injury data was taken from the FRA Office of Safety's Web site in June 2004.

[4] Going back to 1983, the average yearly number of switching fatalities is 10.4, virtually identical to the 10.3 average back to 1992. A standard deviation for the period back to 1992 is 2.8 fatalities; and, back to 1983 is 2.6 fatalities.

Seven-Year History of SOFA-defined Severe Injuries

The seven-year history of SOFA-defined Severe Injuries is shown below along with amputations, an acute form of Severe Injuries. These Severe Injuries include, in addition to amputations, fractures of bones other than fingers and toes. As such, Severe Injuries often result from high-energy impacts and can be career threatening. Severe Injuries can be defined back to 1997 with the revision of reporting form FRA F6180.55a. In 2003, there were 116 Severe Injuries, the lowest count in the seven-year period, 1997 through 2003; and 14.4 percent lower than the mean of 135.5 for the previous six years. There have been 24 Severe Injuries in January through April 2004.

Severe Injuries and Amputations
1992 through April 2004

	SOFA-defined Severe Injuries								Amputations							
	1997	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
JAN	11	13	16	15	21	12	11	10	1	0	2	1	0	0	2	2
FEB	17	15	9	9	9	13	17	14	0	1	0	1	0	2	1	2
MAR	14	12	17	11	10	10	13	10	3	4	3	2	1	1	3	1
APR	8	10	6	10	12	6	9	12	1	2	0	1	2	0	1	1
MAY	6	12	8	8	12	14	10		1	2	3	0	2	2	2	
JUN	9	10	8	11	8	5	10		2	1	1	0	1	0	0	
JUL	9	14	10	8	10	7	6		1	5	1	0	4	0	1	
AUG	13	10	11	14	8	10	7		1	0	1	4	0	1	0	
SEP	10	11	15	10	20	12	5		2	4	3	2	5	4	0	
OCT	12	12	16	10	5	11	9		2	5	2	2	0	0	2	
NOV	12	9	12	11	13	14	10		2	2	2	2	3	0	1	
DEC	18	9	7	22	12	9	9		4	1	0	4	1	1	2	
totals	**139**	**137**	**135**	**139**	**140**	**123**	**116**		**20**	**27**	**18**	**19**	**19**	**11**	**15**	

1. INTRODUCTION TO SOFA UPDATE

1.1 Purpose

Formed in February 1998, the SOFA Working Group (SWG), made up of railroad industry representatives, has undertaken a number of activities since the release of its *SOFA Report: Findings and Recommendations of the SOFA Working Group*, in October 1999. That report was based on the review of 76 fatalities that occurred to railroad employees engaged in switching operations from January 1, 1992 through July 1, 1998.

The SWG activities have been directed towards achieving the goal of Zero Switching Fatalities:

- reviewing the 48 switching fatalities that occurred through December 2003, since the 76 fatalities upon which the *SOFA Report* was based;
- drawing the attention of those engaged in switching operations to the Five Operating Recommendations made in the *SOFA Report*;
- identifying 'Special Switching Hazards' such as close clearance, being struck by mainline trains, and shoving that resulted in switching fatalities that were not necessarily preventable by one or more Operating Recommendations;
- studying Severe Injuries, such as amputations, that cause harm to employees engaged in switching operations; and
- publicizing information about the number and types of switching fatalities and Severe Injuries.

In serving as an update, this report describes SWG activities. These activities are important because through December 2003, there have been 38 switching fatalities since the release of the *SOFA Report*. Of these 38 fatalities, 17 (45 percent) may have been avoided had the Operating Recommendations been followed. This possibility demonstrates the need for continuing education to reach the goal of Zero Switching Fatalities.

1.2 Origin of the SOFA Working Group

In February 1998, George A. Gavalla, Associate Administrator for Safety of the Federal Railroad Administration (FRA), charged the SWG to: "Conduct a detailed fact-finding review and analysis of these incidents [switching fatalities] to determine whether trends or patterns can be found, identify best practices, and, if possible, formulate recommendations for the entire industry based on the findings." Appendix B contains Mr. Gavalla's letter that includes this charge.

From Mr. Gavalla's charge the SWG was formed, made up of representatives from the FRA, American Short Line and Regional Railroad Association (ASLRRA), the Association of American Railroads (AAR), the Brotherhood of Locomotive Engineers and Trainmen (BLET),[5] the United Transportation

[5] Note: Brotherhood of Locomotive Engineers and Trainmen (BLET) was formerly the Brotherhood of Locomotive Engineers (BLE).

Union (UTU), and the Volpe National Transportation System Center (VNTSC). The SWG held meetings on a nearly monthly basis since its inception in February 1998.

While the organizations represented in the SWG remained unchanged since its inception, some members, because of retirement or new work assignments, have been replaced. As expressed in the acknowledgments, current SWG members wish to recognize the considerable contribution to railroad safety that these former members made.

1.3 History of Switching Fatalities

SWG switching fatality records date back to 1975. Fatalities in the years 1975 through 1982 were relatively higher than in the years following. After 1982, fatalities began to decline, moving within a range of 7 to 15 per year, until 2002 when there were 6 (Figure 1-1). However, in 2003 fatalities increased to 10. There have been 4 switching fatalities through June 2004.

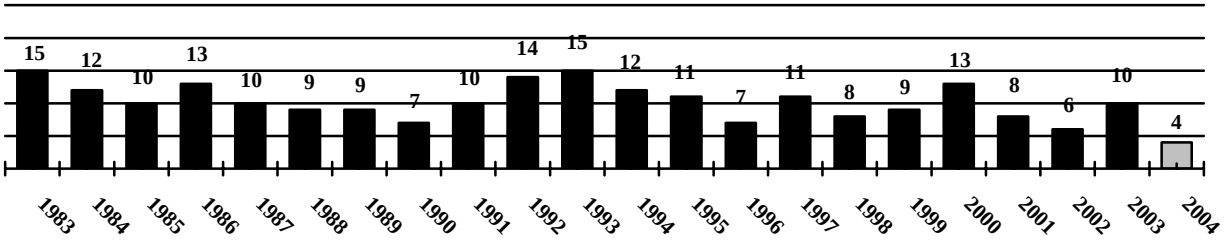

Figure 1-1. Switching Fatalities, 1982 through June 2004

The necessity for immediate, preventive action is implied by the 21 years of fatality counts shown in Figure 1-1. On average, back to 1983, 10.4 employees died each year in switching operations. Equivalently, on average 2.6 employees died every three months.

1.4 Operating Recommendations and The Five Lifesavers

In its *SOFA Report* the SWG made Five Operating Recommendations based on a review of 76 fatality cases that occurred from January 1, 1992 through July 1, 1998. The SWG believes these Recommendations, each based on between 8 and 12 fatality cases, if used when appropriate in switching operations, will prevent fatalities. The Five Operating Recommendations are shown in Appendix D. Subsequently, the SWG developed shortened versions of each Recommendation that may involve a series of steps. These shortened versions came to be known as:

The Five Lifesavers

- Secure equipment before action is taken.
- Protect employees against moving equipment.
- Discuss safety at the beginning of a job or when a project changes.
- Communicate before action is taken.
- Mentor less experienced employees to perform service safely.

1.5 Narrative Descriptions of Switching Fatalities

Section 3 contains a short narrative summary of each of the 124 switching fatalities and whether one or more Operating Recommendations applies. These narratives were written by the SWG as part of its review of each switching fatality. In Section 2, the numbers of fatalities that apply to an Operating Recommendations before and after the release of the *SOFA Report* are compared.

1.6 Additional Recommendations

In addition to making Five Operating Recommendations in its *SOFA Report*, the SWG made Additional Recommendations concerning:

- Unexpected train movement
- Crew resource management
- Review of Severe Injuries
- Maintenance of the SOFA Matrix
- Computer support for fatality investigation
- Continued review and monitoring of switching fatalities
- Team-oriented approach to switching fatality investigation

'Additional Recommendations' are for the most part recommendations not involving switching operations directly (unexpected train movement being the exception) that the SWG believes, nonetheless, will help reduce risk in switching operations and facilitate the collection of fatality information. These Additional Recommendations are described verbatim below, from the *SOFA Report*:[6] (Note: the abbreviation 'FE' in the cited material stands for 'fatality of an employee.')

Safety Training Concerning the Implications of Unexpected Train Movement

Finding: Compelling evidence suggests many fatalities resulted from unexpected train movement, particularly at very low speeds.

Action: The railroad industry should consider their existing switching operations training programs to assure that no opportunities are being overlooked to heighten safety awareness and to focus it on the

[6] The *SOFA Report: Findings and Recommendations of the SOFA Working Group*, October 1999, page 4-16, Section 4.2.2.

serious implications of unexpected train movement, and on the importance of continual mutual awareness of the location and activities of all crew members.

Rationale: Such FEs are preventable if the crew members have proper understanding of all planned movements, take care to be sure that no individuals are exposed to potential hazards at the time movements are initiated and to assure that detached equipment has been properly protected, i.e., locomotive reverser centered or hand brakes applied, to prevent unplanned movement. Safety awareness training can encourage a strong focus on these issues.

Train Crew Resource Management

Finding: The Working Group has also concluded that an important contributing factor to many of the FEs reviewed was incomplete or inadequate communication among crew members. Sometimes this was a failure of, or improper use of communications equipment, but more often it was a failure or reluctance of the crew member to elevate the importance of communications impacting on safety to the level needed to assure successful, safe operations.

Action: The industry (labor, management, FRA) should consider programs that address improving crew coordination and communication such as Crew Resource Management (CRM) that has been used effectively in the aviation industry.

Rationale: The goal of these training procedures in all industries is to promote safe operations through improved crew member proficiency, situational awareness, effective communication and teamwork, and by providing strategies for appropriately challenging and questioning authority where safety could be jeopardized. Training in the importance of and procedures for effective intra-crew communication has the potential to make a major contribution to the safety of switching operations.

Follow-on SOFA Analysis: Review of Incidents Involving Severe Injury

Finding: The SOFA Working Group has been an effective task force for accomplishing goals that span the interests of labor, management and the FRA in switching operations. Although the review of switching fatalities has been very useful, the body of data is relatively small. Incidents in which serious injury has resulted, such as loss of a limb or requiring that the employee be placed on extended disability are likely to be very similar in kind to FEs. They are likely to reflect the same safety implications in the sense that the only difference is in the degree of severity of the injury.

Action: The SOFA Working Group or its successor should extend the scope of its investigations by undertaking the review of available FEs where severe injuries have resulted.

Rationale: The data collection procedures for examining railroad injuries has recently been improved so that more complete and useful data for understanding the safety implications are available. In 1998 there were more than 8,000 non-fatal railroad incidents, not including grade crossing incidents. While we do not know the number of these that would be classified as serious and the number that involved switching operations, it is likely to be a significant proportion of this total and therefore would substantially augment the statistical reliability of the aggregate database and the ability to make objective recommendations based on it.

Establish and Maintain Database of Objective FE Data

Finding: FRA's existing FE files could be greatly improved by including a much broader range of information that can support the interpretation of the possible contributing factors associated with FEs.

Recommendation: When investigating FEs, the FRA should establish a comprehensive historical database summarizing the objective data and interpretation of FEs occurring in switching operations that will be updated regularly to accumulate reliable and consistent information about the occurrence of switching operations fatalities.

The Working Group, taking advantage of the insights resulting from its extensive analysis of existing data, is providing its recommendations for ensuring that specific data are collected by the FRA during its investigation of FEs.

Discussion: The generated database will provide more reliable clues to the factors contributing to switching operations FEs and support the justification of safety improvements in terms of the number of lives potentially saved. Additionally, the newly generated database will substantially reduce the time and cost of subsequent analyses and recommendations.

Recommendation for Providing Computer Support to the Data Collection Process

Finding: Current data collection procedures involve use of printed forms, notes, diagrams and photographs that do not provide a thorough or uniform data collection to perform accurate statistical analyses.

Recommendation: The FRA should consider creating software to facilitate data entry at the source and at the time the investigation is taking place. This software could operate on portable laptop computers already available to investigators or on off-the-shelf personal data units (PDUs) that are especially suited to the data collection application. The SOFA Working Group offers its assistance in a project to revise the data collection protocol and to develop software to support the fatality investigation and data codification process.

Discussion: The efficiency, accuracy, and thoroughness of the existing data collection in each investigation would be improved. Computer support could reduce the time and cost associated with the complete data collection and consistent codification process.

Recommendation for Continued Review and Monitoring of Fatal Accident Data

Finding: The SOFA Working Group has accumulated the most knowledge of the potential causes of switching operation FEs in the industry.

Recommendation: The SOFA Working Group, or its successor, should undertake a periodic review of the FE switching operations data as it accumulates to seek new lessons learned, to review the integrity of the data, to monitor its usefulness and recommend improvements to the data being collected where appropriate.

Discussion: Their review of the data will (1) provide the best checks that the data being requested are useful; (2) put them in a position to recommend improvements to data collection; and (3) put them in a position to recommend potential safety improvements to reduce the incidence of death and injury.

Modification of FRA's Data Collection Process to Include a Team Concept

Finding: No one has all the expertise required to undertake a comprehensive review and revision of FE investigation procedures.

Recommendation: The Working Group believes it is important that FRA's investigation process be consistent, and that a team concept be implemented to insure complete data collection.

Rationale: The SOFA Working Group recognizes that some inspectors collect and produce reports better than others, while other inspectors are more versed in analyzing the FE data. A team (to include all affected disciplines) concept in data collection and analysis will insure a more consistent FE investigation.

The above material was taken from the *SOFA Report: Findings and Recommendations of the SOFA Working Group*, on October 1999, Section 1.4.

1.7 SOFA-defined Severe Injuries

In addition to reviewing each switching fatality, the SWG monitors the number and type of Severe Injuries to employees engaged in switching operations. 'Severe Injuries' were defined by the SWG to include injuries that are (1) potentially life threatening; (2) having a high likelihood of permanent loss of function; (3) likely to result in significant work restrictions; and (4) caused by a high-energy impact to the human body. An anatomical definition, along with a discussion of Severe Injuries, is presented in Section 5.

The SWG reviewed Severe Injuries because it felt the causes were similar to those of fatalities. However, the information necessary to determine that relationship does not exist. Severe Injuries are not normally investigated by the FRA, while fatalities to employees on duty are required to be investigated.

As shown in Figure 1-2, Severe Injuries declined in 2002 and 2003 from the almost similar counts of the previous five years. Severe Injury counts are not available before 1997 when FRA FORM F 6180.55a was revised. (By comparison switching fatalities declined in 2002 to a historic low, but increased in 2003 as shown in Figure 1-1.) There were 123 Severe Injuries in 2002; and 116 in 2003. The 116 Severe Injuries in 2003 were the lowest value in the seven-year period, 1997 through 2003.

Compared to the previous five years, amputations declined in 2002 and 2003. Amputations are a subset of Severe Injuries and are shown separately because of the acute trauma involved. Most Severe Injuries are fractures of the worst kind, fractures to fingers and toes being excluded by the SWG from the definition of Severe Injuries.

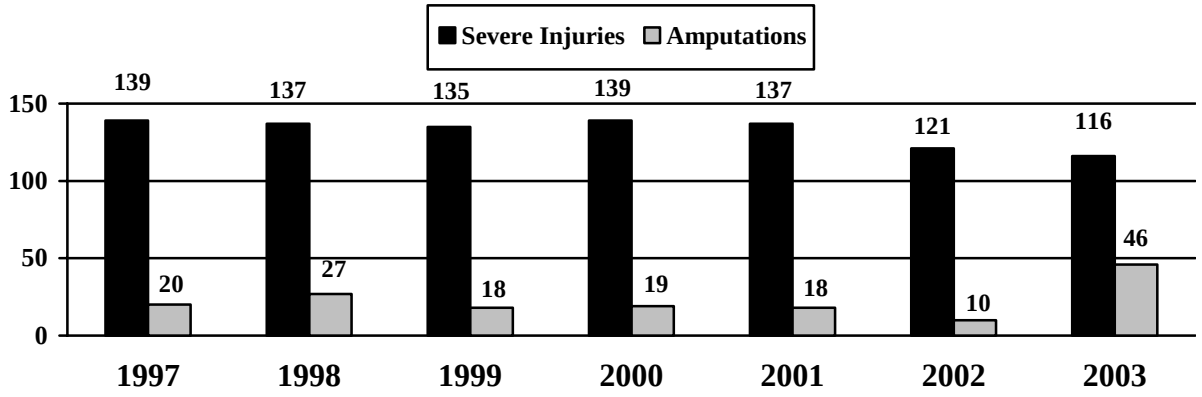

Figure 1-2. SOFA-defined Severe Injuries and Amputations, 1997 through 2003

1.8 Summary of Report Contents

The remainder of this report consists of four sections, an appendix, and data appendix:

Section 2: SOFA Working Group Activities. A discussion of SWG activities since the publication of the *SOFA Report* in October 1999.

Section 3: Switching Fatalities. A complete list and description of the 124 switching fatalities that occurred from January 1992 through December 2003. The fatalities are classified by Operating Recommendations if one or more applies. Or, if no Recommendation applies, by type of event or characteristic.

Section 4: Switching Fatalities – Understanding and Prevention. An accounting system for classifying the 124 fatalities for understanding and prevention.

Section 5: SOFA-defined Severe Injuries. Severe Injuries by various characteristics and track location.

Appendix:

A: SOFA Implementation Guidelines for Operating Recommendations

B: Origin of SOFA Working Group

C: Original Introduction *to SOFA Report*, October 1999

D: Five Operating Recommendations

E: Obtaining Electronic Versions of SOFA Reports

F: Examples of Job Briefings – Operating Recommendation 4

Data Appendix

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2. SOFA WORKING GROUP ACTIVITIES

2.1 SOFA Activities

The SOFA Working Group (SWG) engaged in a number of safety-related activities in the nearly four and one-half years since the release of its *SOFA Report: Findings and Recommendations of the SOFA Working Group*, on October 1999. These activities are discussed below.

Zero Switching Fatality Goal

The SWG established a Zero Switching Fatality Goal with no tolerance for any other outcome. There were 6 switching fatalities in 2002, the lowest on record. SWG fatality records go back to 1975. The next lowest count was 7 in 1996; and in 2003 there were 10 switching fatalities. In 2004 through June, there have been 4 fatalities.

Because switching fatalities continue to occur, the SWG recognizes additional safety efforts are needed, including those based on the Five Operating Recommendations, to achieve the Zero Switching Fatality Goal.

It should be noted that the Operating Recommendations are for all employees engaged in switching operations – not just yard employees. Switching fatalities occur at all locations – yards, mainlines, industries, and sidings - wherever switching occurs there are risks to employees.

Ongoing Review of Switching Fatalities

Since July 1, 1998, the date of the 76th and last switching fatality upon which the *SOFA Report* was based, 48 fatalities occurred to employees engaged in switching operations through December 31, 2003. The SWG reviewed each of these fatalities and entered available information into its database, the 'SOFA Matrix,' already containing descriptions of the 76 fatalities. Review of each additional switching fatality remains a SWG priority. Maintaining the SOFA Matrix provides the SWG with a searchable database of current and past switching fatalities going back through January 1, 1992. Searches are undertaken to answer railroad-community queries, provide fatality count updates, and undertake analyses.

Ongoing Evaluation of the Five Operating Recommendations

Forty-one of the 76 switching fatalities in the *SOFA Report* period, January 1, 1992 through July 1, 1998, involved one or more of the Five Operating Recommendations – 54 percent. Originally, when the *SOFA Report* was released, 37 switching fatalities formed the basis of one or more of the Operating Recommendations. Upon subsequent review of the 76 fatalities, the SWG determined that 4 more of the 76 fatalities also involved one or more Operating Recommendations.

When the *SOFA Report* was released in October 1999, an additional 10 fatalities occurred in the period July 2, 1998 through October 31, 1999. Six of these fatalities involved one or more Recommendations. Thus, from January 1, 1992 through October 31, 1999, 47 of the 86 switching fatalities involved Recommendations – 55 percent.

Since October 31, 1999, (the post-*SOFA-Report* period), the SWG reviewed 38 switching fatalities, 17 involving one or more Operating Recommendations – 45 percent. While the 54 vs. 45 percent

reduction is worth noting, the focus should remain on the fact that fatalities occur and are preventable by the Five Operating Recommendations; and switching fatalities still occur at the rate of 10.3 per year.

Table 2-1 shows the frequency of the Five Operating Recommendations partitioned into the pre-and post-SOFA report period. It is difficult to draw conclusions because the post-SOFA report period counts are small.

Table 2-1. 124 Switching Fatalities Grouped by Operating Recommendations, 1992 through 2003

Total Fatality Cases	Pre- and post-SOFA Report Period	Recommendation					Total Number of Recommendations
		1	2	3	4	5	
86	January 1992 through October 1999	13	9	10	15	16	63
38	November 1999 through December 2003	6	3	4	3	3	19
124	Totals	19	12	14	18	19	82*

* Total sums to more than the number of fatality cases because multiple Operating Recommendations apply to some cases. Thirty-eight cases from January 1992 and October 1999, and 22 cases from November 1999 and December 2003, did not generate any additional Operating Recommendations.

Special Switching Hazards

In addition to the Five Operating Recommendations, the SWG wants to make those engaged in switching operations aware of Special Switching Hazards. In its review of each of the 124 fatalities, the SWG identified a number of fatalities involving close clearances (10 fatalities), being struck by mainline trains (8 fatalities), and occurring during shove movements (61 fatalities). The number of fatalities involving close clearance and being struck by mainline trains would be greater if those classified both as a Special Switching Hazard and an Operating Recommendation were included in these fatality counts.

Periodic Safety Alerts

The SWG uses the SOFA Matrix, containing the history of 124 fatalities, to identify trends, commonalities, and Special Switching Hazards among fatality events. When such patterns occur, the SWG informs those engaged in switching operations. When the SWG recognized recently that 13 fatalities resulted from employees being struck by mainline trains, it sent out an alert. Employees on the ground were struck by mainline trains while performing 'roll by' inspections, inspecting equipment, or getting on and off their equipment. These fatalities are shown in Table 2-2. Each of the fatality events was described in detail in the alert.

Table 2-2. Thirteen Struck-By-Mainline-Train Fatalities

Date	RR	Location	FRA Report #	Operating Recommendation
06/07/92	SSW	Conlen Siding, TX	FE-20-92	none
04/13/93	CSX	Dwale, KY	FE-13-93	none
12/05/93	SOU	Atlanta, GA	FE-49-93	Recommendation 3
07/07/96	NS	Sidney, IN	FE-17-96	Recommendation 5
07/18/97	MNCW	Stamford, CT	FE-22-97	none
12/02/97	BNSF	Emporia, KS	FE-36-97	none
12/28/00	UP	Dupo, IL	FE-32-00	none
12/29/00	BNSF	Gillette, WY	FE-33-00	none
01/10/01	CSX	Chicago, IL	FE-02-01	Recommendation 5
01/11/01	NS	South Fork, PA	FE-03-01	Recommendation 3
03/03/01	BNSF	Willmar, IL	FE-08-01	Recommendation 1
12/24/01	NS	Lynchburg, VA	FE-40-01	none
03/21/02	NS	Claymont, DE	FE-09-02	none

Similarly, the SWG issued an alert in December 2003 calling attention to the 15 switching fatalities occurring in the 24-day period, December 22 through January 14, for the eleven years, 1992 through 2002, as shown in Table 2-3. Only three years – 1992, 1996, and 2002 – in this period were switching-fatality free. Twelve of the 15 employees (80 percent) had 20 or more years of service; and 13 of the 15 employees (87 percent) were over 40 years old. In the alert, the SWG stressed that while this period was extremely risky, switching fatalities can occur at any time to anyone engaged in switching operations.

Table 2-3. Switching Fatalities, December 22 through January 14, 1992

Period	RR	Location	Age	Service	Date
December					
22	NS	Eden, NC	50	29	12/22/01
24	NS	Lynchburg, VA	30	4.5	12/24/01
26	UP	Boise, ID	55	32	12/26/97
28	IC	Durrant, MS	55	26	12/28/98
28	UP	Dupo, IL	52	30	12/28/00
29	BNSF	Gillette, WY	29	6	12/29/00
30	CR	Brook Park, OH	61	38	12/30/93
January					
2	CIRR	Cedar Springs, GA	49	21	01/02/00
4	BN	Hastings, NE	46	20	01/04/94
10	CSX	Chicago, IL	42	1	01/10/01
11	CR	Indianapolis, IN	51	30	01/11/95
11	NS	South Fork, PA	52	34	01/11/01
12	UP	S Fontana, CA	60	35	01/12/97

12	CR	Port Newark, NJ	54	55	01/12/99
14	BN	Amarillo, TX	57	36	01/14/94

Appendix to SOFA Report

In August 2000, the SWG published an appendix to the *SOFA Report* entitled *Findings and Recommendations of the SOFA Working Group, Appendix – Volume II*. It contains SWG working papers, many in the form of figures and tables, used to analyze fatality events, search for commonalities, and develop the Five Operating Recommendations contained in the *SOFA Report.*

This report is available electronically at the FRA's Office of Safety Web site: http://www.fra.dot.gov/us/content/102.

Severe Injury Report

In July 2001, the SWG published *Severe Injuries to Train and Engine Service Employees: Data Description and Injury Characteristics*. This report contains information developed from the review of 446 Severe Injuries occurring to employees from January 1, 1997 to March 31, 2000. 'Severe Injuries' are defined by the SWG as injuries (1) potentially life threatening; (2) having a high likelihood of permanent loss of function; (3) likely to result in significant work restrictions; and (4) caused by a high-energy impact to the human body. (The full definition of Severe Injuries is given in Section 5.) Since 1997, on average, 132.7 Severe Injuries have occurred each year.

The SWG reviewed Severe Injuries because it felt the causes were similar to those of fatalities. However, the information necessary to determine that relationship does not exist. Severe Injuries are not normally investigated by the FRA, while fatalities to employees on duty are required to be investigated.

The *Severe Injury Report* is available electronically at the FRA's Office of Safety Web site: http://www.fra.dot.gov/us/content/102.

Best Practices Guidelines for Implementing Operating Recommendations

In March 2000, George A. Gavalla, FRA's Associate Administrator for Safety, asked the SWG to develop guidelines — 'best practices' — for industry implementation of the Five Operating Recommendations. The developed guidelines, shown in Appendix A, emphasize education and a positive, judicious approach to implementation; and that the Recommendations should not be used as a basis for discipline.

SOFA Video

The SWG developed a video describing results of the *SOFA Report* with emphasis on the Five Operating Recommendations, and the fatality cases upon which each of the Recommendations were based. The SOFA video addresses the needs of the employees at the ballast level for information explaining the Operating Recommendations.

Crew Resource Management (CRM)

The railroad industry took the lead in initiating a Task Force to implement an Additional Recommendation made in the *SOFA Report* (page 4-16, Section 4.2.2). 'Additional Recommendations' are for the most part recommendations not involving switching operations directly

(unexpected train movement being the exception) that the SWG believes, nonetheless, will help reduce risk in switching operations and facilitate the collection of fatality information. This Task Force drew upon two existing, Class I programs. Southern Pacific established a CRM program in the late 1980s, based on programs in the commercial and military aviation industries. Union Pacific inherited that program with its merger, and developed a lesson plan and video based upon it. In the mid-1990s, Canadian Pacific Railway expanded its existing CRM materials to include other human factor issues and resources. This effort evolved into a classroom-based, instructional program.

The railroad industry Task Force created a generic program for train and engine employees. This CRM program provides a team-based framework through which to evaluate conditions, apply rules, and safely perform work tasks. Topics covered in the program include decision-making, assertiveness, crew coordination, leadership, teamwork, situational awareness, and active practice and feedback.

In June 2000, this CRM program was made available to the railroad industry. The course syllabus contains 10 lesson plans with coordinating videotape that provides opportunities for role-playing, discussion of textbook examples, classroom style instruction, and opportunities for group participation. The program has three phases: awareness, practice and feedback, and reinforcement.

At the January 2004 annual meeting of the Transportation Research Board (TRB), the Texas Transportation Institute (TTI) presented a paper[7] that reviewed CRM progress in the U.S. railroad industry. In their presentation, current CRM programs and materials were shown to be in use by train and engine service employees. Issues pertinent to switching operations in yards and industries were also discussed.

The SWG has reviewed the industry's CRM program and observes that it has application for addressing identified hazards in switching operations. The CRM program has great utility to eliminate risks identified with Operating Recommendations. Those Recommendations include Recommendation 3 (job briefing) and Recommendation 5 (mentoring). The other Operating Recommendations can also be benefited by exercise of principles used in CRM.

Industry Leadership Conference Calls

The SWG participates in periodic Leadership Conference Calls with representatives from the Association of American Railroads (AAR), the American Short Line and Regional Railroad Association (ASLRRA), the FRA, the Brotherhood of Locomotive Engineers and Trainmen (BLET), and the United Transportation Union (UTU). These calls developed out of a Railroad Safety Advisory Committee (RSAC) declaration.

The original purpose of these Leadership Conference Calls was a discussion by each representative of issues specific to their organizations' implementation of the SOFA Operating Recommendations and to report measurable results. The calls now include general discussions of SOFA-related issues. There have been eight calls to date.

[7] *Assessment of Existing Teams and Crew Resource Management (CRM) Training within the Rail Industry*. Morgan, Curtis A.; Kyte, Tobin B.; Olson, Leslie E.; and Roop, Stephen S. Texas Transportation Institute. November 15, 2003. Presented at TRB 2004 Annual Meeting. Available on CD-ROM.

The Five Lifesavers

The SWG developed shortened versions of the Five Operating Recommendations. 'The Five Lifesavers' serve as reminders to employees engaged in switching operations of the Operating Recommendations that will reduce their risk - and that of crew members. The Five Lifesavers are not meant as substitutes for the more comprehensive Recommendations that represent a series of safe actions that employees can take in reducing their risks in switching operations.

The Five Lifesavers

- Secure equipment before action is taken.
- Protect employees against moving equipment.
- Discuss safety at the beginning of a job or when a project changes.
- Communicate before action is taken.
- Mentor less-experienced employees to perform service safely.

It should be noted that the Five Lifesavers and the Operating Recommendations are for all employees engaged in switching operations – not just yard employees. Switching fatalities occur at all locations – yards, mainlines, industries, and sidings - wherever switching occurs, there are risks to employees.

SOFA Educational Material

The SWG developed educational safety material: hats, pens, wallet-size cards, refrigerator magnets (allowing family members to be aware of safety efforts), stickers, and switch-list covers. Much of this material displays the Five Lifesavers. The intent is that this material will serve as a reminder to work safely when engaged in switching operations.

Speaking Publicly About Switching Fatalities

The SWG speaks to its respective member organizations, and other groups involved in railroad safety. These discussions include review of the Five Operating Recommendations, SWG activities, and updates of switching fatalities and Severe Injuries. As an example, on February 10, 2003, the SWG spoke at the *2003 Winter Meeting of the American Association of Railroad Superintendents* (AARS) in Chicago, Illinois.

Ballast Level Safety Information

The SWG periodically provides the railroad industry with updated counts of switching fatalities, Severe Injuries, and amputations (a type of Severe Injuries). It is the intent of the SWG that this information reach those actively engaged in switching operations – employees and managers at the ballast level. The updates also include descriptions of the sequence of events leading to specific types of fatalities. It is hoped that by drawing attention to past fatalities, future ones can be prevented.

Examining Experimental Safety Proposals and Devices

The SWG has examined several proposals and experimental devices developed to enhance safety in switching operations. These devices included methods for detection of rail equipment, reflectorization,

warning alarms, and physical characteristics identification training. The SWG encourages the investigation of technologies holding promise for safer switching operations.

SOFA Safety Web Site

The SWG maintains a page on the FRA's Office of Safety Web site containing safety information and access to electronic copies of SOFA reports and a PowerPoint presentation: http://www.fra.dot.gov/us/content/102.

Review of Additional Recommendations

In the *SOFA Report* of October 1999, the SWG made Additional Recommendations. These Additional Recommendations (listed in section 1.6) are for the most part recommendations not involving switching operations directly (unexpected train movement being the exception) that the SWG believes, nonetheless, will help reduce risk in switching operations and facilitate the collection of fatality information. As a result of these Additional Recommendations, the FRA updated investigational protocols and adopted a more consistent procedure for collecting, and analyzing switching fatality investigation reports.

2.2 Future SOFA Group Activities

The SWG will continue its efforts toward the Zero Switching Fatality Goal.

- The SWG recognizes additional safety efforts are needed to achieve the Zero Switching Fatality Goal. Total commitment to a safety culture based on the life-saving potential of the Five Operating Recommendations is essential. This commitment includes other Special Switching Hazards like close clearances, being struck by mainline trains, and the risk inherent in shoving operations.

- Any future SWG work should include plans to improve the database design of the SOFA Matrix to enhance input and retrieval of information. The SOFA Matrix should be converted to a searchable database with the FRA's Accident Analysis Branch maintaining this database for future review. During this process, the SWG will update the database to include all aspects of any new technologies, such as remote control operations, to ensure that operations unique to those technologies accurately reflect new situations that may impact the safety of yard-switching movements and at a minimum the hazards associated with unprotected movements that include both shoving and pulling rail equipment.

- The SWG should continue its review and analysis of switching fatalities, particularly those not associated with the Five Operating Recommendations. Of the 124 switching fatalities occurring from January 1992 through December 2003, sixty-four fatalities (52 percent) involved one or more Recommendations. Additional analysis of the remaining 60 fatalities, combined with any future switching fatalities, may yield safety information in addition to the awareness of identified switching hazards.

- The SWG will work towards implementation of the Additional Recommendations made in the *SOFA Report* of October 1999. These Additional Recommendations include:

    - Continued education on unexpected train movement

- Computer support for fatality investigation
- A team oriented approach to switching fatality investigation
- Consideration of new technologies and operating procedures that hold promise to reduce risk to employees engaged in switching operations.

3. SWITCHING FATALITIES AND OPERATING RECOMMENDATIONS

3.1 Reviewing Switching Fatalities

The SOFA Working Group (SWG) continues to review each switching fatality after the FRA's investigation is complete. Information from each investigation, along with information from other sources, is entered into a database, 'the SOFA Matrix.' The SWG has reviewed all of the 124 fatalities occurring from January 1992 through December 2003. An important step of each review is determining if one or more Operating Recommendations apply. If no Operating Recommendations apply, the fatality case is classified under the appropriate Special Switching Hazard.

3.2 Classifying the 124 Switching Fatality Cases

By classifying fatalities by Operating Recommendations, the SWG can determine if switching fatalities are following similar patterns, or if new event sequences have developed. In determining if new event sequences are occurring, it is helpful first to divide the fatality cases into two groups. The first group contains fatalities that apply to Operating Recommendations. The second group - Special Switching Hazards - contains fatalities to which no Operating Recommendation applies.

Operating Recommendation Cases

Of the 124 switching fatalities, 64 involve one or more Recommendations – 52 percent as shown in Table 3-1. Note that because a fatality case can involve more than one Recommendation, as 16 of the 64 fatality cases do, the number of Recommendations cited by the SWG is greater than the number of cases that have Recommendations applying. Two of the 16 cases involved 3 Operating Recommendations each; the other 14 cases involved 2 Recommendations each.

The SWG firmly believes that switching fatalities directly related to the Five Operating Recommendations will be reduced when all parties accept and operate according to these Recommendations. The SWG encourages compliance with the Operating Recommendations and all other safety rules.

Table 3-1. Sixty-Four Switching Fatalities Involving Operating Recommendations

Lifesaver Applying to Operating Recommendation	Number of Fatality Cases	Percentage of 124 Fatality Cases
1-Secure equipment before action is taken.	19	15.3 %
2-Protect employees against moving equipment.	12	9.7 %

3-Discuss safety at the beginning of a job or when a project changes.	14	11.3 %
4-Communicate before action is taken.	18	14.5 %
5-Mentor less experienced employees to perform service safely.	19	15.3 %
total times a Recommendation was cited	82	
less multiple citations of Recommendations	18	
number of cases involving Recommendations	**64**	

Special Switching Hazard Cases

The remaining 60 fatality cases, those not involving an Operating Recommendation, are classified by the SWG into eleven groups (one group is a miscellaneous group), as shown in Table 3-2, based on a sequence of events leading up to the fatality, as being struck by mainline trains; or by a fatality event characteristic, as drugs or alcohol. The SWG believes that the groupings suggest Special Switching Hazards that employees engaged in switching operations should constantly be aware of to insure their safety and that of their crew members.

Table 3-2. Sixty Switching Fatalities Involving Special Switching Hazards

Type	**Number**
Close Clearance	10
Struck by Mainline Trains	8
Employee Tripping, Slipping, Falling	6
Free Rolling Railcars	6
Unsecured Cars	6
Equipment	4
Struck by Motor Vehicle or Loading Device	4
Unexpected Movement of Railcars	4
Environment	3
Drugs and Alcohol	3
Miscellaneous	11
total	65
* less cases classified in two category types	5
net total	60

* FE-15-92 was classified under 'Employee Tripping, Slipping, Falling' and 'Unsecured Cars'; FE-46-93, 'Unsecured Cars' and 'Drugs and Alcohol'; FE-30-96, 'Drugs and Alcohol' and 'Employee Tripping, Slipping, Falling'; FE-40-01, 'Close Clearance' and 'Struck by Mainline Trains'; FE-09-02, 'Close Clearance' and 'Struck by Mainline Trains'.

3.3 List of Switching Fatalities, 1992 through 2003

Table 3-3 contains a complete, chronological list of the 124 switching fatalities reviewed by the SWG. The second column to the right indicates if a fatality involved an Operating Recommendation and if so the number of the Recommendation(s). Sixteen fatalities involved more than one Recommendation. The third column to the right indicates if a fatality involved a Special Switching Hazard.

Fatalities in this report have been classified by the SWG as either involving an Operating Recommendation, or a Special Switching Hazard. In reality, fatality events are complex sequences of events occurring amidst a variety of background conditions. Some of the fatalities involving Operating Recommendations also involve Special Switching Hazards. However, for prevention purposes, adherence to the Operating Recommendations and awareness of Special Switching Hazards will potentially prevent all switching fatalities.

Table 3-3. Chronological Listing of 124 Switching Fatalities, 1992 through 2003

#	SOFA Recommendation	Special Switching Hazard	Date	Railroad	Location	FRA Report #
1	4		01/28/92	BN	Willmar, MN	FE-03-92
2	5		01/30/92	AGC	Polk County, FL	FE-04-92
3	4		03/11/92	FEC	Fort Pierce, FL	FE-08-92
4		Free-Rolling Railcars	04/09/92	ATSF	Cheto, AZ	FE-09-92
5	4		06/01/92	ATSF	Escondido, CA	FE-14-92
6		Employee Tripping,… Unsecured Cars	06/01/92	BN	Seattle, WA	FE-15-92
7	5		06/02/92	IHRC	Henderson, KY	FE-16-92
8	1		06/20/92	CNW	Northlake, IL	FE-18-92
9		Struck by Mainline Trains	07/07/92	SSW	Conlen Siding, TX	FE-20-92
10	2,3		07/24/92	GBW	Wisconsin Rapids, WI	FE-30-92
11	4		07/25/92	UP	Portland, OR	FE-22-92
12		Miscellaneous	10/15/92	BN	Omaha, NE	FE-33-92
13		Free-Rolling Railcars	10/23/92	GTW	Dearborn, MI	FE-34-92
14		Miscellaneous	11/16/92	TTIS	Maysville, KY	FE-39-92
15		Employee Tripping,…	03/27/93	SP	Guadalupe, CA	FE-11-93
16		Struck by Mainline Trains	04/13/93	CSX	Dwale, KY	FE-13-93
17		Miscellaneous	05/22/93	ATSF	El Paso, TX	FE-20-93

18		Miscellaneous	06/04/93	SEPTA	Devon, PA	FE-22-93
19	3		06/07/93	IC	Fulton, KY	FE-23-93
20	4		07/15/93	CR	Anderson, IN	FE-26-93
21		Close Clearance	08/04/93	UP	Pryor, OK	FE-27-93
22	3,4		08/11/93	SP	Tracy, CA	FE-30-93
23	2		08/12/93	ATSF	Evandale, TX	FE-31-93
24		Miscellaneous	09/02/93	ATSF	Carlsbad, NM	FE-35-93
25	5		10/19/93	SOO	Leal, ND	FE-40-93
26		Unsecured Cars Drugs and Alcohol	11/12/93	ATSF	Farewell, TX	FE-46-93
27	3,5		11/13/93	GC	Macon, GA	FE-47-93
28	3		12/05/93	SOU	Atlanta, GA	FE-49-93
29		Environment	12/30/93	CR	Brook Park, OH	FE-53-93
30		Unsecured Cars	01/04/94	BN	Hastings, NE	FE-02-94
31		Equipment	01/14/94	BN	Amarillo, TX	FE-03-94
32		Miscellaneous	01/18/94	CSX	Bainbridge, GA	FE-04-94
33	2		01/20/94	UP	Fall City, NE	FE-06-94
34		Close Clearance	04/12/94	SP	Houston, TX	FE-12-94
35		Free-Rolling Railcars	07/05/94	BN	Essex, MT	FE-16-94
36		Struck by Motor Vehicle…	09/20/94	ARR	Clear Site, AK	FE-20-94
37	1		10/17/94	UP	Donaldsonville, LA	FE-26-94
38	5		11/10/94	PTRA	Houston, TX	FE-28-94
39	3,4		11/15/94	CR	Painted Post, NY	FE-29-94
40	2,4,5		12/06/94	CR	Campbell Hall, NY	FE-31-94
41	1		12/13/94	UP	Thorton, CA	FE-32-94
42		Equipment	01/11/95	CR	Indianapolis, IN	FE-02-95
43	3,4		02/17/95	CR	St. James, OH	FE-09-95
44	1,2		02/24/95	ATSF	Amarillo, TX	FE-11-95
45	1,3		03/02/95	NS	Aiken, SC	FE-12-95
46		Miscellaneous	03/21/95	SP	Bassett, CA	FE-17-95
47		Unsecured Cars	04/06/95	WC	Argoe, WI	FE-16-95
48	2		05/03/95	CSX	Evansville, IN	FE-18-95
49		Employee Tripping,…	07/21/95	CR	Hershey, PA	FE-23-95
50	1,5		10/04/95	CSX	Riverdale, IL	FE-29-95
51		Close Clearance	12/11/95	NS	Toledo, OH	FE-33-95
52		Close Clearance	12/14/95	CSX	Monroe, NC	FE-34-95
53	1,5		03/20/96	BRC	Bedford Park, IL	FE-09-96
54	5		06/15/96	CSX	Charlotte, NC	FE-12-96
55	5		07/07/96	NS	Sidney, IN	FE-17-96
56	5		09/03/96	DGNO	Dallas, TX	FE-22-96

57	1,5		10/07/96	UP	Eagle Pass, TX	FE-24-96
58		Employee Tripping,… Drugs and Alcohol	12/16/96	UP	Clinton, IA	FE-30-96
59		Unsecured Cars	12/18/96	IC	Chicago, IL	FE-31-96
60		Employee Tripping,…	01/12/97	UP	S Fontana, CA	FE-02-97
61	4		01/29/97	UP	Mason City, IA	FE-04-97
62	2		02/02/97	CR	Burns Harbor, IN	FE-05-97
63	4		06/06/97	CMRC	Bay City, MI	FE-16-97
64		Unexp. Movement of Railcars	06/24/97	NS	Rowesville, SC	FE-19-97
65		Employee Tripping,…	06/24/97	UP	Portland, OR	FE-18-97
66		Struck by Mainline Trains	07/18/97	MNCW	Stamford, CT	FE-22-97
67	1		08/15/97	UP	Elko, NV	FE-25-97
68	5		10/16/97	MRL	Laurel, MT	FE-32-97
69		Struck by Mainline Trains	12/02/97	BNSF	Emporia, KS	FE-36-97
70	4		12/26/97	UP	Boise, ID	FE-45-97
71		Drugs and Alcohol	01/24/98	BNSF	Omaha, NE	FE-02-98
72	2		02/04/98	BRC	Bedford Park, IL	FE-05-98
73	1		05/26/98	BRC	Bedford Park, IL	FE-15-98
74	2,5		06/01/98	BNSF	Lubbock, TX	FE-16-98
75	1		06/05/98	NS	Hapeville, GA	FE-17-98
76		Close Clearance	07/01/98	NS	Buechel, KY	FE-19-98
77		Miscellaneous	10/26/98	CCP	Cicero, IL	FE-28-98
78	4		12/28/98	IC	Durrant, MS	FE-37-98
79	3,4		01/12/99	CR	Port Newark, NJ	FE-01-99
80		Environment	01/22/99	CR	Alexander, NY	FE-03-99
81		Struck by Motor Vehicle…	02/17/99	KCS	Kansas City, MO	FE-05-99
82	3		04/02/99	DME	Waseca, MN	FE-11-99
83		Equipment	04/09/99	UP	Richland, WA	FE-12-99
84	5		05/19/99	NS	Cincinnati, OH	FE-14-99
85	1,4		06/23/99	UP	Redding, CA	FE-16-99
86	1,5		09/14/99	AM	Van Buren, AR	FE-24-99
87		Unexp. Movement of Railcars	11/17/99	UP	Lincoln, NE	FE-32-99
88		Environment	01/02/00	CIRR	Cedar Springs, GA	FE-02-00
89	1		03/09/00	IHB	Riverdale, IL	FE-09-00
90		Free-Rolling Railcars	04/21/00	BNSF	Galesburg, IL	FE-13-00
91		Close Clearance	05/22/00	CSX	Richmond, VA	FE-16-00
92		Miscellaneous	05/31/00	UP	Pine Bluff, AR	FE-17-00
93	1		07/07/00	CKRY	Wichita, KS	FE 21-00
94	4		07/24/00	PARN	Skagway, AK	FE-22-00
95		Close Clearance	07/28/00	UP	St. Louis, MO	FE-23-00

96	2		08/11/00	BNSF	Port of Los Angeles, CA	FE-25-00
97	4		09/09/00	BNSF	Keokuk, IA	FE-29-00
98	3		10/15/00	UP	Houston, TX	FE-30-00
99		Struck by Mainline Trains	12/28/00	UP	Dupo, IL	FE-32-00
100		Struck by Mainline Trains	12/29/00	BNSF	Gillette, WY	FE-33-00
101	5		01/10/01	CSX	Chicago, IL	FE-02-01
102	3		01/11/01	NS	South Fork, PA	FE-03-01
103	1		03/03/01	BNSF	Willmar, MN	FE-08-01
104		Miscellaneous	04/08/01	BNSF	Clark, OK	FE-14-01
105		Free-Rolling Railcars	07/13/01	CPRS	Bensenville, IL	FE-21-01
106		Close Clearance	10/10/01	PAL	Clayburn, KY	FE-31-01
107		Struck by Motor Vehicle…	12/22/01	NS	Eden, NC	FE-39-01
108		Close Clearance	12/24/01	NS	Lynchburg, VA	FE-40-01
109		Struck by Mainline Trains Close Clearance Struck by Mainline Trains	03/21/02	NS	Claymont, DE	FE-09-02
110	1		05/14/02	UP	Pine Bluff, AR	FE-12-02
111	1,3,5		06/16/02	BNSF	Memphis, TN	FE-16-02
112	4		07/16/02	NS	Bonlee, NC	FE-17-02
113	2		08/08/02	CWRO	Cleveland, OH	FE-19-02
114		Unexp. Movement of Railcars	09/02/02	CSX	Madisonville, KY	FE-22-02
115	2		02/11/03	CNIC	Flat Rock, MI	FE-03-03
116		Free-Rolling Railcars	02/16/03	CSX	Syracuse, NY	FE-04-03
117		Unsecured Cars	02/18/03	CSX	Cheektowaga, NY	FE-05-03
118	3		04/11/03	UP	Pocatello, ID	FE-11-03
119		Struck by Motor Vehicle…	06/06/03	CSX	Kingsport, TN	FE-12-03
120	1		08/26/03	LC	Chester, SC	FE-20-03
121	5		09/12/03	GC	Dublin, GA	FE-22-03
122		Equipment	09/14/03	UP	Ogden, UT	FE-23-03
123		Miscellaneous	09/24/03	BNSF	Fresno, CA	FE-25-03
124		Unexp. Movement of Railcars	12/07/03	UP	San Antonio, TX	FE-35-03

3.4 Narratives of the 124 Switching Fatalities

The narratives for the 124 switching fatalities that occurred from January 1992 through December 2003 are given below. These narratives were written by the SWG as part of its review of each switching fatality. Those narratives involving Recommendations are presented under the applicable Recommendation. Potentially, these 64 fatalities could have been averted by application of the Recommendation(s). The Special Switching Hazard fatality cases are presented under the eleven groupings that describe the fatal event or condition.

Switching Fatalities Involving Operating Recommendations

Recommendation 1

Any crew member intending to foul track or equipment must notify the locomotive engineer before such action can take place. The locomotive engineer must then apply locomotive or train brakes, have the reverser centered, and then confirm this action with the individual on the ground. Additionally, any crew member that intends to adjust knuckles/drawbars, or apply or remove EOT device, must insure that the cut of cars to be coupled into is separated by no less than 50 feet. Also, the person on the ground must physically inspect the cut of cars not attached to the locomotive to insure that they are completely stopped and, if necessary, a sufficient number of hand brakes must be applied to insure the cut of cars will not move.

Lifesaver 1

Secure equipment before action is taken.

June 20, 1992 – CNW - Northlake, IL FE-18-92 Recommendation 1
Crew was in the process of coupling cars together in a class track. Standing equipment was not properly secured before conductor fouled the track to adjust couplers and the equipment rolled back in and coupled him up.

October 17, 1994 – UP - Donaldsonville, LA FE-26-94 Recommendation 1
Crew switching in class yard, brakeman attempted to cross between equipment separated by an insufficient distance, and engineer moved locomotive in the wrong direction, coupling him up.

December 13, 1994 – UP – Thorton, CA FE-32-94 Recommendation 1
Crew coupling up cars in an industry track, brakeman attempted to couple air between cars when unexpected movement of railcars occurred, resulting in his fatal injury.

February 24, 1995 – Amarillo, TX FE-11-95 Recommendation 1
also Recommendation 2
Two crews working in the same yard from opposite ends, one crew dropped ten free rolling cars in on top of the cut where the other crew's foreman was installing the E.O.T. at the opposite end. Cars impacted with sufficient force to knock down and run over the foreman.

March 02, 1995 –NS – Aiken, SC FE-12-95 Recommendation 1
also Recommendation 3
Switch crew was pulling a cut of cars out of an industry. Brakeman stepped in track gauge to open knuckle on the rear car at the same time crew shoved back to kick two cars that ran over the brakeman.

October 04, 1995 – CSX – Riverdale, IL FE-29-95 Recommendation 1
also Recommendation 5
Crew performing switching in class yard. Switch foreman placed himself between the rails to adjust a misaligned coupler on the fifteenth car after the cut was stretched. Switch foreman was facing the coupler with his back to a cut of seven cars that rolled in on top of him and coupled him up.

March 20, 1996 – BRC – Bedford Park, IL FE-09-96 Recommendation 1
also Recommendation 5

Three-person crew was switching in class yard, coupling between sixth and seventh car failed to couple. Conductor stopped locomotive and went between the cars to straighten the drawbar, and twenty-three cars rolled in behind him and coupled him up.

October 07, 1996 – UP – Eagle Pass, TX FE-24-96 Recommendation 1
also Recommendation 5

Three-person crew was switching in class yard, locomotive failed to couple to cut of seven standing cars. Yard foreman used hand signals to separate the locomotive by twenty feet. While adjusting the locomotive drawbar, the seven cars rolled in and coupled him up.

August 15, 1997 – UP – Elko, NV FE-25-97 Recommendation 1

Crew was switching in class yard. Helper was attempting to adjust the drawbar in order to couple to three cars about forty feet away that had not coupled the first time. While adjusting the drawbar, the helper did not notice the three free-rolling cars coming back in on him and the cars coupled him up.

May 26, 1998 – BRC – Bedford Park, IL FE-15-98 Recommendation 1

Crew was working in one track in class yard with helper controlling engine moves, conductor was adjusting coupler when three free rolling cars struck him from behind and coupled him up.

June 05, 1998 – NS – Hapeville, GA FE-17-98 Recommendation 1

A three-person crew was performing industrial switching using a runaround track, the yard foreman was attempting to couple up two super-cushion boxcars in a curve with power attached in a shove movement. Drawbars bypassed and yard foreman was crushed between the ends of the two cars.

June 23, 1999 – UP - Redding, CA FE-16-99 Recommendation 1
also recommendation 4

A three-person switching crew was shoving a cut of cars down a track with the intent of coupling to another cut that was sitting in the track. It was hard to shove the cars and the conductor told the brakeman to look for closed angle cocks. The brakeman found a closed angle cock when the shove move was within two car lengths of a coupling and opened it. The conductor was crushed and killed between the leading car of the shove and the head car to be coupled to when the shove move unintentionally accelerated just prior to coupling.

September 14, 1999 – AR - Van Buren, AR FE-24-99 Recommendation 1
also Recommendation 5

A two-person switching crew was in the process of shoving ten cars onto a clear track, with the intention of cutting three off, and pulling the other seven cars out. The conductor counted down the cars via radio, and the engineer stopped one half-car lengths after the last radio transmission of one-half cars to go. Subsequently, the engineer discovered that the conductor had stepped in between the cars and had been coupled up.

March 09, 2000 – IHB – Riverdale, IL FE-09-00 Recommendation 1

The employee was struck by an unsecured cut of cars that rolled into him while he was attempting to adjust the coupler or drawbar.

July 07, 2000 – CKRY – Wichita, KS FE-21-00 Recommendation 1
Employee was struck by his own train when he tripped and fell onto the rail as he stepped in between moving equipment to open a knuckle while walking backwards.

March 03, 2001 – BNSF – Willmar, MN FE-08-01 Recommendation 1
The switchman of a three-person yard switching crew made a cut on a block of cars sitting on a yard track and told the engineer to pull the cars out. Apparently, as the cars were being pulled out, the switchman stepped between the gauge of the track and was struck and killed by the remaining cars on the track that had begun to roll in the same direction as the cars being pull out of the track.

May 14, 2002 – UP – Pine Bluff, AR FE-12-02 Recommendation 1
The switchman of a three-person yard switching crew asked the engineer to stretch a track. Noticing that there was a separation between the forth and fifth head cars, the switchman went in to align the couplers. The switchman was coupled up when unsecured cars rolled in on him.

June 16, 2002 – BNSF - Memphis, TN FE-16-02 Recommendation 1
also Recommendation 3 and 5
A yard foreman, with 18-months of service, along with his helper, engineer, and a utility employee had just finished making up a train in the yard. However, the crossover from the track on which the train had been made had to be cut. This last minute instruction led to an increased level of conversation among the crew, yard foreman, utility employee and the yardmaster. The yard foreman jumped on a ATV, rode it to the cut point, separated the train; and, when the cut not attached to the locomotive rolled, he was caught between the two sections of the train and killed.

August 26, 2003 – LC – Chester, SC FE-20-03 Recommendation 1
A three-person crew that included a brakeman trainee was switching an industry when the conductor requested a short backup move when the cars he intended to couple to did not couple. A short time later and after failed attempts to contact the conductor the trainee discovered him dead and lying between the cars he had been trying to couple together.

Recommendation 2
When two or more train crews are simultaneously performing work in the same yard or industry tracks, extra precautions must be taken:

SAME TRACK
Two or more crews are prohibited from switching into the same track at the same time, without establishing direct communication with all crew members involved.

ADJACENT TRACK
Protection must be afforded when there is the possibility of movement on adjacent track(s). Each crew will arrange positive protection for (an) adjacent track(s) through positive communication with yardmaster and/or other crew members.

Lifesaver 2
Protect employees against moving equipment.

July 24, 1992 – GBW – Wisconsin Rapids, WI FE-30-92 Recommendation 2
also Recommendation 3

The road job's brakeman was trying to help the switch crew make up his train. The brakeman was in between cars on an active track being used by the switch crew and was killed when the cars he was between moved upon being struck by a cut of free rolling cars.

August 12, 1993 – ATSF – Evandale, TX FE-31-93 Recommendation 2

Upon detraining, brakeman was struck and killed by another railroad's yard job working in the same small yard. Members of both crews saw each other but the brakeman apparently did not see the short line crews shove move.

January 20, 1994 – UP – Fall City, NE FE-06-94 Recommendation 2

Conductor riding side of two cars to be kicked, he moves to the opposite side of car to work hand brake and is immediately struck by locomotives standing on adjacent track creating a no-clearance condition. Conductor was not aware that the locomotives had arrived at that location since he had last been there.

December 06, 1994 – CR – Campbell Hall, NY FE-31-94 Recommendation 2
also Recommendation 4 and 5

First local had left the immediate location of the work area to be used by the second local without notifying the second local of the position of the switches, derails or returning the switches to a non-conflicting position. Second local shoving three cars and a caboose with a two-month trainee directing the move, struck standing equipment after traversing switches that were unexpectedly lined for the equipment.

February 24, 1995 – ATSF – Amarillo, TX FE-11-95 Recommendation 2
also Recommendation 1

Foreman of one job was installing the rear end marker on a cut of cars when the foreman of another job sent ten free rolling cars into the same track. The resulting impact caused all the cars to roll enough to knock down and kill the foreman who had been installing the marker.

May 03, 1995 – CSX – Evansville, IN FE-18-95 Recommendation 2

Conductor was struck and killed by a shove move on the track adjacent to where he was working. Communication about the move on that adjacent track had been conveyed to the conductor via the "bleeder," a utility type employee.

February 02, 1997 – CR – Burns Harbor, IN FE-05-97 Recommendation 2

Two yard jobs working on adjacent tracks. The conductor of one is studying his switch list as the other job is shoving into the adjacent track. Conductor is struck and killed by the lead car of the adjacent track shove move.

February 04, 1998 – BRC – Bedford Park, IL FE-05-98 Recommendation 2

Conductor and switchman making hoses on track 12, last transmission by conductor is "I think I got all the hoses after that next one…." Conductor later found to have been struck and killed by a free rolling car on the adjacent track.

June 01, 1998 – BNSF – Lubbock, TX FE-16-98 Recommendation 2
also Recommendation 5
Two yard engines working on adjacent tracks. One left a car fouling a clear track being used by the other engine. The foreman directing the shove move of the lite locomotives was crushed when his engine consist cornered the car fouling the adjacent track.

August 11, 2000 – BNSF – Port of Los Angeles, CA FE-25-00 Recommendation 2
Employee was struck and killed by the lead car of another switching movement that was operating on the adjacent yard track.

August 08, 2002 – CWRO – Cleveland, OH FE-19-02 Recommendation 2
A two-person crew was switching cars in a yard and, without the trainman's knowledge, another switching crew had set cars into a track adjacent to the one being used by the first crew. The set out included a wide ladle car and it created a clearance issue on the adjacent track. Some time later, the trainman was riding the lead car down the track adjacent to the wide ladle car and was killed when he was rolled between the car he was riding and the wide ladle car sitting on the adjacent track.

February 11, 2003 – CNIC – Flat Rock, MI FE-03-03 Recommendation 2
A three-person crew (engineer, conductor, brakeman) were stopped and the engineer and conductor were awaiting the brakeman's return from the "Trim Shanty". During this time, another crew was in the process of shoving a cut of cars down a track that was located between where the brakeman's crew were waiting and the Shanty. The brakeman exited the Shanty and was struck by the shove move as he crossed the tracks to get to his crew. The shove move was being preceded by two of the striking train's crew who were riding in a van at the time.

Recommendation 3
At the beginning of each tour of duty, all crew members will meet and discuss all safety matters and work to be accomplished. Additional briefings will be held any time work changes are made and when necessary to protect their safety during their performance of service.

Lifesaver 3
Discuss safety at the beginning of a job or when a project changes.

July 24, 1992 – GBW – Wisconsin Rapids, WI FE-30-92 Recommendation 3
also Recommendation 2
Crew performing switching in class yard while road brakeman from another crew was coupling air hoses in a track without proper precautions and protection. Yard crew switched into the track and equipment ran over the road brakeman.

June 07, 1993 – IC – Fulton, KY FE-23-93 Recommendation 3
Crew performing switching duties in class yard failed to have a clear understanding of movements being made. Results were that the rear brakeman was run over by moving equipment. There were no witnesses, but a hand brake was applied. It was thought that the brakeman had gone between the equipment on the ground to release the low hand brake.

August 11, 1993 – SP – Tracy, CA FE-30-93 **Recommendation 3**
also Recommendation 4

Crew performing industry switching. Brakeman attempted to couple air hoses while conductor gave engineer instructions to shove the movement. Resulting movement was unexpected to brakeman who was fatally injured.

November 13, 1993 – GC – Macon, GA FE-47-93 **Recommendation 3**
also Recommendation 5

Trainmaster became involved with crew performing switching in class yard without knowledge of the conductor who was coupling air hoses on a cut of cars. Cars were shoved without his knowledge while he was in the foul of the movement. Movement ran over conductor and killed him.

December 05, 1993 – SOU – Atlanta, GA FE-49-93 **Recommendation 3**

Change in operating procedure between two crews swapping equipment resulted in conductor being struck by unexpected movement while he was in the foul of the track.

November 15, 1994 – CR – Painted Post, NY FE-29-94 **Recommendation 3**
also Recommendation 4

Crew switching in class yard failed to establish and maintain effective communications. Subsequent changes in switching line-up by the conductor resulted in trainman who was in the foul of Track 7 being struck by unexpected movement of equipment.

February 17, 1995 – CR – St. James, OH FE-09-95 **Recommendation 3**
also Recommendation 4

Arbitrary change in switching operations by conductor resulted in him being unexpectedly struck and fatally injured by approaching cars while he was fouling the track.

March 02, 1995 – NS – Aiken, SC FE-12-95 **Recommendation 3**
also Recommendation 1

Switching crew was pulling cut of cars out of an industry. No clear understanding of moves to be done by crew members resulted in brakeman being run over when he stepped in track gauge to open knuckle on the rear car of a cut and the locomotive engineer shoved that cut back over him.

January 12, 1999 – CR – Port Newark, NJ FE-01-99 **Recommendation 3**
also Recommendation 4

A three-person industry switching crew was in the process of switching cars back and forth over a private crossing equipped with an in-ground hand throw switch. The brakeman was at the switch and the conductor was going back and forth from one set of cars to another. The conductor shouted to the brakeman that he wanted the next move down one track but the cars started down the other. The brakeman tried to warn the conductor who had his back to the move and then stopped the move but to late to save the conductor who was hit and run over by the leading car of the shove.

April 02, 1999 – DME – Waseca, MN FE-11-99 **Recommendation 3**

A three-person yard switching crew was switching and the conductor was pulling pins while the brakeman was taking orders from him and working the yard tracks during a flat switching operation. The conductor cut off three cars that rolled into other cars on the track. The brakeman was run over by these cars.

October 15, 2000 – UP – Houston, TX FE-30-00 Recommendation 3
Employees failed to discuss movement, resulting in employee falling from locomotive platform and being rolled between the locomotive and the elevated walkway.

January 11, 2001 – NS – South Fork, PA FE-03-01 Recommendation 3
The engineer and conductor of a road train were told to stop and check their locomotives for flat spots. Once stopped, and without a job briefing the locomotive engineer left the lead unit and shortly thereafter, was struck and killed by a passing mainline train.

June 16, 2002 – BNSF – Memphis, TN FE-16-02 Recommendation 3
also Recommendation 1 and 5
A yard foreman, with 18-months of service, along with his helper, engineer and a utility employee had just finished making up a train in the yard. However, the crossover from the track on which the train had been made had to be cut. This last minute instruction led to an increased level of conversation among the crew, yard foreman, utility employee and the yardmaster. The yard foreman jumped on a ATV, rode it to the cut point, separated the train; and, when the cut not attached to the locomotive rolled, he was caught between the two sections of the train and killed.

April 11, 2003 – UP – Pocatello, ID FE-11-03 Recommendation 3
A road conductor was riding the point of a 122-car shove down a track that was partially out of service. The out of service portion was marked by a red flag and derail. The crew was not able to stop the movement before the car being ridden by the conductor went over the derail, landed on its side and crushed the conductor to death.

Recommendation 4
When using radio communication, locomotive engineers must not begin any shove move without a specified distance from the person controlling the move. Strict compliance with "distance to go" communication must be maintained.

When controlling train or engine movements, all crew members must communicate by hand signals or radio signals. A combination of hand and radio signals is prohibited. All crew members must confirm when the mode of communication changes.

Lifesaver 4
Communicate before action is taken.

January 28, 1992 – BN - Willmar, NM FE-03-92 Recommendation 4
A four-person crew (engineer, switch foreman, 2 switchman) had just shove cars into track 11 and held onto one for track 9. The switch foreman got the switch for 9, noticed his front switchman standing near cars on track 11, and rode the locomotive onto the lead. After the 11th switch was lined for the lead, the switch foreman kicked the single car into track 9. The front switchman was struck and killed by the free rolling car.

March 11, 1992 – FEC – Fort Pierce, FL FE-08-92 Recommendation 4
This case involved the conductor riding a car into Track 8. The car derailed at the spiked switch and the conductor was subsequently killed. The conductor's last radio transmission was "…we're lined in eight rail, three or four cars to a joint." Movement stopped after car had derailed and side swiped adjacent car.

June 01, 1992 – ATSF – Escondido, CA FE-14-92 Recommendation 4
Brakeman had control of the move and told the engineer, by radio, to back up six cars to a coupling. The brakeman assumed that the conductor would "pick-up" the move when it came into his (the conductor's) view. The movement continued until it struck sitting cars on the track which, when moved, killed the conductor who was in between them.

July 25, 1992 – UP – Portland, OR FE-22-92 Recommendation 4
A three-person crew had arrived at the yard, pulled their train into a track, cut off the engines and were given permission to return to the other end of the yard via an adjacent clear track. The conductor remained on the end originally entered and the brakeman stayed with the engineer. The brakeman got what he thought was the proper switch, instructed the engineer by radio to back up and, apparently turned his back on the move. Before the brakeman had a chance to mount the returning locomotives, he was struck and killed by the movement that continued for 400 feet before stopping when the engineer noticed the brakeman between the gauge of the rail in front of the locomotives.

July 15, 1993 – CR – Anderson, IN FE-26-93 Recommendation 4
After the brakeman had tied the locomotives onto a cut of cars in the yard, the engineer received an instruction, via radio, from the brakeman to "shove to hold more cars." The engineer began to shove and didn't stop until he was on the other end of the track. The brakeman was run over by the shove move. There was no evidence of any other radio transmissions concerning the shove move.

August 11, 1993 – SP – Tracy, CA FE-30-93 Recommendation 4
also Recommendation 3
Crew performing industry switching. Brakeman attempted to couple air hoses while conductor gave engineer instructions to shove the movement. Resulting movement was unexpected to brakeman who was fatally injured.

November 15, 1994 – CR – Painted Post, NY FE-29-94 Recommendation 4
also Recommendation 3
Trainman and conductor working together with two locomotives and involved in switching a few cars, between three different tracks, using a mixture of hand and radio signals. Conductor tells the trainman his instructions by radio and instructs the engineer by hand signals. The engineer moves on a hand signal to back up, the conductor boards the locomotives and the movement continues without further instruction until it runs into a cut of cars that the trainman was apparently fouling, killing the trainman. Engineer thought he would hear, by radio, from the trainman.

December 06, 1994 – CR – Campbell Hall, NY FE-31-94 Recommendation 4
The brakeman trainee was on the caboose to direct the shove move of the three engines, three cars and a caboose toward Track 1 in the yard. The shove move continued although the only radio transmission after getting the move started was "the derail is off." The movement, which reached approximately 19

mph, struck standing equipment after diverging through two mis-aligned switches and killed the brakeman trainee.

February 17, 1995 – CR – St. James, OH FE-09-95 Recommendation 4
also Recommendation 3

Conductor instructs engineer, by radio, to "come ahead" (position of controlling locomotive causes this instruction to result in a shove move) with the same cars that he had just come out of the track with. There are no other radio transmissions from the conductor and eventually, the trainman, standing at the other two cars on the same track that was just pulled, directs the move to re-couple figuring that the conductor changed his mind. The movement traveled approximately eleven car lengths prior to coupling.

January 29, 1997 – UP – Mason City, IA FE-04-97 Recommendation 4

Conductor and engineer were moving toward engine house area with lite engines and using hand signals. The conductor stopped the movement to line a switch. The engineer while waiting heard and acted upon an unidentified radio transmission "come ahead 21." The engineer initiated the shove movement and eventually, the conductor was struck from behind and killed.

June 06, 1997 – CMRC – Bay City, MI FE-16-97 Recommendation 4

Conductor began a move using radio communication to shove a cut of cars approximately twenty-five car lengths to a coupling. After the move had begun the engineer didn't hear another radio transmission from his conductor. The shove move eventually collided with the cars that were to be coupled to. The conductor was crushed in the collision and it was later determined that the portable radio being used by the conductor may have lost enough of its charge to effect the transmission.

December 26, 1997 – UP – Boise, ID FE-45-97 Recommendation 4

Conductor was riding equipment while setting hand brakes. Move was being shoved; improper radio communication.

December 28, 1998 – IC – Durrant, MS FE-37-98 Recommendation 4

Shove movement was not properly controlled by radio communication and resulted in a collision with a fallen tree which caused the derailment and death of the conductor.

January 12, 1999 – CR - Port Newark, NJ FE-01-99 Recommendation 4
also Recommendation 3

A three-person industry switching crew was in the process of switching cars back and forth over a private crossing equipped with an in-ground hand throw switch. The brakeman was at the switch and the conductor was going back and forth from one set of cars to another. The conductor shouted to the brakeman that he wanted the next move down one track but the cars started down the other. The brakeman tried to warn the conductor who had his back to the move and then stopped the move but to late to save the conductor who was hit and run over by the leading car of the shove.

June 23, 1999 – UP - Redding, CA FE-16-99 Recommendation 4
also Recommendation 1

A three-person switching crew was shoving a cut of cars down a track with the intent of coupling to another cut that was sitting in the track. It was hard to shove the cars and the conductor told the brakeman to look for closed angle cocks. The brakeman found a closed angle cock when the shove

move was within two car lengths of a coupling and opened it. The conductor was crushed and killed between the leading car of the shove and the head car to be coupled to when the shove move unintentionally accelerated just prior to coupling.

July 24, 2000 – PARN – Skagway, AK FE-22-00 Recommendation 4
A two-person yard switching crew was in the process of moving their light locomotives to a track where it was to be stored for the night. The conductor was on the leading end of the unit and directing the move by radio communication. After instructing the engineer to stop, the conductor got off the locomotive, lined two switches and told the engineer to back up. The engineer backed up until he placed the unit at the location where it is always left without further radio contact from his conductor. The conductor was struck and killed by the locomotive and found, by the engineer, under the locomotive's fuel tanks.

September 09, 2000 – BNSF - Keokuk, IA FE-29-00 Recommendation 4
While shoving one car into an industry site, and using radio communication, the switch foreman was run over by the leading wheel as the shove move continued until coupling was made.

July 16, 2002 – NS - Bonlee, NC FE-17-02 Recommendation 4
While shoving lite engines back to train on mainline, employees failed to control the movement by radio, resulting in a collision with a standing train.

Recommendation 5
Crew members with less than one year of service must have special attention paid to safety awareness, service qualifications, on-the-job training, physical plant familiarity, and overall ability to perform service safely and efficiently. Programs such as peer review, mentoring, and supervisory observation must be utilized to insure employees are able to perform service in a safe manner.

Lifesaver 5
Mentor less experienced employees to perform service safely.

January 30, 1992 – AGC – Polk County, FL FE-04-92 Recommendation 5
Industry switch crew, engineer and two flagmen, both flagmen rode the lower steps of the leading end of the lead locomotive. FE (flagman) was on left side, the other flagman on right side. After 2000 feet into this lite engine movement the surviving flagman noticed the FE stopped talking and he crossed over to the FE's side and saw FE lying next to the track behind movement. Investigation showed FE either slipped off the fireman's side or tripped while dismounting or attempting to remount from the fireman's side. FE had six months experience.

June 02, 1992 – IHRC – Henderson, KY FE-16-92 Recommendation 5
A two-person crew was switching an industry. The conductor had 11 months service with the railroad and, as the last move of the night, was to pull one car and set another in its place. As he set out the car and separated it from the car to go into the spot location, it began to roll away. He chased after it, tried to mount the end of the car with the handbrake and was killed when he slipped and fell under the car.

October 19, 1993 – SOO – Leal, ND FE-40-93 Recommendation 5

A three-person train crew was in the process of picking up 18 cars off a siding. The trainman had 10 weeks of experience, forgot to remove the derail, and was killed when the leading car he was riding derailed on top of him. During the stop, the conductor remained in the cab of the lead locomotive with the engineer.

November 13, 1993 – GC – Macon, GA FE-47-93 Recommendation 5

also Recommendation 3

Trainmaster became involved with crew performing switching in class yard without knowledge of the conductor who was coupling air hoses on a cut of cars. Cars were shoved without his knowledge while he was in the foul of the movement. Movement ran over conductor and killed him.

November 10, 1994 – PTRA – Houston, TX FE-28-94 Recommendation 5

Yard switch crew, engineer, conductor and brakeman, spotting paper mill. FE (brakeman) instructed by conductor to de-train and stay at road crossing while he spotted track. FE found in nearby wood chip auger/conveyer system after mill crew started up the system while crew searched for missing FE. Mill crew was instructed by conductor not to start equipment until FE was located. FE was not familiar with the dangers associated with this mill process. FE had 5 months experience.

December 06, 1994 – CR – Campbell Hall, NY FE-31-94 Recommendation 5

also Recommendation 2 and 4

First local had left the immediate location of the work area to be used by the second local without notifying the second local of the position of the switches, derails or returning the switches to a non-conflicting position. Second local shoving three cars and a caboose with a two-month trainee directing the move, struck standing equipment after traversing switches that were unexpectedly lined for the equipment.

October 04, 1995 – CSX – Riverdale, IL FE-29-95 Recommendation 5

also Recommendation 1

Crew performing switching in class yard. Switch foreman, with 5 months service, placed himself between the rails to adjust a misaligned couple on the fifteenth car after the cut was stretched. Switch foreman was facing the coupler with his back to a cut of seven cars that rolled in on top of him and coupled him up.

March 20, 1996 – BRC – Bedford Park, IL FE-09-96 Recommendation 5

also Recommendation 1

Three-person crew was switching in class yard, coupling between sixth and seventh car failed to couple. Conductor stopped locomotive and went between the cars to straighten the drawbar, and twenty-three cars rolled in behind him and coupled him up.

June 15, 1996 – CSX – Charlotte, NC FE-12-96 Recommendation 5

Yard crew, engineer, conductor and switchman, switching at an industry. While crew was shoving two cars to a spot inside an industry building, FE (switchman) was rolled between lead box car and unloading platform. Platform or building was not marked with any type of ‘no-clearance’ or ‘close clearance’ signage. FE was last seen by the conductor on the ground next to movement in a ‘cut-out’ space in the unloading platform. The conductor reported that there is enough room for a man to clear

the movement in this 'cut-out'. After hearing a strange noise the conductor instructed engineer to stop the movement. FE was rolled for 21 feet between boxcar and platform. FE had one year of experience.

July 07, 1996 – NS – Sidney, IN FE-17-96 Recommendation 5
Road crew, engineer and conductor, while stopped on siding track to meet an opposing train, FE (conductor) detrained to perform a roll-by inspection of other train. FE stepped off his train shortly before opposing trains arrival then stood in that trains track while trying to adjust his portable radio. Opposing train struck FE at this point. FE had one year of experience.

September 03, 1996 – DGNO – Dallas, TX FE-22-96 Recommendation 5
Yard switch crew, engineer, conductor and brakeman, while switching at an industry on a downhill grade experienced an unwanted run away car. While FE (brakeman) was in position on a car and setting a hand brake, the car started to roll away from the crew. FE continued to try to apply hand brake in an effort to stop the car. When discovering that the car was rolling away, the conductor attempted to slow and stop it by putting wood blocks under the wheels. The car accelerate to 30 to 35 mph. FE did not detrain before car collided with seven other cars at that speed. FE had three weeks experience.

October 07, 1996 – UP – Eagle Pass, TX FE-24-96 Recommendation 5
also Recommendation 1
Three-person crew was switching in class yard, locomotive failed to couple to cut of seven standing cars. Yard foreman used hand signals to separate the locomotive by twenty feet. While adjusting the locomotive drawbar, the seven cars rolled in and coupled him up.

October 16, 1997 – MRL – Laurel, MT FE-32-97 Recommendation 5
Yard switch crew, engineer, switch foreman and switchman, were shoving a cut 41 cars up a grade to a stop. While this was taking place the ground crew boarded the first two cars so they could apply the hand brakes. FE (switchman) fell off the first car while attempting this. This car was found to have a brake platform with a decreasing width. Under the hand brake this platform was found to be 2 inches under the required width over a length of about 30 inches. FE had 10 months experience.

June 01, 1998 – BNSF – Lubbock, TX FE-16-98 Recommendation 5
also Recommendation 2
Two yard engines working on adjacent tracks. One left a car fouling a clear track being used by the other engine. The foreman directing the shove move of the lite locomotives was crushed when his engine consist cornered the car fouling the adjacent track.

May 19, 1999 – NS – Cincinnati, OH FE-14-99 Recommendation 5
A conductor with one year of service was riding in the stairwell of the leading locomotive. He was directing the move by radio when he realized to late that the move would not clear the standing equipment. He was crushed between the handrail of his locomotive and the standing locomotive.

September 14, 1999 – AM – Van Buren, AR FE-24-99 Recommendation 5
also Recommendation 1
A two-person switching crew was in the process of shoving ten cars onto a clear track, with the intention of cutting three off, and pulling out the other seven out. The conductor counted down the cars via radio, and the engineer stopped one half-car lengths after the last radio transmission of one-

half cars to go. Subsequently, the engineer discovered that the conductor had stepped in between the cars and had been coupled up.

January 10, 2001 – CSX – Chicago, IL FE-02-01 Recommendation 5
Conductor with 14-months service was struck and killed by passing mainline train while attempting to board locomotive at crew-change point.

June 16, 2002 – BNSF – Memphis, TN FE-16-02 Recommendation 5
also Recommendation 1 and 3
A yard foreman, with 18-months of service, along with his helper, engineer and a utility employee had just finished making up a train in the yard. However, the crossover from the track on which the train had been made had to be cut. This last minute instruction led to an increased level of conversation among the crew, yard foreman, utility employee and the yardmaster. The yard foreman jumped on a ATV, rode it to the cut point, separated the train; and, when the cut not attached to the locomotive rolled, he was caught between the two sections of the train and killed.

September 12, 2003 – GC – Dublin, GA FE-22-03 Recommendation 5
A two-person train crew was in the process of setting off and picking up cars in a small yard. The conductor, who had 8 weeks of experience, was killed when the leading car of the shove struck him as he stepped into its path.

Switching Fatalities Involving Special Switching Hazards

Sixty switching fatalities that occurred from January 1992 through December 2003, did not involve circumstances associated with the Five Operating Recommendations. These fatality cases have been classified by the SWG into eleven groups (one group is a miscellaneous group) based on a sequence of events leading up to the fatality, such as being struck by mainline train; or by a fatality event characteristic, such as drugs or alcohol. The SWG believes an employee's awareness of the Special Switching Hazards identified in the grouping will insure their safety and that of their crew members.

Five of the Special Switching Hazard cases were classified under two groups: FE-15-92 was classified under 'Employee Tripping, Slipping, Falling' and 'Unsecured Cars'; FE-46-93, 'Unsecured Cars' and 'Drugs and Alcohol'; FE-30-96, 'Drugs and Alcohol' and 'Employee Tripping, Slipping, Falling'; FE-40-01, 'Close Clearance' and 'Struck by Mainline Trains'; FE-09-02, 'Close Clearance' and 'Struck by Mainline Trains'. Such multiple classification reflects long sequence of actions and background conditions that can lead to switching fatalities.

The SWG narratives of each fatality are presented below, classified by related event or characteristic into eleven groups:

- Close Clearance
- Struck by Mainline Trains
- Free Rolling Railcars
- Employee Tripping, Slipping, Falling
- Struck by Motor Vehicle or Loading Device
- Unsecured Cars
- Environment
- Drugs and Alcohol

- Unexpected Movement of Railcars
- Equipment
- Miscellaneous

Close Clearance

August 04, 1993 – UP – Pryor, OK FE-27-93 Close Clearance
A three-person industrial switching crew was shoving three cars down a track. The conductor was on the ground, ahead of the move and the brakeman was riding the side of the leading end of the leading car. A bush created a clearance issue and the brakeman stepped around the side of the leading car to the end of the car just as it began to derail. The brakeman was killed when he fell from the derailing car.

April 12, 1994 – SP – Houston, TX FE-12-94 Close Clearance
A three-person switching crew was in the process of switching out the car repair shop. The foreman had taken a position on the trailing end of the third leading car as the move was being shoved into a track having a close clearance condition that involved a protective grate that covered a winch. The foreman was knocked off the car by the covering, fell in front of the leading wheels of the forth leading car, and was later pronounced dead at the hospital.

December 11, 1995 – NS – Toledo, OH FE-33-95 Close Clearance
A three-person crew was called to switch an industry that all were very familiar with. During the switching moves, the brakeman was inside an area with no clearances between the cars and the hand railings installed on the walls. He was making coupling and, according to the conductor and engineer, upon completion of that work, ordered the engineer to haul out of the building where the conductor would take over the next move to be performed. Subsequently, a plant employee observed the brakeman slumped beside the track, rushed to assistance, call 911 and notified the conductor that his man was down. The brakeman died later on at the hospital of crushing wounds incurred when he was rolled between the cars being pulled out and the railing.

December 14, 1995 – CSX – Monroe, NC FE-34-95 Close Clearance
A three-person crew (engineer, conductor & conductor trainee) was called to operate a local freight train. During a switching operation at a yard, the conductor was riding nine cars down a clear track and directing the shove move by radio. When the engineer did not hear any more radio transmissions from the conductor, he stopped the move and found the conductor dead and lying beside the track he had been shoving down. Post accident investigation revealed that he had been struck by a truck trailer door positioned on a flat car standing on an adjacent track and that had been left open and swinging freely. The investigation revealed that a vandal had broken into the trailer and stolen material from it.

July 01, 1998 – NS – Buechel, KY FE-19-98 Close Clearance
A three-person local switching crew (conductor, engineer and utility employee) had just begun to pull five cars out of an industrial loading dock while the conductor and the utility employee began to walk toward the door providing egress out of the dock area. Suddenly, according to the conductor, the utility employee allegedly tripped on some material on the dock, grabbed the side of the outgoing cut of cars and was pulled between the car he was holding onto and the handrail structure that accompanied the stairs leading from the platform to the door. He died two weeks later.

May 22, 2000 – CSX – Richmond, VA FE-16-00 Close Clearance

A three-person road switching crew was in the process of spotting loaded coal cars at a unloading facility that was equipped with a "shaker" that helped empty each car. The shaker's position causes a close clearance condition. The conductor was riding one side of the leading coal car and the brakeman was riding the other. Although having a clear view of the fouling equipment, the brakeman did not get off the car as the conductor had expected and was crushed between it and the fouling shaker equipment.

July 28, 2000 – UP – St. Louis, MO FE-23-00 Close Clearance

A three-person local switching crew was in the process of setting cars into a track within an industry. The switchman was riding the side ladder of the leading end of the leading car as it went into the building. The doorway would not clear a man riding on the side of the car and the trainman was killed as he was compressed between it and the car he was riding.

October 10, 2001 – PAL – Clayburn, KY FE-31-01 Close Clearance

A three-person, local freight train crew was switching a plant and had 2 engines 6 cars and a caboose when they moved over a small bridge and coupled to 5 standing cars in the storage track. The conductor made the coupling and told the engineer to pull the cars out of the track. The conductor got on the side of the trailing end of the second last car in the cut and was knocked off the car by a metal pole adjacent to the storage track. He fell between the car he was riding and the last car in the cut being pulled. He died when the lead wheels of the last car rolled over him.

December 24, 2001 – NS – Lynchburg, VA FE-40-01 Close Clearance

also Struck by Mainline Trains

A conductor, engineer and conductor in training had been transported to an unattended train standing on a siding a portion of which was in a tunnel adjacent to the main track. After storing their equipment, the conductor and the conductor in training left the locomotive to release hand brakes on the train. The conductor was killed when she failed to step in between two boxcars of her train as the conductor in training had done and was subsequently struck by a passing mainline train.

March 21, 2002 – NS – Claymont, DE FE-09-02 Close Clearance

also in Stuck by Mainline Trains

A locomotive engineer had been dropped off at the head end of his train while the conductor was taken to the rear to check on the REM. After crossing over the ATK corridor mainline tracks, and beginning to board his locomotive, the engineer was dragged off the stairs of the locomotive and killed by a passing 110 MPH passenger train.

Struck by Mainline Trains

July 07, 1992 – SSW – Colen Siding, TX FE-20-92 Struck by Mainline Trains

A two-person crew was called to deadhead to a siding and bring the train that was there and tied down into the yard. Upon arrival at the train, the conductor began releasing handbrakes on the train and the engineer began releasing handbrakes and inspecting the four head end locomotives. An approaching 60 MPH mainline train whistled for a highway crossing at grade and the conductor stopped what he was doing and positioned himself to do a roll by train inspection. His engineer was killed when he was struck by the passing train as he stepped out from between two of his units and began walking adjacent to, and in the foul of, the main track.

April 13, 1993 – CSX - Dwale, KY FE-13-93 Struck by Mainline Trains
A three-person crew reported for duty and was transported to a location where they took control of a mainline train. En-route, their work included swapping rear end marking devices. The brakeman apparently became confused, stepped into and began walking within the gauge of the main track, and was struck in the back by a passing mainline train.

July 18, 1997 – MNCW – Stamford, CT FE-22-97 Struck by Mainline Trains
A conductor/flagman was assigned to protect contractor workers that were installing construction poles near a passenger station platform. To better observe the work, the conductor/flagman placed himself within the gauge of a "live" main track and was struck and killed by a passing train.

December 02, 1997 – BNSF – Emporia, KS FE-36-97 Struck by Mainline Trains
The three-person crew had just finished making up their train at the yard. The conductor, for unknown reasons, had positioned himself on the "live" main trackside of his train, near the second and third locomotives. The conductor was struck and killed by a passing main track train that had approached the area from the opposite direction than that the conductor's train was to proceed.

December 28, 2000 – UP – Dupo, IL FE-32-00 Struck by Mainline Trains
A three-person yard switching crew was in the process of pulling cars down a long lead that ran parallel to a main track. The switchman was standing between the cars that were being pulled out onto the lead and the main track. While the cars were being moved, a main line train approached his location. The switchman, with nowhere to go, was struck by the passing main line train and killed by a blow to the head.

December 29, 2000 – BNSF – Gillette, WY FE-33-00 Struck by Mainline Trains
A two-person freight train crew was about to be passed by another freight train at a location on line-of-road. The conductor of the stopped train got up out of his seat, exited the leading locomotive and crossed over the track on which the on-coming train was proceeding. The conductor was struck and killed by the lead locomotive of the passing train.

December 24, 2001 – NS – Lynchburg, VA FE-40-01 Struck by Mainline Trains
also Close Clearance
A conductor, engineer and conductor in training had been transported to an unattended train standing on a siding a portion of which was in a tunnel adjacent to the main track. After storing their equipment, the conductor and the conductor in training left the locomotive to release hand brakes on the train. The conductor was killed when she failed to step in between two boxcars of her train as the conductor in training had done and was subsequently struck by a passing mainline train.

March 21, 2002 – NS – Claymont, DE FE-09-02 Struck by Mainline Trains
also in Close Clearance
A locomotive engineer had been dropped off at the head end of his train while the conductor was taken to the rear to check on the REM. After crossing over the ATK corridor mainline tracks, and beginning to board his locomotive, the engineer was dragged off the stairs of the locomotive and killed by a passing 110 MPH passenger train.

Free-Rolling Railcars

April 09, 1992 – ATSF – Cheto, AZ FE-09-92 Free-Rolling Railcars

A three-person crew was called to operate a road local and arrived at a location where an eight-car drop would be necessary. After a job briefing, the engineer was at the throttle, the conductor at the switch and the brakeman was riding the first car of the drop, "A" end. The engineer began to pull, the brakeman lifted the pin, the engineer accelerated the locomotive beyond the switch, the conductor got the switch and the cars began free rolling into the yard. However, the speed of the movement would not allow the brakeman to safely dismount and, just before impact with another cut of cars, the brakeman attempted to dismount from the car he was riding and was killed as the cars rolled over him.

October 23, 1992 – GTW – Dearborn, MI FE-34-92 Free-Rolling Railcars

A three-person train crew found it necessary to drop a car by and in doing so, the car hung up fouling the switch and blocking the locomotive into the track it had cleared up on. The crew decided to "stake" the car to clear the track in which the locomotive sat. This process requires a board or pole placed between the locomotive and car to move the car when it cannot be coupled to. The brakeman was killed when the board used slipped, the car started to move toward the locomotive and the brakeman was caught between the two pieces of equipment.

July 05, 1994 – BN – Essex, MT FE-16-94 Free-Rolling Railcars

A three-person work train crew was in the process of dropping 14 cars they thought were empty into a quarry-loading track. The brakeman was riding the leading and brake end of the car. As the cars were separated from the engine, he set the high brake on the car he was riding. However, because there were residual materials in many of the cars, the weight added momentum to the cars and the brakeman got off and back on between two other cars in an attempt to set more hand brakes. When the cut of cars collided with a ballast pile, used as a bumping post, that was located at the end of the track, he was crushed to death between the two cars he was trying to apply hand brakes.

April 21, 2000 – BNSF – Galesburg, IL FE-13-00 Free-Rolling Railcars

A three-person switching crew was in the process of hauling cars over the hump and the foreman of the crew was observing the move from between his track and another track that was being used by another yard job. The foreman was killed when he fouled and then was struck by a free rolling car on the adjacent track.

July 13, 2001 – CPRS – Bensenville, IL FE-21-01 Free-Rolling Railcars

The three-person crew had just finished kicking a flat car into a clear track and the conductor was about to mount the leading end of a cut of cars to be kicked into another track further down the lead. As the conductor issued instructions to the engineer to begin the move, and to the crew, the flat car had not cleared the fouling point to the lead. The shove move rode up onto the flat car derailing the car the conductor was riding on which crushed him to death.

February 16, 2003 – CSX – Syracuse, NY FE-04-03 Free-Rolling Railcars

A two-person crew was flat switching in a yard when the switchman, needed a break. He mentioned it to the yard foreman and they decided to go to break after one last car was "kicked" into a specific track. A short time after the car had been released, the foreman's operating control unit indicated a "no poll" failure and the locomotive shut down. When the foreman couldn't contact the switchman he went looking for him. The brakeman was found struck and killed by the last car that had been "kicked".

June 01, 1992 – BN – Seattle, WA FE-15-92 Employee Tripping, Slipping, Falling
also Unsecured Railcars

A four-person crew (engineer, switch foreman, 2 switchman) had 3 cars with them when they coupled onto 56 cars standing on a yard track. They were told to pull the head 16 cars and leave the remaining 40 there. They were also told that the 16 had been separated from the remaining 40. The crew pulled the 19 cars out of the track and per radio instructions from the switchman, began a shove into another track. As the movement entered the track it was struck by the 40 car cut that had been left on the first track. The switchman died falling from the cars while getting on and off the free rolling cut to set hand brakes in an attempt to stop them.

March 27, 1993 – SP – Guadalupe, CA FE-11-93 Employee Tripping, Slipping, Falling
A four-person crew (engineer, conductor, 2 brakeman) were in the process of pulling one track out and then intended to shove back into another track to pick up more cars. The head brakeman was in control of the move. The rear brakeman was found dead adjacent to the track that was pulled. Evidence suggests that the rear brakeman may have mounted, or tried to mount the car that ran him over as the cut was pulled out of the track.

July 21, 1995 – CR – Hershey, PA FE-23-95 Employee Tripping, Slipping, Falling
A three-person crew was switching an industry. The conductor had directed a few switching moves and then instructed the engineer to haul out of the plant. The conductor was observed by a plant employee riding on the trailing end of the first of two tank cars being pulled out of the plant. Moments later the conductor fell between the cars and was killed when he was run over by the trailing car in the two car move.

December 16, 1996 – UP – Clinton, IA FE-30-96 Employee Tripping, Slipping, Falling
also Employee Drugs and Alcohol

A three-person crew was in the process of switching a plant when the conductor sent the locomotive and cars out of one track toward the brakeman who was to handle the switches and direct the cars into another track. The conductor stopped the move after the cars had cleared an industry road crossing and the engineer waited to receive instructions from the brakeman. However, the brakeman had mounted the second head car behind the locomotives and had apparently slipped or fell from that position and was found dead by the engineer and conductor lying between and beneath the fourth head car. The brakeman tested positive for THCA & THC.

January 12, 1997 – UP – S Fontana, CA FE-02-97 Employee Tripping, Slipping, Falling
A three-person road crew arrived at a siding, pulled into the siding and stopped their train. They then cut off their locomotive consist, ran around the 50 loaded cars in their train, and tied onto the opposite end. The conductor and brakeman then positioned themselves on the leading end of the shove move and directed the engineer by radio to begin the shove into the plant. As the move entered a descending grade into the plant, the slack ran out, the conductor lost his hold on the leading car, fell in front of the car he was riding, was run over and died.

June 24, 1997 – UP – Portland, OR FE-18-97 Employee Tripping, Slipping, Falling
FE-18-97: A three-person yard switching crew was in the process of pulling a five car articulated cut of cars from out of one track with the intent of moving them to another. The yard foreman was killed

when he was run over by the leading wheels of the trailing car. It appears that the foreman tried to release a hand brake at the trailing end of the second to the last car and while attempting to do so, stumbled, fell and was run over by the trailing car.

Struck by Motor Vehicle or Loading Device

September 20, 1994 – ARR – Clear Site, AK FE-20-94 Struck by Motor Vehicle…
A three-person work train crew was shoving their train on the main line. The locomotive engineer was operating the locomotive and the brakeman and conductor were in the caboose. A tractor-trailer pulled over the crossing and was struck by the shove move, derailing the caboose and killing the brakeman.

February 17, 1999 – KCS – Kansas City, MO FE-05-99 Struck by Motor Vehicle…
A three-person switching crew was working in a piggy-back facility and had just finished shoving a cut of cars down a track to be worked by the piggy-packers (equipment used to load and unload TOFC/COFC rail shipments). The conductor was returning to the locomotive when he was struck and killed by one of the piggy-packers.

December 22, 2001 – NS – Eden, NC FE-39-01 Struck by Motor Vehicle…
A three-person, local switching crew that included a conductor in training were in the process of shoving a cut of cars over a highway road crossing at grade. The brakeman was riding one corner of the leading car and the conductor in training was riding the opposite side of the car. All warning devices were in operation when a van struck the leading end of the car knocking the brakeman off the car and under the leading wheels.

June 06, 2003 – CSX – Kingsport, TN FE-12-03 Struck by Motor Vehicle…
A three-person industrial switching crew was shoving one car on a track that ran down the middle of a two-lane road and that was located in an industrial area. The conductor was riding on one side of the car and the brakeman was riding on the other. As the move approached a standing eighteen-wheel truck awaiting permission to back into the same area that the railroad was servicing, the driver began to back up, jack-knifed the trailer, and struck the brakeman crushing him between the truck box and the car he was riding.

Unsecured Cars

June 01, 1992 – BN – Seattle, WA FE-15-92 Unsecured Cars
also Employee Tripping, Slipping, Falling
A four-person crew (engineer, switch foreman, 2 switchman) had 3 cars with them when then coupled onto 56 cars standing on a yard track. They were told to pull the head 16 cars and leave the remaining 40 there. They were also told that the 16 had been separated from the remaining 40. The crew pulled the 19 cars out of the track and per radio instructions from the switchman, began a shove into another track. As the movement entered the track it was struck by the 40 car cut that had been left on the first track. The switchman died falling from the cars while getting on and off the free rolling cut to set hand brakes in an attempt to stop them.

November 12, 1993 – ATSF – Farewell, TX FE-46-93 Unsecured Cars
also Drugs and Alcohol
A three-person industrial switching crew had been working together to get the switches lined and the derail off in preparation for a shove move into the plant. The conductor was on the leading end of the lead car and the brakeman was on the trailing end of the same car. The conductor was crushed by a car

he had set out without setting a hand brake. The car rolled into a car he and his brakeman were riding and impairment (drugs) contributed to the fatality.

January 04, 1994 – BN – Hastings, NE FE-02-94 Unsecured Cars
A three-person crew were in the process of pulling a cut of cars out of a track and leaving two additional cuts sitting separately in the track. The helper was riding the cut out of the track and the foreman was last seen walking between the two remaining cuts of cars. Evidence suggests that the foreman attempted to cross over the tracks between the cars being pulled out and the first of two remaining cuts of cars when he was crushed between the cars being pulled out and the second cut of cars after they were impacted by the third, unsecured cut.

April 06, 1995 – WC – Argoe, WI FE-16-95 Unsecured Cars
A two-person crew was switching at a siding in single-track territory. The conductor left a portion of his train on the mainline and went into the siding with a cut of cars. While in on the siding, the cars left on the mainline and, as post accident investigation revealed, had been left with the air "bottled", rolled away. The crew chased the runaway cars with the conductor riding the leading end of the lead car and the engineer, 23 cars away, shoving as directed by radio commands from the conductor. The shove move struck the runaway cars and the conductor was crushed to death as a result of the collision.

December 18, 1996 – IC – Chicago, IL FE-31-96 Unsecured Cars
A three-person yard crew was in the process of switching a plant. The brakeman was at the plant doors and the conductor and engineer had hauled out to put away a car that had been removed from the plant. After the conductor had tied onto the cars to go into the plant and begun to shove toward the plant, the car that had just been placed on an adjacent track rolled out, fouled the conductor's movement, and crushed him between the leading car and the rolling car.

February 18, 2003 – CSX – Cheektowaga, NY FE-05-03 Unsecured Cars
A three-person switching crew was in the process of shoving cars into a track at an industry. The switch foreman was riding the leading end of the shove and directing the move when he was struck by the cut of cars that they had left on another track and which had rolled out and into his shove move.

Environment

December 30, 1993 – CR – Brook Park, OH FE-53-93 Environment
A three-person industrial switching crew was shoving over an industrial crossing within the confines of a plant. The conductor was riding the leading end of the lead car when it rode up on ice, built up within the flange-ways, and derailed the car into the side of the building. The conductor was crushed between the car he was riding and the building.

January 22, 1999 – CR – Alexander, NY FE-03-99 Environment
A three-person local switching crew was shoving a loaded covered hopper down an industrial lead. The conductor was riding on one side of the car and the brakeman was riding the other. As the car was shoved over a private crossing, the accumulation of ice and snow lifted the car off the rails and it tipped over and onto the conductor who was killed as a result of the derailment.

January 02, 2000 – CIRR – Cedar Springs, GA FE-02-00 Environment
A two-person switching crew was in the process of switching cars in a storage yard and the conductor was riding the leading end of a cut of cars being shoved down a track. The move was taking place in

dense fog and in darkness when the car he was riding collided with other cars on an adjacent track that were fouling the track he was on. The conductor was killed as a result of the collision.

Equipment

January 14, 1994 – BN – Amarillo, TX FE-03-94 Equipment

A three-person crew reported for duty and later was in the process of shoving cars down a track with the switch foreman riding the point. At the same time, another yard switching job was pulling cars in the opposite direction on an adjacent track and derailed. The foreman immediately told the other crew that they were on the ground and then told his engineer to stop the shove he was riding. The foreman was found crushed between the car he was riding and the car that derailed on the adjacent track.

January 11, 1995 – CR – Indianapolis, IN FE-02-95 Equipment

A three-person crew was in the process of switching a plant. The conductor was riding the leading end of the lead car during an eight-car shove. He had notified the engineer that he had mounted the moving car and told him by radio to continue shoving. When the engineer did not hear any more from the conductor, he stopped and the brakeman walked back to find the conductor had been run over by five of the eight cars being shoved. An exception was taken by the FRA for the absence of the "BR" end handhold that could have been used to assist the conductor in moving from the side of the car to the end of the car.

April 09, 1999 – UP – Richland, WA FE-12-99 Equipment

A three-person road switcher was in the process of dropping a car into a track. However, the locomotive was fouling the track the car was to enter. The brakeman, realizing this, jumped from the trailing end of the car and ran to the leading end to try and stop the car. The conductor, who was standing near the fouling corner of the locomotive, started up the stairwell of the locomotive when he realized what was happening. However, the stairwell was obstructed with a metal rod that had been welded into place and prevented the conductor an escape route. He was subsequently crushed between the striking car and the metal rod.

September 14, 2003 – UP - Ogden, UT FE-23-03 Equipment

A four-person yard switching crew had been working together and classifying cars into various tracks throughout the morning. The conductor was on the leading end of a two car free rolling cut of cars moving at 3 miles per hours when he fell from the leading end and was run over by the car he had been riding.

Drugs and Alcohol

November 12, 1993 – ATSF – Farewell, TX FE-46-93 Drugs and Alcohol

also Unsecured Cars

A three-person industrial switching crew had been working together to get the switches lined and the derail off in preparation for a shove move into the plant. The conductor was on the leading end of the lead car and the brakeman was on the trailing end of the same car. The conductor was crushed by a car he had set out without setting a hand brake. That car rolled into a car he and his brakeman were riding and impairment (drugs) contributed to the fatality.

December 16, 1996 – UP – Clinton, IA FE-30-96 Drugs and Alcohol
also Employee Trips, Slips, and Falls
A three-person crew was in the process of switching a plant when the conductor sent the locomotive and cars out of one track toward the brakeman who was to handle the switches and direct the cars into another track. The conductor stopped the move after the cars had cleared an industry road crossing and the engineer waited to receive instructions from the brakeman. However, the brakeman had mounted the second head car behind the locomotives and had apparently slipped or fell from that position and was found dead by the engineer and conductor lying between and beneath the fourth head car. The brakeman tested positive for THCA & THC.

January 24, 1998 – BNSF – Omaha, NE FE-02-98 Drugs and Alcohol
A three-person switching crew was working in close proximity to another switching crew and, after some discussion, but no absolute understanding of the move just made by the other crew, began to pull down the switching lead. As they approached a mis-aligned switch, the foreman jumped off the moving locomotive, ran to the switch and was in the process of "flopping it over" when the leading wheels of the locomotive entered the switch, popped the handle up, striking the foreman in the face and killing him. Post accident testing indicated that drug impairment may have contributed to the fatality.

Unexpected Movement of Railcars

June 24, 1997 – NS – Rowesville, SC FE-19-97 Unexpected Movement of Railcars
The engineer and conductor of a local road switcher were reassembling their train at a siding halfway through their work assignment. After running around the inbound cars, making a couple of switches to line up their train for the return trip, the conductor tied the EOT device onto the rear car, came back to the switch, and told the engineer to back up five cars. The engineer did not get any other radio instructions after three cars and stopped. The conductor was found dead having been run over by the leading car and not having reversed the siding switch as he had intended to do.

November 17, 1999 – UP – Lincoln, NE FE-32-99 Unexpected Movement of Railcars
A three-person local switching crew had cut away from their train on the main track and proceeded to pull by the switch providing access to a clear track. The brakeman was at the switch and the conductor had removed the derail from the clear track and was awaiting the shove move at the point where the cut would be made. Meanwhile, the brakeman, who was to have gotten the switch from the main to the clear track, was walking between the gauge of the mainline track toward the remaining portion of his train. The conductor saw the cars being shoved toward the remaining portion of his train and shouted to the brakeman and then to the engineer to stop. The brakeman with his back to the move was hit and run over by the leading car of the shove.

October 02, 2002 – CSX – Madisonville, KY FE-22-02 Unexpected Movement of Railcars
A two-person road crew stopped at a yard to make a set-off. The conductor made the cut on his train, instructed the engineer to haul ahead to clear the switches into the yard, lined the switches into what he thought was Track 4 and told the engineer to begin backing the set off into the yard. The conductor was struck and killed by the leading end of the shove move as it entered Track 3.

December 07, 2003 – UP – San Antonio, TX FE-35-03 Unexpected Movement of Railcars
A pitch/catch remote control operation was being run by a single operator who was struck and killed during a yard operation by his own locomotive. He stepped in front of its movement as he was headed

for the other end of a crossover switch that he intended to line for the route he intended his engine to use.

Miscellaneous

October 15, 1992 – BN – Omaha, NE FE-33-92 Miscellaneous
A three-person yard crew was in the process of spotting cars over a material unloading pit and after the first of the cars was spotted the switch foreman took the locomotive out of the plant building to get the other car for spotting. The switchman remained in the building, set a handbrake on the spotted car and awaited the return of the foreman with the engine and second car to be spotted. The switchman was killed when he ended up falling into the second pit and was crushed by the industrial machinery located within.

November 16, 1992 – TTIS – Maysville, KY FE-39-92 Miscellaneous
A two-person train crew was taking a coal train down a 3 percent grade and through an eight-degree curve when the train separated at the 17th head car. The cause of the separation was a broken knuckle. To remove the partially broken knuckle, the conductor decided that he had to impact the standing cars with the 17 head cars. On his third attempt, the couplers by-passed and the corners of the 18th and 17th head cars came together at the push pole pads crushing the conductor between them.

May 22, 1993 – ATSF – El Paso, TX FE-20-93 Miscellaneous
A three-person switching crew was in the process of shoving cars into a track in the TOFC yard. The switch foreman was directing the move when he was struck from behind by the left front fender of a hostler truck and run over by its rear wheels.

June 04, 1993 – SEPTA – Devon, PA FE-22-93 Miscellaneous
A commuter train locomotive engineer fell from the operating compartment of the train he was operating while it was moving. Two minutes before he fell speed had been reduced from 61 to 51 MPH.

September 02, 1993 – ATSF – Carlsbad, NM FE-35-93 Miscellaneous
A three-person crew, accompanied by an engineer and a brakeman trainee, were trying, for the second time to make a coupling between two cars in a yard. The conductor was allowing the brakeman trainee to learn radio use and had just told him to tell the engineer to come back for another attempt at coupling. The brakeman turned toward the locomotives, relayed the conductor's instructions, looked back at the conductor and saw him impaled between the knuckles of the two cars.

January 18, 1994 – CSX – Bainbridge, GA FE-04-94 Miscellaneous
A three-person switching crew was in the process of shoving cars down an industrial lead. The conductor and brakeman were riding the end platform of a tank car and, as the move approached a highway/rail grade crossing, the brakeman gave the engineer a car count in which to stop. As a result, there was some "slack action" and the conductor fell from the end platform onto the rail and was pronounced dead at the hospital over five hours later.

March 21, 1995 – SP – Bassett, CA FE-17-95 Miscellaneous
A three-person crew was called to operate a road local and arrived at a location where some plant switching was to take place. After lining up their cars, the two locomotives and two cars began a shove move on the brakeman's radio command. The brakeman was walking adjacent to the track on

which the cars were being shoved and had his back to the move. He was killed when he suddenly crossed the tracks in front of the movement and was struck. The move stopped immediately. Post accident investigation revealed that the brakeman was concerned about the results of a medical examination that were due the next day.

October 26, 1998 – CCP – Cicero, IL FE-28-98 Miscellaneous
An engineer, having just gone off duty, was distracted and subsequently struck and killed by a lite engine move being operated by a hostler. The hostler was operating the locomotive consist from the trailing end at the time and did not have anyone on the leading end when the engineer was struck.

May 31, 2000 – UP – Pine Bluff, AR FE-17-00 Miscellaneous
A three-person yard switching crew was in the process of moving their light locomotives through a series of crossover switches however, the switchman had gone to the yard office for another list of cars to switch and the foreman, who had two (2) years of service, was directing the lite engine move by radio. The foreman told the engineer to stop, the foreman got off the leading end of the lead locomotive to line switches, he then told the engineer to continue backing up. Shortly thereafter, the foreman was crushed in a side collision between the locomotive consist he was directing and other cars standing on an adjacent track.

April 08, 2001 – BNSF – Clark, OK FE-14-01 Miscellaneous
The conductor of a road switcher pulled his train into a yard, got off, made a cut behind three cars and told the engineer to pull ahead to clear a crossover switch he intended to use. After getting the crossover, he mounted the leading end of the move and told the engineer to come back seven cars. Three car lengths later, the movement passed through one end of another crossover switch in reverse position and diverted the movement into the side of a standing cut of cars crushing the conductor to death.

September 24, 2003 – BNSF – Fresno, CA FE-25-03 Miscellaneous
A three-person switching crew was shoving a cut of cars into a yard track and the switching foreman was riding the leading end of the 35 car cut. There was no air in the train line and the engineer was using engine brake to control the shove during the 50 car lengths of clear track to be shoved prior to making a coupling on other cars in the same track. Twenty cars into the move the foreman was either dislodged or fell from the leading end of the movement and was run over by the sixth head car of the shove.

4. SWITCHING FATALITIES – UNDERSTANDING AND PREVENTION

4.1 Switching Fatalities Occur for a Reason

The SOFA Working Group (SWG) is trying to understand why each and every switching fatality occurred in working towards the prevention of switching fatalities. The SWG believes that switching fatalities happen for reasons that can be understood – and are not just random occurrences, nor a series of unlikely and unfortunate events, nor just plain bad luck. The risk to employees engaged in switching operations is real, and it can be reduced through understanding of past fatality events. Further, many switching fatalities occur for the same reason. Thus, any one of the Five Operating Recommendations, and its operating procedure, will prevent many fatalities.

The SWG developed a classification system that will:

- provide understanding of why each fatality occurred
- group similar fatalities together
- suggest preventive measures.

4.2 Switching Fatalities Involving the SOFA Five Operating Recommendations

In Section 3, the 124 switching fatalities occurring from January 1992 through December 2003 were first classified as to whether one or more of the Five Operating Recommendations applied. Sixty-four fatalities fell into that group – 52 percent. For these fatalities, the SWG believes that future fatalities of a similar nature can be prevented by implementing one or more of the Five Operating Recommendations. The Recommendations were developed from review of 76 switching fatalities and were included in the *SOFA Report* released October 1999.

4.3 Switching Fatalities Involving Special Switching Hazards

The remaining 60 fatality cases, those involving Special Switching Hazards, were classified by the SWG into eleven groups (one group is a miscellaneous group), as shown in Table 4-1, based on a sequence of events leading up to the fatality, such as being struck by mainline trains; or by a fatality event characteristic, such as drugs or alcohol. The SWG believes an employee's awareness of the Special Switching Hazards identified in the grouping will insure their safety and that of their crew members.

Table 4-1. Sixty Special Switching Hazard Fatalities Not Involving SOFA Operating Recommendations

Type	Number
Close Clearance	10
Struck by Mainline Trains	8
Employee Tripping, Slipping, Falling	6
Free Rolling Railcars	6

Unsecured Cars	6
Equipment	4
Struck by Motor Vehicle or Loading Device	4
Unexpected Movement of Railcars	4
Environment	3
Drugs and Alcohol	3
Miscellaneous	11
total	65
* less cases classified in two category types	5
net total	60

* FE-15-92 was classified under 'Employee Tripping, Slipping, Falling' and 'Unsecured Cars'; FE-46-93, 'Unsecured Cars' and 'Drugs and Alcohol'; FE-30-96, 'Drugs and Alcohol' and 'Employee Tripping, Slipping, Falling'; FE-40-01, 'Close Clearance' and 'Struck by Mainline Trains'; FE-09-02, 'Close Clearance' and 'Struck by Mainline Trains'.

Close Clearance

The Special Switching Hazard group with the largest number of fatalities is Close Clearance. Ten fatalities fall into this group (Table 4-2). The group would be larger if those involving Operating Recommendations were included. To date, the SWG has identified five cases involving Operating Recommendations that also involve Close Clearance, bringing the total to fifteen.[8]

Table 4-2. Ten Close Clearance Fatalities Not Involving SOFA Operating Recommendations*

#	RR	Date	Location	FRA Report #
1	UP	08/04/93	Pryor, OK	FE-27-93
2	SP	04/12/94	Houston, TX	FE-12-94
3	NS	12/11/95	Toledo, OH	FE-33-95
4	CSX	12/14/95	Monroe, NC	FE-34-95
5	NS	07/01/98	Buechel, KY	FE-19-98
6	CSX	05/22/00	Richmond, VA	FE-16-00
7	UP	07/28/00	St. Louis, MO	FE-23-00
8	PAL	10/10/01	Clayburn, KY	FE-31-01
9	NS	12/24/01	Lynchburg, VA	FE-40-01
10	NS	03/21/02	Claymont, DE	FE-09-02

'Close Clearance' is defined by the SWG: When an employee is passing, or being passed, by an object or equipment and the conditions are such that there is not enough room for the employee to avoid being struck. The definition is a broad one. It includes the traditional definition used by some railroads

[8] The SWG determined that five switching fatalities involving Operating Recommendations also involved Close Clearance: FE-18-92 (Recommendation 1), FE-06-94 (Recommendation 2), FE-12-96 (Recommendation 5), FE-05-98 (Recommendation 2), and FE-29-00 (Recommendation 4). Thus, of 124 fatalities occurring from January 1992 to December 2003, 15 (12 percent) fatalities involved Close Clearance.

as the lack of sufficient "... space between objects; and on the roadway, as the lack of clearance in the absents of space between wayside objects and rolling stock, or between rolling stock on adjacent tracks." [9]

'Close Clearance' for the SWG also includes fouling a track, defined as "the placement of an individual or an item of equipment in such proximity to a track that the individual or equipment could be struck by a moving train or on-track equipment, or in any case is within four feet of the field side of the near running rail."[10]

FE-16-00 and FE-31-01, described below, illustrate the traditional definition of Close Clearance, i.e., dangers inherent with close or no clearance structures:

> **FE-16-00:** A three-person road switching crew was in the process of spotting loaded coal cars at a unloading facility that was equipped with a "shaker" that helped empty each car. The shaker's position causes a close clearance condition. The conductor was riding one side of the leading coal car and the brakeman was riding the other. Although having a clear view of the fouling equipment, the brakeman did not get off the car as the conductor had expected and was crushed between it and the fouling shaker equipment.
>
> **FE-31-01:** A three-person, local freight train crew was switching a plant and had 2 engines 6 cars and a caboose when they moved over a small bridge and coupled to 5 standing cars in the storage track. The conductor made the coupling and told the engineer to pull the cars out of the track. The conductor got on the side of the trailing end of the second last car in the cut and was knocked off the car by a metal pole adjacent to the storage track. He fell between the car he was riding and the last car in the cut being pulled. He died when the lead wheels of the last car rolled over him.

As mentioned, the SWG also includes cases of fouling track in its definition of 'Close Clearance.' The SWG recognizes that it can justifiably be argued that cases such as FE-09-02 or FE-40-01, described below, are fouling track issues, not close clearance problems:

> **FE-09-02:** A locomotive engineer had been dropped off at the head end of his train while the conductor was taken to the rear to check on the REM. After crossing over the ATK corridor mainline tracks, and beginning to board his locomotive, the engineer was dragged off the stairs of the locomotive and killed by a passing 110 MPH passenger train.

[9] Christopher F. Schulte. *Railroad Track Terms*, 3rd edition, 2003. Simmons-Boardman Books, Inc., Omaha, NE.

[10] 49 CFR, Part 214.7, Definitions. Revised October 2003.

FE-40-01: A conductor, engineer and conductor in training had been transported to an unattended train standing on a siding a portion of which was in a tunnel adjacent to the main track. After storing their equipment, the conductor and the conductor in training left the locomotive to release hand brakes on the train. The conductor was killed when she failed to step in between two boxcars of her train as the conductor in training had done and was subsequently struck by a passing mainline train.

There are some cases in the SWG's definition of Close Clearance that exceed expected operational conditions, such as FE-34-95:

FE-34-95: A three-person crew (engineer, conductor & conductor trainee) was called to operate a local freight train. During a switching operation at a yard, the conductor was riding nine cars down a clear track and directing the shove move by radio. When the engineer did not hear any more radio transmissions from the conductor, he stopped the move and found the conductor dead and lying beside the track he had been shoving down. Post accident investigation revealed that he had been struck by a truck trailer door positioned on a flat car standing on an adjacent track and that had been left open and swinging freely. The investigation revealed that a vandal had broken into the trailer and stolen material from it.

In the end, the SWG decided that these 10 cases shown in Table 4-2, and the five cases also involving Operating Recommendations, had one thing in common, an object or equipment was passing or being passed and the conditions were such that there was not enough room for the employee to avoid being struck. Sometimes, the condition was speed, sometimes environment (trees or brush fouling the track); but in any case, the SWG could not identify enough commonalities regarding the event, location, or even the physical act to make a one size fits all recommendation.

The SWG urges safety committees, engineering departments, and other railroad industry stakeholders to address all aspects of Close Clearances:

- Where feasible, re-engineer and/or eliminate close clearances.
- Provide safe clearance in future engineering projects.
- Mark all permanent close clearance areas with highly visible signs.
- Expand job briefings (Operating Recommendation 3) to include:
    - emphasis of dangers of equipment left fouling
    - warnings to other crews when placing oversized cars on tracks adjacent to their work
    - discussions of risks of passing trains when working near mainline

Struck by Mainline Trains

While there have been 13 of 124 cases that involved an employee being struck by a mainline train, the SWG believes that 5 of the 13 fatalities were preventable by observing Operating Recommendations. The 8 fatalities not involving an Operating Recommendation did not occur for a single reason or for a few reasons. Other than general vigilance, awareness, and alertness to the switching environment, it is difficult to prescribe a preventive measure.

Table 4-3. Eight Being-Struck-By-Mainline-Train Fatalities Not Involving SOFA Operating Recommendations*

#	RR	Date	Location	FRA Report #
1	SSW	06/07/92	Conlen Siding, TX	FE-20-92
2	CSX	04/13/93	Dwale, KY	FE-13-93
3	MNCW	07/18/97	Stamford, CT	FE-22-97
4	BNSF	12/02/97	Emporia, KS	FE-36-97
5	UP	12/28/00	Dupo, IL	FE-32-00
6	BNSF	12/29/00	Gillette, WY	FE-33-00
7	NS	12/24/01	Lynchburg, VA	FE-40-01
8	NS	03/21/02	Claymont, DE	FE-09-02

* The SWG determined that five switching fatalities involving Operating Recommendations also involved being-struck-by-mainline-trains: FE-49-93 (Recommendation 3), FE-17-96 (Recommendation 5), FE-02-01 (Recommendation 5), FE-03-01 (Recommendation 3), and FE-08-01 (Recommendation 1). Thus, of 124 fatalities occurring from January 1992 to December 2003, 13 (11 percent) fatalities involved being-struck-by-mainline-trains.

4.4 Job Briefing and Mentoring – Operating Recommendation 3 and 5

After examination of the 124 fatality cases, the SWG expressed concern about further identifying relevant recommendations to improve safety of switching based on the available objective data. The diversity of the events and occurrences surrounding these employee deaths was clearly evident to the SWG. This realization lead to the re-examination of:

Recommendation 3: *At the beginning of each tour of duty, all crew members will meet and discuss all safety matters and work to be accomplished. Additional briefings will be held any time work changes are made and when necessary to protect their safety during their performance of service.*

Table 4-4. Fourteen Fatalities Involving SOFA Operating Recommendation 3

#	RR	Date	Location	FRA Report #
1	GBW	07/24/92	Wisconsin Rapids, WI	FE-30-92
2	IC	06/07/93	Fulton, KY	FE-23-93
3	SP	08/11/93	Tracy, CA	FE-30-93
4	GC	11/13/93	Macon, GA	FE-47-93

5	SOU	12/05/93	Atlanta, GA	FE-49-93
6	CR	11/15/94	Painted Post, NY	FE-29-94
7	CR	02/17/95	St. James, OH	FE-09-95
8	NS	03/02/95	Aiken, SC	FE-12-95
9	CR	01/12/99	Port Newark, NJ	FE-01-99
10	DME	04/02/99	Waseca, MN	FE-11-99
11	UP	10/15/00	Houston, TX	FE-30-00
12	NS	01/11/01	South Fork, PA	FE-03-01
13	BNSF	06/16/02	Memphis, TN	FE-16-02
14	UP	04/11/03	Pocatello, ID	FE-11-03

It was apparent to the SWG that many of the diverse events and occurrences that lead to the death of employees may have been mitigated through effective "job safety briefing." You can never communicate too effectively. It became apparent to the SWG that providing a minimum suggested content for an initial job safety briefing should be made available. It was also evident to the SWG that the perception of "work changes" is very qualitative and should be addressed in specific language that is understandable and comprehensible to all crew members. Job Safety Briefing instructions for *various* carriers are available for review in Appendix F.

All crew members should receive training in the art of job safety briefings. The initial job safety briefing should provide detailed and specific information on all relevant activities to be performed. The training should help necessitate sufficient conversation and review between every crew member to make everyone feel comfortable about the service to be performed. When practical, a supervisor or other knowledgeable employee should be present during the entire job safety briefing and take part in it when appropriate. Every concern should be addressed to the satisfaction of each crew member. Crew members should engage in active communications sufficient to establish their mutual understanding and safely perform the service required. Successful communication among all parties is essential.

Any work changes or developments that may impact safety should be immediately addressed to everyone's satisfaction. Any crew member observing a safety concern should safely stop all activity and thoroughly review the concern with every other crew member. Job safety briefings should offer a comfortable environment for fellow employees to discuss yard and industry switching issues where questions or concerns may exist. Crew members should be afforded the opportunity to resolve any yard and/or industry switching issues. They should seek the advice of knowledgeable and experienced crew members, or proper authority if necessary. No action should be taken until a solution is reached and then communicated to all concerned.

Further, the Working Group recommends that additional advantage be taken of its Recommendation 5 in conjunction with its additional suggested action of Train Crew Resource Management (CRM).

Recommendation 5: *Crew members with less than one year of service must have special attention paid to safety awareness, service qualifications, on-the-job training, physical plant familiarity, and overall ability to perform service safely and efficiently. Programs such as peer*

review, mentoring, and supervisory observation must be utilized to insure employees are able to perform service in a safe manner.

Table 4-5. Nineteen Fatalities Involving SOFA Operating Recommendation 5

#	RR	Date	Location	FRA Report #
1	AGC	01/30/92	Polk County, FL	FE-04-92
2	IHRC	06/02/92	Henderson, KY	FE-16-92
3	SOO	10/19/93	Leal, ND	FE-40-93
4	GC	11/13/93	Macon, GA	FE-47-93
5	PTRA	11/10/94	Houston, TX	FE-28-94
6	CR	12/06/94	Campbell Hall, NY	FE-31-94
7	CSX	10/04/95	Riverdale, IL	FE-29-95
8	BRC	03/20/96	Bedford Park, IL	FE-09-96
9	CSX	06/15/96	Charlotte, NC	FE-12-96
10	NS	07/07/96	Sidney, IN	FE-17-96
11	DGNO	09/03/96	Dallas, TX	FE-22-96
12	UP	10/07/96	Eagle Pass, TX	FE-24-96
13	MRL	10/16/97	Laurel, MT	FE-32-97
14	BNSF	06/01/98	Lubbock, TX	FE-16-98
15	NS	05/19/99	Cincinnati, OH	FE-14-99
16	AM	09/14/99	Van Buren, AR	FE-24-99
17	CSX	01/10/01	Chicago, IL	FE-02-01
18	BNSF	06/16/02	Memphis, TN	FE-16-02
19	GC	09/12/03	Dublin, GA	FE-22-03

CRM promotes training in the importance of and procedures for effective intra-crew communications. The Working Group pointed out in its original report that such communications have the potential to make a major contribution to the safety of switching operations. The Working Group again recommends that the railroad industry, i.e., labor, management, and FRA, consider CRM programs that address improving crew coordination and communications. Again, compelling evidence suggests that many fatalities resulted from unexpected train movement, particularly at very low speeds. Switching operations training programs should employ the principles of CRM to assure than no opportunities are overlooked to heighten safety awareness and focus it on the serious implications of unexpected train movement, and on the importance of continual mutual awareness of the location and activities of all crew members. Additionally, the initial on duty and subsequent job safety briefings afford an opportunity to focus the message and further the common goal of a safe working environment.

4.5 Shoving as a Special Switching Hazard

In reviewing the 124 switching fatalities, it was apparent to the SWG that shove movements present special risks in switching operations. Sixty-one fatalities involved shove moves. There are 116 of the 124 fatalities known to involve train movement. Thus, 53 percent (61/116) of fatalities involving movement had shoving as the direction of movement.

Whether given the amount of shoving done, compared to pulling, makes fatalities with shoving as the direction of movement over- or under-represented in switching operations is answerable only by having the appropriate number of train miles dimensioned by direction of movement. But whatever the answer is does not change the fact that fatalities involving shoving are a sizable cluster of switching fatalities.

Shove movements clearly create an exposure to greater risk than pulled train movements. Wherever feasible, efforts should be made to avoid shoved movements especially where light engines are involved. Greater use of procedures such as running around cars and changing ends should be utilized.

5. SEVERE INJURIES

5.1 SOFA-defined Severe Injuries and Amputations

'Severe Injuries' were defined[11] by the SOFA Working Group (SWG) as (1) potentially life threatening; (2) high likelihood of permanent loss of function, permanent occupational limitation, or other permanent disability; (3) likely to result in significant work restrictions; and (4) result from a high-energy impact to the human body. 'Severe Injuries' include amputation, dislocation of the neck, loss of eye, electric shock or burn, and fracture to any bone except the lower arm, fingers, foot, and toes. Tables 5-1 and 5-2 describe Severe Injuries as defined by the SWG.

Table 5-1. Definition of SOFA-defined Severe Injuries

Type	Body Location
Fracture	Upper arm, upper leg, knee, lower leg, ankle, heel, eye, skull, neck, spine, upper back, lower back, shoulder, collar bone, rib/rib cage, hips, and multiple fractures
Amputation	Any body part
Dislocation	Neck
Loss of eye	One or both
Electric Shock/burn	Eye, ear, nose, mouth/teeth, skull, and neck
Other burn	Eye, ear, nose, mouth/teeth, skull, and neck

[11] See *Severe Injuries to Train and Engine Service Employees: Data Description and Injury Characteristics*. July 2001. This report may be found on the FRA's Web site.

Table 5-2. Type of Information Available for Severe Injuries

#	Information Type	Variables
1	Record identification	-Incident number
2	Date and time	-Date of injury occurrence
		-Time of injury
3	Railroad	-Reporting railroad
		-Type railroad: ICC categories
4	Geographic location	-City, county, and state
		-FRA designated region
5	Reporting extent	-Whether additional FRA forms were filed
6	Work missed	-Days absent or restricted
		-Whether employee was suspended or transferred
7	Hazardous material exposure	-Whether injury involved exposure to hazardous material
8	Alcohol and drug testing	-Number of positive alcohol and drug tests
9	Employee	-Type person injured, i.e., "employee on duty"
		-Job occupation, i.e., "road conductor "
		-Age
10		-Type and location of injury
		-Whether death occurred
11	Circumstance codes	-Physical act worker was doing before injury
		-General location of worker before injury, i.e., yard, main/branch
		-Specific location of worker before injury, i.e., beside track
		-Equipment location, i.e., freight car moving, locomotive standing
		-Event causing injury, i.e., lost balance, slipped…
		-Tools, machinery, appliances, structures, surfaces (etc.), i.e., ground, ballast
		-Injury cause, i.e., human factors, environmental, equipment
12	Written description	-Narrative

5.2 Information Available for SOFA-defined Severe Injuries

In issuing its report at the conclusion of its study of Severe Injuries, the SWG said:

> The SOFA Working Group has looked at the injury data from the perspective of the knowledge gained from its detailed investigation of FEs where the circumstances surrounding, and leading up to, a FE where identified. The SOFA Working Group realizes that Serious Injuries are not investigated the way FEs are; hence, it is not always possible to identify these circumstances. The implication of this is clear: it is not possible for the Working Group to tell if one or more of its five safety recommendations applies to a particular Serious Injury event.[12]

[12] *ibid*

5.3 History of Severe Injuries

The seven-year history of SOFA-defined Severe Injuries is shown in Table 5-3 along with amputations, an acute form of Severe Injuries. Since 1997, on average, 132.7 Severe Injuries have occurred each year. These Severe Injuries include, in addition to amputations, fractures of bones other than fingers and toes. As such, Severe Injuries often result from high-energy impacts and can be career threatening. Severe Injuries can be defined back to 1997 with the revision of reporting form FRA F6180.55a.

In 2003, there were 116 Severe Injuries, the lowest count in the seven-year period, 1997 through 2003; and 14.4 percent lower than the mean of 135.5 for the previous six years. There have been 46 Severe Injuries in January through April of 2004.

Table 5-3. SOFA-defined Severe Injuries and Amputations, 1997 through April 2004[13]

	SOFA-defined Severe Injuries								Amputations							
	1997	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
JAN	11	13	16	15	21	12	11	10	1	0	2	1	0	0	2	2
FEB	17	15	9	9	9	13	17	14	0	1	0	1	0	2	1	2
MAR	14	12	17	11	10	10	13	10	3	4	3	2	1	1	3	1
APR	8	10	6	10	12	6	9	12	1	2	0	1	2	0	1	1
MAY	6	12	8	8	12	14	10		1	2	3	0	2	2	2	
JUN	9	10	8	11	8	5	10		2	1	1	0	1	0	0	
JUL	9	14	10	8	10	7	6		1	5	1	0	4	0	1	
AUG	13	10	11	14	8	10	7		1	0	1	4	0	1	0	
SEP	10	11	15	10	20	12	5		2	4	3	2	5	4	0	
OCT	12	12	16	10	5	11	9		2	5	2	2	0	0	2	
NOV	12	9	12	11	13	14	10		2	2	2	2	3	0	1	
DEC	18	9	7	22	12	9	9		4	1	0	4	1	1	2	
totals	**139**	**137**	**135**	**139**	**140**	**123**	**116**		**20**	**27**	**18**	**19**	**19**	**11**	**15**	

5.4 Severe Injuries by Selective Attributes and Track Location

Using the Severe Injury data for the period from January 1, 1997 to December 31, 2003, the frequency of selective attribute variables were calculated based on the track location where the injury occurred. For instance, the frequency of occurrence for the job code related to the injured employee was calculated based on seven track locations: yard, mainline/branch line, industry, siding, highway/roadway, passenger terminal, and other. Other attributes for which the frequency of injuries are calculated by track location: injury type; body location of injury; year; month; day; time of day; activity; age; injury event; equipment location; working location; tools, machinery, appliances, structures, surfaces (etc.); and assigned cause of injury. The calculated frequencies for the 14 variables are shown in Table 5-4 for 929 Severe Injuries that occurred

[13] The Severe Injury data was taken from the Federal Railroad Administration Office of Safety's Web site in June 2004.

among the nineteen, 600-series (train and engine service) job codes from January 1, 1997 to December 31, 2003.

Table 5-4: SOFA-defined Severe Injuries by 14 Attributes and 7 Track Locations January 1, 1997 to December 31, 2003	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
JOB CODE									
conductor, yard-614	107	14	30	1	0	0	2	154	16.6%
brakeman, yard-615	90	10	19	1	0	0	5	125	13.5%
conductor, road freight-608	46	68	10	9	9	0	6	148	15.9%
engineer, road freight-617	38	43	1	6	9	0	5	102	11.0%
brakeman, road freight local-613	37	22	14	6	1	0	2	82	8.8%
conductor, road freight local-609	36	32	23	13	0	0	2	106	11.4%
engineer, yard-619	31	4	2	1	2	0	2	42	4.5%
conductor, road passenger-606	18	12	0	0	1	4	3	38	4.1%
engineer, road freight-618	16	9	1	2	2	0	0	30	3.2%
engineer, road passenger-616	14	10	0	0	0	2	0	26	2.8%
brakeman, road freight through-612	10	6	8	5	1	0	0	30	3.2%
switch tender-601	6	3	2	0	0	0	0	11	1.2%
conductor, asst. road passenger-607	5	4	0	0	0	8	1	18	1.9%
hostler, outside-603	3	0	0	0	0	0	0	3	0.3%
brakeman, lead passenger-611	2	1	0	0	0	0	0	3	0.3%
miscellaneous-600	1	0	1	1	0	0	1	4	0.4%
hostler, inside-605	1	0	0	0	0	0	0	1	0.1%
fireman, yard-623	1	0	0	0	0	0	0	1	0.1%
other	3	0	1	0	0	0	1	5	0.5%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	
INJURY TYPE									
fracture-70	368	202	90	40	25	13	26	764	82.2%
amputation-80	83	25	16	3	0	0	2	129	13.9%
other burns-50	9	8	6	2	0	1	2	28	3.0%
electric shock/burns-40	4	2	0	0	0	0	0	6	0.6%
dislocation-60	1	1	0	0	0	0	0	2	0.2%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	

Table 5-4: Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2003	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
INJURY LOCATION									
leg or foot	246	113	64	20	3	0	18	464	49.9%
torso	147	81	31	18	18	6	8	309	33.3%
arm or hand	41	20	10	1	3	7	2	84	9.0%
head or face	28	20	7	3	0	1	2	61	6.6%
various body parts-equal severity	3	4	0	3	1	0	0	11	1.2%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	
YEAR									
1997	72	28	23	5	4	1	6	139	15.0%
1998	66	32	18	12	3	0	6	137	14.7%
1999	67	31	16	6	4	3	8	135	14.5%
2000	73	39	18	1	3	4	1	139	15.0%
2001	73	34	17	9	3	1	3	140	15.1%
2002	59	35	12	7	2	5	3	123	13.2%
2003	55	39	8	5	6	0	3	116	12.5%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	
MONTH									
Jan	55	19	11	3	4	2	5	99	10.7%
Feb	48	23	6	4	3	0	5	89	9.6%
Mar	46	21	13	1	0	2	4	87	9.4%
Apr	29	16	9	2	2	1	2	61	6.6%
May	32	22	5	4	3	1	3	70	7.5%
Jun	30	15	7	1	5	0	3	61	6.6%
Jul	33	14	11	6	0	0	0	64	6.9%
Aug	35	25	8	3	2	0	0	73	7.9%
Sep	46	13	14	4	1	5	0	83	8.9%
Oct	37	17	7	7	3	1	3	75	8.1%
Nov	34	29	10	4	1	1	2	81	8.7%
Dec	40	24	11	6	1	1	3	86	9.3%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	

Table 5-4: Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2003	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
DAY									
Sunday	66	18	8	7	9	4	3	115	12.4%
Monday	67	36	15	9	2	1	2	132	14.2%
Tuesday	64	41	19	7	4	1	6	142	15.3%
Wednesday	64	32	13	6	4	4	7	130	14.0%
Thursday	70	40	23	8	4	2	5	152	16.4%
Friday	74	38	20	1	2	1	5	141	15.2%
Saturday	60	33	14	7		1	2	117	12.6%
column totals	465	238	112	45	25	14	30	929	
	50%	26%	12%	5%	3%	2%	3%	100.0%	100.0%
TIME OF DAY									
00:00-01:00	28	17	6	3	3	0	2	59	6.4%
01:01-02:00	24	12	4	2	2	0	0	44	4.7%
02:01-03:00	22	10	3	1	0	0	1	37	4.0%
03:01-04:00	27	11	1	1	2	1	0	43	4.6%
04:01-05:00	17	2	0	2	1	1	1	24	2.6%
05:01-06:00	10	7	5	5	1	1	3	32	3.4%
06:01-07:00	5	9	3	1	0	0	1	19	2.0%
07:01-08:00	13	11	0	4	2	2	3	35	3.8%
08:01-09:00	21	10	5	1	0	0	1	38	4.1%
09:01-10:00	27	9	5	1	1	0	4	47	5.1%
10:01-11:00	14	11	6	2	1	0	1	35	3.8%
11:01-12:00	18	12	6	1	1	1	2	41	4.4%
12:01-13:00	21	13	11	2	1	0	1	49	5.3%
13:01-14:00	16	10	13	0	1	0	0	40	4.3%
14:01-15:00	19	15	2	1	1	1	3	42	4.5%
15:01-16:00	21	7	2	1	1	1	0	33	3.6%
16:01-17:00	22	13	4	2	0	0	0	41	4.4%
17:01-18:00	21	8	6	3	2	1	0	41	4.4%
18:01-19:00	19	8	7	2	0	1	1	38	4.1%
19:01-20:00	24	6	6	2	0	1	1	40	4.3%
20:01-21:00	19	11	4	2	0	2	2	40	4.3%
21:01-22:00	22	13	6	4	2	1	1	49	5.3%
22:01-23:00	23	6	2	1	3	0	1	36	3.9%
23:01-24:00	12	7	5	1	0	0	1	26	2.8%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	

Table 5-4: Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2003	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
ACTIVITY									
walking	123	59	29	14	1	4	10	240	25.8%
riding	64	35	26	8	20	0	0	153	16.5%
getting off	57	25	14	6	0	1	1	104	11.2%
stepping down	34	22	7	3	0	4	6	76	8.2%
getting on	20	5	4	1	0	2	0	32	3.4%
standing	17	7	4	0	1	1	3	33	3.6%
climbing over/on	14	5	4	3	0	0	0	26	2.8%
adjusting coupler	13	0	0	0	0	0	0	13	1.4%
coupling air hose	11	0	0	1	0	0	0	12	1.3%
operating	10	16	1	2	1	0	0	30	3.2%
lining switches	10	5	3	0	0	0	0	18	1.9%
pulling pin/uncoupling	10	2	2	1	0	0	0	15	1.6%
crossing over	10	1	1	2	0	0	0	14	1.5%
stepping	8	2	0	0	0	0	1	11	1.2%
closing	7	4	1	0	0	0	0	12	1.3%
75…unknown	6	0	1	1	0	0	0	8	0.9%
other	5	4	4	0	0	0	1	14	1.5%
74…unknown	5	1	1	1	0	0	1	9	1.0%
adjusting, other	5	0	0	0	0	0	1	6	0.6%
jumping from	4	15	3	0	0	0	0	22	2.4%
opening	4	7	0	0	0	0	0	11	1.2%
stepping over	4	3	0	0	0	0	0	7	0.8%
inspecting	3	3	0	0	0	0	0	6	0.6%
sitting	2	5	0	0	1	0	1	9	1.0%
reaching	2	0	1	0	0	0	1	4	0.4%
coupling electric cables	2	0	0	0	0	0	0	2	0.2%
handling car parts	2	0	0	0	0	0	0	2	0.2%
pushing	2	0	0	0	0	0	0	2	0.2%
opening/closing angle cock	1	2	1	0	0	0	0	4	0.4%
bending, stooping	1	0	1	0	0	0	0	2	0.2%
crossing between	1	0	1	0	0	0	0	2	0.2%
driving (vehicle…)	1	0	0	0	1	0	1	3	0.3%
handling material, general	1	0	0	0	0	0	0	1	0.1%
pulling	1	0	0	0	0	0	0	1	0.1%
uncoupling air hose	1	0	0	0	0	0	1	2	0.2%
handling other	0	3	1	0	0	0	0	4	0.4%
jumping onto	0	1	1	0	0	0	0	2	0.2%
cleaning	0	1	0	1	0	0	0	2	0.2%
flagging	0	1	0	0	0	0	0	1	0.1%
handling loc parts	0	1	0	0	0	0	0	1	0.1%
not coded	0	1	0	0	0	0	1	2	0.2%
chaining, cabling car or locomotive	0	0	1	0	0	0	0	1	0.1%
cutting, other	0	0	0	0	0	0	1	1	0.1%
handling baggage	0	0	0	0	0	1	0	1	0.1%
loading/unloading	0	0	0	0	0	1	0	1	0.1%

Table 5-4: Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2003	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
repairing	1	0	0	0	0	0	0	1	0.1%
running	3	1	0	1	0	0	0	5	0.5%
welding	0	1	0	0	0	0	0	1	0.1%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	
AGE									
15-20	2	0	0	0	0	0	0	2	0.2%
21-26	20	7	9	2	0	0	0	38	4.1%
27-32	53	22	12	5	1	1	2	96	10.3%
33-38	54	22	11	3	3	4	3	100	10.8%
39-44	53	35	10	3	7	1	7	116	12.5%
45-50	88	60	28	10	6	2	10	204	22.0%
51-56	107	51	24	15	4	5	2	208	22.4%
57-62	74	36	17	6	3	1	5	142	15.3%
63-68	14	4	1	1	1	0	1	22	2.4%
69-74	0	1	0	0	0	0	0	1	0.1%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	

Table 5-4: Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2003	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
INJURY EVENT									
slipped, fell, stumbled, etc. due to object…	57	38	10	3	1	2	1	112	12.1%
70-unknown	51	23	13	5	0	1	4	97	10.4%
slipped, fell, stumbled, etc. due to climatic…	49	15	9	6	0	1	9	89	9.6%
struck by on-track equipment	44	10	7	2	0	0	0	63	6.8%
lost balance	42	15	9	3	0	4	1	74	8.0%
slipped, fell, stumbled, etc. due to irregular…	30	20	4	8	0	1	4	67	7.2%
missed handhold, grabiron, step, etc.	21	5	6	4	0	0	1	37	4.0%
struck against object	20	5	13	1	1	1	2	43	4.6%
68…unknown	15	4	1	0	0	1	0	21	2.3%
collision between on-track equipment	14	25	2	3	0	0	0	44	4.7%
other (describe in narrative)	13	7	6	0	1	0	0	27	2.9%
sudden/unexpected movement of on-track equipment	12	5	2	0	4	0	0	23	2.5%
slack action, draft, compressive buff/coupling	12	4	0	1	0	0	0	17	1.8%
stepped on object	11	3	2	0	0	0	1	17	1.8%
slipped, fell, stumbled, etc. on oil, grease	10	1	1	1	0	0	1	14	1.5%
derailments	8	7	3	0	0	0	0	18	1.9%
struck by object	6	9	6	0	0	0	0	21	2.3%
defective/malfunctioning equipment	6	2	2	0	0	0	0	10	1.1%
exposure to chemicals-external	5	4	3	0	0	1	0	13	1.4%
ran into object/equipment	5	0	1	1	0	0	0	7	0.8%
caught in or crushed by materials	4	1	1	1	0	0	0	7	0.8%
overexertion	3	2	1	1	0	1	0	8	0.9%
bodily function/sudden movement, e.g., sneezing	3	2	0	0	0	0	0	5	0.5%
sudden/unexpected movement of on-track equipment	2	5	0	0	0	0	1	8	0.9%
sudden/unexpected movement of material	2	1	2	0	0	0	1	6	0.6%
69…unknown	2	1	0	0	0	0	0	3	0.3%
caught in or compressed by other machinery	2	1	0	0	0	0	1	4	0.4%
ran into on-track equipment	2	1	0	1	0	0	0	4	0.4%
struck by thrown or propelled object	2	0	1	0	0	0	0	3	0.3%
collision/impact-auto, truck, bus, van, etc.	2	0	0	0	18	0	0	20	2.2%
electric shock due to contact with third rail	2	0	0	0	0	0	0	2	0.2%
71…unknown	1	2	1	0	0	0	0	4	0.4%
other impacts on-track equipment	1	1	1	1	0	0	0	4	0.4%
pushed/shoved into/against	1	1	0	1	0	0	0	3	0.3%
struck by falling object	1	0	2	0	0	0	2	5	0.5%
highway-rail collision/impact	0	16	2	0	0	0	0	18	1.9%
assaulted by other	0	0	0	0	0	0	0	0	0.0%
climatic conditions, other (e.g., high winds)	0	0	0	0	0	0	1	1	0.1%

Table 5-4: Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2003	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
exposure to welding light	0	0	0	0	0	0	0	0	0.0%
pushed/shoved onto	1	0	1	0	0	0	0	2	0.2%
pushed/shove from…	0	0	0	0	0	1	0	1	0.1%
rubbed, abraded, etc.	1	0	0	0	0	0	0	1	0.1%
cave in, slide, etc.	0	1	0	0	0	0	0	1	0.1%
sudden release of air	0	1	0	0	0	0	0	1	0.1%
aggregated pre-existing condition	0	0	0	1	0	0	0	1	0.1%
sustained viewing	0	0	0	1	0	0	0	1	0.1%
76…unknown	1	0	0	0	0	0	0	1	0.1%
80…unknown	1	0	0	0	0	0	0	1	0.1%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	

Table 5-4: Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2003	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
EQUIPMENT LOCATION									
freight car moving	88	18	31	6	0	0	0	143	15.4%
other non-equip	63	37	17	5	2	1	18	143	15.4%
freight train moving	55	64	24	10	1	0	0	154	16.6%
freight train standing	70	37	6	13	0	0	1	127	13.7%
locomotive standing	76	33	8	6	0	1	4	128	13.8%
freight car standing	45	11	18	5	0	0	2	81	8.7%
locomotive moving	38	14	4	0	0	0	0	56	6.0%
pass train moving	2	11	0	0	0	3	1	17	1.8%
pass train standing	13	4	0	0	0	7	1	25	2.7%
auto	6	0	0	0	4	2	0	12	1.3%
pass car standing	4	1	0	0	0	0	1	6	0.6%
pass car moving	0	1	0	0	0	0	0	1	0.1%
van passenger	0	0	0	0	9	0	1	10	1.1%
taxi	0	0	0	0	9	0	0	9	1.0%
crane	0	1	0	0	0	0	0	1	0.1%
loaders, etc.	0	0	1	0	0	0	1	2	0.2%
other equip	1	1	0	0	0	0	0	2	0.2%
other on-track equip moving	0	0	1	0	0	0	0	1	0.1%
other on-track equip standing	0	1	0	0	0	0	0	1	0.1%
truck	0	1	1	0	0	0	0	2	0.2%
excavating equip	1	0	0	0	0	0	0	1	0.1%
van utility	1	0	0	0	0	0	0	1	0.1%
other operating equip	1	0	0	0	0	0	0	1	0.1%
camp car moving	0	1	0	0	0	0	0	1	0.1%
maintenance equip moving	0	1	0	0	0	0	0	1	0.1%
inspection vehicle moving	0	1	0	0	0	0	0	1	0.1%
unknown	1	0	1	0	0	0	0	2	0.2%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	

Table 5-4: Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2003	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
WORKING LOCATION									
near on-track equip-on ground	91	32	25	6	0	0	2	156	16.8%
beside track	76	36	25	8	2	0	2	149	16.0%
on side of car	65	15	29	7	1	1	0	118	12.7%
in/on loc	60	73	4	10	0	1	3	151	16.3%
on end of car	30	9	12	6	0	1	1	59	6.4%
other location on loc	25	10	2	1	0	0	2	40	4.3%
between cars/loc	25	6	3	2	0	0	1	37	4.0%
between tracks	24	5	5	0	0	0	0	34	3.7%
on track	19	4	1	2	0	0	0	26	2.8%
on ladder	14	3	0	1	0	0	0	18	1.9%
other location	9	2	1	0	0	0	1	13	1.4%
on stairs	8	8	2	0	0	1	5	24	2.6%
at work station	7	6	0	0	0	5	8	26	2.8%
on platform	5	8	3	0	0	4	2	22	2.4%
on bridge/trestle	3	5	0	0	0	0	0	8	0.9%
in car	2	9	0	1	3	1	0	16	1.7%
under car	1	1	0	0	0	0	0	2	0.2%
in/operating vehicle	1	0	0	0	17	0	1	19	2.0%
on highway-rail crossing	0	6	0	0	2	0	0	8	0.9%
in tower	0	0	0	0	0	0	1	1	0.1%
on pole/signal mast	0	0	0	1	0	0	0	1	0.1%
under loc	0	0	0	0	0	0	1	1	0.1%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	

Table 5-4: Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2003	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
TOOLS, MACHINERY, APPLIANCES,									
STRUCTURES, SURFACES (ETC.)									
ground	160	70	38	11	0	1	9	289	31.1%
other	53	27	24	4	0	1	8	117	12.6%
ballast	49	30	8	8	0	0	2	97	10.4%
ladder	28	9	12	3	0	0	0	52	5.6%
36…unknown	25	2	3	4	0	0	0	34	3.7%
grabiron	20	5	4	2	0	0	0	31	3.3%
coupler	20	2	2	0	0	0	0	24	2.6%
floor	14	22	1	3	2	1	3	46	5.0%
switch	13	2	5	3	0	0	0	23	2.5%
door	12	11	1	0	0	1	1	26	2.8%
tie	11	2	2	2	0	0	0	17	1.8%
stair	9	13	1	1	0	1	6	31	3.3%
43…unknown	9	2	0	3	0	7	0	21	2.3%
37…unknown	8	0	0	0	0	0	0	8	0.9%
34…unknown	4	7	0	0	1	0	0	12	1.3%
hose	4	3	1	0	0	0	0	8	0.9%
baggage	4	1	0	0	0	1	0	6	0.6%
bridge/trestle	3	5	1	0	0	0	0	9	1.0%
42…unknown	3	2	1	0	1	0	0	7	0.8%
end of train device	3	1	0	1	0	0	0	5	0.5%
46…unknown	2	2	2	0	0	0	0	6	0.6%

Table 5-4: Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2003	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
41…unknown	2	0	0	0	0	0	0	2	0.2%
81…unknown	2	0	0	0	0	0	0	2	0.2%
window	2	0	0	0	0	0	0	2	0.2%
highway, street, road	1	9	2	0	18	0	0	30	3.2%
38…unknown	1	3	0	0	0	0	0	4	0.4%
caboose	1	1	0	0	0	0	0	2	0.2%
TOFC, COFC	1	1	0	0	0	0	0	2	0.2%
fusees/torpedoes	1	0	0	0	0	0	0	1	0.1%
derail	0	2	1	0	0	0	0	3	0.3%
40…unknown	0	1	0	0	0	0	0	1	0.1%
82…unknown	0	1	0	0	0	0	0	1	0.1%
87…unknown	0	1	0	0	0	0	0	1	0.1%
welder-electric	0	1	0	0	0	0	0	1	0.1%
35…unknown	0	0	1	0	0	0	0	1	0.1%
44…unknown	0	0	1	0	0	0	0	1	0.1%
cutting tools	0	0	1	0	0	0	0	1	0.1%
39…unknown	0	0	0	0	0	1	0	1	0.1%
not coded	0	0	0	0	3	0	0	3	0.3%
torch, acetylene, gas, etc.	0	0	0	0	0	0	1	1	0.1%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	

Table 5-4: Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2003	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
ASSIGNED CAUSE OF INJURY									
human factors	193	100	35	21	13	8	12	382	41.1%
undetermined	130	80	43	12	8	1	10	284	30.6%
environmental	56	19	14	9	4	4	7	113	12.2%
equip procedures not followed	49	15	8	1	0	1	0	74	8.0%
equipment	27	13	7	1	0	0	0	48	5.2%
track	4	4	3	0	0	0	0	11	1.2%
other	3	1	1	0	0	0	0	5	0.5%
physical condition	2	2	0	0	0	0	0	4	0.4%
trespassing	1	2	0	0	0	0	0	3	0.3%
no safety equip	0	1	1	1	0	0	1	4	0.4%
substance use	0	1	0	0	0	0	0	1	0.1%
column totals	465	238	112	45	25	14	30	929	100.0%
	50%	26%	12%	5%	3%	2%	3%	100.0%	

5.5 Statements About Frequency of Serious Injuries by Track Location

To look at Severe Injuries for just yard and road crews, a slightly smaller group of track locations and job codes were used. This reduced set contained 843 Severe Injuries. Track locations used in the analysis below were yard, mainline/branch line, industry, and siding. The remaining three track locations (highway/roadway, passenger terminal, and other) were not used in this analysis. The following job codes were used for yard and road crews:

- Yard crews consist of 619-engineers, 623-firemen, 603-hostlers, outside, 601-switch tenders; 614-conductors, and 615 brakemen.

- Road crews consist of 616-passenger engineer, 617-through freight engineers, 618-local freight engineers, 606-passenger conductors, 607-assist. passenger conductors, 608-through freight conductors, 609-local freight conductors, 612-freight brakemen and flagmen, and 613-freight brakemen and flagmen.

The following observations, based on the information presented in Tables 5.4 and 5.5, are examples of how the Severe Injury data might be used in trying to understand the injury process. When there is mention of yard and road crews, the information came from the restricted number of job codes and track locations given in Table 4-5.

- The total number of Severe Injuries has remained nearly the same during the years 1997 thru 2001. There was a significant reduction in the number of Severe Injuries in 2002 and a further numerical reduction in 2003.

- There were significant reductions in Serious Injuries in the yard and at industries in 2002 and 2003. Serious Injuries in the yard have declined from 72 in 1997 to 55 in 2003, and from 23 in 1997 to 8 in 2003 at industries.

- Serious Injuries on main/branch line have increased from 28 in 1997 to a high of 39 in 2003.

- Over half (53.9%) the total number of Severe Injuries occurred in the yard during the years 1997 thru 2003.

- Forty-two percent of all Severe Injuries to road train and engine service crews occurred in yards. Road train and engine service crews sustained almost as many Severe Injuries in the yard as yard train and engine service crews. (220 vs. 234 Serious Injuries)

- During the seven-year period, yard train and engine service employees sustained 38.1 percent of the total Severe Injuries, while road train and engine service employees sustained 61.9 percent of the total Severe Injuries. (321 vs. 522 Serious Injuries)

- Yard engineers sustained 12.2 percent of the total number of Severe Injuries to yard crews, while road engineers sustained 26.7 percent of the total number of Severe Injuries to road crews. (39 of 321 vs. 139 of 522)

- Yard train service employees sustained 87.9 percent of the total Severe Injuries to yard crews, while road train service employees sustained 73.3 percent of the total number of Severe Injuries to road crews. (282 of 321 vs. 383 of 522)

- During the seven-year period, road freight engineers incurred 3.6 times as many Severe Injuries as yard engineers.

- There were significantly more Severe Injuries in the yard during the months of January (55), February (48), March (46), and September (46) than during the other months of the year. On the main/branch line, the fewest Serious Injuries occurred during the month of September (13), and the most during the month of November (29).

- There does not appear to be any significant differences in the day of the week when these Severe Injuries occurred in the yard.

- Significantly fewer Serious Injuries occur on main/branch line (18) and at industries (8) on Sunday, than during the other days of the week.

- Significantly more Severe Injuries occurred in the first hour after midnight than during any other time of the day or night. (6.4 percent of the total Serious Injuries).

- At all locations, many more Severe Injuries occurred to older employees, i.e., those over 38 years of age.

- Over 96 percent of the Severe Injuries during the data period were amputations and fractures.

- Severe Injuries are nine times more likely to affect legs and feet than hands and arms.

- There were four times as many amputation Severe Injuries in the yard (83) and at industries (16) than on the main track/branch line (25) for the same seven-year period.

- The proportion of "human factor" Possible Contributing Factor (PCF) Severe Injuries to the total Severe Injuries (41.1 percent) is about the same in the yard (41.5 percent) and on the main track/branch line (42.0 percent). The proportion of (PCF) Serious Injuries is lower, 31.3%, at industries.

- Over one half of the Severe Injuries in each identified location were impacted by "the ground, ballast, or floor" as the identified "tools, machinery, appliances, structures, surfaces, etc."

Table 5-5. Severe Injuries by Selective Job Codes and Track Locations, 1997 to 2003

Job Code	yard	main or branch line	industry	siding	TOTAL
Conductor, road freight-608	46	68	10	9	133
Conductor, road freight local-609	36	32	23	12	103
Brakeman, road freight through-612	10	6	8	5	29
Brakeman, road freight local-613	37	22	14	6	79
Conductor, road passenger-606	18	12	0	0	30
Conductor, assist. road passenger-607	5	4	0	0	9
Total, Road Train Service	**152**	**144**	**55**	**32**	**383**
Conductor, yard-614	107	14	30	1	152
Brakeman, yard-615	89	10	19	1	119
Switch tender-601	6	3	2	0	11
Total, Yard Train Service	**202**	**27**	**51**	**2**	**282**
Total, Train Service	**354**	**171**	**106**	**34**	**665**
Engineer, road through freight-617	38	42	1	6	87
Engineer, road passenger-616	14	10	0	0	24
Engineer, road local freight-618	16	9	1	2	28
Total, Road Engine Service	**68**	**61**	**2**	**8**	**139**
Engineer, yard-619	30	4	2	1	37
Fireman, yard-623	1	0	0	0	1
Hostler, outside-603	1	0	0	0	1
Total, Yard Engine Service	**32**	**4**	**2**	**1**	**39**
Total, Engine Service	**100**	**65**	**4**	**9**	**178**
ROAD, TRAIN & ENGINE	**220**	**205**	**57**	**40**	**522**
YARD, TRAIN & ENGINE	**234**	**31**	**53**	**3**	**321**
TOTAL	**454**	**236**	**110**	**43**	**843**

5.6 Conclusion on Severe Injury Data

The SWG again looked at the injury data from the perspective of the knowledge gained from its detailed investigation of switching fatalities where the circumstances surrounding, and leading up to, an FE were identified. The SWG realized that Severe Injuries are not investigated or reported the way FEs are; hence, it is not always possible to identify these circumstances. The implication of this is clear; it is not possible for the SWG to tell if one or more of the five major safety recommendations applies to a particular Severe Injury event. The SWG makes this information in section 5 available in the interest of railroad safety.

APPENDIX

A: SOFA Implementation Guidelines for Five Operating Recommendations

B: Origin of SOFA Working Group

C: Original Introduction to *SOFA Report*, October 1999

D: Five SOFA Operating Recommendations

E: Obtaining Electronic Versions of SOFA Reports

F: Examples of Job Briefings – Operating Recommendation 4

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Appendix A: SOFA Implementation Guidelines for Five Operating Recommendations

The Switching Operations Fatality Analysis (SOFA) Working Group submits the following suggestions in response to a request made by Federal Railroad Administration's (FRA) Associate Administrator of Safety George A. Gavalla. During the call, Mr. Gavalla asked that the SOFA group produce guidelines that it feels would help to more effectively implement the Five Major Safety Recommendations contained in the *SOFA Report* released in October 1999. Here are the suggestions:

Impact

Implementation of SOFA Recommendations should be planned, conducted, and reported in ways that encourage follow through by stakeholders, so that the likelihood that it will be effective is increased.

Political Viability

Implementation of SOFA Recommendations should be planned and conducted with anticipation of the different positions of various interest groups, so that their cooperation may be obtained; and so that possible attempts by any of these groups to curtail efforts to improve safety, or to bias or misapply the SOFA Recommendations, can be adverted or counteracted.

Obligations

Obligations of the formal parties to the implementation of the SOFA Recommendations (what is to be done, how, by whom & when) should be agreed to, so that these parties adhere to all specified conditions. Do not expect participation in the implementation by persons or parties who have not previously agreed to do so.

Valid Information

Ensure that the individuals who will administer or supervise (a) new particular procedure(s) are qualified and adequately prepared (in terms of knowledge, training, and practice) to do so.

Propriety (Human Interactions)

Participants should respect human dignity and worth in their interactions with other persons associated with implementation of the SOFA Recommendations, so that participants are not threatened or harmed.

And finally:

- Convey the SOFA messages in a positive manner.
- Keep rules that are not directly related to SOFA separate and apart.
- Messages should be consistent with the five SOFA Recommendations.

- SOFA should be a culture change where necessary.
- SOFA endeavors should be cooperative efforts between management, labor and FRA.
- SOFA Recommendations should be viewed as possible lifestyle changes.

Appendix B: Origin of SOFA Working Group

The letter below was sent by George Gavalla, Associate Administrator for Safety, Federal Railroad Administration to Charles E. Dettmann, Association of American Railroads (AAR), William E. Loftus, President, American Short Line and Regional Railroad Association (ASLRRA), Clarence V. Monin, International President, Brotherhood of Locomotive Engineers (BLE), and Charles L Little, International President, United Transportation Union (UTU).

This letter forms the basis for the creation of the Switching Operations Fatality Analysis (SOFA) Working Group.

February 1998

U.S. Department
Of Transportation
Federal Railroad
Administration

Dear Sirs:

I would like to bring your attention to a serious concern that I have with respect to train and engine service (T&E) employee fatalities. The Federal Railroad Administration (FRA) recently conducted a preliminary review of all T&E employee fatalities for a six year period beginning in 1992. We found that 66 T&E employees were fatally injured in incidents other than major train collisions. These fatal train incidents typically occurred in yards and terminals when the T&E employee was struck by, fell from, or run over by equipment. Unlike major train collisions, the root cause of these incidents, as well as any appropriate corrective action, is often far more difficult to determine.

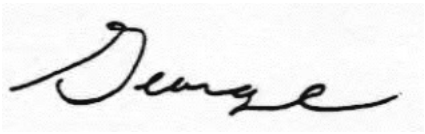
As in the past, we need your help if we are going to reduce and eliminate these fatal train incidents. I believe that a task force consisting of representatives from labor, management, and FRA should be formed to find a way to prevent these tragic occurrences. The team will conduct a detailed fact finding and review and analysis of these incidents to determine whether trends or patterns can be found, identify best practices, and, if possible, formulate recommendations for the entire industry based on the findings.

The process is very similar to the highly successful approach utilized by the joint labor and management Roadway Worker Protection Task Force to analyze roadway worker fatalities and injuries prior to the first formal negotiated rulemaking committee meeting. However, unlike that task force, the findings and recommendations from this team are neither intended to be used in a rulemaking process not to otherwise lead to formal action by FRA. Rather, railroads will be able to evaluate the team's findings and recommendations with respect to their individual operating requirements and would, through the Safety Assurance and Compliance program process, be

encouraged to implement recommendations that would benefit their safety program.

I would like to invite you or your representatives to a planning meeting to discuss the feasibility of such an effort and to determine the team make-up. I suggest a meeting at FRA Headquarters, 1120 Vermont Avenue, N.W., Room 6046, Washington, D.C., on February 10 at 10 a.m. If this is inconvenient, please contact my office at (202) 632-3310. I will be glad to arrange for an alternate date and time or perhaps set up a conference call at a mutually convenient time.

Sincerely,



George Gavalla
Acting Associate Administrator for Safety

Appendix C: Original Introduction to *SOFA Report*, October 1999

1. INTRODUCTION

Background of SOFA

In February 1998, a Switching Operations Fatalities Analysis (SOFA) Working Group, with representatives from the Federal Railroad Administration (FRA), labor and management, was formed at the request of the FRA to review recent employee fatalities (FEs) and develop recommendations for reducing fatalities in switching operations. The charge to the Working Group was contained in a letter (see Appendix A) from George Gavalla, Associate Administrator for Safety of the FRA to the following four organizations: Association of American Railroads (AAR), American Short Line and Regional Railroad Association (ASLRRA), Brotherhood of Locomotive Engineers (BLE), and the United Transportation Union (UTU). It proposed that the group, "Conduct a detailed fact-finding review and analysis of these incidents to determine whether trends or patterns can be found, identify best practices, and, if possible, formulate recommendations for the entire industry based on its findings."

This small group of senior railroad experts in switching operations met almost monthly for the past 20 months, and reviewed the individual case histories of FEs that occurred in switching operations since 1992. Initial efforts of this Working Group have been sponsored by the Office of Safety and supported by the Office of Research and Development at the FRA. Working Group membership and affiliation are given in Appendix B.

The group began its work by reviewing the FEs summaries available from the FRA. However, they soon realized that to better understand the underlying causal factors of these fatalities, they would need to look in more detail at the entire FE files, including photographs of the site and statements of eyewitnesses. From experience, the SOFA Working Group recognized they could not objectively evaluate the underlying causal factors common across these fatalities by reviewing individual case files.

Consequently, it was determined that a database of selected information in the case files was needed for aggregating data and conducting expert analysis. After several months of dedicated effort pouring over dozens of case files, and with considerable give-and-take from the different parties represented, the SOFA Working Group generated a codified database of standardized information, referred to as the "SOFA Matrix." This codified database was then used to help generate trends or patterns in the data for a more comprehensive understanding of the fatalities they were investigating, and became the foundation for the analysis and recommendations in this report. These recommendations include short- and long-term actions to improve the safety of railroad switching operations and the quality of data collected on fatalities in switching operations.

While the FE reports generally tried to establish a single probable cause of each switching FE, it appeared, to the SOFA Working Group, that fatalities more often resulted from the coming together of a complex set of factors. Had any one of these factors not been present, the fatality

would have been less likely to occur.

Shortly after beginning their evaluation process, the SOFA Working Group accepted Human Factors support offered from the Office of Research and Development at the FRA, which then requested additional Human Factors support from the Volpe Center. The Human Factors team brought additional perspectives to the SOFA Working Group while supporting their premise that most FEs have multiple contributing factors. They also helped the SOFA Working Group to refine the SOFA Matrix, and suggested methods to analyze the database to help answer some of the many questions that arose.

In the course of these lengthy investigations, the Working Group became a highly experienced team in understanding the variety of circumstances that can lead to FEs in switching operations. Periodically, the Human Factors Team would lead one of the meetings, devoting specific attention to such things as elaborating and systematizing the possible contributing factors to fatalities, and establishing the relative importance of these possible contributing factors for each of the FEs they had studied. Results of these meetings form the basis for this report.

Appendix D: Five SOFA Operating Recommendations

Below are the Five Operating Recommendations contained in the *SOFA Report*. These Recommendations were each based on between eight and twelve switching fatalities during the January 1, 1992 through July 1, 1998. In the view of the SWG, these fatalities *may not* have occurred if the respective Recommendation was observed. About six months after the release of the *SOFA Report*, the SWG issued shorter versions of the Recommendations in the form 'The Five Lifesavers.' The intend of the shorter Five Lifesavers was to aid in remembering the Recommendations – not to serve as substitutes for the more detailed Recommendations.

Recommendation 1

Any crew member intending to foul track or equipment must notify the locomotive engineer before such action can take place. The locomotive engineer must then apply locomotive or train brakes, have the reverser centered, and then confirm this action with the individual on the ground. Additionally, any crew member that intends to adjust knuckles/drawbars, or apply or remove EOT device, must insure that the cut of cars to be coupled into is separated by no less than 50 feet. Also, the person on the ground must physically inspect the cut of cars not attached to the locomotive to insure that they are completely stopped and, if necessary, a sufficient number of hand brakes must be applied to insure the cut of cars will not move.

Lifesaver 1
Secure equipment before action is taken.

Discussion 1
This recommendation emphasizes the importance of securing the equipment. A thorough understanding by all crew members that the area between cars is a hazardous location, whether equipment is moving or standing, is imperative.

Nineteen Fatalities Involving SOFA Operating Recommendation 1

#	RR	Date	Location	FRA Report #
1	CNW	06/20/92	Northlake, IL	FE-18-92
2	UP	10/17/94	Donaldsonville, LA	FE-26-94
3	UP	12/13/94	Thorton, CA	FE-32-94
4	ATSF	02/24/95	Amarillo, TX	FE-11-95
5	NS	03/02/95	Aiken, SC	FE-12-95
6	CSX	10/04/95	Riverdale, IL	FE-29-95
7	BRC	03/20/96	Bedford Park, IL	FE-09-96
8	UP	10/07/96	Eagle Pass, TX	FE-24-96
9	UP	08/15/97	Elko, NV	FE-25-97
10	BRC	05/26/98	Bedford Park, IL	FE-15-98
11	NS	06/05/98	Hapeville, GA	FE-17-98
12	UP	06/23/99	Redding, CA	FE-16-99

13	AM	09/14/99	Van Buren, AR	FE-24-99
14	IHB	03/09/00	Riverdale, IL	FE-09-00
15	CKRY	07/07/00	Wichita, KS	FE-21-00
16	BNSF	03/03/01	Willmar, MN	FE-08-01
17	UP	05/14/02	Pine Bluff, AR	FE-12-02
18	BNSF	06/16/02	Memphis, TN	FE-16-02
19	LC	08/26/03	Chester, SC	FE-20-03

Recommendation 2

When two or more train crews are simultaneously performing work in the same yard or industry tracks, extra precautions must be taken:

SAME TRACK

- **Two or more crews are prohibited from switching into the same track at the same time, without establishing direct communication with all crew members involved.**

ADJACENT TRACK

Protection must be afforded when there is the possibility of movement on adjacent track(s). Each crew will arrange positive protection for (an) adjacent track(s) through positive communication with yardmaster and/or other crew members.

Lifesaver 2

Protect employees against moving equipment.

Discussion 2

FE-06-94 and FE-31-94 both involved standing equipment left by another crew. In both cases, it can be argued that there was no possibility of either piece of equipment being moved. However, the fact that both pieces of equipment contributed to the fatalities and in both cases the respective crews had no knowledge that the equipment had been moved into the work area and that the physical layout expected by each fatality had changed contributed to the incident. Compliance with and an understanding of this recommendation would have prevented the other seven fatalities.

Twelve Fatalities Involving SOFA Operating Recommendation 2

#	RR	Date	Location	FRA Report #
1	GBW	07/24/92	Wisconsin Rapids, WI	FE-30-92
2	ATSF	08/12/93	Evandale, TX	FE-31-93
3	UP	01/20/94	Fall City, NE	FE-06-94
4	CR	12/06/94	Campbell Hall, NY	FE-31-94
5	ATSF	02/24/95	Amarillo, TX	FE-11-95
6	CSX	05/03/95	Evansville, IN	FE-18-95

7	CR	02/02/97	Burns Harbor, IN	FE-05-97
8	BRC	02/04/98	Bedford Park, IL	FE-05-98
9	BNSF	06/01/98	Lubbock, TX	FE-16-98
10	BNSF	08/11/00	Port of Los Angeles, CA	FE-25-00
11	CWRO	08/08/02	Cleveland, OH	FE-19-02
12	CNIC	02/11/03	Flat Rock, MI	FE-03-03

Recommendation 3

At the beginning of each tour of duty, all crew members will meet and discuss all safety matters and work to be accomplished. Additional briefings will be held any time work changes are made and when necessary to protect their safety during their performance of service.

Lifesaver 3

Discuss safety at the beginning of a job or when a project changes.

Discussion 3

Safe switching operations require teamwork and accountability among all crew members. Each crew member takes responsibility for their own and their fellow crew member's safety. Team work begins with a detailed, effective job briefing, but includes continued updates to all crew members describing the current state of each move as it is executed.

Fourteen Fatalities Involving SOFA Operating Recommendation 3

#	RR	Date	Location	FRA Report #
1	GBW	07/24/92	Wisconsin Rapids, WI	FE-30-92
2	IC	06/07/93	Fulton, KY	FE-23-93
3	SP	08/11/93	Tracy, CA	FE-30-93
4	GC	11/13/93	Macon, GA	FE-47-93
5	SOU	12/05/93	Atlanta, GA	FE-49-93
6	CR	11/15/94	Painted Post, NY	FE-29-94
7	CR	02/17/95	St. James, OH	FE-09-95
8	NS	03/02/95	Aiken, SC	FE-12-95
9	CR	01/12/99	Port Newark, NJ	FE-01-99
10	DME	04/02/99	Waseca, MN	FE-11-99
11	UP	10/15/00	Houston, TX	FE-30-00
12	NS	01/11/01	South Fork, PA	FE-03-01
13	BNSF	06/16/02	Memphis, TN	FE-16-02
14	UP	04/11/03	Pocatello, ID	FE-11-03

Recommendation 4

When using radio communication, locomotive engineers must not begin any shove move without a specified distance from the person controlling the move. Strict compliance with "distance to go" communication must be maintained.

When controlling train or engine movements, all crew members must communicate by hand signals or radio signals. A combination of hand and radio signals is prohibited. All crew members must confirm when the mode of communication changes.

Lifesaver 4

Communicate before action is taken.

Discussion 4

The SOFA group believes that the key to radio use when backing, shoving or pushing a train or cut of cars is the communication between the locomotive engineer and the train crew. The crew must develop the discipline to remain stopped until specific car counts are given by the ground person, rather than to begin moving and then expect to receive the count. If this is done, fatalities related to improper radio communication can be substantially reduced. Additionally, mixing radio and hand signals causes confusion, reduces the chance that other members of the crew would hear of a change in the switching operations, thereby greatly increasing misunderstandings, and, has directly led to fatalities studied by the SOFA Group.

Eighteen Fatalities Involving SOFA Operating Recommendation 4

#	RR	Date	Location	FRA Report #
1	BN	01/28/92	Willmar, MN	FE-03-92
2	FEC	03/11/92	Fort Pierce, FL	FE-08-92
3	ATSF	06/01/92	Escondido, CA	FE-14-92
4	UP	07/25/92	Portland, OR	FE-22-92
5	CR	07/15/93	Anderson, IN	FE-26-93
6	SP	08/11/93	Tracy, CA	FE-30-93
7	CR	11/15/94	Painted Post, NY	FE-29-94
8	CR	12/06/94	Campbell, Hall, NY	FE-31-94
9	CR	02/17/95	St. James, OH	FE-09-95
10	UP	01/29/97	Mason, City, IA	FE-04-97
11	CMRC	06/06/97	Bay City, MI	FE-16-97
12	UP	12/26/97	Boise, ID	FE-45-97
13	IC	12/28/98	Durrant, MS	FE-37-98
14	CR	01/12/99	Port Newark, NJ	FE-01-99
15	UP	06/23/99	Redding, CA	FE-16-99
16	PARN	07/24/00	Skagway, AK	FE-22-00
17	BNSF	09/09/00	Keokuk, IA	FE-29-00
18	NS	07/16/02	Bonlee, NC	FE-17-02

Recommendation 5

Crew members with less than one year of service must have special attention paid to safety awareness, service qualifications, on-the-job training, physical plant familiarity, and overall ability to perform service safely and efficiently. Programs such as peer review, mentoring, and supervisory observation must be utilized to insure employees are able to perform service in a safe manner.

Lifesaver 5

Mentor less experienced employees to perform service safely.

Discussion 5

While classroom training time has increased, in general, the SOFA group has focused on experience and on-the-job training. We have found that limited training and experience continues to factor into many switching operation fatalities. Additional on-the-job training and experience, while working with more experienced peers, may help reduce fatalities among crew members with limited service.

Nineteen Fatalities Involving SOFA Operating Recommendation 5

#	RR	Date	Location	FRA Report #
1	AGC	01/30/92	Polk County, FL	FE-04-92
2	IHRC	06/02/92	Henderson, KY	FE-16-92
3	SOO	10/19/93	Leal, ND	FE-40-93
4	GC	11/13/93	Macon, GA	FE-47-93
5	PTRA	11/10/94	Houston, TX	FE-28-94
6	CR	12/06/94	Campbell Hall, NY	FE-31-94
7	CSX	10/04/95	Riverdale, IL	FE-29-95
8	BRC	03/20/96	Bedford Park, IL	FE-09-96
9	CSX	06/15/96	Charlotte, NC	FE-12-96
10	NS	07/07/96	Sidney, IN	FE-17-96
11	DGNO	09/03/96	Dallas, TX	FE-22-96
12	UP	10/07/96	Eagle Pass, TX	FE-24-96
13	MRL	10/16/97	Laurel, MT	FE-32-97
14	BNSF	06/01/98	Lubbock, TX	FE-16-98
15	NS	05/19/99	Cincinnati, OH	FE-14-99
16	AM	09/14/99	Van Buren, AR	FE-24-99
17	CSX	01/10/01	Chicago, IL	FE-02-01
18	BNSF	06/16/02	Memphis, TN	FE-16-02
19	GC	09/12/03	Dublin, GA	FE-22-03

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Appendix E: Obtaining Electronic Versions of SOFA Reports

Obtaining Electronic Versions of SOFA Working Group Reports

The SOFA Working Group has issued three reports on switching fatalities and casualties. These reports may be obtained electronically at the FRA's Web site, for Switching Operations Fatality Analysis, at: http://www.fra.dot.gov/Content3.asp?P=102.

1. *Findings and Recommendations of the SOFA Working Group*, October 1999

2. *Findings and Recommendations of the SOFA Working Group, Appendix – Volume II*, August 2000

3. *Severe Injuries to Train and Engine Service Employees: Data Description and Injury Characteristics. July 2001*

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Appendix F: Examples of Job Briefings – Operating Recommendation 4

Example 1

5009
For Yard Crews:
(a) The specific job(s) to be done, or moves to be made.
(b) The responsibilities of each employee.
(c) Any additional instructions due to an unusual situation.
(d) The means to be used to communicate hand signals, radio, etc.
(e) Who will be responsible for securing equipment to be left unattended.
If back up hose is required, whether it has been properly connected and tested.
(g) Any job related safety issues, including the Safety Instruction of the Day.
5010
Use caution when carrying multiple items, especially those of different sizes, shapes, and those containing hot or corrosive liquids. Carry only so much as permits you to maintain a firm grip on each item.
NOTE: When obtaining moves from a yardmaster, employees must inquire about other crews that might be switching on the same or adjacent tracks. To avoid injury or damage when engines may be working at both ends of the same track, crews switching must have a clear understanding of the movements to be made.
This information does not relieve employees of their responsibility to be vigilant for movements on any track, at any time, in any direction.
Prior to beginning work, all train and engine crew members must hold a "JOB BRIEFING to ensure that they have a clear and common understanding of all safety critical tasks to be performed, and their individual responsibilities in performing those tasks. When operating conditions change, an additional job briefing must be conducted with all affected crew members to ensure uniform and complete understanding.

For Road Crews: (h) All new or temporary operational requirements affecting the train movement that are necessitated by changes in written instructions such as Timetables, General Orders, Bulletins, Notices or Circulars, etc. , or operational requirements of the Train Manifest.
Whether authority to proceed has been received, and how far that authority extends.
If the authority is not for the entire trip, when and where an additional job briefing will need to take place.
(k) Where required, the need to check with the proper person to ensure that current copies of all required forms governing the movement of the train have been received.
If additional forms must be obtained during the trip, when and where these forms must be obtained.
(m) Any job related safety issues, including the Safety Instruction of the Day.
Employees must discuss the following topics during the "JOB BRIEFING"
(i)
(I)
(f)
AMT 5 – 2

Example 2

ITEM 17. JOB BRIEFING

Safety, Quality, and Productivity are the result of well-planned and conducted job briefings.
In addition, printing shown in italics are instructions specific to Train, Engine, and Yard Employees.

Step 1. Plan the Job Briefing.

A. Develop your own work plan by:
Reviewing work or task to be accomplished.
Checking the job location and work area. Know the condition of gates, switches, derails, track conditions, close clearances, short spurs (next to end of track), bad footing, and that cars are secure before coupling.
Breaking the work or task down into step-by-step procedure.
Determining tool, equipment, and material requirements.
Determine what safety rules or procedures are applicable.
Consider close clearances and gates, etc.

B. Consider existing and potential hazards that might be involved as a result of:
Job and weather.
The nature of the work to be done. Consider switching, spotting, picking up, or setting out.
The job location. Consider whether yard, industry, or road.
The tools, equipment, and materials used.
Equipment to be work on.
Traffic conditions and visibility. Consider people, vehicles, time of day, other jobs in track or area, and obstructions.
Time of day. Consider whether 0300 - 0500 (alertness), or end of shift ("go home" moves).
Safety or personal protective equipment required.

C. Consider how work assignments will be made:
1. Group assignments. Remember that the whole crew is a team and will be held jointly responsible.
2. Individual assignments (who checks for what?). Engineers need to check with crew about the status of gates, switches, derails, hand brakes, how much room, how many cars are already there, etc.
3. Abilities and experience of individuals. Make sure that each

crew member is able to do their assignments (experience, mental state, and physical condition).

Step II. Conduct the Job Briefing.

A. Explain work or task to employees.

1. What is to be done.
2. Why it is to be done.
3. When it is to be done.
4. Where it is to be done.
5. How it is to be done. Everyone needs to understand what signals will be used. If radio, know the condition of the radio and verify the correct radio channel.
6. Who is to do it. Who will open and secure gates, line switches, line derails, make the cut or joint, protect the move?

7. What safety precautions are necessary. All crew members must know that the following are done:
   Gates open, switches lined, derails lined, cars not attached to the facility (plates and hoses removed), cars secured before coupling, sufficient room has been verified for the move, etc. Identify close clearances and bad footing. Engineers must not move until direction and distance has been received, and will stop after moving 1/2 the distance given unless further instructions are received.

B. Discuss existing or potential hazards and way to eliminate or protect against them.

C. Make definite work assignments.

1. Make sure employees understand assignments.
2. Ask questions of the "how" and "why" type.

D. If special tools, materials, equipment, or methods are to be used, make sure employees know how to proceed safely.

E. Issue all instructions clearly and concisely; check to see that they are understood by all members of the crew, including the engineer.

Step III. Job Brief for Special Conditions.

A. Complex Jobs.

1. Brief only a portion of the job.

2. Give additional briefing as the job progresses.

B. Change in job conditions - when it becomes necessary to change plans and procedures as the job progresses, brief employees on these changes. (As examples: the weather condition changes, or use of a third party to relay messages)

Step IV. Follow up by Supervisor.

It is important that frequent checks be made as the job progresses to be sure that:

1. Your plans are being followed and correct work methods are used.
2. Each person is carrying out the assigned responsibilities.
3. Any hidden hazards have been identified and action initiated to eliminate them or what precautions are required.

Step V. Individual Responsibility.

All employees are responsible to see that the work plan is carried out according to the Job Briefing or modified when conditions change.

Constant Communication is Necessary and Required

JOB SAFETY
BREIFING GUIDELINES

Step I Plan the Job Safety Briefing

Develop your own work plan
Identify existing and potential hazards
Assign work based on manpower, abilities, experience and equipment

Step II Conduct the Job Safety Briefing

Explain the work or task to all affected individuals:

Establish two-way dialogue.
Issue instructions clearly and concisely
Discuss ways to eliminate or protect against risks and hazards
Describe use of any special tools, materials equipment or methods
Solicit questions to verify understanding

Step III Briefing for Special Conditions

Brief only a portion of complex jobs at a time
Hold re-briefings whenever job conditions, equipment or personnel change

Step IV Follow up by employee in charge

Check job progress frequently to verify that:

Each person is carry out assigned task,
Work plan is being followed, and
New hazards are identified

Step V Debriefing

Review what went right
Discuss any unexpected occurrences
Discuss ideas for improvement
Recognize good performance

ALL EMPLOYEES ARE RESPONSIBLE FOR CARRY OUT WORK ACCORDING TO THE WORK PLAN AND UPDATING BRIEFING WHEN CONDITIONS CHANGE.

RISK EVALUATION

1. Calculate approximate time for job completion to avoid shortcuts and the need to hurry: _____

2. Compile procedures for implementing job: _____

3. *List Machinery to be used and designate safe working distances for each without making contact with Operator:*

Machine	*Safe Working Distance around machine*

4. Directions to job site: _____

5. Did you talk with all employees who will be in your work area? Yes ☐ No ☐

   Employee initials and comments (all employees must initial):

6. End of Day or End of Job Debriefing. _____

NOTE: Use job-briefing guidelines and remember to do continuous job briefings throughout the day!

JOB BRIEFINGS

The First Tool for Any Job

Job Briefings should be done:

1. **At the beginning of each job.**
2. **When conditions change or the work gets confusing.**
3. **When new tasks are started.**
4. **When a rule violation is observed.**

Step 1 - Plan your Job Briefing

1. **Review the work to be performed.**
2. **Break the work down into a step-by-step procedure.**
3. **Determine the tools, equipment and materials needed for each step.**
4. **Check the job location or work area.**
5. **Determine what rules or procedures are applicable.**
6. **Consider potential hazards that may be involved as a result of:**
   - Job and weather conditions.
   - The nature of the work to be done.
   - The job location.
   - Equipment that will be used.
   - Traffic conditions and visibility.
   - The time of day.
7. **Plan the work assignments.**
   - Group assignments.
   - Individual assignments.
   - Abilities and experience of individuals.

Step 2 – Conduct your Job Briefing

1. **Explain the work to be done to the work group.**
   - What is to be done.
   - When it is to be done.
   - Where it is to be done.
   - How it is to be done.
   - Who will do each part.
2. **Discuss existing or potential hazards and ways to eliminate or safeguard them. List the personal protective equipment required.**
3. **Make sure everyone understands his or her work assignments. Discuss any unclear elements.**
4. **Discuss any special or unfamiliar equipment to be used. Make sure employees know how to safely operate.**
5. **Confirm understanding of all instructions.**

Step 3 – Job Brief when conditions change.

1. **The job changes** – When it becomes necessary to change job plans and procedures as the job progresses, huddle and discuss the changes and how it affects each team member.
2. **Weather conditions change** – When weather conditions change during the course of a job, huddle and discuss any necessary changes to the work procedures or additional personal protective equipment or precautions that need to be taken to safeguard against the exposures.
3. **Team members change** – If it becomes necessary to introduce a new team member after the job starts, huddle and make sure the new team member understands the work procedures, potential hazards, and operation of the equipment involved.

Step 4 – If a rule violation is observed, STOP the work and do a Job Briefing.

Discuss the violation and the correct way to perform the task.

Step 5 – Follow Up

Are things going as planned? Are the correct procedures being followed?
Is each team member carrying out his/her assigned responsibilities?
Is communication good among the team members?

2.0 Job Briefings

Safety Requirements

a) Effective job briefings ensure crew members communicate critical information pertaining to safe train operations prior to and throughout their tour of duty in road and yard service.

b) Before performing any job involving two (2) or more employees, a job briefing must be held to ensure that all employees have a clear understanding of:
   i) The task to be performed;
   ii) Your individual responsibility; and
   iii) Situational awareness concerns.

c) Additional job briefings should be carried out as necessary, while the work progresses or as the situation changes.

Reference: Safe Work Procedure 1.0

3.0 Personal Protective Equipment (PPE)

Local management and/or local health and safety committees may request PPE exemptions for specific jobs. Requests for exemptions shall be in writing and forwarded to the Director of Safety and Program Development, after review and approval by the Safety Advisory Board Committee.

a) Wear approved PPE as required for the job classification and/or the work environment, as identified in Sectin 3.8, Table 1 of this manual;

b) PPE should be maintained in proper condition and be properly fitted. Prior to usage it should be inspected and, if found defective, it should be repaired or replaced. This equipment should not be unnecessarily marked or otherwise tampered with and should be properly stored when not in use;

c) Be suitably clothed to perform job functions safely. Protect against hazards to the skin. (Example: cuts and abrasions, chemical, ultraviolet rays, cold, etc.);

d) Avoid wearing clothing that is torn or loose enough to catch on objects or that is greasy or saturated with flammable substances;

e) Avoid any burning operation if clothing is of a flammable material;

f) Pants, trousers or coveralls shall be at least ankle length. Flared, loose or torn cuffs shall be tied or secured to prevent catching in machinery or on equipment. Use of ankle straps are recommended. Shirts shall cover the torso and have at least ¼ length sleeves. Loose or torn sleeves shall be tied or secured in some manner. Tank tops are prohibited;

g) Long hair, beards, dangling accessories, jewelry or other similar items that are likely to be hazardous to the safety or health of an employee in a work place should not be worn unless they are tied, covered or otherwise secured to eliminate the hazard, and

h) Employees reporting for duty must be clean and neat. They must wear the prescribed uniform when required.

SECTION 3 - Safe Work Procedures

1.0 Job Briefings

1.1 Originating Terminal or Shift Start

After reporting for duty, all crew members must ensure they are aware of conditions that will effect safe train operations. Employees are reminded that they must comply with the requirements of Operating Rules (documents required on duty).

Employees Must:

- Ensure all operating bulletins and notices are read and understood;
- Obtain, read, discuss and sign or initial operating authorities as required;
- Confirm proper designation of train/engine and all operating authorities;
- Identify presence of dimensional, speed restrictions and special dangerous cars;
- Ensure proper documentation for all dangerous goods/hazardous materials;
- Discuss and review items affecting the territory the train or engine will operate over; and
- Obtain permission to depart and confirm routing and limits of authority, including applicable limits.

1.2 En-Route

To ensure all crew members maintain awareness of conditions that will effect safe train operations they must verbally discuss between themselves:

- Fixed signals encountered;
- Operating restrictions en-route;
- Set-off/Set-out and lifts/pick-ups prior to reaching work location and ensure proper marshalling;
- Proper train speed;
- Documentation;
- Transfer requirements if relieved en-route; and
- Proper securement of cars set out.

Note: Train crews must promptly report and record locomotive and equipment defects discovered on line in accordance with applicable operating procedures.

1.3 Final Terminal or End of Shift

Ensure crew members do the following:

- Discuss arrival and yarding instructions;
- Ensure proper securement of train and locomotives;
- Report any car or locomotive defects or any needed supplies; and
- Confirm documentation and details of en-route and supplemental work performed is reported.

Reference: General Safety Rules: 1.0, 2.0, 3.1, 3.2, 3.3, 4.0, 10.0
Core Safety Rules: 11.0

SECTION 5 - Glossary

3-Point Protection: A means of protecting employees going on or fouling standing equipment. This protection requires the employee being protected and the employee providing the protection to act together when providing and releasing the protection.

Air: The train's air brake system, as in "to handle (operate) the air"

Air Brake Hose: The flexible connection between the brake pipes of cars or locomotives

Angle Cock: The two-position valve located at both ends of the brake pipe on locomotives, passenger and freight cars. When open, it allows the passage of air.

Approved: Acceptable according to CPR Policy

Bad Order: Equipment that is need for repair.

Compliance: The act of obeying the rule, procedure, policy, program, or law.

Core Safety Rule: Rule applying to Transportation/Field Operations employees.

Coupler: An appliance for connecting cars or locomotives

Derail: A track safety device designed to guide a car off the rails at a selected spot as a means of protection against collisions or other accidents.

EOT/SBU Device: Device that monitors air brake system and train integrity on trains being operated.

Firm Footing: A stance with your feet firmly on the ground, equipment, or other level of space

Frog: A track structure used at the intersection of two running rails to provide support for wheels and passageways for their flanges, thus permitting wheels on either rail to cross to the other.

Fusee: A red flare for flagging purposes.

General Safety Rule: Rule applying to all employees.

Hand Brake: The brake apparatus used to manually apply or release the brakes on a car or locomotive.

Handhold: A firm grip with both hands, when possible, on a handhold or other stationary support.

Knuckle: The pivoting casting that fits into the head of a coupler to engage a mating coupler.

Operator: The person who "runs" and so must maintain control of any locomotive.

Personal Protective Equipment (PPE): Any material or device worn to protect a person from exposure to or contact with any harmful substance or force.

Proper Authority: (1) Those individuals who are qualified by virtue of their expertise or their position of leadership to approve, certify or sanction. (2) Having secured approval for acting in a particular manner. (3) Proper authorization

Restricted Clearance: Space in which two or more objects, usually on stationary and one moving or both moving - pass within hazardous distance of each other.

Rolling Stock: Any on-track wheeled equipment.

Safe Work Procedures: Procedures and or instructions pertaining to the safe performance of a particular task and/or job

Skate: A metal skid placed on the rail in a hump yard to stop cars from rolling out of the lower end of the classification yard.

SOFA: Switching Operation Fatality Analysis. The recommendations of the SOFA working group, which was a true collaborative effort of all stakeholders (FRA, UTU, BLE, AAR, and ASLRAA), establishes five (5) Lifesavers which if carried out as intended, help ensure that fatalities and injuries associated with switching operations are eliminated.

Three-Point Contact: Bodily contact consisting of two hands and one foot or two feet and one hand.

Trained: Has participated in learning event(s) appropriate to the topic.

Transportation/Field Operations Employee: Unionized or non-unionized personnel working within the department of Transporation/Field Operations.


The 5 SOFA Lifesavers
1 Secure equipment before action is taken.
2 Protect employees against moving equipment.
3 Discuss safety at the beginning of a job or when a project changes.
4 Communicate before action is taken.
5 Mentor less experienced employees to perform service safely.
keep
your head
in the
game

2000 General Rules

2001 Job Briefing

Effective job briefings at the beginning of and throughout our work day make us more aware of our surroundings and better prepared to recognize and avoid potential hazards. Remain alert for anything out of the ordinary that occurs during your shift and report any suspicious activity to your immediate supervisor, yardmaster or dispatcher immediately. If they are not available, report the condition or activity directly to the Police Command Center at 1-800-232-0144.

A. When to Conduct a Job Briefing

Conduct a job briefing:

- before beginning a work activity.
- when work activity or work conditions change.
- when another person joins the crew.

B. Conducting a Job Briefing

When conducting a job briefing:

- Discuss the sequence of basic job steps.
- Discuss potential hazards related to the job.
- Make certain that everyone understands all instructions and how the job should be performed.

C. Following up a Job Briefing

Follow up with fellow employees to ensure compliance with safe work practices.

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Data Appendix: Switching Fatalities by Selective Characteristics

Many of the tables contained in the *SOFA Report* released in October 1999 are updated here in the Data Appendix. As such, where the *SOFA Report* tables included 76 switching fatalities, January 1, 1992 through July 01, 1998, dimensioned by attributes such as state, time of day, or day of week. The tables below include 124 fatalities, January 1992 through December 2003.

Table A-1. Switching Fatalities by State, 1992 through 2003

State	Fatalities	State	Fatalities	State	Fatalities
Texas	13	Minnesota	3	Washington	2
Illinois	12	Pennsylvania	3	Wisconsin	2
California	9	South Carolina	3	Arizona	1
Kentucky	7	Alaska	2	Connecticut	1
Georgia	6	Florida	2	Delaware	1
Indiana	5	Idaho	2	Louisiana	1
Nebraska	5	Kansas	2	Mississippi	1
New York	5	Missouri	2	North Dakota	1
Ohio	5	Montana	2	New Jersey	1
North Carolina	4	Oklahoma	2	New Mexico	1
Arkansas	3	Oregon	2	Nevada	1
Iowa	3	Tennessee	2	Utah	1
Michigan	3	Virginia	2	Wyoming	1
				total	124

Table A-2. Switching Fatalities by Shift, 1992 through 2003

Shift		Fatalities	Percent
First	(8:00 a.m. - 4:00 p.m.)	51	41.1%
Second	(4:00 p.m. - 12:00 a.m.)	40	32.3%
Third	(12:00 a.m. - 8:00 a.m.)	33	26.6%
	total	124	100.0%

Table A-3. Switching Fatalities by Shift and Day of Week, 1992 through 2003

	Shift			
	First	**Second**	**Third**	**total**
- Day -	8:00 a.m. to 4:00 p.m.	4:00 p.m. - 12:00 a.m.	12:00 a.m. - 8:00 a.m.	
Sunday	2	3	6	11
Monday	8	6	2	16
Tuesday	7	11	7	25
Wednesday	7	7	6	20
Thursday	8	3	8	19
Friday	11	9	4	24
Saturday	8	1	0	9
total	51	40	33	124

Table A-4. Time On Duty Before Fatal Event, 1992 through 2003

Time (hours and minutes)	**Frequency**	Percent
0:00 to 0:59	11	8.9%
1:00 to 1:59	18	14.5%
2:00 to 2:59	14	11.3%
3:00 to 3:59	11	8.9%
4:00 to 4:59	16	12.9%
5:00 to 5:59	13	10.5%
6:00 to 6:59	12	9.7%
7:00 to 7:59	5	4.0%
8:00 to 8:59	6	4.8%
9:00 to 9:59	6	4.0%
10:00 to 10:59	5	4.0%
11:00 to 12:00	5	1.6%
not known	2	--
total	124	100.0%

Table A-5. Switching Fatalities by Day, 1992 through 2003

Day	Frequency	Percent
Sunday	11	8.9%
Monday	16	12.9%
Tuesday	25	20.2%
Wednesday	20	16.1%
Thursday	19	15.3%
Friday	24	19.4%
Saturday	9	7.3%
total	124	100.0%

Table A-6. Switching Fatalities by Month, 1992 through 2003

Month	Frequency	Percent	Cumulative Percent
January	15	12.1%	
February	8	6.5%	18.7%
March	8	6.5%	25.0%
April	9	7.3%	32.3%
May	7	5.6%	37.9%
June	15	12.1%	50.0%
July	14	11.3%	61.3%
August	7	5.6%	66.9%
September	9	7.3%	74.2%
October	10	8.1%	82.3%
November	6	4.8%	87.1%
December	16	12.9%	100.0%
total	124	100.0%	

Table A-7. Switching Fatalities by Night and Day, 1992 through 2003

Time		Frequency	Percent
Night	(6:01 p.m. – 6:00 a.m.)	67	54.0
Day	(6:01 a.m. – 6:00 p.m.)	57	46.0
	total	124	100.0%

Table A-8. Switching Fatalities with Older Employees and Lower Years of Service, 1992 through 2003

#	Age	Years of Service	FRA #	RR	Location	Date
1	54	5.5	FE-01-99	CR	Port Newark, NJ	01/12/99
2	53	2.5	FE-12-02	UP	Pine Bluff, AR	05/14/02
3	50	7	FE-16-97	CMRC	Bay City, MI	06/06/97
4	47	0.5	FE-24-99	AM	Van Buren, AR	09/14/99
5	47	2	FE-17-00	UP	Pine Bluff, AR	05/31/00
6	47	1	FE-47-93	GC	Macon, GA	11/13/93
7	45	1	FE-03-99	CR	Alexander, NY	01/22/99
8	45	7	FE-16-95	WC	Argoe, WI	04/06/95
9	43	2	FE-40-93	SOO	Leal, ND	10/19/93
10	43	0.06*	FE-22-96	DGNO	Dallas, TX	09/03/96
11	42	1	FE-02-01	CSX	Chicago, IL	01/10/01
12	40	7.58	FE-22-97	MNCW	Stamford, CT	07/18/97
13	40	4	FE-03-04	NS	Kankakee, IL	01/14/04
14	39	0.5	FE-29-95	CSXT	Riverdale, IL	10/04/95
15	38	2	FE-16-00	CSX	Richmond, VA	05/22/00
16	36	4	FE 25-00	BNSF	Port of Los Angeles, CA	08/11/00
17	36	3.75	FE-08-01	BNSF	Willmar, MN	03/03/01
18	36	1	FE-12-96	CSX	Charlotte, NC	06/15/96
19	36	1	FE-14-99	NS	Cincinnati, OH	05/19/99
20	36	5	FE-35-03	UP	San Antonio, TX	12/07/03
21	36	2.5	FE-04-03	CSX	East Syracuse, NY	02/16/03
22	35	3.75	FE-14-01	BNSF	Clark, OK	04/08/01
23	35	3	FE-12-03	CSX	Kingsport, TN	06/06/03
24	35	2	FE-25-03	BNSF	Fresno, CA	09/24/03
25	32	0.5	FE-04-92	AGC	Polk County, FL	01/30/92
26	31	0.5	FE-28-94	PTRA	Houston, TX	11/10/94

* 10-year gap since 10 years of service

Table A-9. Switching Fatalities by Job Category, 1992 through 2003

Job Category	Frequency	Percent
yard conductor	37	29.8
road local brakeman	23	18.5
road local conductor	20	16.1
yard conductor	18	14.5
road through conductor	15	12.1
road local freight engineer	3	2.4
road through freight engineer	2	1.6
remote control operator	1	0.8
road passenger engineer	1	0.8
laborer – performing duties of yard brakeman	1	0.8
road through brakeman	1	0.8
brakeman trainee	1	0.8
other	1	0.8
total	124	100.0%

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