

Switching Operations Fatality Analysis

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Abstract

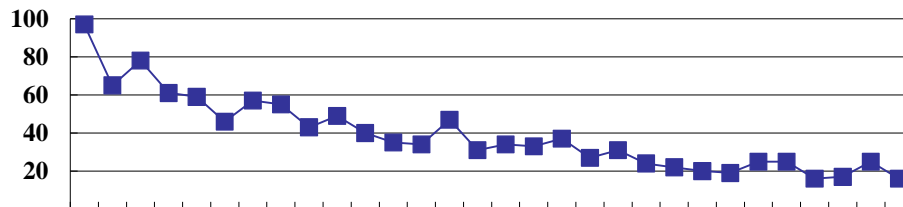
The majority of fatal injuries incurred by on-duty railroad personnel occur during switching operations. Over the past decade the United States Federal Government formed a group comprised of railroad industry (labor and management) representatives focused on fatal injury cases to railroad personnel. Through this collaborative effort the group studied all the cases involving fatally injured railroad employees from 1975 thru 2009 while in switching operations. As a result the group analyzed 179 cases identifying trends, similarities and best practices in mitigating future incidents of this nature. The study is called the Switching Operations Fatality Analysis (SOFA) and a final report will publish later in 2010. The following paper will discuss the premise for SOFA study and review two of the findings from the report dealing with injuries incurred while switching in an industrial area and being struck by a main line train.

The findings in the report are limited to fatalities of train and engine employees who were killed while on the ground or while riding on the outside of railroad equipment. They are based on a set of variables that are prevalent in switching operations.

Context

A vexing issue plaguing all rail operations is the issue of incurring an employee fatality. Such an event brings to bear that there was a systematic failure resulting in causing a crewmember to be in a lethal position. Since 1980 [as seen in the below chart] the U.S railroad industry witnessed a steady decline in crewmember fatalities. Many reasons are attributed to this fact such as crew reduction, remote controlled switching, economic factors and others.

**Overall the U.S. Railroads reduced employee fatalities
by 60% since 1990.**



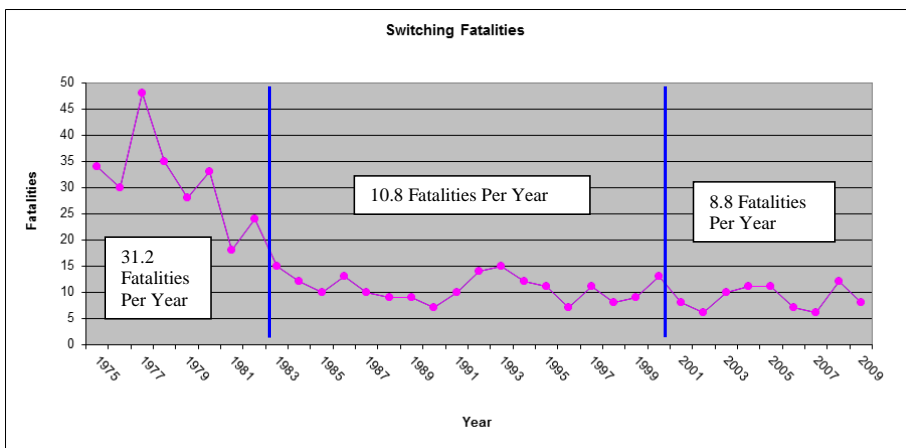
Sources: <http://safetydata.fra.dot.gov/officeofsafety/publicsite/summary.aspx> (2009 preliminary data).
FRA, [Railroad Safety Statistics Annual Report](#), 1997-2007, Tables 1-2, 1-3, 4-2.
FRA [Accident/Incident Bulletin](#), 1980-1996, Tables 13.

However, it was noticed by federal and industry representatives that during the 1990's there was a large number of fatal injuries occurred during switching operations. Addressing this fact in February 1998, the U.S. Department of Transportation Federal Railroad Administration (FRA) formed a group with the mission to investigate and determine the causes of fatal injuries incurred during switching operations. The FRA formed the Switching Operations Fatality Analysis Working Group (SWG) to conduct a detailed fact-finding review and analysis of fatal injuries incurred at switching fatalities. The SWG was charged to determine whether trends or patterns could be discerned, identify best practices, and, if possible, formulate recommendations for the industry based on the findings. The SWG was formed from labor and management representatives from the Federal Railroad Administration (FRA), American Short Line and Regional Railroad Association (ASLRRA), the Association of American Railroads (AAR), the Brotherhood of Locomotive Engineers and Trainmen (BLET), the United Transportation Union (UTU), and the Volpe National Transportation System Center (VNTSC).

History of Switching Fatalities

The SWG produced two reports and is in the process of publishing its third and final report. As a result the publications coincided with the three review periods performed by the group. As one can see in the below chart employee fatalities during switching operations steadily declined in the past 24 years.

The overall mission of the SWG was to achieve a goal of *Zero Switching Fatalities*. Since its inception the SWG produced two reports with a third and final report to be published in late 2010. At first the SWG identified five prevailing switching operations as the main causal areas and made five (5) Operating Recommendations. In its second report (2004) the SWG broadened its scope to include *Special Switching Hazards* to their list of the original five Operating Recommendations.



Switching Fatalities, 1975 through 2009

Source FRA

Operating Recommendations and The Original Five Lifesavers

In 1999 the SWG issued its first report entitled *SOFA Report*, which identified five areas of concern that resulted in fatal injuries. These areas were based on review of 76 fatality cases occurring from January 1, 1992 through July 1, 1998. The SWG believed these Recommendations, when appropriately used in switching operations, would prevent fatalities. Subsequently, the SWG developed condensed versions of each recommendation that may involve a series of steps. These shortened versions came to be known as:

The Five Lifesavers¹

- 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.

August 2004 SOFA Update

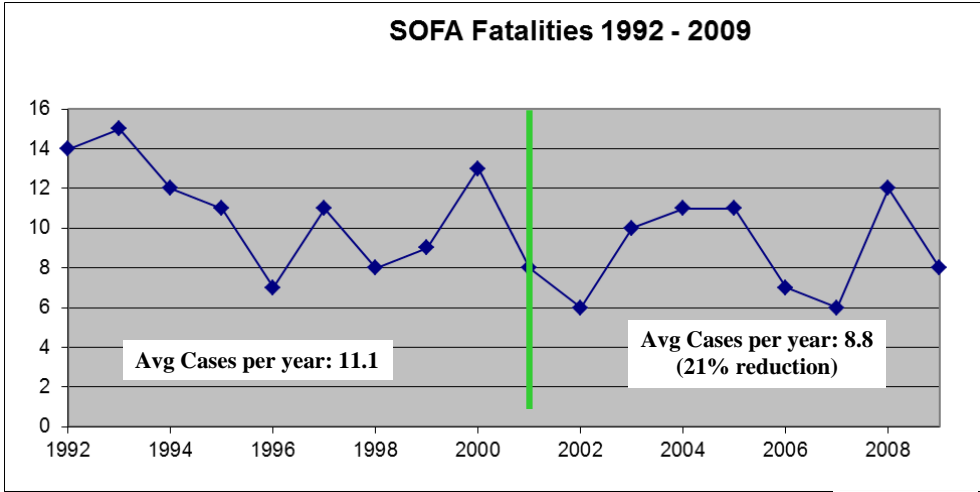
In its second report (issued in 2004) the SWG increased by 47 more cases for a total number to 123 cases. From this review the group noted that a second list of problem areas was being seen in analyzing these 47 additional cases. The SWG wanted a way to characterize the cases which did not meet the criteria for the SOFA 1-5 cases, hence, the new cases were classified into 11 categories called *Special Switching Hazards (SSH)* as seen listed below:

• Close Clearance	• Struck by Mainline Trains
• Employee Tripping, Slipping, Falling	• Free Rolling Railcars
• Unsecured Cars	• Equipment
• Struck by Motor Vehicle or Loading Device	• Unexpected Movement of Railcars
• Environment	• Drugs and Alcohol
• Miscellaneous	

Final SOFA Report 2010

Since the issuance of the August 2004 report the SWG continued to analyze cases up to the end of 2009. In all the SWG reviewed a total 179 switching fatality cases from 1992 through 2009. During this last period (from 2004 thru 2009) the group continued to use the classification of the original Five SOFA Lifesavers and the eleven *Special Switching Hazards*. The SWG utilized a database with its Boolean search-and-retrieve abilities allowing for rapid queries among the 179 cases. Through the use of the database the SWG members proposed ideas for SOFA inquiries that revealed important commonalities that later turned out to be identifiable trends.

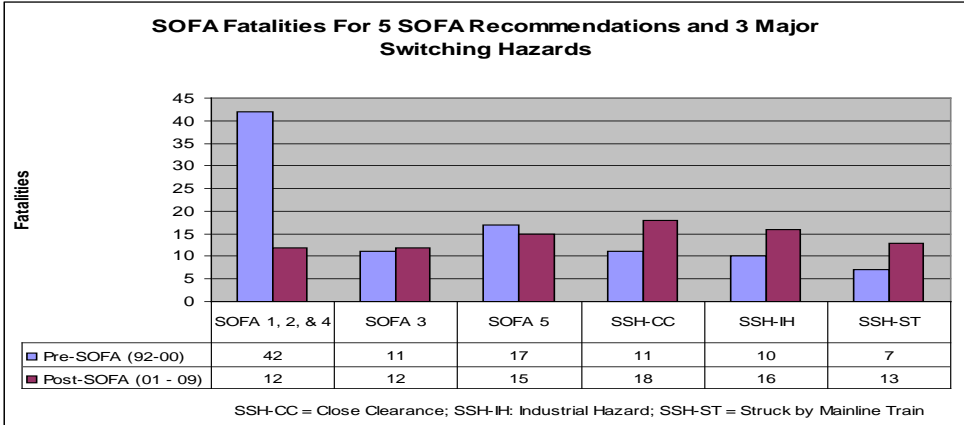
¹ Switching Operations Fatality Analysis Report, The Federal Railroad Administration, report number DOT/FRA/ORD-OO/04, 1999, page xiv.



Source FRA

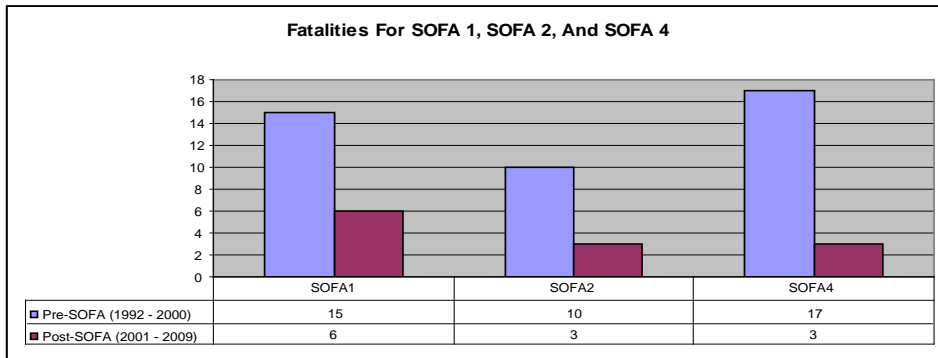
Assumptions and Limitations

The primary information source used by the SWG was the FRA fatality investigation case files. The general assumption by the SWG was that the investigations and associated case folders provide a reasonably complete and accurate account of facts associated with each case. Keeping in mind, that it was not the responsibility of the SWG to re-investigate the incident but to basically review the facts associated to the event. Hence, there was neither sight visits of the incident by SWG members nor contact with individuals associated with the event. Overall the assumptions were that the facts collected by the FRA were accurate and clearly reflect the facts for each case. The limitation encountered was that the SWG relied on the proficiency of the FRA inspectors to aptly identify the facts found in their investigation.



Source FRA

The above chart illustrates the overall findings by the SWG in the five (5) SOFA original Lifesavers and three (3) *Special Switching Hazards* (Close Clearances, Industrial Hazards, and Strikes by Mainline Train). The significance of this chart is that one can readily see where there has been noticeable improvement in the areas of SOFA 1, 2, and 4 and where there has not been as noticeable improvement in the other areas. In the first paired column there has been a 71% reduction in fatal injuries since the SOFA project started in the past eighteen (18) years. (Although a total number of 184 cases is listed on the bar chart several cases were placed in more than one category hence, there are more cases listed than the original 179 cases reviewed.)



Source FRA

Industrial Track Hazards

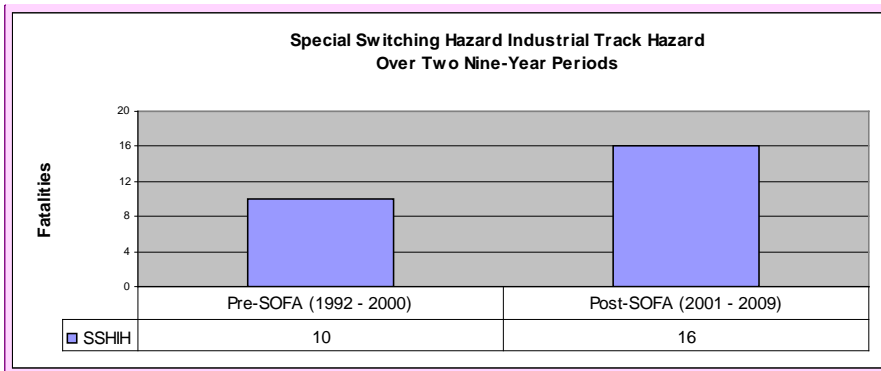
Background

Of the *Special Switching Hazards*, and for the purpose of this paper, I will review the two areas entitled Industrial Track Hazards and Strikes by Mainline Train.

The Industrial Track Hazards (*Special Switching Hazard*) is the third largest category of SOFA fatalities which include cases where a structure, vehicle, or temporary obstruction on industrial track (not on the general railroad system) played a significant role in the cause of the fatal injury. Not all fatalities on industrial track qualify for this category. For example, a case where the crewmember failed to follow proper radio protocol would be categorized as a SOFA 4 (Communicate before action is taken) case, is not an Industrial Track Hazard case. Using the criteria discussed above, 26 of the 43 fatalities which occurred in industrial track qualify a case involving an industrial track hazard.

Statistical Evidence

The below bar chart illustrates the number of fatalities occurring in industrial areas over two nine-year periods (Pre-SOFA versus Post SOFA).



Source FRA

註解 [MM1]:

註解 [MM2]:

Discussion

The issues with industrial track hazards are primarily focused on areas that are owned by a railroad shipper/receiver. In many cases property owner has a “*service agreement*” with the railroad. The “*service agreement*” outlines what will be acceptable switching conditions and the responsibilities for maintaining these conditions. It was found that in some cases the “*service agreement*” was not followed or maintained hence, creating an unsafe environment. Most importantly, there was the need to identify problems with close/no clearance, signage, lighting, faulty reflectors, walkways, debris, obstructions, snow/debris removal and grade crossing safety. Also the SWG found that unfamiliarity of the physical characteristics and lack of job aids were problematic (i.e., a crew member who is unfamiliar with an industrial property may not be aware of the close/no clearance hazards.)

The SWG found that nine fatalities [out of the 26 cases] where an employee was struck during shove moves at highway grade crossings while switching in an industrial area. All nine occurred when the employee was riding the point [lead] railcars at the time of the collision. It should be noted that since 1989 there has been no fatal injuries incurred when a crewmember dismounted the rail car and flagged the crossing while on the ground. Noting the number of fatal cases the SWG will promote the fact that, when practicable, a crewmember should dismount the rail equipment and stand at the crossing in the industrial area. Hence the SWG believes that there is a greater likelihood of a fatal injuring occurring when a crewmember rides on the side of a rail car while crossing a grade crossing in an industrial area.

Suggested Best Practices

Through consultation with senior leaders in the rail industry and labor organizations the SWG gleaned additional insight as to attack the issue of switching in industrial areas. Resulting from these discussions as well as due diligence in seeking other inputs the SWG was able to collect a list of suggested best practices to mitigate the hazards associated with switching in an industrial area. Some of the best practices suggested are:

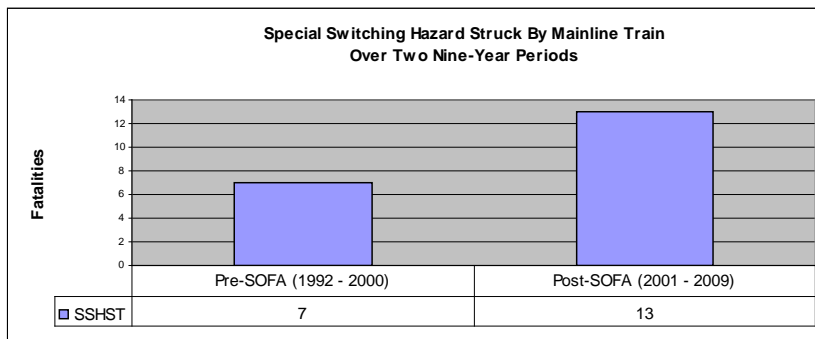
- Review service agreements ensuring a clear delineation of responsibilities to ensure they are up to date. Make sure they include the following provisions:
 - Removal of close or no clearances obstacles along the track.

- Installation and maintenance of lighting.
- Require notification of a change in conditions.
- When practicable do not ride rail equipment in an industrial area when crossing grade crossings.
- Provide employees with job aids such as maps and descriptions of plant characteristics.
- Schedule inspections to ensure compliance with lease/service agreements. Safety committees should get involved and conduct their own visits.
- Employees unfamiliar with the area are to survey the area then proceed.
- Encourage the labor/management safety teams to partake in visiting industrial switching areas and inspect for unsafe conditions.

Strikes by Mainline Trains

Background

The SWG first brought to light the fact that where employees were fatally injured when struck by a mainline train. Albeit the premise of the SWG was to focus on switching operations the group encountered 20 cases where a crewmember as stuck by mainline train was the causal factor for the fatal injury. It was agreed by the SWG members in 2004 to include Strikes by Mainline Trains as part of the SOFA report. The preponderance of the fatalities occurred when a crewmember would exit at control cab to make a “roll-by inspection” for an oncoming train.



Source FRA

Findings

Prominent factors found in this area produced the following findings was that 75% of the fatalities occurred during non-daylight hours and were in the period from December through February. The prevailing thinking, based on this evidence, is that crewmembers visual acuity and hearing were impaired due to environmental factors. Vision may have been impaired due to the lack of lighting, and hearing impairment was due to the wearing of heavy winter gear that constitute hooded clothing restricting hearing and vision. Also, was the matter of communications as a factor between crewmembers and between trains. Several cases the

oncoming train was not aware that a crewmember from another train was on the ground and possibly close to the right-of-way.

Suggested Best Practices

The SWG reviewed safety literature and the opinions generated after conversations with industry officials and identified the most promising best practices to reduce fatalities of crewmembers struck by mainline trains. The two most prominent ideas brought forth were enhanced communication and additional retro-reflective gear.

A notable suggested best practice is in the form of a track breach protection program. Under this program, traffic on main track is halted when there is a crewmember on the ground along the main track. The track breach program calls for a crew that is stopped to contact the train dispatcher and ask for permission to exit the control compartment of the locomotive. The train dispatcher contacts the oncoming train and alerts them that a crewmember will be on the ground at a certain location. Once receiving acknowledgement from the oncoming train that they are cognizant that a crewmember will be on the ground the train dispatcher contacts the requesting train and the crewmember exits the locomotive while wearing a retro-reflective gear. Hence, all parties involved are knowledgeable that a crewmember is on the ground at a certain location. Also, recent federal rules in the usage of retro-reflective equipment aids in the prevention of crewmembers being struck by a mainline train.

Conclusion

Since its inception the SWG focused on the goal of *ZERO FATALITIES* during switching operations and has seen a noticeable change in the reduction of fatal injuries in several areas. In some cases methodologies and traffic demand changes throughout the years directly affecting the minimization of exposing crewmembers to possible lethal situations. Also, management and labor, working together, continue to seek “best practices” that will further mitigate the repeat of incidents that we have witnessed in the past. It is the fervent hope of the SWG that the results sited in their upcoming report will further the ideal of a safer railroad industry. However, one fatality is too many and we continue to strive for a goal of *ZERO FATALITIES*.