

Switching Operations Fatality Analysis



**Findings and Advisories
Of the SOFA Working Group
Volume II:
Appendices B through L**

March 2011 Update

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APPENDIX B: SOFA TASKING LETTER

The letter immediately 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 nor 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

The next letter below was sent by Jo Strang, Associate Administrator for Safety, Federal Railroad Administration to Mr. Robert VanderClute, Association of American Railroads, Mr. Edward Rodziewicz, Brotherhood of Locomotive Engineers and Trainmen, Mr. Mike Futhey, United Transportation Union, and Mr. Richard Timmons, American Short Line and Regional Railroad Association

This letter became the basis for reestablishing the Switching Operations Fatality Analysis (SOFA) Working Group which produced this report.

October 20, 2008

U.S. Department
Of Transportation
**Federal Railroad
Administration**

I would like to bring to your attention 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 45 T&E employee fatalities that occurred from January 2004 through October 15, 2008. These 45 incidents all represent T&E fatalities that occurred in other than major train collisions since the original Switching Operation Fatality Analysis (SOFA) Group updated their findings and published them in August 2004. I have included that update and a listing of the 45 cases with this letter. Of further concern is the fact that during calendar year 2007, there were a total of six SOFA-type fatalities. This year to date, there have been 10.

As you will note in the 2004 SOFA Update, on page 47, paragraph 4.3, the SOFA Group identified a new class of issues that they believed merited increased oversight. They grouped these issues under the title, "Special Switching Hazards." As I reviewed the list, I noticed that very few seem to relate to the operating and safety rules reflected in the five SOFA Safety Recommendations developed and published in the first SOFA report, dated October 1999. Further, shortly after the original SOFA publication, the railroad industry made a long-term effort to implement the operating and safety rules reflected in the five SOFA Safety Recommendations into their training programs and testing methodologies, with great success. The number of T&E employee deaths related to the five SOFA Safety Recommendations were significantly reduced. At the same time, the railroad management and union efforts to enhance job briefings and focus more on newly hired T&E employee mentoring appears to be beneficial for everyone as well.

As was the case with the original SOFA effort, we need your help again if we are to reduce and eliminate the fatal train incidents reflected in the identified Special Switching Hazards. I believe that, once again, 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 detailed fact finding, review, and analysis of these latest incidents, add their findings to the original SOFA database and, if possible, formulate additional recommendations for the entire industry based on their collective findings.

I anticipate the process would be much like the highly successful approach utilized by the original SOFA Group, that is, free from concerns that the finding might be used to initiate a rulemaking or used for any other formal action by FRA. Rather, railroads will be able to evaluate the SOFA's findings and recommendations with respect to their individual operating requirements and would, through the Railroad Safety Advisory Committee process, be encouraged to implement recommendations that would benefit their safety programs.

I would like to invite you (or your representative) to a planning meeting to discuss the feasibility of such an effort and to determine the composition of the team. I suggest a meeting at FRA headquarters in Washington, DC, on Wednesday, November 12, 2008, at 1:00 p.m., or at some other time and date during the week of November 10, 2008. If this is inconvenient, please contact Mr. Joe Gallant at (202) 493-6324, and he will be glad to arrange for an alternate date and time, or perhaps set up a conference call at a mutually convenient time.

Sincerely,

Jo Strang
Associate Administrator for Safety

APPENDIX C: 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 of ‘The Five Lifesavers.’ The intent 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.

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

This recommendation emphasizes the importance of inter-crew communication and coordination with yardmasters. Compliance with and an understanding of this recommendation would have prevented these fatalities.

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.

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 Appendix D 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, the 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.

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 class room 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.

APPENDIX D: DATA FIELDS USED IN THE SOFA DATABASE

Table Name: SOFA CASES		
Number	Data Field	Comment
1	REPORT_NUMBER	All tables are related to this master table through this key field
2	RAILROAD	
3	INCIDENT_CATEGORY	
4	CITY	
5	STATE	
6	INCIDENT_DATE	
7	INCIDENT_TIME	
8	TYPE_SIGNALING	
9	SUMMARY	Narrative entry
10	REMARKS	Narrative entry
11	EMERGENCY_RESPONSE	Yes/No/Unknown/NA
12	ER COMMENT	Narrative entry
13	EMERGENCY_RESPONSE_PROCEDURES_FOLLOWED	Yes/No/Unknown/NA
14	ER_PROCEDURES_COMMENT	Narrative entry
15	TIMELY_ER_RESPONSE	Yes/No/Unknown/NA
16	TIMELINESS_COMMENT	Narrative entry
17	AUTOPSY_PERFORMED	Yes/No/Unknown/NA
18	AUTOPSY_COMMENT	Narrative entry
Table Name: Conditions		
	REPORT_NUMBER	
19	WEATHER	
20	TEMPERATURE	
21	HUMIDITY	
22	WIND DIRECTION	
23	WIND SPEED	
24	WIND CHILL FACTOR	
25	VISIBILITY	Based on FRA Guide for Preparing Accident/Incident Reports
26	LIGHTING CONDITIONS	Based on FRA Guide for Preparing Accident/Incident Reports
27	GROUND CONDITIONS	Based on FRA Guide for Preparing Accident/Incident Reports
28	FOOTING CONDITIONS	Based on FRA Guide for Preparing Accident/Incident Reports

Table Name: FE Background		
	REPORT_NUMBER	
29	JOB CODE	
30	JOB DESCRIPTION	
31	AGE	
32	LENGTH OF SERVICE (YR)	
33	TIME IN OCCUPATION (YR)	
34	LAST RULES TRAINING DATE	
35	LAST RULES TRAINING (MO)	
36	LAST SAFETY TRAINING DATE	
37	LAST SAFETY TRAINING (MO)	
38	Formal Training (MO)	
39	Informal Training (MO)	
40	LAST EFFICIENCY TEST DATE	
41	LAST EFFICIENCY TEST (MO)	
42	LAST PHYSICAL EXAM DATE	
43	LAST PHYSICAL EXAM (MO)	
44	COMMENTS	Narrative entry
45	NUM SHIFTS IN LAST 30 DAYS	
46	COMMENT SHIFTS	Narrative entry
47	HRS ON DUTY, PRIOR SHIFT	
48	COMMENT HRS ON	Narrative entry
49	HRS OFF BEFORE ACCID SHIFT	
50	COMMENT HRS OFF	Narrative entry
51	HRS ON DUTY BEFORE ACCID	
52	COMMENT HRS BEFORE ACCIDENT	Narrative entry
53	REGULAR ASSIGNMENT?	Yes/No/Unknown/NA
54	COMMENT REG ASSIGNMENT	Narrative entry
55	WORKED ASSIGNMENT BEFORE?	Yes/No/Unknown/NA
56	COMMENT WORKED BEFORE	Narrative entry
57	STRESS_BEHAVIOR_ISSUES	Yes/No/Unknown/NA
58	STRESS_BEHAVIOR_COMMENT	Narrative entry
59	TAKING_PRESCRIPT_MEDS	Yes/No/Unknown/NA
60	PRESCRIPT_MEDS_COMMENT	Narrative entry
61	ALCOHOL_DRUGS_A_FACTOR	Yes/No/Unknown/NA
62	ALCOHOL_DRUGS_FACTOR_COMMENT	Narrative entry
63	ALCOHOL_DRUGS_PRESENT	Yes/No/Unknown/NA
64	ALCOHOL_DRUGS_PRESENT_COMMENT	Narrative entry
Table Name: FE Crew Information		
	REPORT_NUMBER	
65	CREW SIZE	
66	ENGINE CREW	
67	TRAIN CREW	
68	CREW ON GROUND	
69	ACT INVOLVED GRND CREW	

Table Name: FE Crew Employees		
	REPORT_NUMBER	
70	JOB_TITLE	
71	RR_EXPERIENCE	
72	CRAFT_EXPERIENCE	
73	COMMENT	Narrative entry
Table Name: Other Crew Information		
	REPORT_NUMBER	
74	CREW SIZE	
75	ENGINE CREW	
76	TRAIN CREW	
77	CREW ON GROUND	
78	ACT INVOLVED GRND CREW	
Table Name: Other Crew Employees		
	REPORT_NUMBER	
79	JOB_TITLE	
80	RR_EXPERIENCE	
81	CRAFT_EXPERIENCE	
82	COMMENT	Narrative entry
Table Name: Movement		
	REPORT_NUMBER	
83	TYPE TRACK 1	
84	TYPE TRACK 2	
85	TYPE TRACK 3	
86	AUTHORITY	
87	TYPE_MOVEMENT_STRIKING	
88	OTHER MOVE LOCATIONS	
89	TYPE_MOVEMENT_OTHER	
90	CREW OF STRIKER	
91	EQUIPMENT_SPEED	
92	METHOD ENGINE CONTROL	RCL/Conventional
93	BRAKES_CONTROLLED FROM_LEAD_CAR	
94	BRAKES_CONTROLLED_COMMENT	
95	RULE_COMPLIANT_EQUIP_OPS	Yes/No/Unknown/NA
96	RULE COMPLIANT COMMENT	Narrative entry
97	MOVEMENT_CAUSED_FATALITY	Yes/No/Unknown/NA
98	CAUSED_FATALITY_COMMENT	Narrative entry
99	ENGINEER ACTIVITY	Based on FRA Guide for Preparing Accident/Incident Reports
100	ENGINEER ACTIVITY COMMENT	Narrative entry
101	ENGINEER LOCATION	Based on FRA Guide for Preparing Accident/Incident Reports
102	ENGINEER LOCATION COMMENT	Narrative entry

103	OTH TRAINMAN ACTIVITY	Based on FRA Guide for Preparing Accident/Incident Reports
104	OTH TRAINMAN ACTIVITY COMMENT	Narrative entry
105	OTH TRAINMAN LOCATION	Based on FRA Guide for Preparing Accident/Incident Reports
106	OTH TRAINMAN LOCATION COMMENT	Narrative entry
107	PLANNED NEXT MOVE	
108	FE_BETWEEN_EQUIPMENT	Yes/No/Unknown/NA
109	BETWEEN EQUIPMENT COMMENT	Narrative entry
110	FE_WORKED_LOCATION_BEFORE	Yes/No/Unknown/NA
111	WORKED LOCATION COMMENT	Narrative entry
112	ACTIVITY CODE	Based on FRA Guide for Preparing Accident/Incident Reports
113	ACTIVITY COMMENTS	Narrative entry
114	LOCATION CODE	Based on FRA Guide for Preparing Accident/Incident Reports
115	LOCATION COMMENTS	Narrative entry
116	EVENT CODE	Based on FRA Guide for Preparing Accident/Incident Reports
117	EVENT COMMENTS	Narrative entry
118	CAR_TYPE_RIDDEN	
119	WEARING_PPE	Yes/No/Unknown/NA
120	PPE COMMENT	Narrative entry
121	WEARING_HEARING_PROTECTION	Yes/No/Unknown/NA
122	HEARING PPE COMMENT	Narrative entry
123	WEARING_EYE_PROTECTION	Yes/No/Unknown/NA
124	VISION PPE COMMENT	Narrative entry
125	WEARING_PPE_FOOTWEAR	Yes/No/Unknown/NA
126	FOOTWAR PPE COMMENT	Narrative entry
127	WEARING_HARD_HAT	Yes/No/Unknown/NA
128	HARD HAT COMMENT	Narrative entry
129	WEARING_LINER_HOOD	Yes/No/Unknown/NA
130	HOOD-LINER COMMENT	Narrative entry
131	CLOTHING_CONTRIB_TO_INCIDENT	Yes/No/Unknown/NA
132	CLOTHING CONTRIBUTION COMMENT	Narrative entry
133	FOOTWEAR_CONTRIB_TO_INCIDENT	Yes/No/Unknown/NA
134	FOOTWEAR CONTRIBUTION COMMENT	Narrative entry
135	PPE_Comment	Narrative entry
Table Name: Communication Issues		
	REPORT_NUMBER	
136	TYPE_SIGNALING	Hand, Radio, Both

Table Name: Hand Signals

	REPORT_NUMBER	
136	HAND SIGNS USED	Yes/No/Unknown/NA
137	UNAIDED_HAND_SIGNAL	Yes/No/Unknown/NA
138	RR_LANTERN	Yes/No/Unknown/NA
139	FLASHLIGHT_OTHR_INDIV_LIGHT	Yes/No/Unknown/NA
140	FUSEE	Yes/No/Unknown/NA
141	HAND_SIGNAL_UNDER_LIGHTS	Yes/No/Unknown/NA
142	OTHER TYPE	Yes/No/Unknown/NA
143	OTHER TYPE COMMENT	Narrative entry
144	PROPER_SIGNAL_GIVEN	Yes/No/Unknown/NA
145	PROPER SIGNAL COMMENT	Yes/No/Unknown/NA
146	SIGNALS_UNDERSTOOD_BY_CREW	Yes/No/Unknown/NA
147	SIGNALS UNDERSTOOD COMMENT	Narrative entry
148	CONFUSING_NONSIGNAL_GESTURES_GIVEN	Yes/No/Unknown/NA
149	NONSIGNAL GESTURES COMMENT	Narrative entry
150	CLEARLY_VISIBLE_SIGNALS_GIVEN	Yes/No/Unknown/NA
151	VISIBLE SIGNAL COMMENT	Narrative entry
152	SIGNALS_CLEARLY_COMMUNICATED	Yes/No/Unknown/NA
153	CLEARLY COMMUNICATED COMMENT	Narrative entry
154	SIGNALS_GIVEN_ENGINEER_SIDE_TRK	Yes/No/Unknown/NA
155	ENGINEER SIDE COMMENT	Narrative entry
156	CREWS_ALERT_FOR_SIGNALS	Yes/No/Unknown/NA
157	ALERT FOR SIGNAL COMMENT	Narrative entry
158	CREWS_COMPLIED_WITH_SIGNALS	Yes/No/Unknown/NA
159	COMPLIED WITH SIGNAL COMMENT	Narrative entry
160	IMPROPER_CREW_RESPONSE	Yes/No/Unknown/NA
161	IMPROPER RESPONSE COMMENT	Narrative entry
162	Stop_Signaler Leaves Sight	Yes/No/Unknown/NA
163	STOP NO SIGHT COMMENT	Narrative entry
164	Light_disapears_mvmtstop	Yes/No/Unknown/NA
165	STOP NO LIGHT COMMENT	Narrative entry
166	Hand_Signal_Comment	Narrative entry

Table Name: Hand Signals

	REPORT_NUMBER	
167	RADIO	Yes/No/Unknown/NA
168	RADIO COMMENT	Narrative entry
169	CHESTPACK	Yes/No/Unknown/NA
170	CHESTPACK COMMENT	Narrative entry
171	HANDSET	Yes/No/Unknown/NA
172	HANDSET COMMENT	Narrative entry
173	REMOTE_MICROPHONE	Yes/No/Unknown/NA
174	REMOTE MICROPHONE COMMENT	Narrative entry
175	WAIST_BELT_PACK	Yes/No/Unknown/NA
176	WAIST PACK COMMENT	Narrative entry
177	LOCOMOTIVE_MOUNTED	Yes/No/Unknown/NA
178	LOCOMOTIVE MOUNTED COMMENT	Narrative entry

179	OTHER TYPE RADIO	Yes/No/Unknown/NA
180	OTHER RADIO COMMENT	Narrative entry
181	HAND_SIGNALS_COULD_BE_USED	Yes/No/Unknown/NA
182	HAND SIGNAL SUBSTITUTABILITY COMMENT	Narrative entry
183	CREW_AWARE_OF_PLANNED_RADIO_MOVES	Yes/No/Unknown/NA
184	PLANNED RADIO MOVES COMMENT	Narrative entry
185	CREW_AWARE_RADIO_LIMITS_HAND_SIGNAL_USE	Yes/No/Unknown/NA
186	RADIO LIMITS HAND SIGNALS COMMENT	Narrative entry
187	MOVEMENT_INSTRUCTIONS_GIVEN	Yes/No/Unknown/NA
188	INSTRUCTIONS GIVEN COMMENT	Narrative entry
189	MOVEMENT_INSTRUCTIONS_FOLLOWED	Yes/No/Unknown/NA
190	INSTRUCTIONS FOLLOWED COMMENT	Narrative entry
191	DIRECTION_DISTANCE_SPECIFIED	Yes/No/Unknown/NA
192	SPECIFIED DIRECTION/DISTANCE COMMENT	Narrative entry
193	DIRECTION_DISTANCE_ACKNOWLEDGED	Yes/No/Unknown/NA
194	DIRECTION/DISTANCE ACKNOWLEDGED COMMENT	Narrative entry
195	CHANNEL_AVAILABILITY_VERIFIED	Yes/No/Unknown/NA
196	CHANNEL AVAILABILITY COMMENT	Narrative entry
197	COMMUNICATION_ID_GIVEN	Yes/No/Unknown/NA
198	ID GIVEN COMMENT	Narrative entry
199	MOVE_MADE_WITHOUT_MSG_ACKNOWLEDGEMENT	Yes/No/Unknown/NA
200	MOVE W/O ACKNOWLEDGEMENT COMMENT	Narrative entry
201	PROPER_ID_A_FACTOR	Yes/No/Unknown/NA
202	PROPER ID COMMENT	Narrative entry
203	"OVER-OUT"_A_FACTOR	Yes/No/Unknown/NA
204	"OVER-OUT" COMMENT	Narrative entry
205	IMPROPER_COMM_RESPONSE_BY_CREW	Yes/No/Unknown/NA
206	IMPROPER CREW RESPONSE COMMENT	Narrative entry
207	RADIO_CALLS_IMMEDIATELY_ACKNOWLEDGED	Yes/No/Unknown/NA
208	CALLS ACKNOWLEDGED COMMENT	Narrative entry
209	MOVEMENT_STOPPED_WITHIN_HALF_DISTANCE	Yes/No/Unknown/NA
210	MOVEMENT STOPPED COMMENT	Narrative entry
211	RADIO_TESTED_BEFORE_INCIDENT	Yes/No/Unknown/NA
212	RADIO TESTED COMMENT	Narrative entry
213	USED_MALFUNCTIONING_RADIO	Yes/No/Unknown/NA
214	MALFUNCTIONING RADIO COMMENT	Narrative entry
215	RADIO_AND_HAND_SIGNALS_USED	Yes/No/Unknown/NA
216	BOTH RADIO HAND SIGNALS USED COMMENT	Narrative entry
217	RADIO_ON_PROPERLY_TUNED	Yes/No/Unknown/NA
218	PROPERLY TUNED RADIO COMMENT	Narrative entry
219	PROPER_RADIO_PROCEDURES_FOLLOWED	Yes/No/Unknown/NA
220	RADIO PROCEDURES COMMENT	Narrative entry
221	RADIO_RECEPTION_CLEAR	Yes/No/Unknown/NA
222	RECEPTION CLEAR COMMENT	Narrative entry
223	RADIO_CONTINUOUSLY_OPERABLE	Yes/No/Unknown/NA
224	RADIO_CONTINUOUS COMMENT	Narrative entry
225	RADIO_COMMENT	Narrative entry

Table Name: Possible Contributing Factors		
	REPORT_NUMBER	
226	PCF CODE	Based on FRA Guide for Preparing Accident/Incident Reports with enhancements by the SWG
227	COMMENTS	Narrative entry
Table Name: Possible Contributing Factors		
	REPORT_NUMBER	
228	PCF CODE	Based on FRA Guide for Preparing Accident/Incident Reports with enhancements by the SWG
229	COMMENTS	Narrative entry
Table Name: Other Cited Factors		
	REPORT_NUMBER	
230	OTHER_FACTORS	Narrative entry

APPENDIX E: POSSIBLE CONTRIBUTING FACTORS (PCFS) USED BY THE SWG

The SOFA Working Group (SWG) based its possible contributing factors (PCFs) on a list of 360 cause codes taken from Appendix C of the FRA Guide for Preparing Accident/Incident Reports. The SWG created 12 more codes to make SOFA more precise; these additional codes are highlighted with an “*” in the table below. The table below shows the 83 codes that the SWG actually used in SOFA.

PCFs Used by the SWG		
PCF CODE	DESCRIPTION	OCCURRENCES
H990	Employee on or fouling track	80
H316	Poor intra-crew communication about work in progress	31
M411	Close or no clearance	27
H307	Shoving movement, man on or at leading end of movement, failure to control	24
H998	Employee falling from moving equipment	15
H399	Other general switching rules (Provide detailed description in narrative)	14
H997	Failure to provide adequate space between equipment	14
H317	Failure to communicate unsafe condition	13
H702	Switch improperly lined	12
H199	Employee physical condition, other (Provide detailed description in narrative)	10
M599	Other miscellaneous causes (Provide detailed description in narrative)	9
H210	Radio communication, failure to comply	9
H211	Radio communication, improper	8
H021	Failure to apply hand brakes on car(s) (railroad employee)	8
H996	Insufficient training	8
H306	Shoving movement, absence of man on or at leading end of movement	8
M101	Snow, ice, mud, gravel, coal, etc. on track	7
H310	Failure to couple	7
H989	Lack of skill or practical wisdom gained by personal knowledge or action. (Provide description in narrative.)	7
H305	Instruction to train/yard crew improper	7
M302	Highway user inattentiveness	7
H302	Cars left foul	6
H999	Other train operation/human factors (Provide detailed description in narrative)	6
H018	Failure to properly secure hand brake on car(s) (railroad employee)	6
H101	Impairment of efficiency or judgment because of drugs or alcohol	5
E29C	Other body defects, (CAR) (Provide detailed description in narrative)	5
H312	Passed couplers	5
H318	Poor crew utilization	5
H602	Switching movement, excessive speed	5
M404	Object or equipment on or fouling track - other than above (for vandalism,	5

PCFs Used by the SWG		
PCF CODE	DESCRIPTION	OCCURRENCES
	see code M503)	
H605	Failure to comply with restricted speed	5
T099	Other roadbed defects (Provide detailed description in narrative)	4
H398	Poor inter-crew communication (Use only for CAWG - use H399 for SOFA.)	4
M412	Local supervision issues (Provide narrative)	4
H706	Failure to confirm route of movement	4
M501	Interference (other than vandalism) with railroad operations by nonrailroad employee	3
H599	Other causes relating to train handling or makeup (Provide detailed description in narrative)	3
M199	Other extreme environmental conditions (Provide detailed description in narrative)	3
H212	Radio communication, failure to give/receive	3
H500	Slack action	3
H019	Failure to release hand brakes on car(s) (railroad employee)	3
E39C	Other coupler and draft system defects, (CAR) (Provide detailed description in narrative)	2
H699	Speed, other (Provide detailed description in narrative)	2
M304	Highway user cited for violation of highway-rail grade crossing traffic laws	2
H303	Derail, failure to apply or remove	2
H020	Failure to apply sufficient number of hand brakes on car(s) (railroad employee)	2
H301	Car(s) shoved out and left out of clear	2
E09C	Other brake defects, cars (Provide detailed description in narrative)	2
E31C	Coupler mismatch, high/low	1
E39L	Other coupler and draft system defects, (LOCOMOTIVE) (Provide detailed description in narrative)	1
H008	Improper operation of train line air connections (bottling the air)	1
H099	Use of brakes, other (Provide detailed description in narrative)	1
E79L	Other locomotive defects (Provide detail description in narrative)	1
E67C	Damaged flange or tread (build up)	1
H207	Hand signal, failure to comply	1
H205	Flagging, improper or failure to flag	1
H025	Failure to control speed of car using hand brake (railroad employee)	1
H075	Setting a hand brake	1
E66L	Damaged flange or tread (flat) (LOCOMOTIVE)	1
M104	Extreme environmental condition - DENSE FOG	1
T307	Spring/power switch mechanism malfunction	1
T299	Other rail and joint bar defects (Provide detailed description in narrative)	1
T222	Worn rail	1
T199	Other track geometry defects (Provide detailed description in narrative)	1
T105	Insufficient ballast section	1
M504	Failure by nonrailroad employee, e.g., industry employee, to control speed of car using hand brake	1

PCFs Used by the SWG		
PCF CODE	DESCRIPTION	OCCURRENCES
M502	Vandalism of on-track equipment, e.g., brakes released	1
M401	Emergency brake application to avoid accident	1
M399	Other causes (Provide detailed description in narrative)	1
H503	Buffing or slack action excessive, train handling	1
M303	Highway user misjudgment under normal weather and traffic conditions	1
H299	Other signal causes (Provide detailed description in narrative)	1
H995	Human Factor - motive power and equipment	1
H799	Use of switches, other (Provide detailed description in narrative)	1
H603	Train inside yard limits, excessive speed	1
H524	Excessive horsepower (H016)	1
H514	Failure to allow air brakes to fully release before proceeding (H005)	1
T319	Switch point gapped (between switch point and stock rail)	1
H509	Improper train inspection	1
E02C	Broken brake pipe or connections	1
H401	Failure to stop train in clear	1
H309	Failure to stretch cars before shoving	1
M307	Malfunction, improper operation of train activated warning devices	1

APPENDIX F: SOFA CASES WITH SOFA CATEGORIES

<i>CASE NUMBER</i>	<i>DATE</i>	<i>RAIL-ROAD</i>	<i>CITY</i>	<i>STATE</i>	<i>OCCUPATION</i>	<i>AGE</i>
FE-1992-03	28-Jan-92	BN	Willmar	MN	Yard Brakeman/Helper	57
	SOFA Category:	SSHFR	Special Switching Hazard: Free-Rolling Railcars.			
	SOFA Category:	SOFA4	SOFA 4: Move controlled by a combination of hand and radio signals or specific distances were not given.			
FE-1992-04	30-Jan-92	AGC	Polk County	FL	Yard Brakeman/Helper	32
	SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.			
FE-1992-08	11-Mar-92	FEC	Fort Pierce	FL	Yard Conductor/Foreman	36
	SOFA Category:	SOFA4	SOFA 4: Move controlled by a combination of hand and radio signals or specific distances were not given.			
	SOFA Category:	SSHDR	Special Switching Hazard: Derailment.			
	SOFA Category:	SSHEQ	Special Switching Hazard: Equipment.			
FE-1992-09	09-Apr-92	ATSF	Cheto	AZ	Freight Engineer	54
	SOFA Category:	SSHFR	Special Switching Hazard: Free-Rolling Railcars.			
FE-1992-14	01-Jun-92	ATSF	Escondido	CA	Freight Conductor	58
	SOFA Category:	SOFA4	SOFA 4: Move controlled by a combination of hand and radio signals or specific distances were not given.			
FE-1992-15	01-Jun-92	BN	Seattle	WA	Switchman	42
	SOFA Category:	SSHUC	Special Switching Hazard: Unsecured Cars.			
	SOFA Category:	SSHET	Special Switching Hazard: Employee Tripping, Slipping, or Falling			
FE-1992-16	02-Jun-92	IHRC	Henderson	KY	Freight Conductor	52
	SOFA Category:	SSHUM	Special Switching Hazard: Unexpected Movement of Railcars.			
	SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.			
FE-1992-18	20-Jun-92	CNW	Northlake	IL	Yard Conductor/Foreman	42
	SOFA Category:	SOFA1	SOFA 1: Adjusting knuckles, adjusting drawbars, or installing EOT			
FE-1992-20	07-Jul-92	SSW	Conlen Siding	TX	Freight Engineer	58
	SOFA Category:	SSHST	Special Switching Hazard: Struck by Mainline Train.			
FE-1992-22	25-Jul-92	UP	Portland	OR	Freight Brakeman/Flagman	54
	SOFA Category:	SOFA4	SOFA 4: Move controlled by a combination of hand and radio signals or specific distances were not given.			
	SOFA Category:	SSHFC	Special Switching Hazard: Failure to Confirm Route of Movement.			
FE-1992-30	24-Jul-92	GBW	Wisconsin	WI	Freight Brakeman/Flagman	34
	SOFA Category:	SSHUM	Special Switching Hazard: Unexpected Movement of Railcars.			
	SOFA Category:	SOFA2	SOFA 2: Struck by equipment other than their own on yard or industry track.			
	SOFA Category:	SOFA3	SOFA 3: Lack of or inadequate job safety briefing.			
FE-1992-33	15-Oct-92	BN	Omaha	NE	Yard Brakeman/Helper	32
	SOFA Category:	SSHIIH	Special Switching Hazard: Industrial Hazard.			
	SOFA Category:	SSHMC	Special Switching Hazard: Miscellaneous.			
FE-1992-34	23-Oct-92	GTW	Dearborn	MI	Freight Brakeman/Flagman	49
	SOFA Category:	SSHFR	Special Switching Hazard: Free-Rolling Railcars.			

<i>CASE NUMBER</i>	<i>DATE</i>	<i>RAIL- ROAD</i>	<i>CITY</i>	<i>STATE</i>	<i>OCCUPATION</i>	<i>AGE</i>
FE-1992-39	16-Nov-92	TTIS	Maysville	KY	Freight Conductor	35
	<i>SOFA Category:</i>	SSHMC	Special Switching Hazard: Miscellaneous.			
FE-1993-11	27-Mar-93	SP	Guadalupe	CA	Freight Brakeman/Flagman	39
	<i>SOFA Category:</i>	SSHET	Special Switching Hazard: Employee Tripping, Slipping, or Falling			
FE-1993-13	13-Apr-93	CSX	Dwale	KY	Freight Brakeman/Flagman	44
	<i>SOFA Category:</i>	SSHST	Special Switching Hazard: Struck by Mainline Train.			
FE-1993-20	22-May-93	ATSF	El Paso	TX	Yard Conductor/Foreman	46
	<i>SOFA Category:</i>	SSHMC	Special Switching Hazard: Miscellaneous.			
FE-1993-22	04-Jun-93	SEPTA	Devon	PA	Road Passenger Engineer	29
	<i>SOFA Category:</i>	SSHMC	Special Switching Hazard: Miscellaneous.			
FE-1993-23	07-Jun-93	IC	Fulton	KY	Yard Brakeman/Helper	49
	<i>SOFA Category:</i>	SSHUM	Special Switching Hazard: Unexpected Movement of Railcars.			
	<i>SOFA Category:</i>	SOFA3	SOFA 3: Lack of or inadequate job safety briefing.			
FE-1993-26	15-Jul-93	CR	Anderson	IN	Yard Brakeman/Helper	43
	<i>SOFA Category:</i>	SOFA4	SOFA 4: Move controlled by a combination of hand and radio signals or specific distances were not given.			
	<i>SOFA Category:</i>	SSHET	Special Switching Hazard: Employee Tripping, Slipping, or Falling			
FE-1993-27	04-Aug-93	UP	Pryor	OK	Freight Brakeman/Flagman	42
	<i>SOFA Category:</i>	SSHCC	Special Switching Hazard: Close Clearance.			
	<i>SOFA Category:</i>	SSHDR	Special Switching Hazard: Derailment.			
	<i>SOFA Category:</i>	SSHIH	Special Switching Hazard: Industrial Hazard.			
FE-1993-30	11-Aug-93	SP	Tracy	CA	Freight Brakeman/Flagman	47
	<i>SOFA Category:</i>	SOFA3	SOFA 3: Lack of or inadequate job safety briefing.			
	<i>SOFA Category:</i>	SOFA4	SOFA 4: Move controlled by a combination of hand and radio signals or specific distances were not given.			
	<i>SOFA Category:</i>	SSHIH	Special Switching Hazard: Industrial Hazard.			
FE-1993-31	12-Aug-93	ATSF	Evandale	TX	Freight Brakeman/Flagman	52
	<i>SOFA Category:</i>	SOFA2	SOFA 2: Struck by equipment other than their own on yard or industry track.			
FE-1993-35	02-Sep-93	ATSF	Carlsbad	NM	Freight Conductor	55
	<i>SOFA Category:</i>	SSHMC	Special Switching Hazard: Miscellaneous.			
FE-1993-40	19-Oct-93	SOO	Leal	ND	Freight Brakeman/Flagman	43
	<i>SOFA Category:</i>	SSHDR	Special Switching Hazard: Derailment.			
	<i>SOFA Category:</i>	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.			
FE-1993-46	12-Nov-93	ATSF	Farewell	TX	Freight Conductor	41
	<i>SOFA Category:</i>	SSHUC	Special Switching Hazard: Unsecured Cars.			
	<i>SOFA Category:</i>	SSHDA	Special Switching Hazard: Drugs and Alcohol.			
FE-1993-47	13-Nov-93	GC	Macon	GA	Yard Conductor/Foreman	47
	<i>SOFA Category:</i>	SOFA3	SOFA 3: Lack of or inadequate job safety briefing.			
	<i>SOFA Category:</i>	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.			
	<i>SOFA Category:</i>	SSHUM	Special Switching Hazard: Unexpected Movement of Railcars.			

<i>CASE NUMBER</i>	<i>DATE</i>	<i>RAIL- ROAD</i>	<i>CITY</i>	<i>STATE</i>	<i>OCCUPATION</i>	<i>AGE</i>
FE-1993-49	05-Dec-93	SOU	Atlanta	GA	Freight Conductor	59
	SOFA Category:	SOFA3	SOFA 3: Lack of or inadequate job safety briefing.			
	SOFA Category:	SSHUM	Special Switching Hazard: Unexpected Movement of Railcars.			
FE-1993-53	30-Dec-93	CR	Brook Park	OH	Yard Conductor/Foreman	61
	SOFA Category:	SSHEV	Special Switching Hazard: Environment.			
	SOFA Category:	SSHIH	Special Switching Hazard: Industrial Hazard.			
FE-1994-02	04-Jan-94	BN	Hastings	NE	Conductor	46
	SOFA Category:	SSHUC	Special Switching Hazard: Unsecured Cars.			
FE-1994-03	14-Jan-94	BN	Amarillo	TX	Conductor	57
	SOFA Category:	SSHEQ	Special Switching Hazard: Equipment.			
	SOFA Category:	SSHDR	Special Switching Hazard: Derailment.			
FE-1994-04	18-Jan-94	CSXT	Bainbridge	GA	Conductor	45
	SOFA Category:	SSHMC	Special Switching Hazard: Miscellaneous.			
FE-1994-06	20-Jan-94	UP	Fall City	NE	Freight Conductor	44
	SOFA Category:	SOFA2	SOFA 2: Struck by equipment other than their own on yard or industry track.			
	SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.			
	SOFA Category:	SSHFR	Special Switching Hazard: Free-Rolling Railcars.			
FE-1994-12	12-Apr-94	SP	Houston	TX	Yard Conductor/Foreman	62
	SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.			
FE-1994-16	05-Jul-94	BN	Essex	MT	Freight Brakeman/Flagman	59
	SOFA Category:	SSHFR	Special Switching Hazard: Free-Rolling Railcars.			
FE-1994-20	20-Sep-94	ARR	Clear Site	AK	Freight Brakeman/Flagman	49
	SOFA Category:	SSHMV	Special Switching Hazard: Struck or struck by Motor Vehicle.			
FE-1994-26	17-Oct-94	UP	Donaldsonville	LA	Freight Brakeman/Flagman	36
	SOFA Category:	SOFA1	SOFA 1: Adjusting knuckles, adjusting drawbars, or installing EOT			
FE-1994-28	10-Nov-94	PTRA	Houston	TX	Yard Brakeman/Helper	31
	SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.			
	SOFA Category:	SSHIH	Special Switching Hazard: Industrial Hazard.			
FE-1994-29	15-Nov-94	CR	Painted Post	NY	Freight Brakeman/Flagman	57
	SOFA Category:	SOFA3	SOFA 3: Lack of or inadequate job safety briefing.			
	SOFA Category:	SOFA4	SOFA 4: Move controlled by a combination of hand and radio signals or specific distances were not given.			
	SOFA Category:	SSHUM	Special Switching Hazard: Unexpected Movement of Railcars.			
FE-1994-31	06-Dec-94	CR	Campbell Hall	NY	Brakeman Trainee	28
	SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.			
	SOFA Category:	SOFA2	SOFA 2: Struck by equipment other than their own on yard or industry track.			
	SOFA Category:	SOFA4	SOFA 4: Move controlled by a combination of hand and radio signals or specific distances were not given.			
FE-1994-32	13-Dec-94	UP	Thorton	CA	Freight Brakeman/Flagman	48
	SOFA Category:	SOFA1	SOFA 1: Adjusting knuckles, adjusting drawbars, or installing EOT			

<i>CASE NUMBER</i>	<i>DATE</i>	<i>RAIL- ROAD</i>	<i>CITY</i>	<i>STATE</i>	<i>OCCUPATION</i>	<i>AGE</i>
FE-1995-02	11-Jan-95	CR	Indianapolis	IN	Conductor	51
	SOFA Category:	SSHEQ	Special Switching Hazard: Equipment.			
FE-1995-09	17-Feb-95	CR	St. James	OH	Conductor	48
	SOFA Category:	SOFA3	SOFA 3: Lack of or inadequate job safety briefing.			
	SOFA Category:	SOFA4	SOFA 4: Move controlled by a combination of hand and radio signals or specific distances were not given.			
	SOFA Category:	SSHUM	Special Switching Hazard: Unexpected Movement of Railcars.			
FE-1995-11	24-Feb-95	ATSF	Amarillo	TX	Engine Foreman	44
	SOFA Category:	SOFA1	SOFA 1: Adjusting knuckles, adjusting drawbars, or installing EOT			
	SOFA Category:	SOFA2	SOFA 2: Struck by equipment other than their own on yard or industry track.			
	SOFA Category:	SSHFR	Special Switching Hazard: Free-Rolling Railcars.			
FE-1995-12	02-Mar-95	NS	Aiken	SC	Brakeman	46
	SOFA Category:	SOFA3	SOFA 3: Lack of or inadequate job safety briefing.			
	SOFA Category:	SOFA1	SOFA 1: Adjusting knuckles, adjusting drawbars, or installing EOT			
FE-1995-16	06-Apr-95	WC	Argoe	WI	Conductor	45
	SOFA Category:	SSHUC	Special Switching Hazard: Unsecured Cars.			
FE-1995-17	21-Mar-95	SP	Bassett	CA	Conductor	55
	SOFA Category:	SSHMC	Special Switching Hazard: Miscellaneous.			
FE-1995-18	03-May-95	CSXT	Evansville	IN	Conductor	52
	SOFA Category:	SOFA2	SOFA 2: Struck by equipment other than their own on yard or industry track.			
FE-1995-23	21-Jul-95	CR	Hershey	PA	Conductor	61
	SOFA Category:	SSHET	Special Switching Hazard: Employee Tripping, Slipping, or Falling			
FE-1995-29	04-Oct-95	CSXT	Riverdale	IL	Conductor	39
	SOFA Category:	SOFA1	SOFA 1: Adjusting knuckles, adjusting drawbars, or installing EOT			
	SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.			
FE-1995-33	11-Dec-95	NS	Toledo	OH	Brakeman	53
	SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.			
	SOFA Category:	SSHIIH	Special Switching Hazard: Industrial Hazard.			
FE-1995-34	14-Dec-95	CSXT	Monroe	NC	Conductor	54
	SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.			
FE-1996-09	20-Mar-96	BRC	Bedford Park	IL	Conductor	28
	SOFA Category:	SOFA1	SOFA 1: Adjusting knuckles, adjusting drawbars, or installing EOT			
	SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.			
	SOFA Category:	SSHUC	Special Switching Hazard: Unsecured Cars.			
FE-1996-12	15-Jun-96	CSX	Charlotte	NC	Switchman	36
	SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.			
	SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.			
	SOFA Category:	SSHIIH	Special Switching Hazard: Industrial Hazard.			
FE-1996-17	07-Jul-96	NS	Sidney	IN	Conductor	29

<i>CASE NUMBER</i>	<i>DATE</i>	<i>RAIL-ROAD</i>	<i>CITY</i>	<i>STATE</i>	<i>OCCUPATION</i>	<i>AGE</i>
	SOFA Category: SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.				
	SOFA Category: SSHST	Special Switching Hazard: Struck by Mainline Train.				
FE-1996-22	03-Sep-96	DGNO	Dallas	TX	Brakeman	43
	SOFA Category: SSHEQ	Special Switching Hazard: Equipment.				
	SOFA Category: SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.				
FE-1996-24	07-Oct-96	UP	Eagle Pass	TX	Engine Foreman	35
	SOFA Category: SSHEQ	Special Switching Hazard: Equipment.				
	SOFA Category: SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.				
	SOFA Category: SOFA1	SOFA 1: Adjusting knuckles, adjusting drawbars, or installing EOT				
FE-1996-30	16-Dec-96	UP	Clinton	IA	Brakeman	51
	SOFA Category: SSHET	Special Switching Hazard: Employee Tripping, Slipping, or Falling				
	SOFA Category: SSHDA	Special Switching Hazard: Drugs and Alcohol.				
FE-1996-31	18-Dec-96	IC	Chicago	IL	Conductor	45
	SOFA Category: SSHUC	Special Switching Hazard: Unsecured Cars.				
FE-1997-02	12-Jan-97	UP	S Fontana	CA	Conductor	60
	SOFA Category: SSHET	Special Switching Hazard: Employee Tripping, Slipping, or Falling				
FE-1997-04	29-Jan-97	UP	Mason City	IA	Conductor	48
	SOFA Category: SOFA4	SOFA 4: Move controlled by a combination of hand and radio signals or specific distances were not given.				
	SOFA Category: SSHFC	Special Switching Hazard: Failure to Confirm Route of Movement.				
FE-1997-05	02-Feb-97	CR	Burns Harbor	IN	Engine Foreman	54
	SOFA Category: SOFA2	SOFA 2: Struck by equipment other than their own on yard or industry track.				
FE-1997-16	06-Jun-97	CMRC	Bay City	MI	Conductor	50
	SOFA Category: SOFA4	SOFA 4: Move controlled by a combination of hand and radio signals or specific distances were not given.				
FE-1997-18	24-Jun-97	UP	Portland	OR	Yard Conductor/Foreman	53
	SOFA Category: SSHET	Special Switching Hazard: Employee Tripping, Slipping, or Falling				
FE-1997-19	24-Jun-97	NS	Rowesville	SC	Conductor	21
	SOFA Category: SSHUM	Special Switching Hazard: Unexpected Movement of Railcars.				
FE-1997-22	18-Jul-97	MNCW	Stamford	CT	Conductor	40
	SOFA Category: SSHST	Special Switching Hazard: Struck by Mainline Train.				
FE-1997-25	15-Aug-97	UP	Elko	NV	Yard Brakeman/Helper	53
	SOFA Category: SOFA1	SOFA 1: Adjusting knuckles, adjusting drawbars, or installing EOT				
	SOFA Category: SSHUC	Special Switching Hazard: Unsecured Cars.				
FE-1997-32	16-Oct-97	MRL	Laurel	MT	Switchman	22
	SOFA Category: SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.				
	SOFA Category: SSHEQ	Special Switching Hazard: Equipment.				
	SOFA Category: SSHET	Special Switching Hazard: Employee Tripping, Slipping, or Falling				
FE-1997-36	02-Dec-97	BNSF	Emporia	KS	Freight Conductor	50
	SOFA Category: SSHST	Special Switching Hazard: Struck by Mainline Train.				

<i>CASE NUMBER</i>	<i>DATE</i>	<i>RAIL- ROAD</i>	<i>CITY</i>	<i>STATE</i>	<i>OCCUPATION</i>	<i>AGE</i>
FE-1997-45	26-Dec-97	UP	Boise	ID	Freight Conductor	55
	SOFA Category:	SOFA4	SOFA 4: Move controlled by a combination of hand and radio signals or specific distances were not given.			
FE-1998-02	24-Jan-98	BNSF	Omaha	NE	Yard Conductor/Foreman	47
	SOFA Category:	SSHDA	Special Switching Hazard: Drugs and Alcohol.			
FE-1998-05	04-Feb-98	BRC	Bedford Park	IL	Yard Conductor/Foreman	42
	SOFA Category:	SOFA2	SOFA 2: Struck by equipment other than their own on yard or industry track.			
	SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.			
	SOFA Category:	SSHFR	Special Switching Hazard: Free-Rolling Railcars.			
FE-1998-15	26-May-98	BRC	Bedford Park	IL	Yard Conductor/Foreman	57
	SOFA Category:	SOFA1	SOFA 1: Adjusting knuckles, adjusting drawbars, or installing EOT			
	SOFA Category:	SSHUC	Special Switching Hazard: Unsecured Cars.			
FE-1998-16	01-Jun-98	BNSF	Lubbock	TX	Yard Conductor/Foreman	24
	SOFA Category:	SOFA2	SOFA 2: Struck by equipment other than their own on yard or industry track.			
	SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.			
FE-1998-17	05-Jun-98	NS	Hapeville	GA	Yard Conductor/Foreman	48
	SOFA Category:	SOFA1	SOFA 1: Adjusting knuckles, adjusting drawbars, or installing EOT			
FE-1998-19	01-Jul-98	NS	Buechel	KY	Utility Employee	54
	SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.			
	SOFA Category:	SSHIH	Special Switching Hazard: Industrial Hazard.			
FE-1998-28	26-Oct-98	CCP	Cicero	IL	Engineer	42
	SOFA Category:	SSHMC	Special Switching Hazard: Miscellaneous.			
FE-1998-37	28-Dec-98	IC	Durrant	MS	Conductor	55
	SOFA Category:	SOFA4	SOFA 4: Move controlled by a combination of hand and radio signals or specific distances were not given.			
	SOFA Category:	SSHDR	Special Switching Hazard: Derailment.			
FE-1999-01	12-Jan-99	CR	Port Newark	NJ	Conductor	54
	SOFA Category:	SOFA3	SOFA 3: Lack of or inadequate job safety briefing.			
	SOFA Category:	SOFA4	SOFA 4: Move controlled by a combination of hand and radio signals or specific distances were not given.			
	SOFA Category:	SSHFC	Special Switching Hazard: Failure to Confirm Route of Movement.			
FE-1999-03	22-Jan-99	CR	Alexandria	NY	Conductor	45
	SOFA Category:	SSHDR	Special Switching Hazard: Derailment.			
	SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.			
	SOFA Category:	SSHEV	Special Switching Hazard: Environment.			
FE-1999-05	17-Feb-99	KCS	Kansas City	MO	Freight Conductor	26
	SOFA Category:	SSHMV	Special Switching Hazard: Struck or struck by Motor Vehicle.			
FE-1999-11	02-Apr-99	DME	Waseca	MN	Brakeman	54
	SOFA Category:	SOFA3	SOFA 3: Lack of or inadequate job safety briefing.			
FE-1999-12	09-Apr-99	UP	Richland	WA	Conductor	58
	SOFA Category:	SSHEQ	Special Switching Hazard: Equipment.			

<i>CASE NUMBER</i>	<i>DATE</i>	<i>RAIL- ROAD</i>	<i>CITY</i>	<i>STATE</i>	<i>OCCUPATION</i>	<i>AGE</i>
FE-1999-14	19-May-99	NS	Cincinnati	OH	Conductor	36
	SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.			
FE-1999-16	23-Jun-99	UP	Redding	CA	Conductor	57
	SOFA Category:	SOFA1	SOFA 1: Adjusting knuckles, adjusting drawbars, or installing EOT			
	SOFA Category:	SOFA4	SOFA 4: Move controlled by a combination of hand and radio signals or specific distances were not given.			
FE-1999-24	14-Sep-99	AM	Van Buren	AR	Conductor	47
	SOFA Category:	SSHDA	Special Switching Hazard: Drugs and Alcohol.			
	SOFA Category:	SOFA1	SOFA 1: Adjusting knuckles, adjusting drawbars, or installing EOT			
	SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.			
FE-1999-32	17-Nov-99	UP	Lincoln	NE	Brakeman	57
	SOFA Category:	SSHUM	Special Switching Hazard: Unexpected Movement of Railcars.			
FE-2000-02	02-Jan-00	CIRR	Cedar Springs	GA	Conductor	49
	SOFA Category:	SSHEV	Special Switching Hazard: Environment.			
FE-2000-09	09-Mar-00	IHB	Riverdale	IL	Engine Foreman	43
	SOFA Category:	SOFA1	SOFA 1: Adjusting knuckles, adjusting drawbars, or installing EOT			
	SOFA Category:	SSHUC	Special Switching Hazard: Unsecured Cars.			
FE-2000-13	21-Apr-00	BNSF	Galesburg	IL	Engine Foreman	60
	SOFA Category:	SSHFR	Special Switching Hazard: Free-Rolling Railcars.			
FE-2000-16	22-May-00	CSX	Richmond	VA	Brakeman	38
	SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.			
	SOFA Category:	SSHIH	Special Switching Hazard: Industrial Hazard.			
FE-2000-17	31-May-00	UP	Pine Bluff	AR	Engine Foreman	47
	SOFA Category:	SSHMC	Special Switching Hazard: Miscellaneous.			
FE-2000-21	07-Jul-00	CKRY	Wichita	KS	Conductor	39
	SOFA Category:	SSHET	Special Switching Hazard: Employee Tripping, Slipping, or Falling			
	SOFA Category:	SOFA1	SOFA 1: Adjusting knuckles, adjusting drawbars, or installing EOT			
FE-2000-22	24-Jul-00	PARN	Skagway	AK	Conductor	55
	SOFA Category:	SOFA4	SOFA 4: Move controlled by a combination of hand and radio signals or specific distances were not given.			
	SOFA Category:	SSHFC	Special Switching Hazard: Failure to Confirm Route of Movement.			
FE-2000-23	28-Jul-00	UP	St. Louis	MO	Switchman	48
	SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.			
	SOFA Category:	SSHIH	Special Switching Hazard: Industrial Hazard.			
FE-2000-25	11-Aug-00	BNSF	Port of Los Angeles	CA	Freight Brakeman	36
	SOFA Category:	SOFA2	SOFA 2: Struck by equipment other than their own on yard or industry track.			
FE-2000-29	09-Sep-00	BNSF	Keokuk	IA	Conductor	53
	SOFA Category:	SOFA4	SOFA 4: Move controlled by a combination of hand and radio signals or specific distances were not given.			
FE-2000-30	15-Oct-00	UP	Houston	TX	Fireman	47

<i>CASE NUMBER</i>	<i>DATE</i>	<i>RAIL-ROAD</i>	<i>CITY</i>	<i>STATE</i>	<i>OCCUPATION</i>	<i>AGE</i>	
	SOFA Category:	SOFA3	SOFA 3: Lack of or inadequate job safety briefing.				
	SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.				
FE-2000-32	28-Dec-00	UP	Dupo	IL	Switchman	52	
	SOFA Category:	SSHST	Special Switching Hazard: Struck by Mainline Train.				
FE-2000-33	29-Dec-00	BNSF	Gillette	WY	Conductor	29	
	SOFA Category:	SSHST	Special Switching Hazard: Struck by Mainline Train.				
	SOFA Category:	SSHED	Special Switching Hazard: Electronic Device (Cell phone, MP3 player)				
FE-2001-02	10-Jan-01	CSX	Chicago	IL	Conductor	42	
	SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.				
	SOFA Category:	SSHST	Special Switching Hazard: Struck by Mainline Train.				
FE-2001-03	11-Jan-01	NS	South Fork	PA	Engineer	52	
	SOFA Category:	SOFA3	SOFA 3: Lack of or inadequate job safety briefing.				
	SOFA Category:	SSHEQ	Special Switching Hazard: Equipment.				
	SOFA Category:	SSHST	Special Switching Hazard: Struck by Mainline Train.				
FE-2001-08	03-Mar-01	BNSF	Willmar	MN	Switchman	36	
	SOFA Category:	SSHUC	Special Switching Hazard: Unsecured Cars.				
	SOFA Category:	SOFA1	SOFA 1: Adjusting knuckles, adjusting drawbars, or installing EOT				
	SOFA Category:	SSHEV	Special Switching Hazard: Environment.				
FE-2001-14	08-Apr-01	BNSF	Clark	OK	Conductor	35	
	SOFA Category:	SSHMC	Special Switching Hazard: Miscellaneous.				
FE-2001-21	13-Jul-01	CPRS	Bensenville	IL	Conductor	55	
	SOFA Category:	SSHFR	Special Switching Hazard: Free-Rolling Railcars.				
	SOFA Category:	SSHDR	Special Switching Hazard: Derailment.				
FE-2001-31	10-Oct-01	PAL	Clayburn	KY	Conductor	38	
	SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.				
FE-2001-39	22-Dec-01	NS	Eden	NC	Brakeman	50	
	SOFA Category:	SSHMV	Special Switching Hazard: Struck or struck by Motor Vehicle.				
FE-2001-40	24-Dec-01	NS	Lynchburg	VA	Conductor	30	
	SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.				
	SOFA Category:	SSHST	Special Switching Hazard: Struck by Mainline Train.				
FE-2002-09	21-Mar-02	NS	Claymont	DE	Engineer	45	
	SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.				
	SOFA Category:	SSHST	Special Switching Hazard: Struck by Mainline Train.				
FE-2002-12	14-May-02	UP	Pine Bluff	AR	Switchman	53	
	SOFA Category:	SOFA1	SOFA 1: Adjusting knuckles, adjusting drawbars, or installing EOT				
	SOFA Category:	SSHUC	Special Switching Hazard: Unsecured Cars.				
FE-2002-16	16-Jun-02	BNSF	Memphis	TN	Engine Foreman	20	
	SOFA Category:	SOFA3	SOFA 3: Lack of or inadequate job safety briefing.				

<i>CASE NUMBER</i>	<i>DATE</i>	<i>RAIL- ROAD</i>	<i>CITY</i>	<i>STATE</i>	<i>OCCUPATION</i>	<i>AGE</i>	
	SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.				
	SOFA Category:	SOFA1	SOFA 1: Adjusting knuckles, adjusting drawbars, or installing EOT				
FE-2002-17	16-Jul-02	NS	Bonlee	NC	Brakeman	55	
	SOFA Category:	SOFA4	SOFA 4: Move controlled by a combination of hand and radio signals or specific distances were not given.				
FE-2002-19	08-Aug-02	CWRO	Cleveland	OH	Switchman	53	
	SOFA Category:	SOFA2	SOFA 2: Struck by equipment other than their own on yard or industry track.				
	SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.				
FE-2002-22	02-Sep-02	CSXT	Madisonville	KY	Conductor	52	
	SOFA Category:	SSHUM	Special Switching Hazard: Unexpected Movement of Railcars.				
FE-2003-03	11-Feb-03	CNIC	Flat Rock	MI	Brakeman	57	
	SOFA Category:	SOFA2	SOFA 2: Struck by equipment other than their own on yard or industry track.				
FE-2003-04	16-Feb-03	CSXT	Syracuse	NY	Switchman	36	
	SOFA Category:	SSHFR	Special Switching Hazard: Free-Rolling Railcars.				
FE-2003-05	18-Feb-03	CSXT	Cheektowaga	NY	Switch Foreman	51	
	SOFA Category:	SSHUC	Special Switching Hazard: Unsecured Cars.				
FE-2003-11	11-Apr-03	UP	Pocatello	ID	Conductor	55	
	SOFA Category:	SOFA3	SOFA 3: Lack of or inadequate job safety briefing.				
	SOFA Category:	SSHDR	Special Switching Hazard: Derailment.				
FE-2003-12	06-Jun-03	CSXT	Kingsport	TN	Brakeman	35	
	SOFA Category:	SSHMV	Special Switching Hazard: Struck or struck by Motor Vehicle.				
	SOFA Category:	SSHIH	Special Switching Hazard: Industrial Hazard.				
FE-2003-20	26-Aug-03	LC	Chester	SC	Conductor	29	
	SOFA Category:	SOFA1	SOFA 1: Adjusting knuckles, adjusting drawbars, or installing EOT				
FE-2003-22	12-Sep-03	GC	Dublin	GA	Brakeman	45	
	SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.				
FE-2003-23	14-Sep-03	UP	Ogden	UT	Conductor	53	
	SOFA Category:	SSHEQ	Special Switching Hazard: Equipment.				
FE-2003-25	24-Sep-03	BNSF	Fresno	CA	Switch Foreman	35	
	SOFA Category:	SSHET	Special Switching Hazard: Employee Tripping, Slipping, or Falling				
FE-2003-35	07-Dec-03	UP	San Antonio	TX	Conductor	37	
	SOFA Category:	SSHUM	Special Switching Hazard: Unexpected Movement of Railcars.				
FE-2004-03	14-Jan-04	NS	Kankakee	IL	Freight Conductor	40	
	SOFA Category:	SSHEV	Special Switching Hazard: Environment.				
	SOFA Category:	SSHET	Special Switching Hazard: Employee Tripping, Slipping, or Falling				
FE-2004-10	10-Mar-04	MNCW	Stanford	CT	Yard Brakeman	46	
	SOFA Category:	SSHFC	Special Switching Hazard: Failure to Confirm Route of Movement.				
FE-2004-13	13-May-04	MSO	Sturgis	MI	Conductor	38	

<i>CASE NUMBER</i>	<i>DATE</i>	<i>RAIL- ROAD</i>	<i>CITY</i>	<i>STATE</i>	<i>OCCUPATION</i>	<i>AGE</i>	
	SOFA Category:	SSHDA	Special Switching Hazard: Drugs and Alcohol.				
	SOFA Category:	SSHET	Special Switching Hazard: Employee Tripping, Slipping, or Falling				
FE-2004-14	18-May-04	NS	Elwood	IN	Freight Brakeman	35	
	SOFA Category:	SSHMV	Special Switching Hazard: Struck or struck by Motor Vehicle.				
	SOFA Category:	SSHIH	Special Switching Hazard: Industrial Hazard.				
FE-2004-20	02-Sep-04	BNSF	Clovis	NM	Conductor/switchman	26	
	SOFA Category:	SSHDR	Special Switching Hazard: Derailment.				
	SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.				
	SOFA Category:	SSHET	Special Switching Hazard: Employee Tripping, Slipping, or Falling				
FE-2004-22	20-Sep-04	AA	Saline	MI	Conductor	46	
	SOFA Category:	SOFA1	SOFA 1: Adjusting knuckles, adjusting drawbars, or installing EOT				
	SOFA Category:	SSHUC	Special Switching Hazard: Unsecured Cars.				
FE-2004-23	04-Oct-04	NS	Harrisburg	PA	Conductor	58	
	SOFA Category:	SOFA2	SOFA 2: Struck by equipment other than their own on yard or industry track.				
FE-2004-25	07-Oct-04	UP	Springfield	IL	Student brakeman	31	
	SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.				
	SOFA Category:	SSHDR	Special Switching Hazard: Derailment.				
	SOFA Category:	SSHED	Special Switching Hazard: Electronic Device (Cell phone, MP3 player)				
FE-2004-26	07-Oct-04	BNSF	Teague	TX	Yard brakeman	60	
	SOFA Category:	SOFA3	SOFA 3: Lack of or inadequate job safety briefing.				
FE-2004-28	01-Nov-04	BNSF	Bowdoin	MT	Conductor	45	
	SOFA Category:	SOFA3	SOFA 3: Lack of or inadequate job safety briefing.				
	SOFA Category:	SSHST	Special Switching Hazard: Struck by Mainline Train.				
	SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.				
FE-2004-30	17-Dec-04	BNSF	Radium	CO	Conductor	44	
	SOFA Category:	SOFA3	SOFA 3: Lack of or inadequate job safety briefing.				
	SOFA Category:	SSHST	Special Switching Hazard: Struck by Mainline Train.				
FE-2005-02	10-Jan-05	UP	Buena Vista	AR	Conductor	52	
	SOFA Category:	SSHST	Special Switching Hazard: Struck by Mainline Train.				
FE-2005-04	26-Jan-05	PHL	Los Angeles	CA	Yard Conductor	52	
	SOFA Category:	SSHFC	Special Switching Hazard: Failure to Confirm Route of Movement.				
FE-2005-13	06-Apr-05	NS	Selma	AL	Brakeman	48	
	SOFA Category:	SSHMC	Special Switching Hazard: Miscellaneous.				
FE-2005-14	11-Apr-05	UP	Ogden	UT	Switchman	38	
	SOFA Category:	SOFA3	SOFA 3: Lack of or inadequate job safety briefing.				
	SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.				
FE-2005-18	13-May-05	DC	Detroit	MI	Yard Conductor	24	
	SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.				

<i>CASE NUMBER</i>	<i>DATE</i>	<i>RAIL- ROAD</i>	<i>CITY</i>	<i>STATE</i>	<i>OCCUPATION</i>	<i>AGE</i>	
		SOFA Category:	SSHIH	Special Switching Hazard: Industrial Hazard.			
		SOFA Category:	SSHDR	Special Switching Hazard: Derailment.			
		SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.			
FE-2005-23	05-Jul-05	BNSF	Emporia	KS	Yard Helper	26.8	
		SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.			
		SOFA Category:	SSHMC	Special Switching Hazard: Miscellaneous.			
		SOFA Category:	SSHIH	Special Switching Hazard: Industrial Hazard.			
FE-2005-24	18-Jul-05	UP	Memphis	TN	Brakeman	59	
		SOFA Category:	SSHMV	Special Switching Hazard: Struck or struck by Motor Vehicle.			
		SOFA Category:	SSHIH	Special Switching Hazard: Industrial Hazard.			
FE-2005-25	22-Jul-05	ATN	Ragland	AL	Brakeman	56	
		SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.			
		SOFA Category:	SSHIH	Special Switching Hazard: Industrial Hazard.			
		SOFA Category:	SSHDR	Special Switching Hazard: Derailment.			
		SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.			
FE-2005-27	09-Aug-05	AM	Rogers	AR	Conductor	23	
		SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.			
		SOFA Category:	SSHIH	Special Switching Hazard: Industrial Hazard.			
FE-2005-33	16-Nov-05	CSX	Lugoff	SC	Conductor	48	
		SOFA Category:	SOFA3	SOFA 3: Lack of or inadequate job safety briefing.			
FE-2005-36	04-Dec-05	BNSF	Burlington	IA	Brakeman	34	
		SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.			
		SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.			
		SOFA Category:	SSHIH	Special Switching Hazard: Industrial Hazard.			
FE-2006-04	02-Apr-06	LSI	Palmer	MI	Freight Conductor	51	
		SOFA Category:	SSHET	Special Switching Hazard: Employee Tripping, Slipping, or Falling			
FE-2006-12	21-Aug-06	FEC	Rockledge	FL	Freight Conductor	45	
		SOFA Category:	SSHMV	Special Switching Hazard: Struck or struck by Motor Vehicle.			
		SOFA Category:	SSHIH	Special Switching Hazard: Industrial Hazard.			
FE-2006-13	25-Aug-06	NS	Chicago	IL	Conductor	43	
		SOFA Category:	SSHUC	Special Switching Hazard: Unsecured Cars.			
FE-2006-14	10-Sep-06	ALS	East St. Louis	IL	Conductor	44	
		SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.			
		SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.			
FE-2006-18	13-Oct-06	UP	Watsonville	CA	Brakeman	49	
		SOFA Category:	SSHFR	Special Switching Hazard: Free-Rolling Railcars.			
		SOFA Category:	SSHET	Special Switching Hazard: Employee Tripping, Slipping, or Falling			
FE-2006-22	04-Dec-06	UP	Carson	CA	Brakeman	35	

<i>CASE NUMBER</i>	<i>DATE</i>	<i>RAIL- ROAD</i>	<i>CITY</i>	<i>STATE</i>	<i>OCCUPATION</i>	<i>AGE</i>	
	SOFA Category:	SSHMV	Special Switching Hazard: Struck or struck by Motor Vehicle.				
	SOFA Category:	SSHIH	Special Switching Hazard: Industrial Hazard.				
FE-2006-26	28-Dec-06	UP	Sioux City	IA	Yard Foreman	57	
	SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.				
	SOFA Category:	SSHFR	Special Switching Hazard: Free-Rolling Railcars.				
FE-2007-12	08-Jul-07	BNSF	Berry	AZ	Freight Conductor	37	
	SOFA Category:	SSHET	Special Switching Hazard: Employee Tripping, Slipping, or Falling				
FE-2007-15	27-Jul-07	CN	Fulton	KY	Yard Conductor	46	
	SOFA Category:	SSHFR	Special Switching Hazard: Free-Rolling Railcars.				
FE-2007-18	25-Aug-07	IHB	East Chicago	IL	Yard Conductor	43	
	SOFA Category:	SOFA4	SOFA 4: Move controlled by a combination of hand and radio signals or specific distances were not given.				
FE-2007-19	30-Aug-07	BNSF	Stockton	CA	Yard Brakeman	50	
	SOFA Category:	SOFA3	SOFA 3: Lack of or inadequate job safety briefing.				
FE-2007-21	27-Oct-07	CSX	Russell	KY	Yard Foreman	52	
	SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.				
FE-2007-25	28-Dec-07	BNSF	Bristol	IL	Freight Brakeman	62	
	SOFA Category:	SSHUC	Special Switching Hazard: Unsecured Cars.				
FE-2008-01	08-Jan-08	UP	Waukegan	IL	Passenger Brakeman	59	
	SOFA Category:	SSHST	Special Switching Hazard: Struck by Mainline Train.				
FE-2008-03	03-Feb-08	NS	Chicago	IL	Freight Conductor	28	
	SOFA Category:	SSHST	Special Switching Hazard: Struck by Mainline Train.				
FE-2008-06	05-Mar-08	WSOR	Random Lake	WI	Freight Conductor	55	
	SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.				
	SOFA Category:	SSHIH	Special Switching Hazard: Industrial Hazard.				
	SOFA Category:	SSHDR	Special Switching Hazard: Derailment.				
	SOFA Category:	SSHEV	Special Switching Hazard: Environment.				
FE-2008-15	26-May-08	CSX	Lumberton	NC	Freight Conductor	46	
	SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.				
	SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.				
	SOFA Category:	SSHIH	Special Switching Hazard: Industrial Hazard.				
FE-2008-16	29-May-08	UP	Amarillo	TX	Yard Conductor	35	
	SOFA Category:	SSHEQ	Special Switching Hazard: Equipment.				
	SOFA Category:	SSHFR	Special Switching Hazard: Free-Rolling Railcars.				
	SOFA Category:	SSHET	Special Switching Hazard: Employee Tripping, Slipping, or Falling				
FE-2008-19	08-Jun-08	UP	La Porte	TX	Yard Brakeman	47	
	SOFA Category:	SSHFC	Special Switching Hazard: Failure to Confirm Route of Movement.				
	SOFA Category:	SSHED	Special Switching Hazard: Electronic Device (Cell phone, MP3 player)				
	SOFA Category:	SOFA4	SOFA 4: Move controlled by a combination of hand and radio signals or specific distances were not given.				

<i>CASE NUMBER</i>	<i>DATE</i>	<i>RAIL- ROAD</i>	<i>CITY</i>	<i>STATE</i>	<i>OCCUPATION</i>	<i>AGE</i>
FE-2008-24	08-Jul-08	BNSF	Fridley	MN	Utility Employee	40
	SOFA Category:	SSHMC	Special Switching Hazard: Miscellaneous.			
FE-2008-31	10-Sep-08	INRD	Terre Haute	IN	Freight Conductor	42
	SOFA Category:	SSHDR	Special Switching Hazard: Derailment.			
	SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.			
	SOFA Category:	SSHIH	Special Switching Hazard: Industrial Hazard.			
FE-2008-33	23-Sep-08	CSX	Darby	PA	Freight Conductor	46
	SOFA Category:	SOFA3	SOFA 3: Lack of or inadequate job safety briefing.			
	SOFA Category:	SSHST	Special Switching Hazard: Struck by Mainline Train.			
	SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.			
FE-2008-35	15-Oct-08	CSX	Decatur	AL	Freight Conductor	28
	SOFA Category:	SSHDR	Special Switching Hazard: Derailment.			
	SOFA Category:	SHED	Special Switching Hazard: Electronic Device (Cell phone, MP3 player)			
FE-2008-37	15-Nov-08	MRL	Laurel	MT	Yard Brakeman	39
	SOFA Category:	SOFA5	SOFA 5: FE had 1.5 years of experience or less or had inadequate training.			
	SOFA Category:	SSHUM	Special Switching Hazard: Unexpected Movement of Railcars.			
	SOFA Category:	SOFA3	SOFA 3: Lack of or inadequate job safety briefing.			
FE-2008-40	03-Dec-08	DRIR	Denver	CO	Freight Conductor	33
	SOFA Category:	SSHMV	Special Switching Hazard: Struck or struck by Motor Vehicle.			
	SOFA Category:	SSHIH	Special Switching Hazard: Industrial Hazard.			
FE-2009-03	16-Jan-09	BNSF	Fort Sumner	NM	Freight Engineer,	59
	SOFA Category:	SSHET	Special Switching Hazard: Employee Tripping, Slipping, or Falling			
	SOFA Category:	SOFA3	SOFA 3: Lack of or inadequate job safety briefing.			
FE-2009-06	28-Jan-09	UP	Council Bluffs	IA	Yard Foreman	41
	SOFA Category:	SSHST	Special Switching Hazard: Struck by Mainline Train.			
	SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.			
FE-2009-08	07-Feb-09	BNSF	Holbrook	AZ	Freight Conductor	43
	SOFA Category:	SSHST	Special Switching Hazard: Struck by Mainline Train.			
FE-2009-09	08-Feb-09	UP	Herington	KS	Freight Conductor	26
	SOFA Category:	SSHST	Special Switching Hazard: Struck by Mainline Train.			
	SOFA Category:	SSHMC	Special Switching Hazard: Miscellaneous.			
FE-2009-11	28-Feb-09	BNSF	Buchanan	NM	Freight Conductor	56
	SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.			
FE-2009-14	10-May-09	CSX	Selkirk	NY	Yard Conductor	33
	SOFA Category:	SOFA1	SOFA 1: Adjusting knuckles, adjusting drawbars, or installing EOT			
	SOFA Category:	SSHEQ	Special Switching Hazard: Equipment.			
FE-2009-20	24-Jun-09	ATN	Albertville	AL	Freight Conductor	33
	SOFA Category:	SSHDR	Special Switching Hazard: Derailment.			

<i>CASE NUMBER</i>	<i>DATE</i>	<i>RAIL- ROAD</i>	<i>CITY</i>	<i>STATE</i>	<i>OCCUPATION</i>	<i>AGE</i>
SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.				
SOFA Category:	SSHIH	Special Switching Hazard: Industrial Hazard.				
FE-2009-26	29-Dec-09	BNSF	Minneapolis	MN	RCL Operator	44
SOFA Category:	SSHEV	Special Switching Hazard: Environment.				
SOFA Category:	SSHCC	Special Switching Hazard: Close Clearance.				
SOFA Category:	SSHIH	Special Switching Hazard: Industrial Hazard.				
SOFA Category:	SSHDR	Special Switching Hazard: Derailment.				

APPENDIX G: ADDITIONAL STATISTICS ON SOFA 3 (JOB BRIEFINGS), INDUSTRIAL TRACK HAZARDS, STRUCK BY MAINLINE TRAINS, AND FATALITIES DURING THE SECOND HOUR OF DUTY

SOFA 3 (Job Briefings)

Section 3.3 of this report demonstrated SOFA 3 is the fourth largest category of SOFA fatalities. Figure G-1 illustrates SOFA 3 fatalities over two nine-year periods (Pre-SOFA versus Post-SOFA) and shows an increase from 11 to 12 fatalities between the two periods.

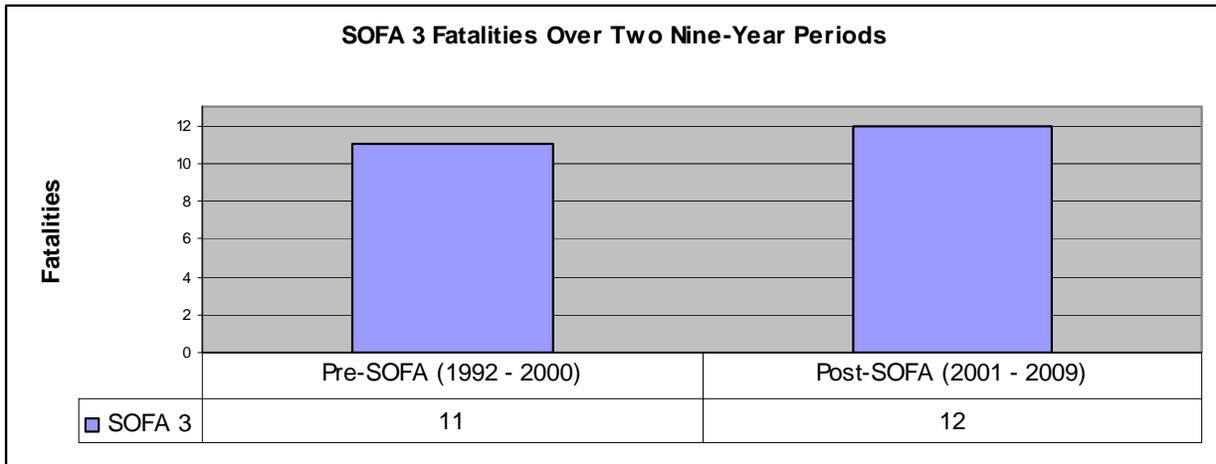


Figure G-1: SOFA 3 Fatalities Over Two Nine-Year Periods

Some of the growth between the two periods can be attributed to incidents when a freight crew member exited the cab while the train was on main track outside of yards. There were no fatalities of this type during the first nine-year period compared to five fatalities during the second nine years (FE-2001-03, FE-2004-28, FE-2004-30, FE-2008-33, FE-2009-03). Figure G-2 below compares SOFA 3 fatalities over two nine-year periods when these five fatalities are removed from the analysis.

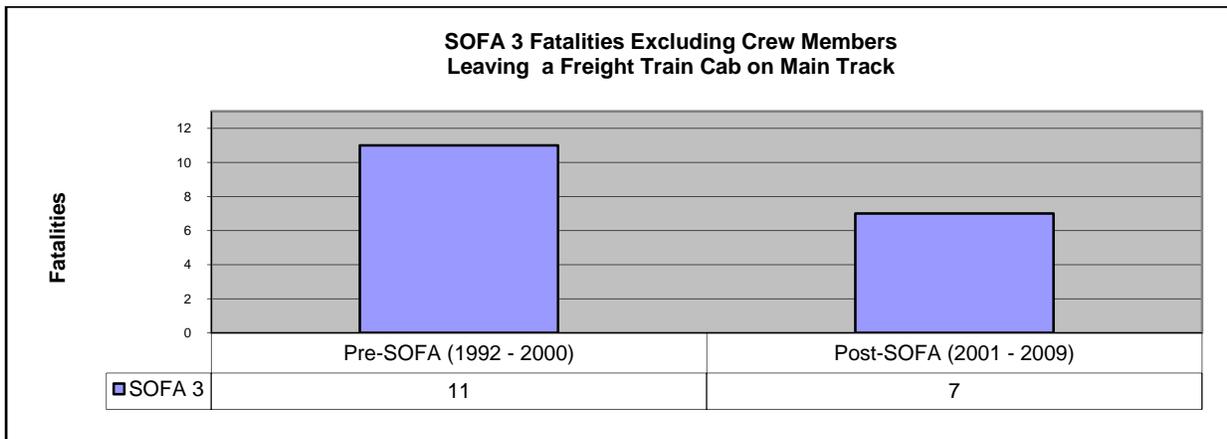


Figure G-2: SOFA 3 Fatalities Excluding Crew Members Leaving a Freight Train Cab on Main Track

Figure G-2 represents SOFA 3 fatalities during pure switching operations and demonstrates some progress (about a 36% reduction) has been made in this area. However, the SWG is not entirely satisfied with this progress. The progress in SOFA 1, 2, and 4, suggests there is still room for more improvement in SOFA 3, the fourth largest SOFA category.

Industrial Track Hazards

Table G-1 shows the FE was riding in 20 out of 26 cases (77%) involving industrial track hazards. This percentage is more than twice the percentage other cases (28%).

Table G-1: Industrial Track Hazard FE Riding

	Industrial Track Hazard Cases	All Other Cases
Cases when FE was riding (63)	20	43
Total cases (179)	26	153
Proportion for FE was riding	77%	28%

Table G-2 shows 20 of 26 industrial track hazard cases (77%) involved shove moves. This percentage is about 25% higher than other cases (52%).

Table G-2: Industrial Track Hazard Shove Moves

	Industrial Track Hazard Cases	All Other Cases
Cases involving shove moves (99)	20	79
Total cases (179)	26	153
Percentage for shove moves	77%	52%

When a shove move was involved, Table G-3 shows “Failure to control shove” was cited as a PCF for 35% of the industrial track hazard cases. This is well above the percentage (22%) for all other cases.

Table G-3: Industrial Track Hazard Failure to Control Shove

	Industrial Track Hazard Cases	All Other Cases
Cases with failure to control shove	7	17
Total cases involving shove moves	20	79 ¹
Percentage for failure to control shove	35%	22%

¹ Since this table only covers shove moves, the total cases add to 99 instead of 179 which is the total seen on the other three tables in this appendix.

Struck by Mainline Trains

65% of Struck by Mainline Train cases occurred during the December-February period. Since this period includes the Christmas and New Year holidays, some attendees at the SOFA Safety Forum and SOFA members suggested FEs, working on a new or unfamiliar assignments, may play a significant role in these cases. However, the available SOFA data did not support this suggestion as an issue for the Struck by Mainline Train.

Table G-4² shows three of the fourteen cases (21%) involving strikes by mainline trains occurred when the FE was not working a regular assignment. This is less than half the percentage (43%) for all other cases (see Table G-15).

Table G-4 Struck by Mainline Trains – Employee Not Working Regular Assignment

	Struck By Mainline Train Cases	All Other Cases
Cases when employee is not on regular assignment (56)	3	53
Total cases where it is known if this was a regular assignment (138)	14	124
Percentage for employee is not on regular assignment	21%	43%

Table G-5³ shows none the fifteen cases (0%) involving strikes by mainline trains occurred when the FE had not worked the assignment before. This is lower than the percentage (3%) for all other cases (see Table 3-15).

Table G-5 Struck by Mainline Train – Employee Not Worked Assignment Before

	Struck By Mainline Train Cases	All Other Cases
Cases when employee had not worked assignment before (4)	0	4
Total cases where it is known if the employee ad worked the assignment before (136)	15	121
Percentage for employee had not worked the assignment before	0%	3%

² For Table 3.16, there were 41 cases where the SWG did not have data to indicate whether a worker was on his/her regular assignment. So the cases in Table 3.16 total to 138, not 179.

³ For Table 3.17, there were 43 cases where the SWG did not have data to indicate whether a worker had worked the assignment before. Accordingly, the cases in Table 3.17 total to 136, not 179.

Table G-6 shows the FE was on the ground in almost all the cases (95%) involving strikes by mainline trains. This is almost 40% higher than the percentage for all other cases (57%).

Table G-6: Struck by Mainline Train – FE Was on the Ground

	Struck By Mainline Train Cases	All Other Cases
Cases where FE was on the ground (110)	19	91
Total cases (179)	20	159
Percentage for FE on the ground	95%	57%

Table G-7 shows the FE was on or fouling track (PCF H990) in almost all the cases involving strikes by mainline trains (95%). This is more than twice the percentage for all other cases (38%).

Table G-7: Struck by Mainline Trains – Employee on or Fouling Track

	Struck By Mainline Train Cases	All Other Cases
Cases where "Employee on or fouling track" was used as a PCF (80)	19	61
Total cases (179)	20	159
Percentage for "Employee on or fouling track" was used as a PCF	95%	38%

Fatalities During The Second Hour of Duty

Table G-8 shows 20 of the 30 (67%) during the second hour of duty occurred while the FE was on or fouling the track. This is about 13% higher than the percentage for cases during other hours of duty (54%).

Table 3-8: 2nd Hour of Duty, FE on or Fouling Track

	Cases During 2nd Hour of Duty	Cases During Other Duty Hours
Cases with FE on or fouling track	20	80
Total cases	30	149
Percentage for FE on or fouling track	67%	54%

Table G-9 shows 5 of the 30 cases (17%) during the second hour of duty occurred when the FE failed to provide adequate space between equipment. This is close to three times higher than the percentage for all other cases (6%).

Table G-9: 2nd Hour of Duty, FE Failed to Provide Adequate Space

	Cases During 2nd Hour of Duty	Cases During Other Duty Hours
Cases involving failure to provide adequate space between equipment	5	9
Total cases	30	149
Percentage for failure to provide adequate space between equipment	17%	6%

APPENDIX H: ADDITIONAL STATISTICS ON FATALITIES IN WINTER AND SUMMER

Table H-1 shows the cases for fatalities in cold weather states during the winter. Table H-2 shows the cases for fatalities in other states during the summer. Appendix A provides narratives on these cases.

Table H-1: Case Numbers For Fatalities In Cold Weather States During Winter

Case Number	Incident Date	Railroad	City	State	Job Description	Age
FE-1992-03	28-Jan-92	BN	Willmar	MN	Yard Brakeman/Helper	57
FE-1993-53	30-Dec-93	CR	Brook Park	OH	Yard Conductor/Foreman	61
FE-1994-31	6-Dec-94	CR	Campbell Hall	NY	Brakeman Trainee	28
FE-1995-02	11-Jan-95	CR	Indianapolis	IN	Conductor	51
FE-1995-09	17-Feb-95	CR	St. James	OH	Conductor	48
FE-1995-33	11-Dec-95	NS	Toledo	OH	Brakeman	53
FE-1996-30	16-Dec-96	UP	Clinton	IA	Brakeman	51
FE-1996-31	18-Dec-96	IC	Chicago	IL	Conductor	45
FE-1997-04	29-Jan-97	UP	Mason City	IA	Conductor	48
FE-1997-05	2-Feb-97	CR	Burns Harbor	IN	Engine Foreman	54
FE-1997-45	26-Dec-97	UP	Boise	ID	Freight Conductor	55
FE-1998-05	4-Feb-98	BRC	Bedford Park	IL	Yard Conductor/Foreman	42
FE-1999-01	12-Jan-99	CR	Port Newark	NJ	Conductor	54
FE-1999-03	22-Jan-99	CR	Alexandria	NY	Conductor	45
FE-2000-32	28-Dec-00	UP	Dupo	IL	Switchman	52
FE-2000-33	29-Dec-00	BNSF	Gillette	WY	Conductor	29
FE-2001-02	10-Jan-01	CSX	Chicago	IL	Conductor	42
FE-2001-03	11-Jan-01	NS	South Fork	PA	Engineer	52
FE-2003-03	11-Feb-03	CNIC	Flat Rock	MI	Brakeman	57
FE-2003-04	16-Feb-03	CSXT	Syracuse	NY	Switchman	36
FE-2003-05	18-Feb-03	CSXT	Cheektowaga	NY	Switch Foreman	51
FE-2004-03	14-Jan-04	NS	Kankakee	IL	Freight Conductor	40
FE-2004-30	17-Dec-04	BNSF	Radium	CO	Conductor	44
FE-2005-36	4-Dec-05	BNSF	Burlington	IA	Brakeman	34
FE-2006-26	28-Dec-06	UP	Sioux City	IA	Yard Foreman	57
FE-2007-25	28-Dec-07	BNSF	Bristol	IL	Freight Brakeman	62
FE-2008-01	8-Jan-08	UP	Waukegan	IL	Passenger Brakeman	59
FE-2008-03	3-Feb-08	NS	Chicago	IL	Freight Conductor	28
FE-2008-40	3-Dec-08	DRIR	Denver	CO	Freight Conductor	33
FE-2009-06	28-Jan-09	UP	Council Bluffs	IA	Yard Foreman	41
FE-2009-26	29-Dec-09	BNSF	Minneapolis	MN	RCL Operator	44

Table H-2: Case Numbers For Fatalities In Other States During Summer

Case Number	Incident Date	Railroad	City	State	Job Description	Age
FE-1992-14	01-Jun-92	ATSF	Escondido	CA	Freight Conductor	58
FE-1992-15	01-Jun-92	BN	Seattle	WA	Switchman	42
FE-1992-16	02-Jun-92	IHRC	Henderson	KY	Freight Conductor	52
FE-1992-20	07-Jul-92	SSW	Conlen Siding	TX	Freight Engineer	58
FE-1992-22	25-Jul-92	UP	Portland	OR	Freight Brakeman/Flagman	54
FE-1993-23	07-Jun-93	IC	Fulton	KY	Yard Brakeman/Helper	49
FE-1993-27	04-Aug-93	UP	Pryor	OK	Freight Brakeman/Flagman	42
FE-1993-30	11-Aug-93	SP	Tracy	CA	Freight Brakeman/Flagman	47
FE-1993-31	12-Aug-93	ATSF	Evandale	TX	Freight Brakeman/Flagman	52
FE-1996-12	15-Jun-96	CSX	Charlotte	NC	Switchman	36
FE-1997-18	24-Jun-97	UP	Portland	OR	Yard Conductor/Foreman	53
FE-1997-19	24-Jun-97	NS	Rowesville	SC	Conductor	21
FE-1997-25	15-Aug-97	UP	Elko	NV	Yard Brakeman/Helper	53
FE-1998-16	01-Jun-98	BNSF	Lubbock	TX	Yard Conductor/Foreman	24
FE-1998-17	05-Jun-98	NS	Hapeville	GA	Yard Conductor/Foreman	48
FE-1998-19	01-Jul-98	NS	Buechel	KY	Utility Employee	54
FE-1999-16	23-Jun-99	UP	Redding	CA	Conductor	57
FE-2000-21	07-Jul-00	CKRY	Wichita	KS	Conductor	39
FE-2000-23	28-Jul-00	UP	St. Louis	MO	Switchman	48
FE-2000-25	11-Aug-00	BNSF	Port of Los Angeles	CA	Freight Brakeman	36
FE-2002-16	16-Jun-02	BNSF	Memphis	TN	Engine Foreman	20
FE-2002-17	16-Jul-02	NS	Bonlee	NC	Brakeman	55
FE-2003-12	06-Jun-03	CSXT	Kingsport	TN	Brakeman	35
FE-2003-20	26-Aug-03	LC	Chester	SC	Conductor	29
FE-2005-23	05-Jul-05	BNSF	Emporia	KS	Yard Helper	26.8
FE-2005-24	18-Jul-05	UP	Memphis	TN	Brakeman	59
FE-2005-25	22-Jul-05	ATN	Ragland	AL	Brakeman	56
FE-2005-27	09-Aug-05	AM	Rogers	AR	Conductor	23
FE-2006-12	21-Aug-06	FEC	Rockledge	FL	Freight Conductor	45
FE-2007-12	08-Jul-07	BNSF	Berry	AZ	Freight Conductor	37
FE-2007-15	27-Jul-07	CN	Fulton	KY	Yard Conductor	46
FE-2007-19	30-Aug-07	BNSF	Stockton	CA	Yard Brakeman	50
FE-2008-19	08-Jun-08	UP	La Porte	TX	Yard Brakeman	47
FE-2009-20	24-Jun-09	ATN	Albertville	AL	Freight Conductor	33

SOFA Characteristics of Cold Weather States in the Winter

Table H-3 shows cases in cold weather states during winter more frequently occurred in the dark than other cases.

Table H-3

	Cold Weather States in Winter	All Other Cases
Fatalities in the dark	17	62
All fatalities	31	148
Percentage for in the dark	0.55	0.42

Table H-4 shows cases in cold weather states during winter more frequently occurred on main or industrial track than other cases.

Table H-4

	Cold Weather States in Winter	All Other Cases
Fatalities on main or industrial track	21	63
All fatalities	31	148
Percentage for main or industrial track	0.68	0.43

Table H-5 shows cases in cold weather states during winter more frequently involved pull moves than other cases.

Table H-5

	Cold Weather States in Winter	All Other Cases
Fatalities involved a pull move	11	28
All fatalities	31	148
Percentage for pull moves	0.35	0.19

Table H-6 shows cases in cold weather states during winter more frequently involved an FE on or fouling track than other cases.

Table H-6

	Cold Weather States in Winter	All Other Cases
Fatalities with FE on or fouling track	19	61
All fatalities	31	148
Percentage for FE on or fouling track	0.61	0.41

Table H-7 shows cases in cold weather states during winter more frequently a strike by a mainline train than other cases.

Table H-7

	Cold Weather States in Winter	All Other Cases
Cases with FE struck by mainline train	8	12
All fatalities	31	148
Percentage for FE struck by mainline train	0.26	0.08

Table H-8 shows cases in cold weather states during winter more frequently involved improper radio communication than other cases. The improper communication took place on main (2 cases), industrial (2 cases), and yard (1 case) track.

Table H-8

	Cold Weather States in Winter	All Other Cases
Fatalities involving improper radio communication	5	3
All fatalities	31	148
Percentage for improper radio communication	0.16	0.02

Table H-9 shows cases in cold weather states during winter more frequently involved mud, snow, or ice than other cases. Two of the three cases involving mud, ice, or snow in the last column occurred in cold weather states between March 1 and March 5 (Just falling outside the criteria for meteorological winter). The remaining case occurred in Georgia during January when it was dark and the temperature was 40°.

Table H-9

	Cold Weather States in Winter	All Other Cases
Fatalities involving mud, snow, or ice	4	3
All fatalities	31	148
Percentage for mud, snow, or ice	0.13	0.02

SOFA Characteristics of Other States in the Summer

Table H-10 shows cases in other states during summer more frequently occurred on industrial track than other cases.

Table H-10

	Other States in Summer	All Other Cases
Fatalities on industrial track	16	28
All fatalities	34	145
Percentage for main or industrial track	0.47	0.19

Table H-11 shows cases in other states during summer more frequently involved a hazard on industrial track⁴.

Table H-11

	Other States in Summer	All Other Cases
Cases involving industrial hazards	11	15
All fatalities	34	145
Percentage for industrial hazards	0.32	0.10

Table H-12 shows cases in other states during summer more frequently involved shove moves than other cases.

Table H-12

	Other States in Summer	All Other Cases
Fatalities involved a shove move	26	72
All fatalities	34	145
Percentage for pull moves	0.76	0.50

Table H-13 shows cases in other states during summer more frequently involved failures to control shoves.

Table H-13

	Other States in Summer	All Other Cases
Fatalities involving failure to control a shove	8	16
All fatalities	34	145
Percentage for failure to control a shove	0.24	0.11

Table H-14 shows cases in other states during summer more frequently involved poor communication about work in progress.

⁴ Hazards on industrial track include cases where a structure, vehicle, or temporary obstruction on industrial track played a significant role. It also can include cases where the action of industrial plant employees played a role. As explained in Section 3.2.6, not all fatalities on industrial track qualify for this category. There are many cases where the actions of the train crew entirely account for the PCFs cited for a case.

Table H-14

	Other States in Summer	All Other Cases
Fatalities involving poor communication about work in progress	11	20
All fatalities	34	145
Percentage for poor communication about work in progress	0.32	0.14

Discussion

Cold Weather States During the Winter

Table H-3 shows lack of daylight is an issue. Lack of daylight can compromise visibility and may affect the mood and alertness of the workforce.

Weather can be an issue. It may be possible that heavy clothing can restrict movement and reduce the ability to see and hear. Furthermore, ice can increase the risk of derailment, snow can reduce visibility, and mud can create unsafe footing conditions.

It may be possible that productivity expectations of management and crew can remain unchanged in the winter despite the challenges of increased darkness and weather conditions.

Tables H-5 and H-7 suggest risk for road crews may increase substantially in cold weather states during the winter.

Fatalities in cold weather states peak in December when weather conditions are changing. The early days of winter could be a time when some employees have not acclimated to changing climate conditions and may not have adjusted their clothing to suit the new conditions.

The effects of cold winter weather are not limited to cold weather states. Other states experience a seasonal peak in January, the coldest month of the year.

Other States During the Summer

Outside the railroad industry there is a study of the relationship between hot weather conditions and hospital admissions due to work-related accidents in Tuscany, Italy⁵. It shows hot weather conditions might represent a risk factor for work-related accidents in Italy during summer. In particular, the early warming days during June stood out as a peak period. June is also a peak month for SOFA fatalities in the Other (Non-Cold Weather) States. The early days of summer could be a time when some employees have not acclimated to changing climate conditions and may not have adjusted their clothing and fluid intake for the new conditions.

Heat exhaustion occurs when bodies are unable to compensate and properly cool themselves. Impaired judgment is one of the symptoms of heat exhaustion and can be deadly in a railroad switching environment. It may be possible heat exhaustion can creep up on an employee because he or she can continue on with duties without realizing judgment, concentration, and

⁵ *Relationship between work-related accidents and hot weather conditions in Tuscany (central Italy)*. Morabito M, Cecchi L, Crisci A, Modesti PA, Orlandini S. *Ind Health*. 2006 Jul;44(3):458-64.

reaction time may be deteriorating. Employees may not recognize the early symptoms of heat exhaustion or be unwilling to express their concerns to peers who continue to work.

The effects of hot summer weather are not limited to these states. Cold weather states experience a seasonal peak in July, the hottest month of the year.

Possible Actions

Cold Winter Weather

Make cold weather an issue in upcoming safety awareness campaigns. Increasing workforce awareness of this problem could be an important step in reducing fatalities in cold weather during the winter. Since many fatalities occur right at the beginning of winter, get an early start with a weather awareness campaign. Emphasize the increase risk on main track, particularly the risk of being struck by a passing train.

Include alerts about weather conditions and how to operate safely in icy conditions in safety briefings and bulletins.

Ensure customers do their part to keep industrial track and walkways clear of mud, ice, and snow.

Advise management and crews to think safety first and adjust productivity expectations to suit the challenging conditions which occur in cold weather states in the winter.

Hot Summer Weather

Make hot weather an issue upcoming safety awareness campaigns. Increasing workforce awareness of this problem could be an important step in reducing fatalities in hot weather during the summer. Since many fatalities occur right at the beginning of summer, get an early start with a weather awareness campaign. Emphasize the increase risk on industrial properties and shove moves.

Educate the workforce on how to prevent heat exhaustion, how to recognize the symptoms, and what to do if it occurs. The symptoms of heat exhaustion include: headache, heavy sweating, intense thirst, dizziness, fatigue, loss of coordination, nausea, impaired judgment, loss of appetite, hyperventilation, tingling in hands or feet, anxiety, cool moist skin, weak and rapid pulse (120-200), and low to normal blood pressure. Employees should not continue work if their judgment, concentration, or reaction time is impaired.

CREW RESOURCE MANAGEMENT

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Background



This course provides training for all Train and Engine service employees in Crew Resource Management (CRM), a methodology that addresses the human element of people working together in safety sensitive conditions with sophisticated equipment.

The course consists of four modules that utilize videos and group discussion. Leader's notes are included with each section of the modules. Each module may be presented as a single training session, or all four may be combined into one training program, depending on the training time available or allotted. Although this allows some flexibility in presenting the CRM modules, the outline of each module is intended to be followed to ensure uniformity.

This training package, distributed by the Association of American Railroads contains the basic elements of Crew Resource Management. The course content is structured to allow additional information, or additional training subjects, depending on the needs of individual roads.

To The Leader



GENERAL

This Leader's Guide contains all four modules of the Crew Resource Management program, including a video for each module and the supporting documentation. At the beginning of each module, you will find an outline of the module, learning objectives and Leader's Notes that give a suggested introduction for the module to be delivered to the participants. The total estimated time required to complete the module is given, although times will vary depending on the amount of discussion. After the introduction, the video should be shown, which will present the module in its entirety. Also included in the Leader's Notes are points from the video for reinforcement and discussion.

A general introduction to Crew Resource Management is presented at the beginning of the video tape, and should be shown prior to starting Module 1 (Crew Member Proficiency). This introduction to CRM is based on the material contained in the section "CRM Overview." A brief summary of the program is included after Module 4.

CHECKLIST

Leader's Guide

Videos and VCR

Roster (have each participant list name and SSN)

Pencils

TRAINING TIPS

Upon receipt of this Leader's Guide, carefully review all videos, training materials, Safety and Operating Rules, and other appropriate materials. Report and replace any damaged videos through your Training or initiating Department Supervisor.

Before beginning the class session:

1. Review related materials and issues from Departmental managers, as they relate to CRM.
2. Insure your A/V equipment is in proper working order. Be prepared to repair or replace if necessary. If you plan to use an overhead projector, have a spare bulb on hand.
3. Select a location for your classes that is as quiet as possible. The room should be comfortable, with minimum distractions.
4. Arrive at classroom sufficiently in advance of start time to insure classroom setup and equipment availability.
5. Begin each class session promptly.

JOB BRIEFING

Remember to begin any training class with a Job Briefing. Be sure to discuss the following:

- Location of fire exits and fire extinguishers.
- Location of telephones and local emergency numbers. Designate one person to make the call in case of an emergency.
- Ascertain if any participants are CPR and/or first aid trained.
- Any hazards near the location, such as construction, weather-related conditions, etc.

Also cover the location of the restrooms, lunch arrangements (if applicable) and the class agenda.

CRM Overview



-
- A. Industry Goals
 - B. Introduction
 - C. History of Crew Resource Management
 - D. Definitions
 - E. CRM and the Influence of Culture

Note: An introduction to CRM (11 Minutes) is included at the beginning of the video before Crew Member Proficiency (Module 1). This introduction should be shown prior to starting Module 1.

Total Estimated Time to Complete Module: 15 Minutes

INDUSTRY GOALS



- To improve safety by understanding and improving the human factor issues involved with train operations.
- To enhance job performance by understanding the issues of Crew Member Proficiency, Situational Awareness, Communications and Teamwork, and Conflict Resolution Techniques.

INTRODUCTION



This course is designed to provide an overview of the history, the definition, elements and purpose of Crew Resource Management (CRM) in order to help improve the work environment for rail industry employees.

HISTORY



CRM is a relatively new concept that addresses the personal side of crew performance. It was designed by the National Aeronautics and Space Administration (NASA) and major airline carriers in response to several aviation accidents that occurred in the 1970s. It was initially known as Cockpit Resource Management. As the concept evolved to include flight attendants, maintenance personnel, and others, the phrase Crew Resource Management (CRM) was adopted. As CRM has continued to develop, it has reached several other industries besides aviation including the medical field, shipping industry, nuclear power industry, and the rail industry.

DEFINITIONS



There are many definitions of Crew and CRM that exist; however, the general concepts are similar.

Crew - refers to any group of people working at different tasks designed to accomplish a common mission, goal or objective.

Crew Resource Management - the methodology that addresses the human element of people working together in safety sensitive conditions with highly sophisticated technology. When applied to the railroad industry, it can be seen as the effective use of all resources to achieve safe and efficient train operations. For the purpose of this training course, CRM is then divided into four basic modules:

1. **Crew Member Proficiency**
2. **Situational Awareness**
3. **Communication and Teamwork**
4. **Conflict Resolution Techniques**

Crew Resource Management is:

- A comprehensive system for improving crew performance.
- A process that addresses the entire crew and other related staff, such as yardmaster, dispatcher, utility employee, or a locomotive engineer performing duties as a pilot.
- A heightened awareness of attitudes and behaviors of crew members and their impact on safety.
- A forum that allows the individuals to examine their behavior and make individual decisions on how to improve teamwork.
- A focus on the function of crew members as teams, not as a collection of technically competent individuals.

Crew Resource Management is not:

- A system that occurs independent of other ongoing training activities.
- A system where crews are given a specific prescription of how to work with others.
- An attempt by management to dictate the behavior of the crew or change personalities.
- A psychological assessment or personality profile.
- A quick fix that can be implemented overnight.
- A training program administered in only a few specialized or “fix it” cases.

CRM AND THE INFLUENCE OF CULTURE



CRM is not a universal recipe for safety. It is a highly effective and essential aspect of any operation, but its impact can be limited to the context in which it is accepted. It is therefore necessary to be aware of the powerful influence of culture on behavior. Culture affects the results of CRM as culture can affect our communications, our life styles and ultimately our approach to safety.

There are four cultures within which CRM is embedded: safety, organizational, professional, and national culture.

1. **Safety culture** is the overall attitude towards safety as demonstrated by the compliance to safety policies and procedures. It is often influenced by the perceptions held by an organization.
2. **Organizational culture** is evidenced in such things as the openness of communications between management and employees, the commitment of resources to training and maintenance, and the attitudes and behavior of critical role models. The level of teamwork among groups (i.e. dispatchers, conductors, locomotive engineers, maintenance personnel, and road crews, etc.) is also part of this culture.
3. **Professional culture** reflects the attitudes and values associated with an occupation. These include pride in the profession and the satisfaction of doing your job well.
4. **National culture** is the overarching framework within which all people behave. It is shared values and attitudes of a national group that direct behavior.

All four cultures exist; however, the two that concern us the most are organizational and safety cultures. These can have both positive and negative influences on the probability of safely operating and moving a train. For example, let's look at how safety culture influences CRM.



One way in which both management and workers can cooperate to reduce accidents or difficult situations is to create a Safety Culture – the overall attitude toward safety as demonstrated by the compliance to safety policies and procedures. This means that both groups work together and actively promote and follow policies that emphasize safety and attempt to reduce social and organizational pressures that would detract from their use.

For management, developing a Safety Culture means not only creating policies and procedures that will lead to a safe workplace, but it also means that front line Supervisors must lead by example, following safety guidelines at all times.

For workers in a company, developing a Safety Culture means recognizing the advantages of safety procedures and following them even though they may require more effort. Employees must try to keep negative peer pressure from influencing themselves and/or others to take “short-cuts” in their work, ignore safety equipment and procedures, or otherwise work unsafely.



- A. System Knowledge of Equipment**
- B. Procedural Knowledge and Compliance**
- C. Execution**

VIDEO: 3.5 Minutes Running Time

Total Estimated Time to Complete Module: 15 Minutes

LEARNING OBJECTIVE

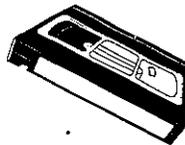
To recognize the three types of crew member proficiency.

INTRODUCTION

An important element of safe and efficient railroad operations is crew member proficiency. An individual crew member's knowledge, training and skills play a key role in the overall effectiveness of a crew.

There are three (3) aspects of crew member proficiency that are discussed in this module – System Knowledge of Equipment, Procedural Knowledge and Compliance, and Execution. Let's look at the video and see how these things interact to effect the way we do our jobs.

SHOW THE VIDEO



POINTS FOR DISCUSSION

- Why is being familiar with the types of locomotives and their operation important with respect to safe operations?
- Why would knowing the different types of freight car equipment be important?
- The video talks about procedural knowledge and compliance. What is the difference between the two? Are they the same thing? (An employee may be able to quote the operating rules, but for a variety of reasons, may choose not to comply with a certain rule at a given instance.) Further, why do we have safety and operating rules?
- Can the way you physically perform your duties affect your safety and that of your crew members?

CREW MEMBER PROFICIENCY



Crew member proficiency relates to railroad operations in several ways:

A. SYSTEM KNOWLEDGE OF EQUIPMENT:

1. Being familiar with the types of locomotives and knowing how to operate them safely.
2. Knowing the various types of freight cars and how to safely operate equipment associated with them in the performance of duties.

B. PROCEDURAL KNOWLEDGE AND COMPLIANCE –

1. Adhering to the documents that govern the movement of trains, such as safety and operating rules, air brake rules, hazardous materials instructions, etc.
2. Being familiar and complying with all of the applicable regulations affecting the operation of locomotives and the operation of trains.

C. TERRITORIAL KNOWLEDGE

Being familiar with the route over which you operate, including the locations of signals, interlockings, railroad crossings, and other conditions affecting train movements.

D. EXECUTION

The physical performance of required tasks.

**A. Recognizing Situational Awareness**

1. Machine and System cues
2. Crew Member cues.
3. Personal Cues.
4. Summary.

B. Maintaining Situational Awareness

1. Planning and preparing.
2. Avoiding distractions.
3. Dwelling on a problem.
4. Developing a plan to handle distraction.
5. Distributing your workload.
6. Prioritizing your decision-making.
7. Communicating with your crew members.
8. Recognizing a deteriorating situation.

C. Regaining Situational Awareness**D. Summary**

VIDEO: 19 Minutes Running Time

Total Estimated Time to Complete Module: 30 Minutes

LEARNING OBJECTIVES

1. Understand the meaning of situational awareness.
2. Recognize situational awareness cues that could potentially lead to an undesirable outcome.
3. Understand the strategies needed to maintain or regain situational awareness.

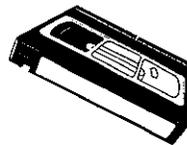
LEADER'S NOTES



INTRODUCTION

The next module in our Crew Resource Management program is “**Situational Awareness.**” Situational Awareness is just that – being **aware** of your surroundings at all times, and pre-plan solutions for any emergency that could result from those conditions. As you will see in the video, crew members must be confident in their ability to work together to anticipate situations that may require action, and they must all be accountable for maintaining a high level of awareness of their environment.

SHOW THE VIDEO



POINTS FOR DISCUSSION

- Situational awareness is contributing to a safe work environment by being aware of your surroundings at all times, complying with rules and instructions, and developing a preventative plan(s) that includes several solutions for any emergency situation that could occur in the near future.
- Cues that can warn of a possible loss of situational awareness can come from different sources, including:
 - Machine and system cues (equipment)
 - Crew member cues
 - Personal cues(Ask for examples of each.)
- There are eight basic steps that help maintain situational awareness:
 1. Planning and preparing.
 2. Avoiding distractions
 3. Avoid dwelling on a problem.

4. Developing a plan to handle distractions.
 5. Distributing your workload.
 6. Prioritizing you decision making.
 7. Communicating with your crew members.
 8. Recognizing a deteriorating situation.
- Types of distractions include personal, task and mechanical.
 - How decisions are made as a crew is important – talking to each other makes crews more accurate in their assessment of problems, and more coordinated in their actions dealing with problems.
 - Lost situational awareness can occur gradually or all at once. It has been shown that failures are often the result of many mistakes and miscalculations – the “error chain.”
 - It is each employee’s responsibility to recognize a loss of situational awareness, and then communicate, resolve and monitor the problems that have led to the loss.

SITUATIONAL AWARENESS



Definition

Situational Awareness is your responsibility, as an individual, and as a member of a crew. As an individual, you must contribute to a safe working environment by being aware of your surroundings at all times, by complying with rules and instructions, and by developing a preventative plan(s) that includes several solutions for any emergency situation that could occur in the near future. All crew members must be confident of their ability to work together to anticipate situations that may require action, as they are all accountable for maintaining awareness of the environment in which they are working. Crew members must know the physical characteristics of the territories over which they are operating.

RECOGNIZING SITUATIONAL AWARENESS



Now that you understand what situational awareness is, you need to be able to identify the sources that will provide you with the cues -cues that can warn of a possible loss of situational awareness. These sources include:

- 1. Machine and System Cues (Equipment)**
- 2. Crew Member Cues**
- 3. Personal Cues**

Cues are hints or suggestions on which to act. They are consciously and/or unconsciously perceived, and they prompt a type of behavior.



Your working environment provides you with sufficient cues to help you recognize the loss of situational awareness and often recover in time to prevent serious incidents and accidents. Your working environment includes the machines and systems that you work with, other crew members, and yourself. The ability to use information from these sources contributes to your maintenance of situational awareness and helps you form an accurate picture of what is happening. It is the ability to integrate these three sources that will help you maintain situational awareness.

1. Machine and System Cues (Equipment)

Maintaining situational awareness of the machines and systems you use, is often where most of your time is spent. The equipment you use can provide you with many important cues about what is happening in your environment.

The following are examples of questions you should ask yourself about the machines and systems you use, which will help you identify important cues:

- Are the machines and systems working effectively?
- Is the equipment providing me with any signals, problems, or warnings of trouble ahead that I should be aware of?
- Am I using the equipment properly and safely?
- Have I maintained technical proficiency?
- Have I done all that is necessary in my job briefing that involves equipment?
- Are there any malfunctions?
- Am I having any equipment problems that I need to clarify with a crew member or other personnel?

Asking yourself these questions, and constantly being aware of all the information provided by the machines and systems can help you identify important cues that may affect the loss of your situational awareness.



2. Crew Members Cues

Your crew members are a valuable source of information. You are a team and it is important that you are constantly aware of each other's behavior, feelings, and actions; in other words, "reading each other's cues." If you are aware of each other's interaction with the environment, you are likely to prevent problems from occurring. As well, sharing and communicating with crew members will provide each of you with information you may not have known or you may have interpreted differently. Cues from your crew members such as inattention or complacency can be signs of degrading situational awareness. That is why it is important that should not only you be aware of a loss of situational awareness with yourself, but also with other crew members.

3. Personal Cues

Sometimes the hardest types of cues to identify are those that relate to our own loss of potential situational awareness. It is easier to point out someone else's weaknesses than it is our own. Always be aware of how you are feeling - you know yourself best.

Asking yourself the following questions can provide you with cues to realize your level of situational awareness:

- How do I feel (rested, alert, motivated)?
- Is there anything bothering me (personal problems)?
- Am I ready for work?
- Is there anything I am feeling uneasy about in this situation? Do I feel safe?

These kinds of questions will help you stay aware of any possible cues you are providing to yourself that may indicate a loss of situational awareness.



Summary

In summary, analysis shows that "usually at least three cues are available to the crew members." These cues are provided to you through your environment, which includes the equipment you interact with, your crew members, and yourself.

Cues are not always obvious; use your judgement and discretion when required. However, the presence of one or more cues is adequate grounds for you to do a conscious assessment of your current state of situational awareness.

MAINTAINING SITUATIONAL AWARENESS



You need to know the steps to take to prevent a loss of situational awareness. The steps in maintaining situational awareness are as follows:

1. Planning and preparing.
2. Avoiding distractions.
3. Dwelling on a problem.
4. Developing a plan to handle distraction.
5. Distributing your workload.
6. Prioritizing your decision-making.
7. Communicating with your crew members.
8. Recognizing a deteriorating situation.

1. Planning and Preparing

Planning and preparing is your ability to combine all the information and resources that are available to you to help you evaluate your working environment. This includes your interaction with both equipment and other crew members.

Situational awareness is affected by your ability to develop and communicate a well thought out job plan. This is done through a job briefing or through a proper transfer. Job briefing or transferring is a critical step in defining your tasks and responsibilities, which will allow you to plan your workday and will contribute to your situational awareness.

Planning means you are constantly evaluating patterns such as those that appear on gauges, readouts, or displays. It is also important that you stay current with rules, operating bulletins, practices, etc., as these are all resources that will help you make proper decisions.



The plan that is developed is the foundation on which crew members build their situational awareness. It is constantly updated as the crew monitors, evaluates, anticipates, and considers all the information and resources that are available.

Preparing involves anticipating and considering what is going to happen later and then projecting an appropriate action or solution. Preparing relies on your ability to project the current situation into the future, which is an important part of maintaining your situational awareness.

2. Avoiding Distractions

Crew distractions are a serious impediment to safety. When an individual is distracted or preoccupied, the ability to detect other important stimuli is lost.

Distractions can be avoided by:

- Increasing your awareness of the three types of distractions.
- Avoiding dwelling on a problem.
- Developing a plan to handle distractions.

Types of Distractions

Distractions include personal distractions, task distractions, and mechanical distractions.

Personal distractions

Personal distractions can refer to preoccupation with family problems, health problems, or other personal problems.

Task distractions

Doing paperwork, check lists, radio communications and training new personnel at inappropriate times. For example, dealing with paperwork should not be attempted when you are entering a restrictive situation. Although activities such as paperwork, radio



communication, and training new personnel are important parts of your job, you must perform these activities without losing sight of the big picture. If this is lost, an important activity has now become a potentially dangerous situation.

Mechanical distractions

Include equipment malfunctions, such as unit not loading properly, or loss of EOT signal, Sometimes malfunctions are big and obvious, and sometimes they are small and not apparent. However, what can happen is that you become so engaged in solving the mechanical problem or addressing a specific consideration, that your attention is diverted from operating the train.

3. Dwelling on a Problem

Dwelling on a problem refers to occasions when you become so focussed on a singular item, that your attention is taken away from other activities or items that may also need your attention. For example, you are less likely to detect a loss of the EOT signal or drop in air pressure when you are focusing on your speed.

Sometimes distractions come from something that has already happened and is over. At these times, the crew may continue to dwell on that situation and neglect the current situation. For example, you are discussing the malfunction of one of your locomotives early in the trip, and you miss a signal.

4. Developing a Plan for Handling Distraction

It is important that you and other crew members develop a plan for handling distractions. Establishing and adhering to standard operating procedures is important as is acknowledging and communicating breaks in the normal sequence of events. You should brief your crew if you decide to break this normal sequence of events for any reason. A complete updated job briefing,



including the planned sequences of events and all changes, must be done with the entire crew.

When distractions occur, this should trigger a heightened sensitivity to a potential loss of situational awareness.

5. Distributing Your Workload

Distributing your workload involves recognizing and admitting to yourself and others when you are too busy to stay on top of every situation. You must learn to delegate and reduce your workload to allow yourself to complete tasks safely. Prioritize your work tasks and responsibilities to ensure you maintain your situational awareness by reducing the chances of overload. Overload means the amount of information being processed is either too much at once, or the information being processed is significantly above the individual's capacity.

6. Prioritizing Your Decision Making

Making quality and timely decisions is the essence of situational awareness and judgement. Decision-making involves two major components: assessing the situation and choosing a course of action. Assessing the situation differs from situational awareness in that it is the active process in which you achieve situational awareness.

Consider the following when assessing the situation:

- Define the nature of the problem.
- Determine how much time is available for coping with it.
- Assess the level of risk both immediate, and in the future.

Once the situation has been perceived and interpreted, there is now a basis for planning and making decisions. First, prioritize your decisions based on the



time available as well as the risk level of what needs to be decided - both immediate and in the future.

Many situations are routine; some are not. Some situations carry significant consequences, but others may not. Therefore, many types of decisions are needed. Some decisions may be made singularly by one member of the crew where as others are so complex or important that the inputs from more than one crew member or from an outside source are needed to ensure higher quality decisions.

In CRM, how we make decisions as a crew is most important. It is your responsibility to recognize when you need help from others and when their expertise can guide you in making appropriate decisions.

7. Communicating with Crew Members

When you communicate, you transfer information to crew members, and communication is imperative in determining situational awareness. You work together like a team of detectives, accurately observing cues provided by your environment. Sharing evidence and interpreting the significance of cues helps in forecasting possible outcomes or solutions. As crew members communicate what they perceive in the environment around them, they increase the knowledge of the other crew members. Crews who communicate well will commit fewer errors because talking to each other makes crews more accurate in their assessment of problems, and they are more coordinated in their actions for dealing with them.

Communication involves managing crew awareness and a willingness to share information. You must continuously ask these questions:

What do they know that I need to know?

As a crew member, you need to use all the sources of information available to you to be sure you are aware of everything you need to know. These sources include what your crew



members see and hear.

What do I know that they need to know?

You should periodically ask yourself "Do I know something my crew members should know?" If the answer is yes, then you need to inform your crew members of this information. If the answer is no, then your crew members should be told that you are keeping an eye on something and they don't need to worry. As well, if something takes your attention away from what crew members are expecting you to keep an eye on, it is important that you let them know.

What do none of us know that we need to know?

As a crew, you need to ask, "Is there information we need that none of us on the crew know?"

Sometimes, the other question to ask is "What are we as a crew not paying attention to?" Defining roles and responsibility during loss of situational awareness allows a crew to function as a team. For example, if all the crew is concerned with the apparent malfunction of the load indicator, then signals may be overlooked.

8. Recognizing a Deteriorating Situation

Recognizing a deteriorating situation involves sharing and communicating with other crew members as well as acknowledging your personal limits. Acknowledging your personal limits is the first step in recognizing a deteriorating situation. Only you know when you are not performing or thinking at normal levels.

EXAMPLE

You are on the last sixty (60) miles of a long trip. You are the locomotive engineer and are aware that you are growing inattentive. In the next ten miles you know you will be approaching a five-mile 15 MPH slow order, Therefore, you alert the conductor to the situation. The conductor, now aware of the whole situation, would ask how he/she could assist you in getting through the rest of the tour of duty.

You must recognize and admit to yourself and others if you are experiencing:

- inattention
- complacency
- confusion and unresolved discrepancies
- absence of anticipation

which may lead to a deteriorating situation.

REGAINING SITUATIONAL AWARENESS



What should you do in the event your situational awareness or a crew member's situational awareness is lost?

If situational awareness is lost, it virtually guarantees failure to achieve your job objectives. It is often the prime factor in incidents and accidents. Lost situational awareness can occur gradually or all at once.

Error Chain

Incident studies have shown that it usually wasn't one isolated event that caused a failure. Many mistakes and miscalculations probably occurred prior to the actual incident. This assumption of multiple problems is the error chain. You must be able to recognize, communicate, resolve, and monitor these problems to prevent an error chain and the subsequent loss of situational awareness.

Problems that could result in an error chain are as follows:

- failing to plan and prepare.
- distractions.
- information overload.
- failing to prioritize decision making.
- failing to recognize a deteriorating situation.
- failing to communicate.
- dwelling on a problem.

The essential factor of regaining lost situational awareness is recognition. No one likes to admit to human frailty, but the risk is too great to keep lost situational awareness a secret. It is your responsibility to recognize a loss of



situational awareness in yourself or in other crew members and to notify crew members of this loss as soon as it is detected. Recognition involves using all the sources of information available - be it machines and systems, other crew members, or you.

There is one other source you should consider. Instinct can often be the most detectable and reliable cue to the loss of situational awareness. Our bodies are able to detect stimuli long before we have consciously put the big picture together. As humans, we are aware of many cues from our surroundings for which we cannot always identify the origin. These cues are very real. Don't ignore them, even when they only manifest themselves in a feeling of uneasiness. Always remember - "if it doesn't feel right, it probably isn't."

Once you have recognized the loss of situational awareness you need to communicate, resolve, and monitor the problems that have led to the loss.

Regaining situational awareness involves the following steps:

- | | |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Communicate | Verbalize your concern to your crew as soon as you detect a loss of situational awareness. |
| Resolve | Take the time to determine how situational awareness was lost and resolve this problem. Make an effort to seek all the information that is necessary to regain situational awareness and be assertive in doing so. |
| Monitor | Monitor the problem(s) that led to the loss of situational awareness and take the time to analyze and discuss with your crew members how to prevent this happening again. (i.e., debrief) |

SUMMARY



In summary, situational awareness means being able to maintain awareness of your surroundings, the current location, events, the environment, the crew members as well as an assessment of the human conditions that affect the operation of the train.

You are an information processor that must monitor, evaluate, anticipate, consider, and plan what is occurring in your work environment. The most situationally aware people think beyond the current situation, and have more than one plan (a backup if the first one doesn't work). Use your environment to determine important cues that warn of a possible loss of situational awareness.

Maintaining your situational awareness will decrease the chances of incidents and accidents. The more aware you are of the environment you work in, which includes your equipment, other crew members, and yourself, the safer you are likely to be. If situational awareness is lost, use all your sources of information to recognize, communicate, resolve, and monitor the problem(s) that caused the loss of situational awareness.

Always learn from your experience - analyze the episode, what led to your lost situational awareness? How can you avoid it in the future? Above all, remember situational awareness is not something you have or don't have. The skills that contribute to situational awareness are learned and practiced and are everyone's responsibility.



A. Communications

- 1. Ask Questions**
- 2. Restate or Paraphrase.**
- 3. Record Information**

B. Effective Communications

- 1. Oral vs. Written Communications.**
- 2. Improving Communications**
- 3. Tips for Oral and Written Communications**

C. Assertive Communications

- 1. Assertiveness.**
- 2. Non-Assertiveness**
- 3. Aggressiveness**
- 4. Assertiveness Techniques**
 - a. Asking Questions**
 - b. Stating Objections**
 - c. Controlling Emotions**
- 5. Summary**

D. Job Briefings

E. Teamwork

- 1. Elements of a Team.**
- 2. Team Responsibilities.**
- 3. Team Roles.**
- 4. Tying it Together in a Team.**
- 5. Effective Teams.**
- 6. Making Team Decisions**
 - a. Advantages of Team Decision Making.**
 - b. Effectiveness in Team Decision Making.**
 - c. Steps in Making Team Decisions.**
 - d. Summary**

VIDEO: Communications - 14 Minutes Running Time
Job Briefings – 3 Minutes Running Time
Teamwork – 6 Minutes Running Time
Effective Teams – 7 Minutes Running Time
Total Time – 30 Minutes

Total Estimated Time to Complete Module: 1 Hour

LEARNING OBJECTIVES

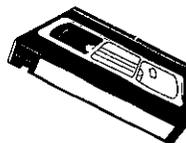
1. Recognize the elements of communication; one-way vs. two-way, active listening, paraphrasing, restating or questioning.
2. Recognize strategies for communicating to others clearly, accurately, and in a timely fashion, in both oral and written forms.
3. Conduct effective job briefings.
4. Recognize the roles and responsibilities of team members.
5. Describe the process for making a team decision.

INTRODUCTION

Who can dispute that Communication and Teamwork are two crucial components of any successful operation? Communication drives our society today – look around, cell phones abound in the vehicles of America. Pagers convey messages without the need to return a call. Most homes are connected to the internet, which provides unlimited communication. Teamwork is a necessity whenever two or more people come together to accomplish a common goal. Communication is required for teamwork.

This module addresses Communication and Teamwork as it relates to crew operations, and how to more effectively communicate to prevent accidents. A new term, “assertive communications,” will be introduced, and how this tool can enhance communication between crew members. Job briefings as a communication tool are also discussed, and finally, some good information on teamwork is presented, including how to function as an effective team, and team decision-making.

SHOW THE VIDEO



NOTE: This module is divided into four segments – Communications, Job Briefings, Teamwork and Effective Teams. Pause the tape for discussion at each prompt that will appear at the end of each segment

POINTS FOR DISCUSSION

Communications

- Oral communications is normally made up of three different components which impact communication – words, voice inflection and body language. (Ask which one of these makes up the largest percentage of communication.)
- Whether oral or written, communication must possess the following traits to be effective:
 - Clarity.
 - Accuracy.
 - Complete message.
 - Organized message.
 - Concise message.
 - Timely.
- Tips for oral communication:
 - Speak clearly.
 - Avoid slang that could be misunderstood.
 - Decide what you want to say before saying it.
 - Ask the receiver to restate or paraphrase important information. Then, actively listen to the response to make sure it is accurate.
 - Don't assume that no response means the message is misunderstood.
 - Follow procedures.
- Tips for written communication:
 - Write neatly.
 - Follow applicable company procedures and rules.
 - Find the most appropriate time to perform written communications.
- Three common communications strategies are:
 - Assertiveness
 - Nonassertiveness (Passiveness)
 - Aggressiveness
- Assertiveness is the willingness to clearly express your opinion, while respecting the opinions and rights of others. An assertive person is persistent, trying different approaches until success is achieved.

- Nonassertiveness is when you are unwilling to express your true opinion or question another person's opinion or actions. How can this affect safety?
- Aggressiveness is doing what you think will achieve your goals, regardless of the opinions and rights of others.
- When applying assertive communications to CRM, crew members are expected to:
 - State their own ideas, opinions and recommendations.
 - Assert themselves and advocate their points of view when necessary for safe operations.
 - Use increasing levels of assertiveness as appropriate to maintain safe operations.
- Techniques for communicating assertively:
 - Ask questions.
 - State objections clearly, without attacking individuals and controlling emotions.

Job Briefings

- A job briefing ensures that all employees have a clear understanding of the task to be performed, the responsibilities of the individuals, and the type of protection required.
- Four basic steps to conducting a job briefing:
 1. Planning the job briefing.
 2. Conducting the job briefing.
 3. Explain special conditions.
 4. Take individual responsibility.

Teamwork

- Elements of a team include:
 - Clarity of purpose.
 - Interdependence.
 - Commitment to synergy.
 - Accountability.
- Teamwork involves developing relationships, requiring interaction and cooperation.

- Awareness of each crew member's roles and related tasks is necessary for a positive and productive work environment. Identifying these roles involves understanding the functions of the individual team members, their technical proficiencies, and how they influence the team as a complete unit.
- Complete communication means voluntarily communicating everything you believe is relevant for others to know, and checking when you are not sure.

Effective Teams

- An effective team:
 - Employs two-way communication.
 - Shares participation and leadership.
 - Evaluates the team's effectiveness and discusses how to improve the working environment
 - Expresses ideas and feelings openly and honestly.
 - Strives for consensus.
 - Employs positive conflict resolution techniques.
 - Participates in constructive criticism.
- An effective team member:
 - Takes responsibility for personal performance.
 - Recognizes strengths and weaknesses.
 - Listens openly to new information, ideas or approaches.
 - Is flexible in handling change.
 - Maintains a standard of honesty and integrity.
 - Senses others' feelings and perspectives.
 - Negotiates and resolves disagreements.
 - Works toward a shared goal.
- Sometimes a decision is best made by an individual; other times, a group decision is necessary when the experience and advice of other crew members is needed to make the best decision.
- Advantages of team decisions:
 - Provides more complete information.
 - Generates more alternatives.
 - Increases the acceptance of a solution.
- There are five basic steps involved in making a team decision:
 - Defining the problem or decision to be made.

- Brainstorm and discuss available alternatives.
- Consider the probable consequence of each alternative.
- Evaluate each of the alternatives.
- Making the decision.

COMMUNICATION AND TEAMWORK



When working as part of a crew, effective communication is especially important as it also contributes to a positive work environment and can prevent misunderstandings that could lead to accidents. There are many ways to communicate. We may speak face-to-face, or use the telephone, or the radio. We may also use written messages such as memos, reports, and forms. On the railroad, some information is communicated using signs, signals, or flags as well. Though communication can take many forms, different situations may make some forms more effective than others. The simplest and least effective type of communications is one-way. This is not real communications. This occurs when one person decides on a message and sends it to another person without requiring any response and acknowledgement. The message may or may not be received and may or may not be interpreted correctly, and there is no way to tell.

More effective forms of communications are two-way. This means that a message is sent and confirmation that it has been received and understood as intended is given as quickly as possible. Successful communications requires that the sender and receiver have the same mental image or understanding of the message. This eliminates the chance of confusion and frustration. Two-way communications is important because messages are often not understood the first time they are sent.

Active Listening

Effective (two-way) oral communication requires active listening, meaning that the receiver takes an active role in trying to understand the message, being sure to listen non-judgmentally.

Three techniques for active listening are as follows:

1. asking questions when the communications is not clear
2. restating or paraphrasing to check understanding
3. recording information

1. Ask Questions

There are two main reasons for asking questions when you are trying to understand someone: 1) to clarify what you have heard and 2) to ask for additional information not included in the original message.

We have all experienced situations where we were not able to make out what another person has said. For example, during switching operations, a conductor may tell a locomotive engineer to back up ten (10) car lengths. However, radio interference may prevent the locomotive engineer from hearing the number of car lengths. To overcome this, he/she should ask for the information to be repeated – “I did not understand your last message. Please repeat.”

There are also times when, though we understand what a person has said, we may need more information to understand what they mean or what they are really asking us to do. A simple example of this happens when acronyms or slang are used to describe equipment and procedures. For the experienced worker, the meaning of these words may be clear, but to a new employee they could be

meaningless. For example, the dispatcher may call and ask a conductor to “sweep the switch,” meaning to clear a switch of snow so that it can be locked into place. A new employee may not understand this instruction.

Sometimes people are reluctant to ask questions for fear of appearing foolish or incompetent. When working in a crew environment, it is essential that each crew member be willing to ask – and to be asked – questions to make sure no incidents or accidents result from a misunderstanding.

2. Restate or Paraphrase

Even when you have asked questions to clarify the meaning of a message, it is important to confirm that your understanding is the same as that of the sender. This can be done by restating or paraphrasing the message.

Restating means to read back information exactly as you received it. This allows the sender to confirm or correct what you have received. This technique is most appropriate for confirming specific numbers, locations, or other details. Restating is required in many situations on the railroad.

Where appropriate, paraphrasing can be another form of ensuring understanding. To paraphrase, use your own words to summarize the message that you have received, including the important details. This allows the sender to confirm your understanding of both the content and the meaning of the message. When paraphrasing, be sure that you don’t include assumptions or judgments you have made about what the sender has communicated.

3. Record Information

Sometimes, a communication may include more information than we can process at once, or information that we may need at a later time. When this is the case, active listening includes recording the information – usually in writing – so

that it can be used later. The record also ensures the information remains consistent. Information about track work, speed restrictions, or mandatory directives are all examples of information that must be recorded.

Summary

Effective communications is important when working in a crew as it contributes to a positive working environment and can prevent misunderstandings that could lead to accidents.

Most effective forms of communications are two-way. This means that a message is sent and confirmation that it has been received and understood is given as quickly as possible. In this type of communication, the sender and receiver alternate roles, exchanging information until they understand each other. This type of communications requires active listening, which includes techniques such as

- Asking questions when information is not clear
- Restating or paraphrasing to check understanding
- Recording information when it is necessary.

Communication is a core crew resource management behavior.

Communication is normally made up of three different components: words (7%), voice inflection (38%), and body language (55%). Clearly, the methods used for many communications needed in the maintenance and movement of trains is often reduced due to the physical distance; for example, the use of facial cues and gestures. Thus, communication often relies on how well the sender and receiver handle words. You need to be aware that there are differences when working with crew members.

1. Oral vs. Written Communications

Most of the communication you will encounter in crew situations and other aspects of your work will be either oral or written. Each of these types of communication has advantages and disadvantages, which makes some better suited for different situations.

2. Improving Communications

Effective communications, whether oral or written, require the following:

- | | |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Clear | Any effective message must be clear – its meaning must be precise and easily understood. Examine your speaking and writing. If you were the receiver, would you understand the message? |
| Accurate | The information in your message must be accurate. A well communicated message with inaccurate information can be more dangerous than no communication at all. |
| Complete | Before sending a message, written or oral, consider whether it contains all the information required. A |



complete message will reduce the need for later clarification or additional information.

Organized

The information in a message should be organized so that it will be easily understood by the receiver. If it is understood, it will be more easily remembered. For example, if you are outlining a procedure, make sure the steps are in the correct order.

Concise

A message should be as short as possible while still being clear and complete. The more unnecessary information you include, the more likely it is to be misinterpreted, or to cause information overload

Timely

No matter how well you construct and convey your message, it will be useless if it is too late. For instance, you may believe that a member of your crew is losing their situational awareness. If you say nothing until the situation is out of control, it is too late for communication to be helpful.

The most effective communication is clear and direct; courteous and to the point; brief, precise, and timely.

3. Tips for Oral Communication in CRM

Here are some suggested guidelines to improve oral communications:

- Speak clearly
- Avoid slang that could be misunderstood
- Decide everything you want to say before saying it
- Ask the receiver to restate/paraphrase important information
- Listen actively to the receiver's response to make sure it is accurate
- Don't assume that no response means the message is understood
- Follow procedures

Tips for Written Communication in CRM

- Write neatly
- Fill in forms as completely and accurately as possible, even if you have to take some extra time to find the information
- Follow applicable company procedures and rules
- Find the most appropriate time to perform written communications

Assertiveness, Nonassertiveness, and Aggressiveness

People use different strategies to achieve their goals. Three common strategies are as follows:

- assertiveness
- nonassertiveness (passiveness)
- aggressiveness

1. Assertiveness

Assertiveness is a willingness to clearly express your opinion, while respecting the opinions and rights of others. It allows you to act in a way that is in your own – or your crew’s – best interest, while maintaining self-respect and respect of others.

An assertive person

- makes plans
- expresses opinions clearly
- listens to the ideas/opinions of others
- is persistent, trying different approaches until success is achieved

This is the most effective strategy for attaining goals or desired outcomes.

2. Nonassertiveness (Passiveness)

Nonassertiveness or passiveness occurs when you are unwilling to express your true opinion or question another person’s opinion/actions, which can result in sacrificing safety.

3. Aggressiveness

Aggressiveness is doing what you think will achieve your goals, but without regard for the opinions and rights of others.

Aggressiveness often leads to strained relations and decreases the crew’s ability to communicate effectively.



4. Assertiveness in CRM

Effective communication between crew members is an essential part of CRM, and leads to safe and efficient operations. Sometimes, however, crew members may disagree about the best course of action, making communication difficult. This is especially true in cases where authority or seniority make it difficult for ideas to be expressed and considered freely. Assertive communications can help to overcome such problems.

In applying assertive communications to CRM, crew members are expected to

- State their own ideas, opinions, and recommendations, especially when solicited by others.
- Assert themselves and advocate their points of view when necessary for safe operation.
- Use increasing levels of assertiveness, as appropriate, to maintain safe operations.

Specific techniques should be used to help communicate assertively, including the following:

1. asking questions.
2. stating objections clearly, without attacking individuals.
3. controlling emotions.

Asking questions

It is often difficult to challenge another person's actions without offending him/her. A good technique is to ask questions first. This will help you to be sure that you understand the situation before voicing an objection.

Examples:

Less Effective

“Hey, don't forget we have a slow order three miles ahead.”



More Effective

“Do we still have that slow order three miles ahead?”

Remember, you have a responsibility to yourself and your crew to make sure that safe procedures are followed. If you do not receive a satisfactory answer to a question, you should continue to question or even state an objection.

**State Objections Clearly,
Without Attacking
Individuals**

When you believe that a crew member is making a mistake or acting unwisely, you should express an objection clearly, not as a weak or disguised comment. You must also be careful to object to the behavior or action, not to the person.

One way to accomplish this is to begin objections with “I.” This shifts responsibility for the statement, and makes the objection less threatening to the other person.

Examples:

Less Effective

“Sure feels like we’re moving too fast.”

or

“You are going too fast!”

More Effective

“I think we’re going faster than track speed.”

Controlling Emotions

You should express yourself as calmly as possible, even when directly challenging a crew member’s action.

Using an angry or threatening tone is aggressive, not assertive. It may help you to get your way immediately, but it leads to decreased cooperation and crew support.

Examples:

Less Effective

(angrily) “That was stupid! You could have killed us both!”

More Effective

(calmly) “That was “too close for comfort.” It could have been avoided.”

5. Summary

People use different strategies to achieve their goals, including

- Assertiveness – clearly expressing opinions, while respecting others’ opinions and rights.
- Nonassertiveness (passiveness) – unwillingness to express true opinions or question another person’s opinion/actions.
- Aggressiveness – doing what will achieve your goals, without regard for the opinions and rights of others.

Assertiveness is usually the best approach for expressing your opinions within a crew, although some circumstances may require other behavior. When necessary, crew members must use increasing levels of assertiveness to maintain safe operations.

Useful techniques for assertive communications include

1. Asking questions
2. Stating objections clearly, without attacking individuals personally
3. Controlling emotions

By using assertive communications appropriately, you can contribute to safer operations and stronger relationships.

JOB BRIEFINGS



Safe and productive work are the results of planning and conducting a well-communicated job briefing. A job briefing must be held to ensure that all employees have a clear understanding of

- The task to be performed
- The responsibilities of the individuals
- The type of protection required

STEP 1: PLAN THE JOB BRIEFING

- A. Plan the work.
- B. Consider existing and potential hazards.
- C. Consider how work assignments will be made.

STEP 2: CONDUCT THE JOB BRIEFING

- A. Explain work or tasks to all involved employees.
- B. Discuss existing or potential hazards and ways to eliminate or protect against them.
- C. Make definite work assignments.
- D. If special tools, material, 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.

STEP 3: EXPLAIN SPECIAL CONDITIONS

- A. Discuss complex jobs.
- B. When it becomes necessary to change plans and procedures as the job progresses, brief employees on these changes.

STEP 4: TAKE INDIVIDUAL RESPONSIBILITY

Additional job briefings must be held when the situation changes. It doesn't take long to do a job briefing that will prevent injuries and save lives.

Getting Results

Job briefings occur every day. To ensure job briefings achieve the results you're looking for, follow these basic steps:

1. Prepare and contribute facts and ideas.
2. Ask questions.
3. Stay focused.
4. Listen actively.
5. Clarify roles and actions to be taken.

Certain transfers conducted between train crews and dispatchers may require a structured meeting at the beginning or the end of the shift or tour of duty to exchange essential information. A more informal process may also be used to improve crew performance.

The most valuable assets of any organization are its employees. The better they work as a team, the better their morale, productivity, and their contribution to the success of the organization. We will look at the definition and elements of a team, as well as the responsibilities and roles of crew members who interact as a team.

The term **crew** is defined as any group of people working at different tasks designed to accomplish a common mission, goal, or objective.

A crew should be thought of as a team. A *team* is a collection of people who must relate to each other to accomplish shared objectives and goals. They combine a unique blend of skills, personalities, attitudes, perceptions, and shared responsibilities. A safe and successful work environment consists of individuals in a group being able to work together, rather than separately.

1. Elements of a Team

There are many elements of a team. These include:

1. Clarity of purpose
2. Interdependence
3. Commitment to synergy
4. Accountability

Clarity of purpose

A team must have a reason for working together. For example, in the railroad industry, the purpose is the safe and efficient operation of the trains.

Interdependence

Team members' need each other's experiences, abilities, and commitment in order to reach common goals. For example, your team may be made up of a locomotive engineer, conductor, dispatcher, and other personnel, who have a

variety of roles, abilities and experiences that contribute to the safe and effective operation of trains.

Commitment to synergy

Team members are committed to the idea that working together leads to more effective decisions and greater productivity than working alone. For example, this means realizing that the operation of a train does not rely on the efforts of a single person, but on the efforts of a group.

Accountability

The team is accountable as a functioning unit within a larger organizational context. For example, when shortcomings occur, it is usually not the result of the actions of one individual. Shortcomings are usually the result of the actions, or inactions, of several individuals.

2. Team Responsibilities

Teamwork involves developing relationships. Interaction and cooperation is essential. Interaction and cooperation are characterized by sharing information that is necessary for establishing team goals and reaching these goals. It requires learning about other team members and their particular functions so that you can offer help when it is needed: sharing information is crucial for cooperation.

The responsibility of the team also involves a joint effort in motivating each other to perform safely and efficiently. You must evaluate your individual performance in relation to its effect and contribution on the performance of the entire team.

Teamwork also relies on using conflict management skills effectively. Conflict resolution involves accepting that each member of the team has different styles of interacting which is influenced by personality and experience.

Identifying these styles will allow the team to discuss conflict in a positive and productive environment, acknowledging that not everyone sees a situation the same way, but each person has a value added contribution to make.

3. Team Roles

Identifying roles in a team involves understanding the functions of the individual team members – their technical proficiencies – and how they influence the team as a complete unit (i.e., locomotive engineer, conductor, dispatcher, and other crew roles). Awareness of each other's roles and related tasks is necessary in building a positive and productive work environment.

Conflict often arises when roles and tasks aren't clearly defined. This causes tension as team members may argue about who has authority over specific areas and which responsibility belongs to which team member. An effort should be made to minimize discrepancies such as these by encouraging each member to communicate what they view their role and subsequent tasks to be. The other team members should provide feedback to clarify if the perception of a person's role as seen by that individual coincides with the team perceptions as a whole.

Teamwork involves working together to clarify roles and tasks, cooperating as a group in the coordination of these roles and tasks. However, it is important to remember that team members need to know more than the individual roles. There should be a genuine interest in each other's individual success, which is essential for cooperation.

4. Tying it Together in a Team

Crew Member Proficiency – It is important that each team member understand his/her job and is able to perform the duties and tasks associated with that job. It

is important that the team be constantly aware of the influence of such factors as rest, diet, and alertness on the performance of the team.

Situational Awareness – The situational awareness level that a team is able to attain together has an important effect on the safety of the work environment. Each team member will have a level of situational awareness; however, how these individual perceptions are joined together is critical in the maintenance of situational awareness.

Communication – Communication is one of the most important influences in building an effective team. Communication must always be two-way and complete. Complete communication means voluntarily communicating everything you believe is relevant for others to know, and checking when you are not sure. Team communication is characterized by an expression of patience and trust. Two-way communication is used for problem solving and decision making when a team encounters conflict.

5. Effective Teams

There are many factors that influence the effectiveness and ultimate success of a team.

An effective team is the result of proper communication techniques and productive team interaction. The team members work together as a cohesive unit which encourages group commitment and strong team dynamics.

An Effective Team:

- Employs two-way communication.
- Shares participation and leadership.

- Evaluates the team's effectiveness and discusses how to improve the working environment.
- Expresses their ideas and feelings openly and honestly.
- Strives for consensus.
- Employs positive conflict resolution techniques.
- Participates in constructive criticism.

An Effective Team Member:

- Takes responsibility for personal performance.
- Recognizes strengths and weakness.
- Listens openly to new information, ideas, or approaches.
- Is flexible in handling change.
- Maintains a standard of honesty and integrity.
- Senses other's feelings and perspectives.
- Negotiates and resolves disagreements.
- Works toward a shared goal.

Summary

Teams share a purpose in their interaction with one another. They contribute a variety of skills and experiences to their work environment. A team is committed to working together and is accountable for their actions as a group. Teamwork involves sharing, interacting, cooperating, and communicating as well as applying positive conflict resolution techniques. A team monitors the influence of technical proficiency, situational awareness, and communication on the team's performance. Teams strive to clarify each member's role and tasks to minimize conflict. Remember, the better you work together as a team, the safer and more productive your working environment will be.

6. Making Team Decisions

Decision-making is a part of the daily life of a railroad employee. In fact, it is planning and decision-making that ultimately leads to the safe operation of a train. In situational awareness we discussed the importance of the individual's role in decision making. Now, we must look at decision making as a collective process. It is important to realize that sometimes it is best to make a decision as an individual; and other times, a group decision is necessary as you may need to call upon experiences and advice of other crew members to make the best decision.

Advantages of Team Decision Making

Individual and team decisions each have their own set of strengths.

However, the advantages of team decisions are:

- Provides more complete information.
- Generates more alternatives.
- Increases acceptance of a solution

Provides more complete information

A group brings diversity of experience and perspectives to the decision process that an individual acting alone may not.

Generates more alternatives

Groups have a greater amount and variety of information, and they can identify more alternatives than an individual. This is particularly evident when team members represent different crafts.

Increases acceptance of a solution

When members of a team are affected by a certain solution and they participate in the process to implement the solution, they will be more likely to accept it.

Effectiveness of Team Decision Making

Making a decision as a team tends to be more accurate. On average, groups make better decisions than individuals. However, if decision effectiveness were defined in terms of speed, the individual would out perform the group. Therefore, learn when to engage in a team decision and when to make decisions as an individual.

Steps in Making A Team Decision

Basic steps involved in making a team decision include:

1. Define the problem or decision to be made.
2. Brainstorm and discuss available alternatives.
3. Consider the probable consequences of each alternative.
4. Evaluate each of the alternatives.
5. Make a decision.

Define the problem or decision to be made

This means the team needs to be involved as a unit in making a decision. It requires asking the team, "What is it we are trying to decide?"

Brainstorm and discuss available alternatives

This involves figuring out how a problem can be solved or how a solution can be reached and with what approach. Brainstorming is an idea generating process that encourages alternatives while withholding criticism. It provides an open forum for every member of the team to discuss what he or she sees as a possible solution to a problem. It involves asking, "What are our choices?"

Consider the probable consequence of each alternative

This step allows the team to consider the outcome of each each decision they could make, given their choices. It requires asking, "What do we want to have happen or what are some things we are looking for in a good decision?"

Evaluate each of the alternatives

This provides an opportunity to discuss each alternative in more detail. It allows each team member to have a chance to express why their alternative or someone else's could be effective. It means asking, "How will each of these choices help us get what we want or what we're looking for?"

Making a decision

This is the key activity of the decision making process when the decision is finally applied to the working environment. Making a decision requires asking, "What solution or decision will do the best job of resolving the problem?"

Summary

Team decision making offers many advantages: more complete information, more alternatives, increased acceptance of a solution, and greater legitimacy. However, group decision making can be time consuming so when considering the need for a team decision, always keep in mind the time that will be involved. Although a group decision can be perceived as more effective, sometimes peer pressure or authority/seniority pressure can create a situation in which the decision isn't truly representative of the group.

MODULE 4 CONFLICT RESOLUTION TECHNIQUES



- A. Causes of Conflict
- B. Conflict Outcome
- C. Effects of Conflict
- D. Conflict Resolution Techniques
- E. Summary

VIDEO: Module 4 - 8 Minutes Running Time
Summary – 2 Minutes Running Time
Total – 10 Minutes

Total Estimated Time to Complete Module: 30 Minutes

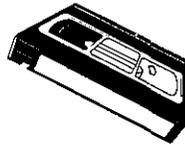
LEARNING OBJECTIVES

1. Apply assertive communication techniques when required.
2. Apply effective conflict resolution techniques to resolve crew disagreements.

INTRODUCTION

The last module of our Crew Resource Management series is “**Conflict Resolution Techniques.**” This module explores the causes of conflict, how it affects crew safety and performance, and presents some conflict resolution techniques. Let’s take a look!

SHOW THE VIDEO



POINTS FOR DISCUSSION

- Conflict resolution in CRM means bringing a conflict to conclusion in order to promote safe and efficient operations.
- Conflict can result from:
 - Aggression.
 - Ineffective communications.
 - Role confusion.
 - Loss or challenge of authority.
 - Incompatible goals.
- Conflict can have a negative impact on crew safety and performance by shifting attention away from essential tasks, which may lead to a loss of situational awareness.
- Positive effects of conflict include correction of mistakes and improved performance, increase motivation and interest in work issues, and a greater understanding between crew members.
- Conflict resolution techniques include:
 - Be mentally and physically prepared.
 - Delay responding.
 - Define the conflict.

- Use effective communication techniques.
- Try to generate solutions together.

CONFLICT RESOLUTION TECHNIQUES



Conflict occurs when people who depend on each other – like crew members – express disagreement over an issue. Whether the issue is real or perceived, differences in thoughts, opinions, feelings, and perspectives may lead to conflict.

Conflict resolution in CRM means bringing a conflict to conclusion in order to promote safe and efficient operations. Resolving conflict may be required on any type of crew or tour of duty.

Small, unresolved disputes between individuals or groups often build and contribute to later, more open conflicts.

CAUSES OF CONFLICT



Some conflict between crew members is unavoidable. Sometimes conflict is the result of personality differences alone. We have all met people with whom we find it difficult to work. Often, conflict results from specific circumstances or behaviors, such as

- Aggression
- Ineffective Communications
- Role Confusion
- Loss or Challenge of Authority
- Incompatible Goals

Aggression

Aggressive behavior does not respect the rights, feelings, and opinions of others, and often leads to strained crew relations.

Ineffective Communications

Ineffective communication can lead to dangerous misunderstandings. These misunderstandings can also lead to confusion and conflict among crew members.

Role Confusion

Conflict can easily develop in a situation where it is not clear who is responsible for a problem or issue.

Loss or Challenge of Authority

When people feel that their authority is being lost or challenged, they often react defensively to protect their status or self-image. This can lead to conflict with the person they feel threatened by.

Incompatible Goals

If two people are working together, but their individual goals do not match, conflict is the likely result.

CONFLICT OUTCOME



Conflicts result in one of three general outcomes:

Win – win

Both parties are satisfied by a win-win outcome. Each feels that the solution meets his/her needs and allows him/her to reach personal goals. This is often – but not always – the best outcome for a crew to work toward.

Win – lose

Only one party gets his/her way in a win-lose outcome this may be the best outcome possible if the actions or goals of one person are unsafe.

Lose – lose

In a lose-lose outcome, neither party is satisfied. This may result from a poor compromise or a decision to “just live with” the problem.

EFFECTS OF CONFLICT



Conflict often has a negative impact on crew safety and performance by

- shifting attention away from essential tasks
- leading to loss of situational awareness, in some cases

While conflict can cause problems for a crew, it can also have positive effects if handled appropriately. These include

- correction of mistakes and improved performance.
- increased motivation and interest in work issues.
- greater understanding between crew members -- leading to less conflict and increase support in the future.

CONFLICT RESOLUTION TECHNIQUES



Whether conflict has a negative or positive impact on a crew depends on how the situation is handled. The following techniques will help you resolve conflicts effectively and create a safer work environment.

Be Physically/Mentally Prepared

Be at your physical and mental best.

Delay Responding

Don't react to another person's actions or statements until you have considered exactly what you want to say or do. Take some time – even a few minutes to think before responding.

Define the Conflict

Define exactly what the conflict is about, and limit your discussion to that topic. Bringing up unrelated disputes or problems during a conflict will not help resolve it and may escalate it.

Use Effective Communication Techniques

Use these strategies to maintain effective communication with your crew, even during conflict situations. These include:

- being assertive, not aggressive nor passive
- asking questions to clarify meaning
- restating/paraphrasing to check understanding
- objecting to actions, not people
- controlling emotions

Generate Solutions Together

Work with others to find possible solutions to your Problem. Try to find one that will contribute to a Win-win outcome if this maintains safe and efficient working conditions.

SUMMARY



Crew Resource Management (CRM) can be an effective tool for recognition and resolution of situations where appropriate actions are required to meet the needs for safety of operations. CRM promotes safe operations by emphasizing the use of available resources to achieve and maintain better coordination of activities. The safety of a train crew requires the total commitment and dedication, and the attention to duties and proper performance, of each and every member. By understanding the human factor issues of CRM, including crew member proficiency, situational awareness, communications and teamwork, and conflict resolution techniques, job performance can be enhanced and safety of train operations assured.

APPENDIX J: SOFA-DEFINED SEVERE INJURIES, ADDITIONAL INFORMATION

Table J-1: Information Available for Severe Injuries

This table is based on *FRA Form F 6180.55a*, but is not a *verbatim* description.

INFORMATION DESCRIPTION
Date and Time:
Year
Month
Day
Hour
Minute
Railroad:
Railroad name
Railroad type
Equipment:
Equipment movement (Y/N)
Type of on-track equipment involved
Geographic Location:
City
County
State
FRA region
Identification Number:
Railroad assigned incident number
Was an equipment or highway-rail accident incident report also filed? If so, linking by incident number can provide additional information about casualty event.
Event Circumstances:
Actions just prior to injury
General location of employee prior at time of injury
Specific location at time of injury
Event which caused injury
Additional information about injury (tools, surfaces, etc.)
Probable cause of injury
Narrative information (if special circumstances dictate)
Hazmat exposure
Injury Description:
Nature of injury
Location of injury on body, general
Location of injury on body, added specificity
Fatality (Y/N)
Days away from work
Days of restricted activity
Type of Employee:
Type of person (employee on duty, etc.)
Employee job occupation
Age
Drugs and Alcohol Testing, Other:
Number of positive alcohol tests
Number of positive drug tests
Employee suspension or permanent transfer

Discussion: Using FORM FRA F6180.55a Information about Severe Injuries, and Further Analysis, to Better Understand Switching Fatalities

Existing Potential to Use Severe Injury Information to Better Understand Fatalities

As mentioned, relationships among switching fatalities and severe injuries are not completely understood. But likely some severe injuries could have resulted in a switching fatality. Hence, fatality preventive findings may help in reducing severe injuries. A reverse relationship may also be true. Because counts of severe injury types are generally higher than those for fatalities, severe injury information may also be useful in further understanding fatality issues. This possibility was raised by at the SSF. There is however a caution. While some factors important to switching fatalities can be identified by severe injury coding, piecing together the complete context of injury events presents challenge.

Information Available to Address SOFA 1-5

Some information exists in severe injury data based on *FORM FRA F6180.55a* to analyze SOFA 1, 2, and 5 (Table J.2). No information exists for job briefings (SOFA 3) or communication issues (SOFA 4), unless contained in narratives.

Table J.2. Information Available from FORM FRA F6180.55a to Address SOFA 1-5

SOFA Recommendations	Potential To Partially Address	Comment
SOFA 1	yes	Physical act coding includes ‘coupling and uncoupling air hoses,’ ‘adjusting coupler and drawbar,’ ‘pulling pin lifter/operating uncoupling lever,’ and ‘opening/closing angle cock.’ Location coding includes ‘between cars/locomotives’
SOFA 2	yes	Type of equipment involved includes whether striking equipment was standing or moving. Cannot always infer if equipment was own or another crew’s
SOFA 3	no	No coded information on job briefings
SOFA 4	no	No coded information on communication issues, or signal type (e.g., hand, radio) used, or whether communication was proper
SOFA 5	yes	No coded information on years of service. The closest concept is age

Information Available to Address Close/No Clearance, Struck by Mainline Trains, and Industrial Hazards

Based on *FORM FRA F6180.55a* some information exists for the three Special Switching Hazards (SSH) given emphasis in this SOFA report (Table J.3): Close/No Clearance, Struck by Mainline Trains, and Industrial Hazards.

Table J.3. Information Available from FORM FRA F6180.55a to Address Close/No Clearance, Struck by Mainline Trains, and Industrial Hazards

Special Switching Hazard	Abbreviation	Potential to Partially Address	Comment
Close/No Clearance	SSHCC	yes	Injury cause coding includes close or no clearance (#17) and probable reason for injury includes ‘failure to provide adequate space between equipment during switching operation (#16)’

Special Switching Hazard	Abbreviation	Potential to Partially Address	Comment
Industrial Hazard	SSHIH	yes	Track type coding is specific to industry location. Other coding identifies event type and circumstances
Struck by Mainline Trains	SSHST	yes	Coding does not provide information on whether a roll-by inspection was involved. However, track location coding identifies type of track (e.g., main/branch, industry). Type of equipment coding captures whether equipment was moving. Location coding identifies whether the employee was standing on ground in the vicinity of track

Information Available to Address Other SSH

Table J.4 describes information available from FORM FRA F6180.55a related to the other 12 SSH.

Table J.4. Information Available from FORM FRA F6180.55a to Address Other Special Switching Hazards

Special Switching Hazard	Abbreviation	Potential to Partially Address	Comment
Derailment	SSHDR	yes	Derailment is an event code (#21)
Drugs and Alcohol	SSHDA	yes	Number of positive alcohol and drug tests is reported. Impairment, substance use, is a coding option for probable reason for an injury
Electronic Device (Cell phone, P3 player)	SSHED	no	Not reported in coded information
Employee Tripping, Slipping, or Falling	SSHET	yes	Captured in event coding with specificity of object and/or condition believed casual
Environment	SSHEV	no	Weather or atmospheric conditions are not coded
Equipment Defect	SSHEQ	no	Although event coding does include 'defective/malfunctioning equipment'
Failure to Confirm Route of Movement	SSHFC	no	Not reported in coded information
Free-Rolling Railcars	SSHFR	yes	'Sudden/unexpected movement of on-track equipment' is coded as an event (#64). But may be difficult to be specific
Struck or struck by Motor Vehicle	SSHMV	yes	Striking vehicle type can be identified (e.g., automobile, truck, van).
Unexpected Movement of Railcars	SSHUM	yes	'Sudden/unexpected movement of on-track equipment' is coded as an event (#64). But may be difficult to be specific
Unsecured Cars	SSHUC	yes	'Sudden/unexpected movement of on-track equipment' is coded as an event (#64). But may be difficult to be specific
Miscellaneous	SSHMC	yes	Coded information may identify some miscellaneous events. Narrative information may be source of unusual circumstances associated with a severe injury

Information Available from FORM FRA F6180.55a) to Address Issues Important to Fatality Prevention

SWG has raised issues related to switching fatalities that are more general than uniquely pertaining to SOFA 1-5 and SSH. These issues include atmospheric and climatic conditions, crew resource management, fouling track, personal protective equipment, and shoving. Table J.5 describes information available from *FORM FRA F6180.55a* for these transcending issues.

Table J.5. Information Available from FORM FRA F6180.55a to Address Issues Important to Fatality Prevention

SOFA Issues	Potential to Partially Address	Comment
Atmospheric and climatic conditions (e.g., darkness, cloudy, weather)	yes	Lighting conditions can only be inferred from the time event occurred. Weather is not universally coded for each event. Ground condition for a tripping, slipped, or fell, stumbled, etc. event is sometimes identified
Car/equipment type	yes	Distinction is made among passenger and freight cars, and locomotive. Striking vehicle (e.g., automobile, truck, bus, motorcycle) and other equipment (e.g., crane, loaders, construction equipment) are also identified
Crew resource management	no	No coded information on communication issues
Employee not on regular assignment	no	Coding does not indicate whether employee was working a regular assignment, or in unfamiliar territory, or working regular shift
Fouling track	yes	Location coding includes 'alongside of on-track equipment-on ground;' 'track, beside;' 'track, between;' 'track, on;' and 'on highway-rail crossing'
General alertness, drugs and alcohol, and fatigue	yes	Alertness can be generally indicated by 'human factor' as a probable reason for injury/illness. General alertness 'impairment, physical, e.g., fatigue' is a coding option for probable reason for an injury/illness
Holidays, winter, and other periods of potential for increased risk	yes	Event date is coded. Evaluation of clustering can be made by month, day-of-week, time-of-day, and holidays. For comparison, states can be grouped to include the likelihood of winter and non-winter conditions
Personal protective equipment (PPE)	yes	Probable reason for injury/illness can include 'safety equipment not worn or in place'
Remotely controlled locomotive (s)	yes	About 20 probable reason injury codes pertain to RCL. Coding differentiates whether probable reason for injury is 'related to using RCL' or 'unrelated to using RCL'
Road crews coming in and out of yards	yes	Job code (e.g., 609-local freight conductors; 617-through freight engineers) and location (e.g., yard) identify these crew members
Second hour on duty	yes	Start time for an employee is not coded
Shoving	yes	Direction of movement is not coded

New Data Items Potentially Useful to SOFA

SWG's understanding of severe injury events could be enhanced by additional information not contained in *FORM FRA F6180.55a*. These items include, but are not limited to:

Item: Employee's start date for calculating years of service

Comment: Additional emphasis on SOFA 5 (less experienced employees) is needed for fatality prevention. Such emphasis may also be needed for severe injuries

Item: Start time for duty

Comment: For fatalities, SWG has observed a spike in the second hour of duty. Determination could be made if time-on-duty is also related to some types of severe injuries, thus providing a target for prevention

Item: SWG-created PCFs as an option in coding injury cause

Comment: Some examples of frequently occurring SWG-created PCFs are H316 (Poor intra-crew communication about work in progress), H997 (Failure to provide adequate space between equipment), H317 (Failure to communicate unsafe condition), and H211 (Radio communication, improper). These and other PCF codes could help in understanding injury events and relationships to switching fatalities

Item: Use of the narrative option to include SOFA issues

Comment: In writing narratives, coders can partner with SWG in identifying where SOFA 1-5 and SSH, and other SOFA issues are potentially involved

Suggestions for Further Analysis of Severe Injuries

Even without new data items, SWG believes discussion of severe injury prevention should proceed based on existing information, and analytical methods for better utilizing this information. One such method is use of existing narratives. SWG used the narrative form when PCF and external circumstance coding could not capture all information associated with a fatality. As well, SWG performed this type of analysis, but on a limited basis, in its 2001 injury report. Railroads are encouraged to use narratives when coding cannot capture all aspects of an injury event. Narratives contained in *FORM FRA F6180.55a* information could be analyzed for implicit indications of SOFA 1-5, SSH, and other SOFA-related issues.

Additionally, if a rail equipment accident (*FRA FORM 6180.54*) and/or highway rail accident (*FRA FORM 6180.54*) report was also filed in addition to the casualty report, linking could provide additional information about the casualty event. However, in most casualty cases, events do require these additional reports because property damage, if at all, was below the reporting threshold, or a grade-crossing location was not involved.

Discussion: Selective Attributes and Track Location

Severe Injuries by Selective Attributes and Track Location

The 1,522 severe injuries, occurring 1992 through 2009, are displayed in Table J.6 by frequency for 14 attributes classified by 7 track locations: yard, main/branch line, industry, siding, highway/roadway, passenger terminal, and other. As an example, severe injuries are shown (Table J.6) for the attribute 'job code' for T&E employees by the seven track locations. The other 13 attributes are, by order of presentation: injury type, injury location, year, month, day, time of day, age, assigned cause of injury, activity, injury event, equipment location, working

location, and surface struck causing injury [tools, machinery, appliances, structures, surfaces (etc.)].

Information contained in Table J.6. and subsequent Table J.7, appeared in the 2001 SOFA Injury Report (with 446 severe injuries, 1997 through March 31, 2000), and the 2004 SOFA Report (with 929 severe injuries, 1997 through 2003); and are included herein (with 1,522 severe injuries, 1997 through 2009) for continuity with SWG's goal to eliminate this harm to T&E employees.

Table J.7 breaks out the severe injuries that occurred just to T&E employees classified as yard and road crews at four track locations (yard, mainline/branch line, industry, and siding). Job codes for these yard and road crews are:

Yard crews: 619-engineers, 623-firemen, 603-hostlers, 601-switch tenders, 614-conductors, and 615-brakemen

Road crews: 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.

Statements about Severe Injuries by Selective Attributes and Track Location

The following observations, drawn from information presented in Tables J.6 and J.7, serve as examples of how severe injury information might be instructive in trying to understand these injury events. Other observations are possible.

Observations made are noted as based on either Table J.6, or a more restricted number of job codes and track locations in Table J.7. This latter table was created to identify the main locations where yard and road employees were being injured. As a possible counter-intuitive example, about 39 percent of road employees were injured at yard locations.

As mentioned above, severe injuries declined, 1997 through 2009. This decline was particularly apparent among yard and main/branch line locations in 2008, and continuing into 2009. From Table J.6.

Declines in severe injuries were not as noticeable among other track locations, although counts at these locations are smaller. There was not any apparent large shift in the proportion of severe injuries from one, or more, track locations to another. From Table J.6.

49 percent of severe injuries occurred in yards, considerably smaller than the percentage (12 percent) occurring in industry. From Table J.6.

By month, there was variation in severe injury occurrence among track locations. In yards, January had the highest number of severe injuries (95). The lowest month for injuries (43) in yards was May. On main/ branch line, February had the highest number of injuries (43), with November also being high (42). The lowest month for injuries (26) on main/ branch line was July; but April, September, and October also had lower injuries (respectively, 29, 27, and 29). From Table J.6.

For days of the week, generally for all track locations, Monday's through Friday's had larger numbers of severe injuries. But the daily pattern varied among track location. From Table J.6.

More severe injuries (82) occurred in the first hour after midnight than during any other time of the day or night, representing 5 percent of all injuries. From Table J.6.

Yard, main/branch line, and industry were track locations experiencing the largest number of amputations (respectively, 128, 34, and 28). From Table J.6.

44 percent of severe injuries occurred to employees between the ages of 45 and 56. Employees between the ages of 57 and 62 experienced 15 percent of severe injuries. From Table J.6.

Most severe injuries involved fractures (83 percent). Amputations were involved in 13 percent of these injuries. Thus, together, these injury types involved 96 percent of all injuries. From Table J.6.

Most severe injuries (85 percent) occurred to the legs, foot, and torso. From Table J.6.

45 percent of severe injuries had an assigned cause of injury as human factors. 11 percent of injuries had an assigned cause of injury as environmental. Table J.6.

Ground was the most common surface involving an injury (28 percent), with ballast, stones, etc. the second highest (10 percent). Table J.6.

39 percent (336 of 855) of severe injuries to road T&E employees occurred in yards. From Table J.7.

Road T&E employees sustained just 19 fewer severe injuries in yards than yard T&E employees in yards (336 v. 355). From Table J.7.

Severe injuries to yard train-service employees (mainly engineers) represented 12 percent (44 of 355) of all yard severe injuries, compared to 25 percent (88 of 355) for road train-service employees (all engineers), about doubled. From Table J.7.

Road train-service employees incurred about 3.8 times as many severe injuries as yard train-service engineers (223/58). From Table J.7.

Road T&E employees sustained 64 percent (885 of 1,335) of all severe injuries, v. 36 percent (480 of 1,335) for yard T&E employees. From Table J.7.

<p align="center">Table J.6 1,522 SOFA-defined Severe Injuries by 14 Attributes and 7 Track Locations January 1, 1997 to December 31, 2009</p>									
	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
JOB CODE									
conductor, yard-614	172	17	43	2	0	0	4	238	15.6%
conductor, road freight-608	78	123	15	16	18	0	12	262	17.2%
brakeman, yard-615	131	14	25	2	0	0	8	180	11.8%
conductor, road freight local-609	67	48	47	17	0	0	3	182	12.0%
engineer, road freight-617	43	77	2	14	14	0	6	156	10.2%
brakeman, road freight local-613	53	35	24	9	3	0	2	126	8.3%
engineer, yard-619	39	7	5	2	4	0	2	59	3.9%
conductor, road passenger-606	27	23	0	0	1	8	4	63	4.1%
brakeman, road freight through-612	16	9	8	5	1	0	0	39	2.6%
engineer, road freight-618	24	15	5	4	3	0	3	54	3.5%
engineer, road passenger-616	21	17	0	1	0	5	1	45	3.0%
conductor, asst. road passenger-607	7	5	0	0	0	12	2	26	1.7%
switch tender-601	8	4	4	0	0	0	0	16	1.1%
hostler, outside-603	4	0	0	0	0	0	1	5	0.3%
brakeman, lead passenger-611	3	2	0	0	0	0	0	5	0.3%
miscellaneous-600	6	4	2	1	0	1	2	16	1.1%
fireman, yard-623	1	0	0	0	0	0	1	2	0.1%
hostler, inside-605	1	0	0	0	0	0	0	1	0.1%
RCL operator, operating-630	19	0	4	0	0	0	0	23	1.5%
RCL operator, not operating-631	19	0	1	1	0	0	0	21	1.4%
other	2	1	0	0	0	0	0	3	0.2%
column total	741	401	185	74	44	26	51	1522	
column percent	49%	26%	12%	5%	3%	2%	3%		100.0%
INJURY TYPE									
fracture-70	588	351	147	64	43	23	47	1263	83.0%
amputation-80	128	34	28	7	0	2	2	201	13.2%
other burns-50	19	10	10	3	0	1	2	45	3.0%
electric shock/burns-40	5	5	0	0	0	0	0	10	0.7%
dislocation-60	1	1	0	0	1	0	0	3	0.2%
column total	741	401	185	74	44	26	51	1522	
column percent	49%	26%	12%	5%	3%	2%	3%		100.0%

Table J.6 1,522 Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2009									
	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
INJURY LOCATION									
leg or foot	410	190	104	36	7	12	28	787	51.7%
torso	223	145	53	26	27	9	17	500	32.9%
arm or hand	63	31	16	4	3	4	3	124	8.1%
head or face	41	27	11	5	4	1	3	92	6.0%
various body parts-equal severity	4	8	0	3	3	0	0	18	1.2%
unknown	0	0	1	0	0	0	0	1	0.1%
column total	741	401	185	74	44	26	51	1522	
column percent	49%	26%	12%	5%	3%	2%	3%		100.0%
YEAR									
1997	72	28	23	5	4	1	6	139	9.1%
1998	66	32	18	12	3	0	6	137	9.0%
1999	67	31	16	6	4	3	8	135	8.9%
2000	73	39	18	1	3	4	1	139	9.1%
2001	73	34	17	9	3	1	3	140	9.2%
2002	59	35	12	7	2	5	3	123	8.1%
2003	54	39	8	5	6	0	2	114	7.5%
2004	47	40	19	3	5	5	4	123	8.1%
2005	59	39	10	8	2	0	4	122	8.0%
2006	50	30	11	6	1	1	1	100	6.6%
2007	57	26	12	4	4	1	6	110	7.2%
2008	40	17	14	6	4	3	3	87	5.7%
2009	24	11	7	2	3	2	4	53	3.5%
column total	741	401	185	74	44	26	51	1522	
column percent	49%	26%	12%	5%	3%	2%	3%		100.0%
MONTH									
Jan	95	30	22	8	5	3	10	173	11.4%
Feb	78	43	9	8	3	1	8	150	9.9%
Mar	63	37	19	3	3	2	9	136	8.9%
Apr	55	29	15	3	6	2	3	113	7.4%
May	45	31	11	4	3	3	3	100	6.6%
Jun	43	32	13	3	6	1	4	102	6.7%
Jul	48	26	20	8	1	1	0	104	6.8%
Aug	60	41	15	7	3	2	1	129	8.5%
Sep	69	27	18	6	3	6	0	129	8.5%
Oct	54	29	11	11	5	1	4	115	7.6%
Nov	59	42	13	6	4	2	3	129	8.5%
Dec	72	34	19	7	2	2	6	142	9.3%
column total	741	401	185	74	44	26	51	1522	
column percent	49%	26%	12%	5%	3%	2%	3%		100.0%

Table J.6 1,522 Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2009									
	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
DAY									
Sunday	93	36	12	8	1	5	7	162	10.6%
Monday	110	57	29	17	10	2	3	228	15.0%
Tuesday	110	81	34	10	3	2	9	249	16.4%
Wednesday	114	54	24	10	8	7	10	227	14.9%
Thursday	111	67	33	12	6	7	8	244	16.0%
Friday	108	56	33	3	8	1	8	217	14.3%
Saturday	95	50	20	14	8	2	6	195	12.8%
column total	741	401	185	74	44	26	51	1522	
column percent	49%	26%	12%	5%	3%	2%	3%		100.0%
TIME OF DAY									
00:00-01:00	37	23	11	3	6	0	2	82	5.4%
01:01-02:00	37	16	7	3	4	0	1	68	4.5%
02:01-03:00	34	18	5	3	2	0	1	63	4.1%
03:01-04:00	41	24	5	2	3	1	2	78	5.1%
04:01-05:00	28	11	1	3	2	1	2	48	3.2%
05:01-06:00	17	13	6	5	2	1	4	48	3.2%
06:01-07:00	11	19	3	1	1	0	5	40	2.6%
07:01-08:00	20	16	2	5	2	3	4	52	3.4%
08:01-09:00	33	16	9	2	2	1	1	64	4.2%
09:01-10:00	40	18	9	3	1	1	4	76	5.0%
10:01-11:00	25	14	11	5	2	1	2	60	3.9%
11:01-12:00	25	20	14	2	1	1	3	66	4.3%
12:01-13:00	36	18	15	4	1	0	1	75	4.9%
13:01-14:00	23	13	19	1	2	0	1	59	3.9%
14:01-15:00	31	22	4	1	1	1	3	63	4.1%
15:01-16:00	27	17	8	4	1	2	0	59	3.9%
16:01-17:00	34	21	7	3	0	1	1	67	4.4%
17:01-18:00	37	15	8	4	4	3	1	72	4.7%
18:01-19:00	36	15	12	3	1	2	3	72	4.7%
19:01-20:00	36	15	6	2	1	2	2	64	4.2%
20:01-21:00	36	16	5	4	0	2	3	66	4.3%
21:01-22:00	37	18	8	7	2	1	2	75	4.9%
22:01-23:00	36	11	3	2	3	1	1	57	3.7%
23:01-24:00	24	12	7	2	0	1	2	48	3.2%
column total	741	401	185	74	44	26	51	1522	
column percent	49%	26%	12%	5%	3%	2%	3%		100.0%

Table J.6 1,522 Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2009									
	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
AGE									
15-20	2	2	0	0	0	0	1	5	0.3%
21-26	43	13	16	4	1	0	0	77	5.1%
27-32	85	40	26	9	2	2	5	169	11.1%
33-38	103	50	15	4	5	5	4	186	12.2%
39-44	77	50	18	7	11	4	7	174	11.4%
45-50	138	87	40	16	10	6	17	314	20.6%
51-56	156	97	44	23	6	6	6	338	22.2%
57-62	118	57	23	10	8	3	10	229	15.0%
63-68	18	4	3	1	1	0	1	28	1.8%
69-74	1	1	0	0	0	0	0	2	0.1%
column total	741	401	185	74	44	26	51	1522	
column percent	49%	26%	12%	5%	3%	2%	3%		100.0%
ASSIGNED CAUSE OF INJURY									
human factors	327	191	68	36	25	17	18	682	44.8%
undetermined	167	112	54	18	11	2	11	375	24.6%
environmental	79	30	22	10	7	4	18	170	11.2%
equip procedures not followed	71	25	16	2	0	1	2	117	7.7%
equipment	36	19	9	1	0	1	0	66	4.3%
track	5	7	6	2	0	0	0	20	1.3%
physical condition	5	3	1	1	0	0	0	10	0.7%
no safety equip	0	1	2	3	0	0	0	6	0.4%
trespassing	1	4	0	0	0	0	0	5	0.3%
substance use	0	1	0	0	0	0	0	1	0.1%
other	50	8	7	1	1	1	2	70	4.6%
column total	741	401	185	74	44	26	51	1522	
column percent	49%	26%	12%	5%	3%	2%	3%		100.0%

**Table J.6
1,522 Severe Injuries
by 14 Attributes and 7 Track Locations (cont.)
January 1, 1997 to December 31, 2009**

ACTIVITY	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
walking	208	104	48	21	3	7	22	413	27.1%
riding	98	63	0	10	34	0	1	206	13.5%
getting off	79	38	21	8	0	2	1	149	9.8%
stepping down	47	31	11	10	0	4	6	109	7.2%
standing	34	21	13	2	1	3	4	78	5.1%
operating	13	27	2	2	1	0	1	46	3.0%
repairing	1	0	45	0	0	0	0	46	3.0%
getting on	24	7	4	1	0	2	0	38	2.5%
jumping from	12	20	4	1	0	0	0	37	2.4%
climbing over/on	17	7	6	4	0	0	1	35	2.3%
lining switches	15	6	3	1	0	0	0	25	1.6%
handbrakes, applying	15	1	3	2	0	0	2	23	1.5%
pulling pin/uncoupling	17	2	2	2	0	0	0	23	1.5%
coupling air hose	19	0	0	1	0	0	0	20	1.3%
crossing over	14	3	1	2	0	0	0	20	1.3%
adjusting coupler	17	0	2	0	0	0	0	19	1.2%
closing	8	6	1	0	0	2	0	17	1.1%
sitting	6	7	0	0	2	0	2	17	1.1%
stepping	11	3	1	0	0	0	1	16	1.1%
opening	5	10	0	0	0	0	0	15	1.0%
handbrakes, releasing	9	0	1	2	0	0	0	12	0.8%
stepping over	7	5	0	0	0	0	0	12	0.8%
adjusting, other	7	0	0	0	0	0	1	8	0.5%
inspecting	3	4	1	0	0	0	0	8	0.5%
reaching	4	0	3	0	0	0	1	8	0.5%
handling other	1	4	1	0	0	1	0	7	0.5%
running	4	1	0	1	0	1	0	7	0.5%
bending, stooping	1	0	2	0	0	1	1	5	0.3%
driving (vehicle...)	1	0	0	0	3	0	1	5	0.3%
coupling electric cables	2	1	0	0	0	0	1	4	0.3%
crossing between	2	1	1	0	0	0	0	4	0.3%
opening/closing angle cock	1	2	1	0	0	0	0	4	0.3%
pulling	3	0	0	0	0	0	0	3	0.2%
handling car parts	2	0	0	0	0	0	0	2	0.1%
jumping onto	0	1	1	0	0	0	0	2	0.1%
pushing	2	0	0	0	0	0	0	2	0.1%
uncoupling air hose	1	0	0	0	0	0	1	2	0.1%
flagging	0	1	0	0	0	0	0	1	0.1%
handling loc parts	0	1	0	0	0	0	0	1	0.1%
handling material, general	1	0	0	0	0	0	0	1	0.1%
welding	0	1	0	0	0	0	0	1	0.1%
other	30	23	7	4	0	3	4	71	4.7%
column total	741	401	185	74	44	26	51	1522	
column percent	49%	26%	12%	5%	3%	2%	3%		100.0%

**Table J.6
1,522 Severe Injuries
by 14 Attributes and 7 Track Locations (cont.)**

January 1, 1997 to December 31, 2009

	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
INJURY EVENT									
slipped, fell, stumbled, other	110	47	23	13	1	2	6	202	13.3%
slipped, fell, stumbled, etc. due to object	81	57	17	7	2	3	1	168	11.0%
slipped, fell, stumbled, etc. due to climatic condition	77	25	13	11	0	1	21	148	9.7%
lost balance	55	25	14	4	0	4	1	103	6.8%
slipped, fell, stumbled, etc. due to irregular surface	44	30	13	8	0	2	5	102	6.7%
struck by on-track equipment	73	14	9	3	0	0	1	100	6.6%
collision between on-track equipment	21	46	3	0	0	0	1	71	4.7%
struck against object	25	6	16	1	0	2	1	51	3.4%
missed handhold, grabiron, step, etc.	28	7	6	6	0	0	1	48	3.2%
collision/impact-auto, truck, bus, van, etc.	3	2	0	0	33	0	0	38	2.5%
sudden/unexpected movement of on-track equipment	21	8	5	0	0	0	1	35	2.3%
caught, crushed, pinched, other	22	9	3	0	0	0	0	34	2.2%
derailments	13	11	6	1	0	0	0	31	2.0%
slack action, draft, compressive buff/coupling	19	9	2	1	0	0	0	31	2.0%
stepped on object	18	8	3	1	0	0	1	31	2.0%
highway-rail collision/impact	1	24	5	0	0	0	0	30	2.0%
struck by object	8	11	7	0	1	0	1	28	1.8%
exposure to chemicals-external	9	5	5	0	0	1	0	20	1.3%
slipped, fell, stumbled, etc. on oil, grease	12	3	1	2	0	1	1	20	1.3%
overexertion	8	3	2	1	0	1	0	15	1.0%
sudden, unexpected movement, other	7	4	2	0	0	1	0	14	0.9%
bodily function/sudden movement, e.g., sneezing	5	5	0	0	0	1	0	11	0.7%
caught in or crushed by materials	5	4	1	1	0	0	0	11	0.7%
defective/malfunctioning equipment	7	2	2	0	0	0	0	11	0.7%
sudden/unexpected movement of vehicle	2	1	0	0	5	0	1	9	0.6%
slack adjustment during switching operation	4	3	2	0	0	0	0	9	0.6%
assaulted by other	0	4	0	0	0	3	0	7	0.5%
caught in or compressed by power hand tools	1	0	0	6	0	0	0	7	0.5%
other impacts-on track equipment	3	2	1	1	0	0	0	7	0.5%
ran into object/equipment	5	0	1	1	0	0	0	7	0.5%
sudden/unexpected movement of material	3	1	2	0	0	0	1	7	0.5%
on track equipment, other incidents	5	1	1	0	0	0	0	7	0.5%
caught in or compressed by other machinery	2	2	0	0	0	0	1	5	0.3%
pushed/shoved into/against	1	2	1	1	0	0	0	5	0.3%
ran into on-track equipment	2	2	0	1	0	0	0	5	0.3%
struck by falling object	1	1	2	0	0	0	1	5	0.3%
struck by thrown or propelled object	2	0	2	0	0	0	0	4	0.3%
struck by own remote control locomotive controlled equipment	2	0	1	0	0	0	0	3	0.2%
electric shock due to contact with 3rd rail...	2	0	0	0	0	0	0	2	0.1%
repetitive motion-work processes	1	0	0	0	0	0	0	1	0.1%
rubbed, abraded, etc.	1	0	0	0	0	0	0	1	0.1%
bumped	1	0	0	0	0	0	0	1	0.1%
other (describe in narrative)	19	10	9	0	2	0	0	40	2.6%
other	12	7	5	4	0	4	5	37	2.4%
column total	741	401	185	74	44	26	51	1522	
column percent	49%	26%	12%	5%	3%	2%	3%		100.0%

<p align="center">Table J.6 1,522 Severe Injuries by 14 Attributes and 7 Track Locations (cont.)</p> <p align="center">January 1, 1997 to December 31, 2009</p>									
	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
EQUIPMENT LOCATION									
freight car moving	162	27	55	9	0	0	3	256	16.8%
other non-equip	112	65	29	10	6	6	28	256	16.8%
freight train moving	76	97	36	13	1	0	0	223	14.7%
freight train standing	97	70	15	15	0	0	3	200	13.1%
locomotive standing	105	48	13	14	0	3	7	190	12.5%
freight car standing	87	22	28	10	0	0	3	150	9.9%
locomotive moving	49	29	4	2	0	0	1	85	5.6%
pass train standing	16	8	0	0	0	12	0	36	2.4%
pass train moving	3	21	0	0	0	3	1	28	1.8%
auto	6	0	0	0	9	0	2	17	1.1%
van passenger	1	1	0	0	14	0	1	17	1.1%
taxi	0	0	0	0	14	0	0	14	0.9%
pass car standing	6	2	0	0	0	2	1	11	0.7%
loaders, etc.	1	0	2	0	0	0	1	4	0.3%
truck	1	1	1	0	0	0	0	3	0.2%
other equip	1	1	0	0	0	0	0	2	0.1%
other on-track equip standing	1	1	0	0	0	0	0	2	0.1%
crane	0	1	0	0	0	0	0	1	0.1%
other on-track equip moving	0	0	1	0	0	0	0	1	0.1%
other	17	7	1	1	0	0	0	26	1.7%
column total	741	401	185	74	44	26	51	1522	
column percent	49%	26%	12%	5%	3%	2%	3%		100.0%

Table J.6 1,522 Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2009									
	yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
WORKING LOCATION									
beside track	132	61	45	13	2	0	4	257	16.9%
near on-track equip-on ground	141	58	36	11	0	0	5	251	16.5%
in/on loc	94	112	8	16	0	1	4	235	15.4%
on side of car	104	25	42	10	1	1	2	185	12.2%
on end of car	49	15	19	7	0	1	1	92	6.0%
between cars/loc	42	9	7	2	0	0	2	62	4.1%
other location on loc	31	18	4	5	0	0	3	61	4.0%
between tracks	41	6	5	0	0	0	1	53	3.5%
at work station	16	11	0	0	1	10	13	51	3.4%
on track	27	9	2	4	0	0		42	2.8%
on platform	8	14	5	0	0	7	3	37	2.4%
in/operating vehicle	1	1	0	0	34	0	1	37	2.4%
on stairs	10	13	2	1	0	3	5	34	2.2%
on ladder	20	4	2	3	0	0	1	30	2.0%
in car	5	14	1	1	3	2		26	1.7%
on highway-rail crossing	1	11	3	0	3	0		18	1.2%
on bridge/trestle	3	13	1	0	0	0		17	1.1%
other location	11	0	2	0	0	0	3	16	1.1%
under car	1	1	1	0	0	0		3	0.2%
under loc	1	0	0	0	0	0	1	2	0.1%
in tower	0	0	0	0	0	0	1	1	0.1%
other	3	6	0	1	0	1	1	12	0.8%
column total	741	401	185	74	44	26	51	1522	
column percent	49%	26%	12%	5%	3%	2%	3%		100.0%

Table J.6 1,522 Severe Injuries by 14 Attributes and 7 Track Locations (cont.) January 1, 1997 to December 31, 2009		yard	main/branch line	industry	siding	highway/roadway	passenger terminal	other	row total	row percent
TOOLS, MACHINERY, APPLIANCES, STRUCTURES, SURFACES (ETC.)										
ground	237	102	56	19	1	2	1	418	27.5%	
ballast, stones, etc.	82	57	0	10	0	0	4	153	10.1%	
ladder	36	12	14	6	0	0	17	85	5.6%	
step/stirrup, equipment	48	8	7	5	0	0	0	68	4.5%	
floor	14	24	2	3	2	2	4	51	3.4%	
highway, street, road	2	14	3	0	27	0	0	46	3.0%	
grabiron	28	9	4	2	0	0	1	44	2.9%	
stair step	16	16	1	2	0	2	6	43	2.8%	
coupler	30	4	7	1	0	0	0	42	2.8%	
platform	16	6	3	4	0	8	2	39	2.6%	
locomotive, other	15	16	2	5	0	1	0	39	2.6%	
door	14	16	1	0	0	4	1	36	2.4%	
switch	21	3	5	4	0	0	0	33	2.2%	
tie	17	5	3	3	0	0	0	28	1.8%	
baggage	4	1	17	0	0	1	0	23	1.5%	
track (rail)	14	6	1	1	0	0	0	22	1.4%	
motor vehicle, non rail	2	5	2	0	12	0	0	21	1.4%	
bridge/trestle	3	14	1	0	0	0	0	18	1.2%	
chair/seat	4	10	0	0	1	1	1	17	1.1%	
handbrake	11	0	2	0	0	1	0	14	0.9%	
chemicals, fumes, etc.	5	3	4	0	0	0	1	13	0.9%	
hose	7	4	1	0	0	0	0	12	0.8%	
locomotive cab floor	3	6	0	0	0	0	1	10	0.7%	
spike, tie plates, rail fasteners, etc.	2	3	1	0	0	0	0	6	0.4%	
derail		3	2	0	0	0	0	5	0.3%	
end of train device	3	1	0	1	0	0	0	5	0.3%	
lever	2	2	0	0	0	0	0	4	0.3%	
fusees/torpedoes	2	0	1	0	0	0	0	3	0.2%	
window	2	1	0	0	0	0	0	3	0.2%	
caboose	1	1	0	0	0	0	0	2	0.1%	
trailer/container on flat car (TOFC, COFC)	1	1	0	0	0	0	0	2	0.1%	
cable	1	0	1	0	0	0	0	2	0.1%	
rock, other than ballast	1	0	1	0	0	0	0	2	0.1%	
remote control transmitter	2	0	0	0	0	0	0	2	0.1%	
hand tools, striking & nailing, e.g., hammers, mallets	1	0	0	0	0	0	0	1	0.1%	
hose connections	1	0	0	0	0	0	0	1	0.1%	
signal equipment (gates, poles, gaffs, etc.)	1	0	0	0	0	0	0	1	0.1%	
MOW equipment	1	0	0	0	0	0	0	1	0.1%	
locomotive cab seat	1	0	0	0	0	0	0	1	0.1%	
other (describe in narrative)	81	37	38	5	0	2	10	173	11.4%	
other	9	11	5	3	1	2	2	33	2.2%	
column total	741	401	185	74	44	26	51	1522		
column percent	49%	26%	12%	5%	3%	2%	3%		100.0%	

Table J.7. Severe Injuries by Selective Job Codes and Track Locations					
1997 through 2009					
Job Code	yard	main or branch line	industry	siding	TOTAL
TRAIN SERVICE					
Conductor, road freight-608	78	123	15	16	232
Conductor, road freight local-609	67	48	47	17	179
Brakeman, road freight through-612	16	9	8	5	38
Brakeman, road freight local-613	53	35	24	9	121
Conductor, road passenger-606	27	23	0	0	50
Conductor, assist. road passenger-607	7	5	0	0	12
Total for Road	248	243	94	47	632
YARD SERVICE					
Conductor, yard-614	172	17	43	2	234
Brakeman, yard-615	131	14	25	2	172
Switch tender-601	8	4	4	0	16
Total for Yard	311	35	72	4	422
Total for Road and Yard	559	278	166	51	1054
ENGINE SERVICE					
Engineer, road through freight-617	43	77	2	14	136
Engineer, road passenger-616	21	17	0	1	39
Engineer, road local freight-618	24	15	5	4	48
Total for Road	88	109	7	19	223
YARD SERVICE					
Engineer, yard-619	39	7	5	2	53
Fireman, yard-623	1	0	0	0	1
Hostler, outside-603	4	0	0	0	4
Total for Yard	44	7	5	2	58
Total for Road and Yard	132	116	12	21	281
ROAD: TOTAL for TRAIN and ENGINE	336	352	101	66	855
YARD: TOTAL for TRAIN AND ENGINE	355	42	77	6	480
GRAND TOTAL	691	394	178	72	1335

Table J.8 SOFA-defined Severe Injuries by Track Type and Year, 1997 through 2009

Year	Yard	Main/Branch	Industrial	Stings	Highway/Rail Crossing	Passenger Terminal	Other	Total
1997	72	28	23	5	4	1	6	139
1998	66	32	18	12	3	0	6	137
1999	67	31	16	6	4	3	8	135
2000	73	39	18	1	3	4	1	139
2001	73	34	17	9	3	1	3	140
2002	59	35	12	7	2	5	3	123
2003	54	39	8	5	6	0	2	114
2004	47	40	19	3	5	5	4	123
2005	59	39	10	8	2	0	4	122
2006	50	30	11	6	1	1	1	100
2007	57	26	12	4	4	1	6	110
2008	40	17	14	6	4	3	3	87
2009	24	11	7	2	3	2	4	53
								1,522

Table J.9 SOFA-defined Severe Injuries classified by FRA Event Codes, By 12 Event Categories, 1997 through 2009

Event Definition	FRA Event Code (s)	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	total	percent
slip, fell, stumbled, etc.	51, 52, 53, 54, 70	46	45	60	70	47	58	52	41	54	48	53	41	25	640	42.0%
lost balance	34	11	12	13	11	11	9	7	8	4	7	5	2	3	103	6.8%
struck by on-track equipment	59	11	12	5	5	11	8	11	5	8	4	10	8	2	100	6.6%
collision-between on-track equipment	17	10	6	3	3	9	5	8	7	10	6	1	8	1	77	5.1%
struck against object	61	3	9	5	7	7	6	4	4	2	1	3	0	1	52	3.4%
missed handhold, grabiron, step, etc.	35	8	5	6	4	7	5	2	3	3	0	1	2	2	48	3.2%
caught, crushed, pinched, other	68	0	3	2	7	6	4	1	5	4	1	5	2	1	41	2.7%
sudden/unexpected movement of on-track equipment	64	3	5	3	1	2	2	3	3	6	1	2	2	2	35	2.3%
slack action, draft, compressive buff/coupling	50	4	3	5	1	2	2	0	6	2	0	5	0	1	31	2.0%
derailment	21	2	2	2	3	4	1	4	4	2	3	2	2	0	31	2.0%
highway-rail collision/impact	32	2	2	3	5	1	3	2	2	2	3	2	2	1	30	2.0%
ALL OTHER EVENTS	all other codes	39	33	28	22	33	20	20	35	25	26	21	18	14	334	21.9%
		139	137	135	139	140	123	114	123	122	100	110	87	53	1,522	100.0%

Table J.10 1,546 Severe Injuries by State and Year, Ranked by State Occurrence, 1997 through April 2010

#	state	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	JAN- APR 2010	total	cumulative percent
1	TX	14	9	11	17	15	12	10	9	10	8	11	2	1	3	132	9%
2	IL	9	11	10	10	17	9	7	10	8	9	8	8	6	1	123	16%
3	CA	7	10	8	4	13	10	9	10	10	6	5	7	1	1	101	23%
4	OH	7	9	7	6	4	7	8	6	8	7	4	4	5	0	82	28%
5	NY	6	8	6	9	9	5	4	7	5	7	7	2	2	2	79	33%
6	PA	7	5	8	9	5	7	3	5	4	5	5	4	3	2	72	38%
7	IN	6	5	4	6	1	1	6	5	2	5	8	5	2	1	57	42%
8	NE	1	7	1	2	3	0	5	3	8	5	2	1	2	2	42	45%
9	IA	4	4	1	3	6	3	2	3	6	1	2	5	0	0	40	47%
10	KY	7	5	4	2	0	2	4	4	3	3	2	1	3	0	40	50%
11	LA	3	5	2	5	3	5	5	3	2	1	4	1	0	0	39	52%
12	WA	0	3	4	8	4	2	1	3	4	3	3	2	1	0	38	55%
13	WI	9	3	2	5	1	4	3	2	2	2	1	2	1	0	37	57%
14	GA	1	3	3	3	3	4	5	2	5	2	1	1	3	0	36	59%
15	KS	6	3	3	1	4	2	2	1	2	0	4	4	2	1	35	62%
16	MI	1	3	6	4	4	2	1	6	1	1	1	2	1	2	35	64%
17	VA	4	5	1	2	4	5	1	1	3	1	3	3	0	0	33	66%
18	AL	0	4	1	3	1	6	3	2	2	2	4	2	2	0	32	68%
19	MO	1	2	3	3	4	1	3	4	4	5	0	2	0	0	32	70%
20	AR	1	1	4	3	4	3	3	2	3	2	1	3	0	0	30	72%
21	CO	5	0	3	2	3	1	2	1	2	4	4	2	0	1	30	74%
22	MN	4	3	2	2	3	4	0	2	2	1	5	1	0	1	30	76%
23	FL	2	4	4	1	2	0	2	6	3	1	0	3	1	0	29	78%
24	TN	2	0	2	4	3	2	2	4	3	1	1	3	1	0	28	80%
25	NJ	3	0	3	3	4	1	4	1	2	4	1	0	1	0	27	81%
26	OR	3	0	5	1	0	3	3	2	1	2	1	0	2	0	23	83%
27	MA	1	1	2	3	2	4	0	2	1	0	0	1	2	1	20	84%
28	WY	2	3	4	1	1	0	0	0	1	1	3	1	3	0	20	86%
29	AZ	4	0	1	3	0	2	0	2	1	2	4	0	0	0	19	87%
30	MS	4	0	0	1	3	1	0	0	5	1	0	1	1	2	19	88%
31	SC	1	1	3	0	2	2	3	3	3	1	0	0	0	0	19	89%
32	WV	3	0	1	2	2	1	1	0	1	0	2	4	1	0	18	90%
33	UT	1	4	1	1	3	0	1	1	0	2	2	1	0	0	17	91%
34	ND	0	3	3	1	0	1	2	1	2	1	1	1	0	0	16	92%
35	OK	0	2	1	0	4	1	1	1	1	1	2	1	0	1	16	94%
36	NC	0	0	1	2	0	2	3	3	0	1	1	1	1	0	15	95%
37	ID	0	2	2	2	0	1	1	0	0	1	2	1	1	1	14	95%
38	MD	1	3	1	0	0	3	2	0	0	1	1	1	0	0	13	96%
39	CT	2	1	1	1	0	1	1	1	0	0	1	0	1	1	11	97%
40	NV	2	0	1	0	0	0	0	2	0	0	1	2	1	1	10	98%
41	MT	0	0	1	0	2	0	0	2	0	0	2	0	1	0	8	98%
42	NM	1	1	1	1	0	1	0	0	0	0	0	1	1	0	7	99%
43	DE	4	0	0	0	0	0	0	0	2	0	0	0	0	0	6	99%
44	ME	0	3	0	0	0	1	0	1	0	0	0	0	0	0	5	99%
45	SD	0	0	1	2	1	0	1	0	0	0	0	0	0	0	5	100%
46	AK	0	1	0	1	0	0	0	0	0	0	0	0	0	0	2	100%
47	DC	0	0	1	0	0	1	0	0	0	0	0	0	0	0	2	100%
48	NH	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	100%
49	RI	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	100%
50	HI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100%
51	VT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100%

APPENDIX K: EVALUATION OF THE SOFA WORKING GROUP FOR THE IMPLEMENTATION OF SOFA FINDINGS, ADDITIONAL INFORMATION

SOFA IMPLEMENTATION GUIDELINES FOR FIVE MAJOR SAFETY RECOMMENDATIONS

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 averted 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.

The SOFA Safety Forum (SSF) Process

Action Phases	Key Activities	Guiding Questions
Communicate	<ul style="list-style-type: none"> ⇒ Draft press release ⇒ Generate invitee list ⇒ Compose letter of invitation with reply request ⇒ Designate read-ahead materials ⇒ Acknowledge ⇒ Plan follow-up updates 	<ul style="list-style-type: none"> - <i>Who are key stakeholders?</i> - <i>What story will create a buzz?</i> - <i>Who should be included?</i> - <i>Why should invitees reply?</i> - <i>How should prepare attendees?</i> - <i>Who was instrumental and/or whom should be honored?</i> - <i>How maintain attendee interest?</i>
Design	<ul style="list-style-type: none"> ⇒ Set event goals ⇒ Craft event-day agenda ⇒ Design content ⇒ Assign participation and leadership roles ⇒ Arrange/hire facilitators, note-takers, greeters, and any other support staff ⇒ Decide venue needs based on information delivery approach ⇒ Designate support materials necessary for event activities 	<ul style="list-style-type: none"> - <i>How will this event be useful?</i> - <i>How should the event be structured for impact?</i> - <i>Who will be responsible for specific roles?</i> - <i>What are the organizational needs?</i> - <i>What type of venue is needed/doable?</i> - <i>How many and/or what type of rooms are needed?</i> - <i>What materials are integral in support of the activities? How be disseminated?</i>
Capture	<ul style="list-style-type: none"> ⇒ Organize and develop instruments and/or protocols to structure event happens and emerging discussions, etc ⇒ Organize data-collection techniques of proceedings ⇒ Inform participants/attendees of data collection activities ⇒ Obtain participant consent ⇒ Train and collaborate with professionals 	<ul style="list-style-type: none"> - <i>What level of professional support is needed to guide and capture data collection (i.e., event proceedings)?</i> <ul style="list-style-type: none"> - <i>How should proceedings be recorded (i.e., note takers, audio/video-recording)?</i> - <i>What informed consent procedure need/should be implemented?</i> - <i>How should the professionals and leaders be trained/organized to ensure a uniform experience for attendees and event goal achievement?</i>
Analyze	<ul style="list-style-type: none"> ⇒ Transform data (i.e., check/final notes, transform recorded notes, code data, organize themes) ⇒ Identify themes that emerge as patterns through the analysis. ⇒ Identify cross-cutting themes, lessons learned 	<ul style="list-style-type: none"> - <i>How should the data be transformed, organized, and secured?</i> - <i>What approach coding will be used – inductive or deductive?</i> - <i>What themes emerge from the data?</i> - <i>What themes are common across themes?</i>

SOFA Safety Forum Group Discussions Themes with Illustrative Quotations

I. Issues related to findings, explanation/context for findings

Changes in work force

- *More inexperienced people*

I think it's fair to say that there are a lot more people with less experience due to the heavy hiring in the industry from 2001 and beyond, as opposed to the 1990s.

[We] went through massive hiring and just threw people out there.

(Talking about apprenticeship)...3 months experience now he's a conductor. I was on a crew one night 6 main tracks, 3 guys and a student with me. One guy had 4 months, the other 2 months, and the student.

Just looking down the list, three (3) [individuals] were in their 30s, one was in 50s, but only on for a short time. Is there a trend with the railroad being younger or because they are new?"

- *Smaller crews*

When I think of mentoring, I think of when I entered the workforce, back when there was a 5 man crew. There was always someone watching you, telling you what to do. It's totally different now

One of the problems we have now is that the way institutional knowledge is passed on, that framework doesn't exist anymore. (Story about how they used to put a white armband on a new guy so everybody in the yard knew he was new.) Tougher to do when crew sizes get smaller and more spread out.

- *Less cohesion*

More of a cultural thing I think. We used to be a family. We used to have a family cookout every summer. My dad was a UTU general chairman. We used to have a family cookout. It was a big party. Those days are long gone.

- *More turnover/changing of positions*

In urban railroads, there are so many people to interact with. In rural railroads, there are a lot of people that stick around, and you development a relationship.

Exasperates issue our inability to lock people in the area they've been trained. Yard guys becoming utility people, brakeman switchers. . . .All the training that we do is going to be lost because of that turnover that will continue to occur. Makes it an incredible challenge to lock someone in who has the knowledge and awareness because it's you today, and someone else tomorrow.

Railroad culture

- *Individualistic/male culture*

Uncommunicative

Lack of communication can be put into every case...not weighted to go down...almost out of your way not to [communicate]. It [reporting the job briefing was a cause to an accident] is another way not to say not communication.

The reason I ask, sometimes the job briefing doesn't occur [because of the culture and veteran railroaders feeling like], "Get out of my face newbie."

Not wanting to show lack of knowledge/experience, especially among newer workers

The new guy may want to improve himself; job briefing is reaching out for help and pride (maybe) getting in the way.

Workers not wanting to tell other workers what to do

Before SOFA experience I thought that was the end of my interaction, I wasn't going to tell the conductor how to do his job.

We are a very male-based culture...males don't like being told what to do.

Work as individuals not as a team

Ok son, you let your brother do his chores; you do yours [talking about how things are commonly done].

- *Pressure to hurry/get the job done*

Was there any pressure from the dispatcher, if the trains were stopped on both sides, pressure from the dispatcher (too move quickly and get the job done)...all adds to anxiety to conductor to get stuff done.

In that case [boy who fell in wood-chipper], through statements we know that this was a place where people had been known to say, if you've never been here before, watch out, especially at night. No lights. Not set out. He said, 'I should have told him. It was just, we were in a hurry, I want to get back. I told him to stay put.'

We can't wait until the last minute in our culture.

We don't know the kind of pressure. Sometimes there's a price to pay if you stop the train and wait for proper action.

The new employee is willing to take risks to satisfy customer. They are walking on pins and needles trying to please customers and doing things you wouldn't do [if you were already experienced].

- *Risk-taking*

Got away with it before, thinks a severe or fatal incident will not happen to them

You're talking to someone who's correct because it won't happen to them. It's 28 years before statistically there is a chance of something happening to them.

Not just an issue with young employees; it is bigger issue with more experienced employees. For example, we lost a 43-year-old switchman with 23 years experience; the brakemen was with him. His mate stood there watching it all happen. Probably did it a thousand times and got away with it a thousand times.

Guys get into these habit patterns thinking, “I get away with it now; I get away with it tomorrow; I get away with it in a few years.”

Unsafe practice becomes standard procedure; sometimes no good alternative

An employee rode on side, next to building, there was a sign saying close clearance, “Do not ride.” He was riding on that side; the train rode up on snow, derailed, and pinned him. He was crushed against the door. He was an experienced conductor. We interviewed every switchman in that yard, and every switchman rides on that side because we had about three inches elevation on the track. If rode outside they were leaning back, so more comfort on inside, also see down building to see if ramps to cars. Everyone knew to do it that way even if they’re not supposed to.

Certain behaviors are witnessed safely and continues to be the way things are done. . . .The crews come up with their own safety approaches. . . .They realize too late.

Tolerance of unsafe conditions

They weigh the risk...they think they’re smarter than the rule.

Routine leads to lack of caution, complacency about risk

Complacency is the hardest...doing the same thing every day. Because tasks are specific, they’ve gone through it (over and over again), time as shown, year after year, the day that they(the workers) lays off (the importance of the job briefing) and you don’t do a thorough job briefing, that is how stuff happens.

Training/Education Problems

- *Inappropriate trainers/mentors: inexperienced or interested/skilled at training*

The trainee was very young. Trainee was with a guy who had just been a trainee, but was now 6 months into his career. When you watch the video, you can see. The conductor walks to the switch, excited to be teaching the trainee, talking to the trainee, reaches down and lines the wrong switch. He should definitely not have had a trainee. Need a mentor who has the capability, experience, knowledge to be a trainer.

I know we’ve done some accident investigation and found that a locomotive engineer who was being a trainer was the wrong personality to do it. That’s common in the industry. I don’t know how to make sure of it, but it’d be ideal to match a trainee with a person who enjoys training and helping people.

- *Emphasis on rote learning rather than OJT*

In learning the rules by memorization, everyone can do that, that’s what you have, then you go out in the field, and even though they scored 100s on their tests, it’s only memorized. If it’s not used and you don’t see that issue, you lose it.

- *Punitive rule enforcement*

Been in situations where I don’t know what I’m doing and I was tested, screwed up, then told how to do it. That knowledge escapes my mind because I was too focused on passing the test.

Our guys are telling us, “I can’t do my job because I’m too worried about the guy sitting there watching me.”

Sometimes management uses safety as a tool of discipline (contractual dispute), but it should be used to save lives.

- *Ingrained bad practices passed on*
You don’t have trained instructors out there, but there’s no standardization, old heads teach and then you’ve got to try and correct those bad habits.

Industrial Site Problems

- *Physical issues*
Industrial sites not up to standards/unsafe
We have grandfathered a lot of conditions because they were there before we were aware of what clearance looks like...we have developed new standards...unfortunately bulk of U.S. industry has been built and there’s a lot to correct.

Tells a story of a guy who was asked why he fell into a pit. He said there was no physical barrier.

High cost to upgrading to safe standards

If this is going to cost more than 6 million to change it, it’s not worth it, that’s the DOL statistic. [DOL statistic is that a human life costs \$6 million.]

- *Communication issues*
Changes made without notifying railroad
I see under comments on M504, we see unauthorized startup of machinery, so apparently there was a reference to the physical plant. As I remember, they had asked the people of the plant not to start it up at that hour.

This was a cement plant, they move coal into another timber, hoppers drop down. Local comes back to gather loads and leaves. This was already a close clearance but with conditions changing. Static close clearance you do a pretty good job marking, clearing. You have industries where they do changes to the dock.

Managers/owners not told about safety problems

Why don’t we send a letter from the railroad reminding them of all these places where there’s a state law and you have a lease agreement where you have to comply? Letter never went out (didn’t want to offend customers).

Managers and supervisors are not aware of safety hazards. Unless we go in and see what the hazards are, we can’t do anything about it. Unless we tell the owner, the crew members don’t tell the managers [or owners].

II. Action Recommendations from Findings

Programs that promote cultural change

- *Establish group-oriented culture*

Need to get people to look out for each other, care for each other.

By the same token, you have great stats as far as low-accident rates on both accident and injury side—really low compared to the rest of the industry. When you see that environment, you know you have a good thing going. It's not one nice package. It's the leadership and an inspired workforce, they like coming in to work. Superintendent, case in point, kind of person that goes to the crew room and starts talking about what their issues are, and knows them, and takes an interest in their life and knows about their family. How do you duplicate that everywhere? Comes back to behavior and culture. Are we, across the system, doing those things that inspire that kind of behavior?

Never rely on one point for protection from failure. . . .It boils down to one guy doing the right thing.

- *Communication Change*

Focus on changing communication from orders to discussion

how do you get from job briefing to job discussion...to the next level... you get a response and answer- people listen.

Best practice (would be) to get everyone engaged in conversation and discussion.

Peer to peer communication. Peer culture being able to talk (to each other).

That'll change the culture, that works, that's a win. Got to do it (double checking) from peers.

Programs that force communication. TBP makes it a rule you cannot dismount your cut without alerting the dispatcher. . . .The practical result is crews are finding ways not to foul. . . .TBP is enacted about 50 times a day. . . .We're thinking about moving it to the yard. . . .People are using it and it is well received.

- *Leadership buy-in*

It's about leadership. How effective leadership is makes the difference.

It's a cultural shift- how did you know when you worked on the railroad what was the right thing?" "Because my boss told me" Luckily what is important to your boss becomes important to you.

Improve training programs

- *Non-punitive training*

Cant' be playing the "I gotcha" (game). It shouldn't be about someone noting what you're doing wrong, and pointing out what you're doing. Needs to be an education process, not a "gotcha" process, or a discipline thing.

They go out, spend their day, we pay them every week to take a day off and they do observations and take score cards and measure compliance. If there is non-compliance, they interact with

employees. We have reduced resistance between management and craft employees. Have employees mentoring each other. No name, no blame. That's become the slogan.

- *Focus on OJT (on the job training)*

Big issue for me, being a new hire on the ground as switchmen, when I had old heads come to me, very rarely, and say you are doing that all wrong, stop, let me show you. You learn so much better in that type of environment. On the management side, I've been fortunate. Had a manager come up to me and show me how to do it. Makes you a lot more receptive to that kind of situation.

Don't just tell me how to do it, show me.

- *Skilled and experienced trainers*

First thing we did was set up a lot more structure about who a trainee can be with. There are designated trainers. If one of those trainers marks off, we take the trainee off the assignment. We don't have this case where a trainee shows up and the trainer had to be off, so here's a guy with 6 months experience to teach you.

Then you need to find someone who wants to train, and not only wants to, but can train. That's a personal trait regarding whether this person is ideally suited.

You could assign people certain tasks, like railroad coaches, you have 20 coaches to handle the flow of new hires to come in.

Program Implementation and Evaluation

- *Find and bring successful programs to all sites*

That's a success story. Statistics don't lie. I appreciate you guys sharing all this, but one thing that disturbs me is that this is a success story that should be moved. If you've seen success in trying to change these things, get it out there. Roll it out.

- *Use SOFA reports*

It seems like, significant delay from what SOFA does, information it puts out and getting it out to front line employees. Delivering it in a way that they (the workers) actually put themselves in that position. They need to realize that these (accidents) could happen to them...you read a few sentences (from the job briefing about an incident)...but does that really reach people like it used to? Having that (information from SOFA) accessible and in a timely manner.

- *Get needed information from non-punitive reporting programs*

The C3RS sponsored by FRA is a confidential way to report close calls. A small committee went to North Platte and reviewed those cases. The employee would turn something in and receive immunity from punishment by FRA. Would be sent here, confess his sins, go through an interview process with three people here. Those people would send a report back to North Platte. Derailments were cut in half.

If a person gets in a situation where they say 'let's stop and figure this out' or don't want to go on the track because can't see a foot in front of them. . . .If we have a no retaliation clause, we shouldn't go back and hammer these people for standing up for what they thought was right at the time.

- *Check for success of programs*

We surveyed our employees. The perceptions of what is fact versus perception was very telling from our survey. As we implement our program we go back and survey. . . .Feedback from employee. Anonymous surveys.

Use the fatality in Indiana, terrific job training aids, you use it when you're new...unless they reviewed it or we create a mechanism to make sure they reviewed it. Now you've got to create some communication process so that we make sure you've done it.

Industrial site solutions

- *Get information about hazards through site visits and safety hotlines*

Even when you talk about industry situations. We must make sure we view [the facility] ourselves. Make sure we provide a safe environment for them.

We (ASLRRA) go inspect the site and say, "You need ties, you need this, etc." And then the inspector comes back and stops the railroad due to safety.

Several railroads like BNS UP have safety hotlines, you call up and say we have a safety hazard out there and the managers have to say, "What do we do to correct that hazard?"

- *Communicate with ownership/management*

Had one situation where built place too close to rail, I called guy at plant and guy said, "I didn't know it was too close." He calls back, "I fixed it." He took a concrete saw and cut off the area. I'm convinced if you just alert the customer there's a problem some of it can be addressed. Elevator incident, called him he says, "gee I wish I'd know that was a safety hazard."

Has there ever been an effort coming out of SOFA to begin to communicate among the broader group?" [% list recommendations], "Things like customer safety handbook; anything that came from SOFA would be useful or reports. Potential of something not too industry specific.

[Ask] industry to make recommendations before they make change to the physical structure, [as in] please contact us (railroad industry) to make sure it complies.

- *Make physical changes, don't just post warning signs*

That's why our employees wear reflective vests...engineer would have seen him. . . .This is the accident why we wear reflective vests.

There are so many things we can address rather than just warning.

Lights and vests ought to be mandatory.

Lighting is also essential. [All agree.]

SWG Stakeholder Engagement Efforts since the SOFA Safety Forum, February 25, 2010

Outreach activities, specifically presentations, to those organizations most directly affected were as follows:

March 18: SOFA presentation on the five major findings to the full RSAC in Washington, D.C.

May 4: SOFA presentation on the five major findings to the ASLRRA at their Conference in Orlando, FL.

June 15: Teleconference call with Snow, Coplen, Connors, and Gallant—early discussion on the Implementation piece.

June 16: GoTo meeting with SWG hosted by the AAR in Washington, D.C. Intent was to prepare for our Kansas City SWG meeting.

July 26: SOFA presentation on the five major findings to the UTU “ballast level” folks in the morning and another presentation to the UTU Leadership in the afternoon at their Western Regional Conference in Phoenix, AZ.

August 9: SOFA presentation on the five major findings to the BLET membership (over 150 attendees) included both “ballast level” folks and BLET Leadership at their Eastern Conference in Pittsburg, PA.

August 23: SOFA presentation on the five major findings to the UTU “ballast level” folks in the morning and another presentation to the UTU Leadership in the afternoon at their Eastern Regional Conference in Asheville, NC.

August 26: SOFA presentation on the five major findings to the FRA Operating Practices Division at their Multi-Discipline Conference in Denver, CO.

August 30: GoTo Meeting with SWG hosted by the AAR in Washington, D.C. Intent was to prepare for our San Francisco, CA. SWG meeting.

September 10: GoTo meeting with many members of the AAR, hosted by the AAR at their Washington, D.C. offices. The SOFA presentation on the five major findings was presented including a question and answer period.

September 21: A SOFA Safety Forum-West where the SWG presented the SOFA presentation on the five major findings, discussed some examples, talked about effective implementation going forward and finished with a question and answer period in San Francisco, CA.

October 6: SOFA presentation to UTU Western General Chairman’s Association in Cleveland, OH.

Many presentations began by emphasizing four important elements of the SWG:

- 1) *We are not the FRA SWG, nor the UTU SWG, nor the AAR SWG. We are an independent Working Group dedicated to identifying commonalities among switching fatalities that may lead to findings, that may lead to actions that, if properly implemented by the industry, will reduce fatalities during switching operations to zero.*
- 2) *Therefore, SWG is an independent, VOLUNTARY, experienced group of professionals, wherein each member is focused on one goal—elimination of switching fatalities—each member has a dog in the fight.*
- 3) *SWG is not, NOT affiliated with RSAC, an RSAC WG, or the RSAC process.*
- 4) *SWG makes its own arrangements for its own meeting rooms. Each member hosts a SWG meeting and makes the arrangements for that meeting. We are extremely aware of cost issues.*

Appendix L



U.S. Department
of Transportation
**Federal Railroad
Administration**

An Evaluation of the Switching Operations Fatality Analysis 2010 Working Group's Processes

Office of Research
And Development
Washington, DC 20590

DOT/FRA/ORD-09/23

November 2009

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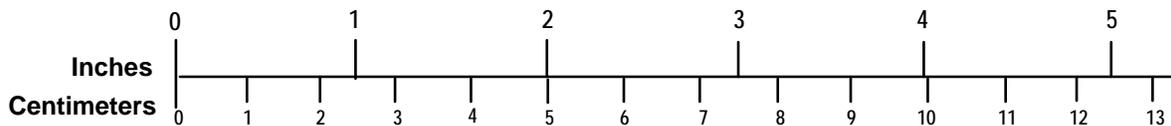
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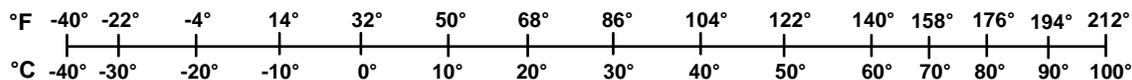
METRIC TO ENGLISH

<p>LENGTH (APPROXIMATE)</p> <p>1 inch (in) = 2.5 centimeters (cm)</p> <p>1 foot (ft) = 30 centimeters (cm)</p> <p>1 yard (yd) = 0.9 meter (m)</p> <p>1 mile (mi) = 1.6 kilometers (km)</p>	<p>LENGTH (APPROXIMATE)</p> <p>1 millimeter (mm) = 0.04 inch (in)</p> <p>1 centimeter (cm) = 0.4 inch (in)</p> <p>1 meter (m) = 3.3 feet (ft)</p> <p>1 meter (m) = 1.1 yards (yd)</p> <p>1 kilometer (km) = 0.6 mile (mi)</p>
<p>AREA (APPROXIMATE)</p> <p>1 square inch (sq in, in²) = 6.5 square centimeters (cm²)</p> <p>1 square foot (sq ft, ft²) = 0.09 square meter (m²)</p> <p>1 square yard (sq yd, yd²) = 0.8 square meter (m²)</p> <p>1 square mile (sq mi, mi²) = 2.6 square kilometers (km²)</p> <p>1 acre = 0.4 hectare (he) = 4,000 square meters (m²)</p>	<p>AREA (APPROXIMATE)</p> <p>1 square centimeter (cm²) = 0.16 square inch (sq in, in²)</p> <p>1 square meter (m²) = 1.2 square yards (sq yd, yd²)</p> <p>1 square kilometer (km²) = 0.4 square mile (sq mi, mi²)</p> <p>10,000 square meters (m²) = 1 hectare (ha) = 2.5 acres</p>
<p>MASS - WEIGHT (APPROXIMATE)</p> <p>1 ounce (oz) = 28 grams (gm)</p> <p>1 pound (lb) = 0.45 kilogram (kg)</p> <p>1 short ton = 2,000 pounds (lb) = 0.9 tonne (t)</p>	<p>MASS - WEIGHT (APPROXIMATE)</p> <p>1 gram (gm) = 0.036 ounce (oz)</p> <p>1 kilogram (kg) = 2.2 pounds (lb)</p> <p>1 tonne (t) = 1,000 kilograms (kg) = 1.1 short tons</p>
<p>VOLUME (APPROXIMATE)</p> <p>1 teaspoon (tsp) = 5 milliliters (ml)</p> <p>1 tablespoon (tbsp) = 15 milliliters (ml)</p> <p>1 fluid ounce (fl oz) = 30 milliliters (ml)</p> <p>1 cup (c) = 0.24 liter (l)</p> <p>1 pint (pt) = 0.47 liter (l)</p> <p>1 quart (qt) = 0.96 liter (l)</p> <p>1 gallon (gal) = 3.8 liters (l)</p> <p>1 cubic foot (cu ft, ft³) = 0.03 cubic meter (m³)</p> <p>1 cubic yard (cu yd, yd³) = 0.76 cubic meter (m³)</p>	<p>VOLUME (APPROXIMATE)</p> <p>1 milliliter (ml) = 0.03 fluid ounce (fl oz)</p> <p>1 liter (l) = 2.1 pints (pt)</p> <p>1 liter (l) = 1.06 quarts (qt)</p> <p>1 liter (l) = 0.26 gallon (gal)</p> <p>1 cubic meter (m³) = 36 cubic feet (cu ft, ft³)</p> <p>1 cubic meter (m³) = 1.3 cubic yards (cu yd, yd³)</p>
<p>TEMPERATURE (EXACT)</p> <p>$[(x-32)(5/9)]\text{ }^{\circ}\text{F} = y\text{ }^{\circ}\text{C}$</p>	<p>TEMPERATURE (EXACT)</p> <p>$[(9/5)y + 32]\text{ }^{\circ}\text{C} = x\text{ }^{\circ}\text{F}$</p>

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EXECUTIVE SUMMARY

This report documents the evaluation of the processes used by the Switching Operations Fatality Analysis (SOFA) 2010 Working Group to analyze the 54 fatalities in switching operations that occurred from January 2004 to November 2009. Utilizing accepted professional standards for evaluation, the evaluation team concluded that the SOFA analyses are systematic, rigorous, comprehensive, and objective. Furthermore, the findings of the SOFA 2010 Working Group are valid, significant, and worthy of the railroad industry's thoughtful attention and bold response. These conclusions are based on the following observations:

1. The SOFA Working Group is appropriately constituted
2. The SOFA Working Group is cohesive and resistant to political influences
3. SOFA 2010 is explicitly designed for utilization
4. Information analyzed by the Working Group was complete, sound, and varied
5. SOFA case analyses are meticulous
6. The Working Group reaches consensus on key conclusions about each case
7. Aggregation of SOFA case data was rigorous
8. The SOFA Working Group practices continuous improvement
9. The process evaluation was thorough and independent

1. INTRODUCTION

Since early 2009, the Switching Operations Fatality Analysis (SOFA) Working Group has been preparing for its third major report, to be released in 2010. The Working Group has applied its tools and processes for analyzing train yard tragedies, refined over its twelve years of experience, to the 54 fatalities that occurred since January 2004. At the same time, the Working Group has worked diligently to ensure widespread and effective use of its 2010 findings to achieve the goal of zero switching deaths. The group has reviewed successes and disappointments from its past efforts, called upon evaluation professionals for guidance, and employed principles of utilization-focused-evaluation¹ to inform their work.

The evaluation team has examined SOFA against accepted professional standards for evaluation.^{2,3} We have found the Working Group's methods appropriate and its findings valid. We offer this report first, to highlight the credibility of SOFA findings, and second, to document how SOFA works for the benefit of other similar initiatives that may draw on SOFA's lessons.

1.1. Background

The SOFA Working Group first convened in February 1998 in response to a letter from a senior official of the Federal Railroad Administration (FRA) to industry leaders. The letter expressed concern that over the prior six years, 66 train and engine service employees had been fatally injured in incidents *other than* major train collisions, and called for a task force consisting of representatives from labor, management, and FRA to find a way to prevent these tragic occurrences. The letter went on to say:

“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 findings and recommendations from this team are neither intended to be used in a rulemaking process nor 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 . . .”

1.1.1. SOFA 1999

The SOFA Working Group met almost monthly for 20 months to analyze the 76 fatalities that occurred to railroad employees engaged in switching operations from January 1, 1992 through July 1, 1998. As their work proceeded, the group learned that:

¹ Patton, M.Q. (2008). *Utilization-Focused Evaluation* (4th ed). Thousand Oaks, CA: Sage.

² Joint Committee on Standards for Educational Evaluation (1994). *The Program Evaluation Standards*. Thousand Oaks, CA: Sage.

³ American Evaluation Association (2004). *Guiding Principles for Evaluators*.
<http://www.eval.org/Publications/GuidingPrinciples.asp>

- The summary reports prepared by FRA investigators alone were not sufficient; to understand the underlying causal factors required reviewing entire case files, including photographs of the site and statements of eye witnesses.
- To find trends and patterns across cases, the Working Group needed a codified database of standardized information. One was developed and continues to evolve.
- While FRA investigation reports tried to establish a single probable cause, fatalities more often resulted from the coming together of a complex set of factors. The SOFA process turned to possible contributing factors rather than probable cause and accommodated more than one factor per case.
- Shortly after beginning their evaluation process, the SOFA Working Group accepted Human Factors support offered by the Office of Research and Development at the FRA and the Volpe National Transportation Systems Center. This assistance proved valuable to the development of systematic and rigorous processes for analyzing individual cases and synthesizing across cases.

The *SOFA Report: Findings and Recommendations of the SOFA Working Group*, released in October 1999, identified 5 Operating Recommendations, later shortened to *5 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.

The report offered additional recommendations to the industry concerning:

- Unexpected train movement
- Crew resource management

Finally, the report recommended the following to the SOFA Working Group and FRA:

- 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

All of the last set of recommendations were carried out, including the publication of SOFA's *Severe Injuries to Train and Engine Service Employees: Data Description and Injury Characteristics*, published in July 2001.

1.1.2. SOFA 2004

The SOFA Working Group continued to meet from time to time. *Findings and Recommendations of the SOFA Working Group: August 2004 Update* was based on the expanding database that added to the original 76 switching fatalities another 48 that occurred between July 1998 and December 2003. The five Operating Recommendations (*Lifesavers*) were further validated. The 2004 report also identified Ten Special Switching Hazards:

- Close clearance
- Struck by mainline trains
- Free rolling railcars
- Employee tripping, slipping, falling
- Unsecured cars
- Unexpected movement of railcars
- Equipment issues
- Struck by motor vehicle or loading device
- Drugs and alcohol

1.1.3. Ongoing Efforts to Promote SOFA Recommendations.

In addition to reviewing fatalities and issuing reports, the SOFA Working Group and others have used a variety of means to educate and motivate the railroad industry, from carrier leaders to workers at the ballast level, to take the necessary actions to ensure safety in switching operations. For a time, the FRA Administrator held monthly conference calls with carrier, labor, and FRA leaders to hear what steps they had taken. The Working Group members took every opportunity to speak publicly about SOFA, and to reinforce its messages privately. It examined and encouraged further inquiry into promising safety technologies. A goal of zero switching fatalities was announced. A memorandum, *Best Practices Guidelines for Implementing Operating Operations* (March 2000), was issued to encourage education and a positive, judicious approach to implementation and to discourage use of the Operating Recommendations as a basis for discipline. There were occasional Safety Alerts when new hazards were identified. A SOFA video was produced and distributed, and a web site was created. The railroad industry took the lead in creating Crew Resource Management, a generic training program for train and engine employees. The 5 *Lifesavers* were printed and distributed nationwide on hats, pens, wallet-size cards, refrigerator magnets, stickers, and switch-list covers.

The Volpe Center has kept the SOFA Working Group and others current on trends in switching operations fatalities by issuing quarterly reports of the number of deaths that appear to be related to SOFA's 1999 and 2004 findings.⁴ The 3rd Quarter 2009 report concluded that *fatalities*

⁴ "Switching Fatality and Severe Injury Updates" are compiled on the basis of investigation reports, without the benefit of the SOFA Working Group's analyses, and should therefore be regarded as preliminary.

related to Operating Recommendations have dropped substantially since SOFA began, although hazard-related fatalities have not.

1.1.4. SOFA 2010

The SOFA Working Group was reconvened in January 2009 with the charge to analyze switching operation fatalities that occurred after December 2003, add them to the database of fatalities between 1992 and 2003, and issue an updated report in early 2010. As of November 1, 2009 there were 54 new fatalities, bringing the total to 178 – an average of ten per year.

Despite extensive efforts and evident successes, the 2010 Working Group was dissatisfied with SOFA’s effectiveness. The goal of zero fatalities had not been achieved. There was a sense that attention to the *5 LifeSavers* and 10 Special Switching Hazards had waned since the fanfare surrounding their introduction. The group was particularly concerned that SOFA’s recommendations had been lifted up as *special* rules—whose violation is often treated as especially egregious—rather than as a special focus on education and collaborative problem-solving. The hope of achieving deep systemic shifts toward organizational cultures where safety takes precedence over productivity had not been realized. To a person, Working Group labor representatives said that, as a result of SOFA participation, they had become far more attuned to safety issues and had substantially changed their behaviors when back on the job. Yet, how to meaningfully extend their personal awakenings to colleagues throughout the industry remained unclear.

“A chart is not going to wake anyone up. I’m not saying to show pictures of corpses, but just talk about how bad it could be and that it is your choice. These images and discussions here helped me change. Because of what I learned here, it woke me up.”

“How many cases have we had that people ran with a pin lifter? I did that for years, but I didn’t know that was a SOFA recommendation. Sure, maybe someone told me not to do it, but until I served here and read the cases, I didn’t realize the importance that this recommendation is followed.”

With these disappointments in mind, the Working Group invited a professional evaluator to its February 2009 meeting to facilitate conversation about how to attain greater and more lasting impact with the 2010 report. The group engaged in a logic modeling process to clarify the outcomes it hoped to achieve (See Appendix A). This exercise led to three important conclusions:

- SOFA had been fairly successful in getting the message of railroad safety out, but the findings and recommendations were too seldom utilized effectively.
- The credibility of SOFA’s processes and findings would be key to subsequent use and implementation of the 2010 report.
- Use would depend not only on the report itself. Various ways of engaging stakeholders held promise of escalating the report’s effectiveness, and planning for utilization needed to begin well in advance of the report’s release.

The present report is one element of the emerging utilization strategy for SOFA 2010.

2. SOFA PROCESS EVALUATION

The SOFA 2010 Working Group submitted itself to the scrutiny of five seasoned evaluation professionals, the authors of this report (See Appendix B).⁵ The evaluation team was first formed for two purposes: (1) to advise the SOFA Working Group on ways to encourage effective utilization of SOFA findings, and (2) to assist in the preparation of the 2010 SOFA report. As our work with the Working Group evolved, two additional purposes emerged. It became clear that SOFA represents an exceptionally systematic and comprehensive model—one that may well serve as an exemplar for other initiatives in the railroad industry and even beyond. Thus, this process evaluation report was also conceived as a way of: (3) highlighting the credibility of SOFA findings, and (4) documenting how SOFA works for the benefit of other similar initiatives.

We concluded that the SOFA analyses are systematic, rigorous, comprehensive, and objective. *The findings are valid, significant, and worthy of the railroad industry's thoughtful attention and bold response.* We base these claims on the following:

1. The SOFA Working Group is appropriately constituted
2. The SOFA Working Group is cohesive and resistant to political influences
3. SOFA 2010 is explicitly designed for utilization
4. Information analyzed by the Working Group was complete, sound, and varied
5. SOFA case analyses are meticulous
6. The Working Group reaches consensus on key conclusions about each case
7. Aggregation of SOFA case data was rigorous
8. The SOFA Working Group practices continuous improvement
9. The process evaluation was thorough and independent

The balance of this report elaborates upon each of these conclusions.

2.1. The SOFA Working Group is Appropriately Constituted

The 2010 SOFA Working Group consists of eleven members representing carrier management, labor, and FRA. Members are appointed by their respective organizations:

- Association of American Railroads (1 member)

⁵The evaluation team and its methods are described later, under the heading, “The process evaluation was thorough and independent.”

- American Short Line and Regional Railroad Association (2)⁶
- Brotherhood of Locomotive Engineers and Trainmen (3)
- United Transportation Union (3)
- Federal Railroad Administration (2)

Collectively, the Working Group brings 359 years of railroad experience while ranging in age from 26 to 65. Two members were on the 1999 and 2004 SOFA Working Groups and one additional member participated in 2004, thereby bringing continuity to the process.

Members are selected not only for their experience, but also for analytic, communication, and teamwork skills—important factors in their collective success as a working group.

2.2. The SOFA Working Group is Cohesive and Resistant to Political Influences

The SOFA Working Group is highly cohesive, and its members are adamant in claiming this as instrumental to SOFA's success. A shared commitment to the importance of the work—saving lives—has pulled the group through some taxing conflicts. The Chairman's skillful leadership has helped cultivate productive group norms of persistent questioning and spirited debate, balanced by mutual respect and ego containment. Other unwritten rules include:

- Working Group members leave their sector allegiances at the door. Getting to the truth of each case trumps protecting turf.
- All SOFA deliberations are private within the group. What's said in the SOFA meeting room is to stay in the SOFA meeting room.
- SOFA members enjoy the backing of the organizations they represent. Their leaders respect the confidential and collaborative nature of the work and refrain from interfering with the group's deliberations and conclusions.

Most notably, SOFA has succeeded where many others have failed by overcoming the traditional adversity among labor, management, and regulators, deeply ingrained in the railroad industry, to achieve quality collaborative work:

"It's a good, collaborative group. The operations work well... We are dealing with real people, and everyone is allowed to express their opinion. It is an effective process, and it does a very good job of getting to the root causes and contributing factors of these accidents. I was surprised to see how much information was provided by the field investigators. They do very comprehensive work that gives us a chance to do a real evaluation based on the facts, which have survived through the whole investigative process."

The Working Group seemed pleased by an evaluation team member's mention that it took all morning of the first day of observation for her to tell who was who—that is, to distinguish

⁶ Two members of the ASLRRA rotate attendance of SOFA meetings, which means that at any given meeting, carriers are represented by two people, labor by six, and FRA by two.

among the management, labor, and government representatives; and further, it was based on their stories, not how they looked or spoke, the opinions they expressed, or the positions they took.

Yet another indicator of the SOFA Working Group's camaraderie is that eight former members, now retired, traveled at their own expense to the September 2009 meeting to reunite with their colleagues. While there, they donated several hours to participate in utilization planning for SOFA 2010.

2.3.SOFA 2010 is Explicitly Designed for Utilization

As mentioned previously, SOFA 2010's second meeting focused on utilization of the report that would be released a year hence. The logic modeling exercise aided in reflecting on past practices and bringing use to the forefront. Throughout the year, the Working Group drew in experts to aid in thoughtful reflection on what worked before, what did not, and how things have changed since 1999.

A pivotal point occurred at the September 2009 meeting. Amid concerns that past SOFA recommendations had been instituted as rules, an alert observer noted that recommendations were written in a way that read like rules: *"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."*⁷ Even when translated into the more user-friendly Lifesavers, SOFA recommendations can still be read as rules: *"Discuss safety at the beginning of a job or when a project changes."*

This insight contributed to the decision to engage the report's intended users in interpretation and decisions for action, thereby deepening their understanding of the implications of the findings. Planning turned toward involving labor, management, and government in a collaborative examination of the data beyond the confines of the SOFA Working Group.⁸

Among other advantages, this utilization-focused approach would recognize that solutions are best formulated in context, and acknowledge that the best fix for a given problem would likely vary from carrier to carrier and site to site.

2.4.Information Analyzed by the Working Group was Complete, Sound, and Varied

By "complete," we mean that *all* fatalities within SOFA's scope are analyzed.

As one would expect, a SOFA case begins with a fatality—Specifically, the accidental death of an on-duty train or engine employee while performing switching operations. All railroad-related deaths are reported immediately to the National Response Center, which alerts the Team Leader of FRA's Accident Analysis Branch (who is also the SOFA Chairman). Cases are assigned to one of FRA's eight regions for investigation. The region appoints one or more FRA investigators to go to the site as soon as possible to begin work. Teams are preferred; in the case of a

⁷ Recommendation 3

⁸ As of this writing, details of this plan are still in development.

switching operation death, the SOFA Working Group prefers that the Inspector in Charge be an Operating Practices Inspector or another inspector trained in human factors.

Investigation protocols are spelled out precisely and clearly in FRA's 101-page *Accident Investigation Guidelines: General Compliance Manual, Part IV, Chapter 9* (2006). The process is complex and thorough. FRA investigators interview virtually everyone with first-hand knowledge of the case. They examine the site and equipment involved, and consult records, photos, maps, etc. When necessary, FRA investigators may subpoena witnesses, require the production of records, exhibits, and other evidence, administer oaths, and take testimony. A given case may involve collaborating with local law enforcement and emergency response authorities, state and local investigators, the National Transportation Safety Board, and/or the Occupational Safety and Health Administration.

Investigation reporting forms are long and detailed. They involve narratives as well as checklists and fill-in-the blank items, and conclude with the investigation team's conclusions regarding probable cause and contributing factors. Supporting documentation is attached.

Investigation Fatality Memoranda are submitted to Regional Review Groups, which may require additional information or corrections before forwarding the complete report to the Accident Analysis Branch at FRA Headquarters, whose Team Leader then determines which cases are within SOFA's scope. In advance of SOFA meetings, all members are provided the Investigation Fatality Memorandum. Supporting documentation (sometimes as thick as six inches) is brought to the meeting.

Veteran SOFA members have noticed a marked improvement in the quality of investigation reports over time. This is due, at least in part, to improvements in the Manual recommended by SOFA in 1999 and 2004, response to the SOFA recommendation to conduct investigations in teams, and regional-level training provided by the Accident Analysis Branch Team Leader.

2.5.SOFA Case Analyses are Meticulous

Though all SOFA Working Group members read all Fatality Memoranda in advance, one member is assigned to dig deeply into each case, examining the entire case file. The presenter completes a data sheet corresponding to the SOFA database fields for basic facts such as time of day of the occurrence and the deceased's age, length of service, and date of last formal safety training. He or she sketches the accident site to show the location of tracks, relevant equipment, workers, and other pertinent elements for use in a formal presentation. After briefly summarizing the case for the Working Group, the presenter highlights particularly relevant supporting documentation not found in the summary narrative, and then responds to questions.

At that point the group disassembles into impromptu small group discussions. These subgroups often request supporting documents, such as photos, which are then passed around to the other groups. Eventually the Working Group reconvenes as a committee of the whole for further discussion and debate. They share theories, alternative explanations, and hunches. By the end, most group members are very familiar with the details of the case.

This year, Google Earth has proven a useful tool. The aerial view of the accident site was instrumental to understanding at least one case. Other sources outside the case file are occasionally consulted, but only rarely and with the group's permission.

The team frequently conducts integrity checks of the SOFA database to assure accuracy and completeness of the data. Whereas past SOFA Working Groups have used spreadsheets, the 2010 Working Group employed a former FRA operations researcher to create a well-designed Microsoft Access database, complete with tabs and pull-down menus. The group uses an LCD projector to display the forms as they are completed. This helps keep the conversation on track and makes it possible to look up similar cases from the past to ensure consistency. The database consultant plays the additional role of reminding the group of definitions, criteria for possible contributing factors, and so on, thereby contributing to the integrity of the database as well as the focus of conversation.

The evaluation team is impressed with the Working Group's tenacity. The case analysis process is exhaustive, penetrating, and self-reflective. For any given case, some group members have experienced or witnessed similar situations. They can picture the circumstances clearly, and often ask out loud, "What would I have done? Have I ever made that mistake?" and are visibly shaken when the answer is "yes."

2.6. The Working Group Reaches Consensus on Key Conclusions About Each Case

The most important database elements are also those requiring the most judgment. Possible contributing factors and external circumstances are assigned only with unanimous agreement. Case abstracts of about three sentences, which are published, are word-smithed by consensus.

Each case analysis is given as much time and attention as necessary to reach consensus. Some are completed in an hour; others take most of a day. The group's commitment to giving each case their full attention and adhering to the consensus process takes precedence over any concerns about time or efficiency. A SOFA cycle begins with an inventory of several years' of cases, and the group meets for three days each month until they are done.

2.7. Aggregation of SOFA Case Data was Rigorous

The SOFA database is thoroughly cleaned. Quantitative analyses are appropriate to the data and the research questions. Qualitative analyses, which venture beyond the raw numbers to capture important themes by drawing on the Working Group's experience and judgment, are nevertheless well grounded in the data; evaluation team members expert in qualitative methods monitored for this as they observed and led the discussions about SOFA's overarching findings.

2.8. The SOFA Working Group Practices Continuous Improvement

The Working Group is to be commended for its commitment to ongoing improvement. SOFA 1999 did good work, but SOFA 2004 did better, and SOFA 2010 better still. For example, based on lessons learned in the aftermath of the 1999 report, the SOFA Working Group issued implementation guidelines. When case codes are found inadequate, they are revised and prior cases are recoded. When spreadsheets became unwieldy, the SOFA Working Group converted to a database. When investigation reports were found incomplete, FRA rewrote the manual and

retrained the investigators. When the Working Group needed help in getting their findings used, they called in experts in evaluation utilization and invited the present process evaluation. More examples abound.

2.9. The Process Evaluation was Thorough and Independent

The evaluation was performed by five seasoned evaluation professionals (see Appendix B for biographical information). The evaluators were independent of the SOFA Working Group and utilized established professional standards for evaluation to assess the SOFA processes.

The evaluation team members attended between two and four SOFA 2010 meetings each. Altogether we observed more than a dozen case analyses and led four full-group discussions covering such topics as SOFA's theories of change, efforts to motivate and support use of earlier reports, what has worked toward that end, and barriers to implementing SOFA recommendations in particular and railroad safety in general. One of those discussions included eight retired SOFA members, as well as the 2010 Working Group. We have read past SOFA reports, the FRA Accident Investigation Guidelines, and various other documents pertaining to SOFA's history.

In addition, we conducted individual face-to-face interviews with ten of the eleven Working Group members and its database management consultant, providing them opportunity to voice reservations and concerns anonymously. We have been briefed by the SOFA Chair on several occasions, conferred with the database management consultant, and examined the database itself.

The evaluation team found the Working Group fully cooperative, candid, and responsive to requests for documents and information.

3. CONCLUSIONS

The evaluation team reiterates: The SOFA analyses are systematic, rigorous, comprehensive, and objective. The findings are valid, significant, and worthy of the railroad industry's thoughtful attention and bold response.

We look forward with optimism to the impact of SOFA 2010's utilization-focused efforts.

4. REFERENCES

FRA's 101-page Accident Investigation Guidelines: General Compliance Manual, Part IV, Chapter 9 (2006).

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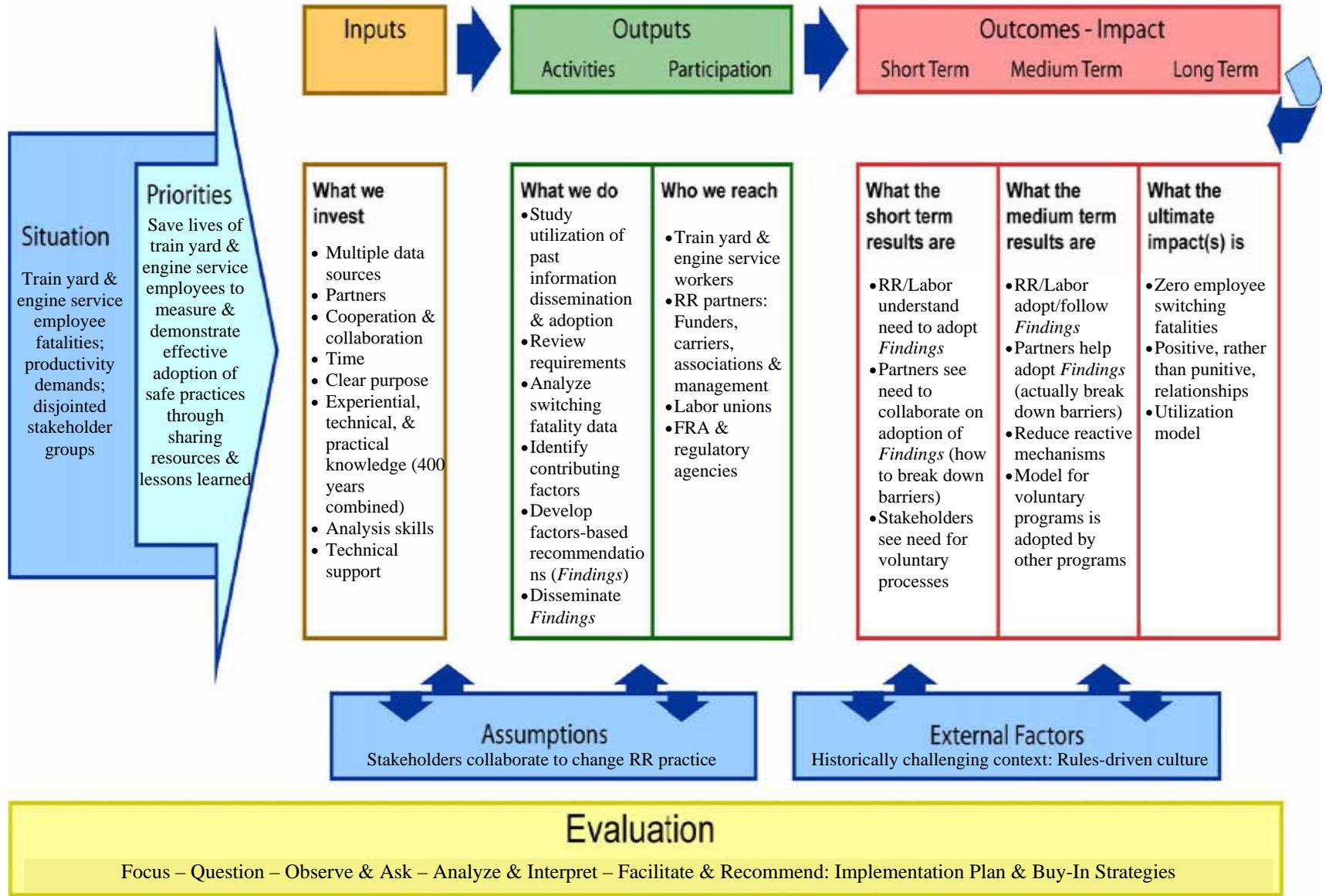
Severe Injuries to Train and Engine Service Employees: Data Description and Injury Characteristics, published in July 2001.

Findings and Recommendations of the SOFA Working Group: August 2004 Update
Best Practices Guidelines for Implementing Operating Operations (March 2000)

The 3rd Quarter 2009 report concluded that fatalities related to Operating Recommendations have dropped substantially

APPENDIX A

SOFA Working Group Process Logic Model



APPENDIX B

The Evaluation Team

Deborah Bonnet is Director of Evaluation for Fulcrum Corporation, an engineering firm based in the Washington area. She has conducted more than 120 studies in her 35-year evaluation career, in most cases as the principal investigator. She earned an M.S. in Human Factors from Virginia Tech and an MBA from Indiana University, and has held various leadership positions in the American Evaluation Association.⁹

Michael Coplen is Senior Evaluator and Manager of Culture and Safety Performance Studies for the Federal Railroad Administration, Office of Research and Development, Human Factors Program. He began his career as a railroad brakeman and engineer and later earned an M.A. in Organizational Behavior from the University of Nebraska. His 15 years as an evaluation practitioner include membership on the first SOFA Working Group. He was recently awarded the Myrdal Award for Government Service by the American Evaluation Association for successful evaluation use in FRA and promotion of evaluation methods in the Federal government.

Michael Quinn Patton is an independent evaluation consultant, former president of the American Evaluation Association, and author of five major books on evaluation, including *Utilization-Focused Evaluation*. After receiving his Ph.D. in Sociology from the University of Wisconsin, he served for many years on the faculties of the University of Minnesota and the Union Institute. He has worked with organizations and programs at the international, national, state, and local levels, and with philanthropic, not-for-profit, private sector, and government programs as a generalist working across the full range of efforts at improving human effectiveness and results.

Joyce Ranney is a senior program evaluator in the Human Factors Research and System Applications Center of Excellence at the Volpe National Transportation Systems Center. In the last several years she has conducted five major multiyear evaluation studies in the railroad industry showing significant bottom line improvements in safety and safety culture. She holds a B.S. in Speech from Southern Illinois University and a Ph.D. from University of Los Angeles, CA in organization behavior.

Juna Snow is Principal Consultant of InnovatEd Consulting and a subcontractor with the Volpe Center. With more than 15 years of experience in educational development, research, and evaluation, she serves on the faculty of the University of Illinois at Urbana-Champaign, where she earned an M.S. in Ecology and a Ph.D. in Education. She chairs the Research of Evaluation Special Interest Group of the American Educational Research Association.

⁹ www.eval.org