Final Report

Safety of Remote Control Locomotive Operations

Federal Railroad Administration
June 2005

Final Report

Safety of Remote Control Locomotive Operations

Federal Railroad Administration
June 2005

Table of Contents

Executive Summary 1
Background 2
Congressional Request and FRA's Assessment 4
RCL vs. Conventional Operations - Safety Statistics 5
RCL Effects on Highway-Rail Grade Crossing Safety 8
Accidents Involving Hazardous Materials 8
Safety of RCLs in Urban Areas 8
Unique Operating Characteristics Presented by RCLs 8
Findings on the Open Issues in the Interim Report 9
1. RCOs Riding on Cars 9
2. Point Protection and Remote Control Zone Procedures 10
3. Remote Camera Highway-Rail Crossing Protection 11
4. Expansion of RCL Technology to Main Tracks 13
FRA's Findings and Recommendations on RCL Main Track Operations 15
Equipment Failure Issues 15
New-Hire Training 16
Special Studies 16
Electromagnetic Field Emissions 16
RCL Signal System Integrity 17
Technical Issues 20
Potential human-factors technical issues related to RCL operations and tasks: 20
1. Task overload: 20
2. Reduction in RCO situational awareness 21
3. RCO training/preparation/experience. 22
4. Inadvertent/accidental activation of the RCD 22
Configuration Management (Revision Control) 22
Conclusions and Recommendations 22
Supporting Documentation 23
Table 1-1 Comparison RCL and Convention Switching Related Train Accidents – Number of Accidents, Yard Switching Miles, and Accident Rates 25
Table 1-2 Comparison of Train Accidents in RCL vs. Conventional Switching Operation By Month, Type of Track, Major Cause and Type of Accident - Grand Totals and by Railroads 26
Table 1-3 Comparison of Train Accidents in RCL vs. Conventional Switching Operation By States, Displaying Number of Accidents and Average Damage Costs 27
Table 1-4 Comparison of Train Accident Causes In RCL Operation vs. Conventional Operation Specific Causes within each Major Cause Area 28
Table 1-5 Railroad/Location Distribution of Train Accidents Involving RCL Operations 32
Table 1-6 Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order 35
Table 2-1 Comparison of Train Accidents Involving Hazardous Material in RCL vs. Conventional Operation 59
Table 2-2 Listing of RCL Train Accidents Involving the Release of Hazardous Materials In Chronological Order 60

Table 3-1 Comparison of Employee on Duty RCL and Convention Switching Related Injuries Number of Injuries, Yard Switching Miles Operated, and Injury Rates – Grand Totals and by Railroads 61
Table 3-2 Comparison of Employee on Duty RCL and Conventional Switching Related Injuries By Month, Type Injury, and Crafts 62
Table 3-3 Comparison of Employee on Duty RCL and Conventional Switching Related Casualties – By States 64
Table 3-4 Comparison of Employee on Duty RCL and Conventional Switching Related Casualties By Location of Injured Employee at Time of Injury 65
Table 3-5 Comparison Of Employee On Duty RCL and Convention Switching Related Injuries By Physical Act the Injured Employee was Involved in at time of injury 66
Table 3-6 Summary of Employee on Duty Injuries to RCL Operators While Riding on Side or End of Cars And When Operating the RCL 68
Table 3-7 Summary Of Employee On Duty Injuries to RCL Operators While Riding on Side or End of Cars And Not Operating the RCL 69
Table 3-8 Listing of Casualties to Employees on Duty Associated with Remote Control Operations 70
Table 4-1 Comparison RCL and Convention Switching Related Highway-Rail Grade Crossing Accidents Number of Accidents, Yard Switching Miles Operated, and Accident Rates 80
Table 4-2 Listing of Highway-Rail Grade Crossing Accidents Related to RCL Use 81
Special Studies: Foster-Miller Inc. 82

Final Report of the Safety Assessment of Remote Control Locomotive Operations

Executive Summary

By letter dated September 2, 2003, the Senate Committee on Commerce, Science, and Transportation (Committee) requested that the Federal Railroad Administration (FRA) conduct an assessment of the impact of remote control locomotive (RCL) operations on safety, including a comparison of the rate of accidents, injuries, and fatalities involving RCLs with similar operations involving manned locomotives. Additionally, the Committee requested that the audit should assess the effects of RCL operations on the safety of highway-rail grade crossings, hazardous materials transportation, RCLs operated in urban areas, any unique operating characteristics presented by RCLs, and the safety benefits of such operations. The Committee requested that FRA's report should include any recommendations for legislative or regulatory changes FRA determines necessary, that FRA report back to the Committee with preliminary findings and initial accident statistics within six months, and that a detailed final report be submitted within 18 months.

In May 2004, FRA submitted the interim report to Congress. Preliminary data prepared for that report indicated that the safety record of RCL operations over the seven-month period May 1, 2003, through November 30, 2003, had been positive. RCL train accident rates were 13.5 percent lower than the train accident rates for conventional switching operations over the same period, while employee injury rates were 57.1 percent lower for RCL operations than for conventional switching operations.

FRA has completed the RCL safety assessment and has concluded that RCL operations are no less safe than conventional operations. Based on the data collected from December 2003 through December 2004 (this period begins where the interim report period ended), RCL train accident rates were approximately 23 percent lower than the train accident rates for conventional switching operations. Employee injury rates were approximately 66 percent lower for RCL operations than for conventional switching operations. During the assessment period, two fatalities occurred involving RCL operations, and four fatalities occurred involving conventional operations.

Based on the data and FRA's experience with this technology, FRA does not believe it is necessary to regulate current RCL operations any further than it already has (49 CFR Parts 240, 229, 225); however, should this technology expand beyond its limits, FRA may reconsider this position. This safety assessment addressed the introduction of RCL operations into classification (switching) yards. Although RCLs have some limited use on the main track, FRA does not believe the current RCL technology is well suited for conducting train operations on the main track. This is explained further under "Expansion of RCL Technology to Main Tracks."

Background

How RCL Technology Works

Generally, traditional yard switching operations consist of three crewmembers–one engineer to operate the locomotive and two switchmen on the ground to operate track switches, to couple and uncouple railroad cars, and to direct movements by giving signals to the engineer on the locomotive. RCL technology has eliminated the engineer's position by introducing a computer onboard the locomotive, which interfaces with the locomotive controls. The computer is controlled by a radio transmitter (beltpack) that is worn around the waist of the switchmen on the round. The beltpack is battery powered and weighs approximately 3½ pounds. The perceived economic benefit of this technology is the elimination of one crewmember from a yard-switching crew. The perceived safety benefit is that the ground crewmen, designated as Remote Control Operators (RCOs), can directly control the locomotive without having to pass signals to the engineer, thus eliminating the chance of miscommunication between the switchman and engineer.

Introducing RCL Operations in the United States

Remote control devices have been used to operate locomotives at various locations in the United States for many years, primarily within certain industrial sites. Railroads in Canada have made extensive use of RCLs for more than a decade. FRA began investigating remote control operations in 1994 and held its first public hearing on the subject in February 1995 to gather information and examine the safety issues relating to this new technology. On July 19, 2000, FRA held a technical conference in which all interested parties, including rail unions, remote control systems suppliers, and railroad industry representatives shared their views and described their experiences with remote control operations. This meeting was extremely beneficial to FRA in developing facts and data about the safety issues associated with RCL technology and operations.

RCL Guidelines (Safety Advisory 2001-01)

On February 14, 2001, FRA published *Notice of Safety Advisory 2001-01* in the Federal Register as guidance for conducting RCL operations. By issuing these recommendations, FRA sought to identify a set of "best practices" to guide the rail industry when implementing this technology. Because this is an emerging technology, FRA believes this approach provides flexibility both to manufacturers who are frequently upgrading RCL equipment designs and to railroads that continue to refine their RCL operations. At the same time, the Safety Advisory reinforces the importance of complying with all existing railroad safety regulations. The major railroads have used these guidelines as a basis for their own RCL programs, although not all of the recommendations have been adopted by all of the railroads.

In addition to the recommended guidelines contained in the Safety Advisory, several existing Federal railroad safety regulations pertain to RCL operations. The Safety Advisory identified them, emphasizing that compliance with these regulations is mandatory:

> [A]lthough compliance with this Safety Advisory is voluntary, nothing in this Safety Advisory is meant to relieve a railroad from compliance with all existing railroad safety regulations. Therefore, when procedures required by regulation are cited in this Safety Advisory, compliance is mandatory. id. at 10343.

The Safety Advisory clearly states that each person operating an RCL must be certified and qualified in accordance with 49 CFR Part 240 (FRA's locomotive engineer rule) if conventional operation of a locomotive under the same circumstances would require certification under that regulation. In November 2001, six major railroads–Burlington Northern Santa Fe (BNSF); Conrail; CSX Transportation (CSX); Kansas City Southern (KCS); Norfolk Southern (NS); and Union Pacific (UP)–submitted to FRA their training programs for a remote control operator as required by Part 240. Since that initial filing, several railroads have made changes to their remote control training programs at FRA's request. FRA is closely monitoring this training and is making additional suggestions for improvement on individual railroads as they become necessary. These programs currently require a minimum of two weeks classroom and hands-on training for railroad workers who were previously qualified on the railroad's operating and safety rules. Federal regulations require that locomotive engineers be trained and certified to perform the most demanding type of service they will be called upon to handle. An RCO who will only perform switching duties using an RCL would not need to be trained to operate a locomotive on main track in over-the-road operations from the control stand of the cab.

In addition to the training, the regulations require railroads to conduct skills-performance testing of RCOs that is comparable to the testing required for any other locomotive engineer performing the same type of work. Federal regulations also hold RCOs responsible for compliance with the same types of railroad operating rules and practices that other locomotive engineers are required to comply with to retain certification (see 49 CFR 240.117). Any such alleged noncompliance triggers a process of investigation and review. If a violation is found, the RCO will be prohibited from operating a locomotive on any railroad in the United States for a minimum of 15 days to a maximum of three years. The length of the prohibition (or revocation of the certificate) depends on whether the person was found to have committed other violations within the previous three years and whether the railroad, using its discretion, determined the person had completed any necessary remedial training.

Furthermore, FRA made the connection in the Safety Advisory between the current Federal locomotive inspection requirements and the application of those requirements to the RCL technology. For example, the Safety Advisory states unequivocally that "the RCL system *must* be included as part of the calendar day inspection required by 49 CFR 229.21, since this equipment becomes an appurtenance to the locomotive." id. at 10344 (emphasis added). Another example of a mandatory requirement mentioned in the guidelines is that "the RCL system components that interface with the mechanical devices of the locomotive, e.g., air pressure monitoring devices, pressure switches, speed sensors, etc., should be inspected and calibrated as often as necessary, but not less than the locomotive's periodic (92-day) inspection. id. (emphasis added), see 40 CFR 229.23. Thus, the Safety Advisory served the purpose of publishing FRA's position that the existing Federal regulations are sufficient to require inspection of the RCL equipment.

RCL Implementation and Training

On November 30, 2001, Amtrak and six of the Nation's largest freight railroads (BNSF, CSX, UP, KCS, NS, and Conrail) submitted RCL training programs to FRA for approval, as required under 49 CFR Part 240. All of these railroads submitted identical programs, which FRA has approved. Currently, the RCL training is divided into two areas: 1) training certified engineers on the new technology, and 2) certifying individuals as RCOs. The former only involves training, while the latter is a certification process. Most of these programs cover both areas; however, the majority of training involves certifying former ground crewmen, i.e., trainmen, switchmen, and conductors who have never operated a locomotive before. This certification training currently consists of a minimum of two weeks. The first week is comprised of approximately two days in the classroom and three days of field training with the RCL. The second week entails on-the-job training, which occurs in a classification yard performing actual switching duties. This is the minimum required by the railroad training programs. All of the railroads have assured FRA that additional training will be furnished if needed and requested by an RCO. FRA works closely with the railroads and rail labor organizations to ensure the continuation of proper training.

The above railroads initially submitted training programs to FRA that specified only one week of training: 1½ days in the classroom, 2½ days of on-the-job training, and a final day of testing. FRA did not approve these programs. It would not accept an RCL training program of less than two weeks minimum training. The agency arrived at this position by studying the training periods that were developed and used in Canada for the past several years, by communicating with the representatives of the employees who were largely responsible for conducting these operations, and by requiring the railroads to define the duties of the RCO. All the above railroads have defined these duties as follows:

> A *Certified Remote Control Operator* may work with equipment by means of a portable controller. In the initial implementation, this equipment will be used in selected locations where the job will be involved in gathering and distributing freight and/or equipment that is typically required of yard, road switcher, or other similar assignments at the implementing location(s). The specific assignments involved will vary by locations and could include such work as hump, trimmer, classification operations, transfer, road switcher, industrial, and station switching.

FRA believes this definition restricts RCOs to performing yard-switching-type operations, which are conducted at traditional yard speeds (slow) and within the immediate vicinity of the yards. The definition also implies some limited main-track movements to move a few cars a short distance to gain access to an industrial park or shipper.

Congressional Request and FRA's Assessment

The Committee requested that FRA assess the impact of RCL operations on safety, including a comparison of the rate of accidents, injuries, and fatalities involving RCLs versus similar operations involving manned locomotives. Additionally, the Committee requested that the audit

should assess the effects of RCL operations on the safety of highway-rail grade crossings, hazardous materials transportation, RCLs operated in urban areas, any unique characteristics presented by RCLs, and the safety benefits of such operations. The following is an itemized report on each of the specific areas the Committee requested FRA to assess:

RCL vs. Conventional Operations - Safety Statistics

The individual railroads send to FRA the information contained in its accident/incident database. Accident/incident reporting is regulated under 49 CFR Part 225. Railroads must report any event that causes damage to on-track equipment and track structure above the current monetary threshold of $6,700. Damages do not include clean-up costs, damage to lading, claims against the railroads, etc. FRA periodically audits the railroads to ensure that proper procedures are in place to report accurately. FRA has relied on this data for many years and believes the majority of data received by the railroads is accurate. The data used represent only those accidents/incidents that occurred on yard and industrial tracks, since this is where RCL operations occur most often.

The accident/incident rates in this report were developed by distributing the total yard-switching-miles reported by each railroad (38 railroads were evaluated in the assessment) between conventional and RCL operations. The rates reflect accidents/incidents per million yard-switching-miles (MYSM) for the two types of operations. Although FRA receives monthly reports from each railroad that indicate total yard-switching-miles for that month, FRA has no way of determining what portion of these miles represents conventional operations and what portion represents RCL operations. Therefore, FRA relied on the railroads to develop a system for making these mileage allocations. While each railroad uses a different system to arrive at these figures, it appears the systems are adequate.

The accident rate for RCL operations for the 13-month period December 2003 through December 2004 was 22.16 accidents/MYSM. The accident rate for conventional operations was 28.65.

The supporting documentation included in this report contains the data FRA used for calculation of the accident/incident rates. It is important to note that the reportable train accidents shown are those that occurred when RCLs were in use, and did not necessarily occur because of the use of RCLs. For example, if an RCL was sitting stationary on a track and was struck by a conventionally operated locomotive, the incident would be reported as RCL-related, even though the collision was unrelated to RCL use. Thus, the data favor conventional operations.

Accidents: The following table shows accident data by major cause classification and human-factors accident rates.

Major Cause Classification	RCL	Conventional	Total	% Total Accidents	% RCL	% Conventional
Human Factors	286	648	934	49.6%	31%	69%
Track Defects	75	454	529	28.1%	14%	86%
Miscellaneous	61	203	264	14.0%	23%	77%
Mechanical	21	81	102	5.4%	21%	79%
Signal & Communications	31	24	55	2.9%	56%	44%
Total	474	1,410	1,884	100.00%		

Human Factors Accident Rates:	Accidents	Yard-Switching-Miles	Rate/MYSM
RCL	286	21,392,572	13.37
Conventional	648	49,218,974	13.17
Total	934	70,611,546	13.23

The table shows that the highest single, major, cause category for train accidents is human factors, which account for approximately one-half of all train accidents. The next highest major cause category is track defects, with approximately one-fourth of all train accidents. The other three major cause categories (miscellaneous causes, mechanical, and signal and communications) account for the remaining one-fourth of all train accidents.

A further analysis of the accident data indicate that while, overall, RCL accident-occurrence rates are lower than conventional operations, i.e., 22.16 for RCL vs. 28.65 for conventional per MYSM, the rates are practically equal where human factors are concerned, i.e., 13.37 for RCL vs. 13.17 for conventional per MYSM. These results appear to show that the same human errors occur during both types of operations.

FRA notes that human factors have been the leading cause of accidents nationwide in recent years and the numbers appear to be increasing. The top five leading causes of accidents are:

1) A track switch improperly lined.
2) Shoving movement of rail cars without an employee on or at the leading end of movement.
3) Shoving movement, with an employee on or at the leading end of movement, but fails to control.
4) Switch previously run through.
5) Car left to foul, i.e., cars not clearing other tracks.

To reduce these accidents, FRA is exploring whether there is a need to federalize certain railroad operating rules related to these causes.

One reported accident involved a transmitter signal failure; however, the failure was not between the communication of the RCO and the locomotive. The failure occurred within a separate system that was installed on the locomotive. In this particular incident, the RCL was used for "hump" operations. Hump operations entail pulling 2 to 3 miles of cars out of a yard and then shoving them up and over a hump. The car or cars are uncoupled as they begin to roll down the hump, which allows them to roll free into the designated classification track. Railroads have taken advantage of RCL technology by installing what has been termed "pull-back protection" on hump pull-out tracks. This protection is basically an electronic fence that prevents the locomotive from operating off the end of the track once it reaches the end of it. The electronic fence consists of placing transducers in the track bed at various intervals. These transducers interact with the locomotive as it passes over them to slow the locomotive and eventually stop it.

Prior to the accident, the RCL had been released from the shop and the pullback protection was not tested before it was placed into service. The locomotive was attached to cars and movement to the end of the pull-out track was initiated. Consequently, the locomotive failed to stop once it reached the end of the track and continued into a dirt bank. While this incident did involve a form of remote control, it was not related to the locomotive's failure to respond to its operator, which has been the biggest perceived concern when one speaks of remote control for any type of machinery–"will it stop when the operator tells it to?" FRA notes that, because of the critical nature of pullback protection, i.e., employees are totally dependent on the protection to stop the locomotive movement when it reaches the end of the track or pull-back limits, railroads should have strict measures in place to ensure the system is operational when the locomotive is used in these types of operations.

Injuries: The employee injury rate for RCL operations was 6.40 injuries/MYSM. The injury rate for conventional switching operations was 18.79. These rates indicate that injuries occur less often during RCL operations. One obvious reason for part of the rate difference is the reduction of crew size from three to two individuals; this certainly reduces injury exposure. An examination of the employee-on-duty reportable casualty data for both modes of operations reveals that "walking" is the leading physical act when an injury occurs to an employee. The second leading physical act is "riding/getting off" equipment. The data do not appear to support a predisposition of one particular injury cause for one mode or the other.

Fatalities: Two fatalities and three injuries, one involving the amputation of a limb, occurred during the evaluation period for RCL operations. For conventional operations, four fatalities and seven injuries involving amputations occurred. The fatality rate for RCL operations is .09 fatalities/MYSM. The fatality rate for conventional switching operations is .08 fatalities/MYSM. The two methods of operation are practically equal in this regard.

Throughout the railroad industry, switching yards are harsh environments in which to work. The nature of switching cars brings employees in constant contact with railroad rolling stock (freight cars and locomotives). Regardless of the technology used, FRA cannot stress enough the importance of using extreme care when working on or about railroad rolling stock. Situational awareness under these circumstances is critical to the well being of railroad employees.

RCL Effects on Highway-Rail Grade Crossing Safety
Federal regulations (49 CFR Part 225.19(b)) require railroads to report all highway-rail grade crossing accidents to FRA. An evaluation of this data indicates that 300 crossing accidents occurred on yard and industrial tracks during the assessment period. Of those, 284 related to conventional operations and 16 related to RCL operations. There were no fatalities and one injury associated with the 16 RCL-involved accidents. The crossing accident rate for RCL operations is 0.75 accidents/MYSM, and the rate for conventional operations is 5.77. The data indicate that RCL operations are no less safe than conventional operations.

Accidents Involving Hazardous Materials
During the 13-month assessment period (December 2003 through December 2004), 1,873 accidents occurred. Of these, 493 involved the movement of hazardous materials. Of the 493 accidents, 13 involved the release of hazardous materials–four (4) during RCL operations and nine (9) during conventional operations. However, when weighing the data by allocated switching-miles, the hazmat-release accident rates between RCL (.187) and conventional (.183) operations are approximately the same. The data indicate that handling hazardous materials in RCL operations is no less safe than conventional operations.

Safety of RCLs in Urban Areas
The majority of RCL operations occur in classification yards located in urban areas. As the previous data has shown, RCL operations appear to be as safe as conventional operations.

Unique Operating Characteristics Presented by RCLs
Typically, conventional yard switching operations are conducted with three crewmembers–two stationed on the ground to operate switches and couple or uncouple cars, and one stationed in the locomotive cab to operate the locomotive. By using RCL technology, the operator (engineer) on board the locomotive may be eliminated because the locomotive can be remotely controlled by either of the two crewmen on the ground. The removal of a crewmember from the locomotive cab posed a problem for the rail industry, however. The engineer operating the locomotive was also required by railroad operating rules to observe the track ahead of the locomotive each time it pulled forward to determine that the movement remained properly routed and clear of other movements. This occurs hundreds of times during switching operations. Absent the engineer, the ground crewman must take on this added responsibility of complying with the rule. The term used for this rule is "point protection." Such rules were developed to conduct movements safely on non-controlled track, i.e., yard tracks, where many locomotive movements occur simultaneously. The RCO would be spending most of the time walking back and forth between the locomotive on one end of the cars and the switching lead on the other end where most of the ground work occurs. This would continuously take the RCO away from the area of his/her switching duties.

The industry addressed this issue by creating what has been termed "remote control zones" (RCZs or zones) to relieve crews from complying with point protection. An RCZ is a designated limit where only one RCL operation exists at a time. No other railroad assignments are allowed into this area unless strict procedures are followed. Therefore, once the RCO responsible for

establishing the zone determines that the zone limits are clear of other movements and that the track is properly routed, the RCO can operate without providing point protection. RCZs are established by railroad operating rules. The limits of RCZs are normally identified by signs, which are placed at the entrances of each end of the zone. Movements into the RCZ can be made only with permission from the RCO who established it.

FRA realized that RCL operations would necessitate such rule modifications. It has been FRA's objective to ensure that safety is not compromised by these changes. FRA has concluded that the rule modifications have not compromised railroad safety, provided the railroads monitor these operations to ensure that their employees understand and comply with these rules.

Additionally, FRA notes that major railroads in the western part of the country have made efforts to bring some uniformity to RCL operations by introducing specific rules into the General Code of Operating Rules (as additions to Chapter 6). FRA encourages other railroads to take similar measures.

Safety Benefits of RCL Operations

FRA encourages the advancement of modern technology into the rail industry, for both efficiency and safety. The future of the country's rail transportation system depends on it. As stated above, FRA's assessment of RCL operations shows that these operations currently appear safer or at least as safe as conventional operations.

Findings on the Open Issues in the Interim Report

Four items listed in the interim report required further evaluation. The following are the results of FRA's additional analysis of these items:

1. RCOs Riding on Cars

Traditional railroad safety rules require employees who are riding the side of railroad cars to always maintain three points of contact, i.e., both feet firmly placed on the latter rung and one hand gripping a ladder rung or hand-hold. The other hand may then be used to give hand signals or key a radio microphone during transmissions.

The Notice of Safety Advisory 2001-01 recommends that RCOs refrain from riding cars under any circumstances while actively engaged in operating the RCL. This recommendation was developed taking into account former RCL equipment that required the manipulation of two levers simultaneously to control speed (throttle and brake). However, the new state-of-the-art RCL technology incorporates a speed control feature that allows the RCO to dial in a specific speed (similar to cruise control on an automobile), and then grasp the car with both hands. This enables the RCO to maintain four points of contact, which exceeds the industry safety standard of three. Both the railroads and the labor organization responsible for conducting the majority of RCL operations in the country have indicated that riding cars while operating the RCL could be performed safely. As an added measure of safety, it was noted that industry practices empower employees to choose when it is safe to ride a car and when it is not.

FRA was concerned that the added responsibilities of operating a locomotive while riding the side of a car could distract an RCO's situational awareness; however, the data appear to indicate otherwise. The data show that 213 injuries occurred involving riding the sides and ends of cars during the assessment period. Of those, 182 were injuries during conventional operations and 30 during RCL operations. Of the 30 RCL injuries specifically related to RCOs riding cars, 17 occurred to non-operating RCOs and 13 occurred to operating RCOs. Although the numbers are small in these calculations, the data do not indicate that operating RCOs are injured any more often than non-operating RCOs.

Regarding the new speed control technology, FRA is recommending that the option of riding on the side of freight cars should be left to the discretion of the individual RCO, who can best make this determination based on the prevailing conditions at the time. However, regarding any RCL systems that require the manipulation of two levers simultaneously to control speed, FRA continues to recommend that those operating the equipment should not ride the side of cars.

2. Point Protection and Remote Control Zone Procedures

The leading cause of train accidents in switching operations involves the failure to provide point protection for the train movement. Point protection refers to the practice (required by railroad operating rules) of having a member of the train crew in position on the leading end of the movement to see that the track ahead is clear and properly routed for the move.

Establishing point protection for RCL operations raises challenges since there is no engineer on the locomotive to provide the point protection on that end of the movement. While one solution would be to require an RCO to protect the point, i.e., walk from the switching lead to the front of the locomotive to determine that the track is clear, this practice would greatly reduce the efficiency of RCL operations. To meet this challenge, railroads have adopted the practice of establishing remote control zones.

An RCZ is a designated area where only one RCL operation occurs at a time. No other railroad assignments are allowed into this area unless strict procedures are followed. Therefore, once the RCO responsible for establishing the RCZ determines that the zone limits are clear of other movements and the route is properly routed, he or she can operate without providing point protection. RCZs are established by railroad operating rules and zone limits are normally identified by signs, which are placed at the entrance tracks at each end of the zone. Movements into the zone can only be made with permission from the RCO who established it.

FRA has expressed concern that there is little consistency within the rail industry regarding the application and design of RCZs. In many large switching yards, the procedures for establishing and utilizing these zones can become complicated. Because RCZs will be replacing a critical rule pertaining to the safety of yard operations, FRA has monitored this transition closely. The railroads were advised in the interim report that FRA would be carefully reviewing point protection rules and RCZ procedures. All railroads agreed to focus operating-rule efficiency tests on RCL operations to determine compliance with rules and instructions relating to point protection and establishing/re-establishing RCZs. Operating-rule efficiency tests are a form of management oversight of railroad operations. Managers observe employees in the field as they perform their duties, and they conduct random, unannounced tests to determine employee compliance with the rules.

FRA audited the efficiency-test data of the majority of Class I railroads in the country for the year 2004. The audit revealed that railroads are conducting a sufficient number of tests to adequately monitor RCL operations.

3. Remote Camera Highway-Rail Crossing Protection

Railroad operating rules essentially require that, unless an occupied locomotive is on the leading end of the movement, a crewmember must be physically located at the crossing each time a switching movement travels over the crossing to ensure that traffic is stopped. There is one exception, however. If a crossing is equipped with gates and it can be determined that the gates are in the fully lowered position and that the crossing is clear of vehicles and/or pedestrians, the movement may travel over the crossing without the physical presence of a crewmember. During conventional operations, a locomotive engineer was always positioned in the cab of the locomotive and could make the required determinations as the locomotive approached the crossing. Without the engineer or another crewmember in the locomotive or at the leading end of the movement, the RCO must make the required determinations. This would require the RCO to be physically present at the crossing each time the RCL operates over it.

To increase the productivity of RCL operations, one major railroad has begun utilizing a remote camera system to make the required determinations. With the installation of a remote camera system at the crossing, the RCO can remain in the yard and observe the crossing from a video monitor to make the required determinations. The railroad believes that crossing protection rules can be observed using this system and it has installed cameras at several crossings.

Once FRA became aware that this system was being implemented, it immediately requested that the railroad cease any further installations until an evaluation of the system could be conducted. FRA sought to determine whether the remote camera system could offer the same or a higher level of protection for switching movements as the traditional methods. The railroad complied with FRA's request.

FRA instructed its Signal and Train Control inspectors to evaluate the crossings. The inspectors were asked to determine certain criteria at these crossings, such as highway and railroad approach characteristics, warning-system malfunction histories, types of train operations, remote-camera monitor visual views, etc. FRA found no major exceptions to the operation of the warning systems at these crossings.

The maximum authorized speed for RCL train operations at the crossings is 4 mph according to the railroad's operating instructions. Maximum authorized highway speed at most of the crossings was 20 mph, with the fastest authorized speed being 35 mph at one crossing. The camera views for most of the crossings appeared to be in accordance with prior FRA recommendations in the interim report. However, there were concerns at two of the crossings about whether the view from the monitors was adequate for RCL operators. The railroad agreed to evaluate and change the camera angle to address this issue. The overall findings indicate that the railroad is maintaining these locations in accordance with the prior FRA recommendations.

Based on FRA's final analysis of the use of remote camera protection at highway-rail grade crossings, FRA believes this form of protection offers an equivalent means of safety, provided the following recommendations are adopted:

- Before camera-assisted RCL operations are permitted at highway-rail grade crossings, a Crossing Diagnostic Team should evaluate the crossing. The diagnostic team should have representatives from the railroad, FRA, the State department of transportation (or another State agency having jurisdiction over the highway), and local government authorities. The diagnostic team should evaluate the suitability of each crossing for remote camera operations. Among the factors it should consider are the following: the average daily traffic counts; the number of highway lanes; highway speed limits; the number of railroad tracks; the volume of school bus, transit bus, emergency vehicle, large truck, and hazardous materials traffic over the crossing; the minimum RCL operator sight distances of roadway approaches to the crossing; and other relevant factors that could affect the safety of the crossing. The diagnostic team should also consider the appropriate number of cameras and appropriate camera angles needed to provide for the remote operation of RCLs over the crossing.
- Remote cameras should only be used at crossings equipped with warning lights, gates, and constant warning and motion sensor devices.
- The cameras should be arranged to give the RCO a view of the rail approaches to the crossing from each direction to accurately judge the locomotive's proximity to the crossing.
- The cameras should be arranged to give the RCO a clear view to determine the speed and driver behavior (e.g., driving erratically) of any approaching motor vehicles.
- Either the camera resolution should be sufficient to determine whether the flashing lights and gates are working as intended or the crossing should be equipped with a remote health monitoring system that is capable of notifying the RCO immediately if the flashing lights and gates are not working as intended.

- The railroad should notify local FRA offices when this type of protection has been installed and activated at a crossing to ensure that FRA grade crossing specialists and signal inspectors can monitor these operations.

FRA also suggests that, if a highway-rail crossing were equipped with supplemental safety devices that prevent motorists from driving around lowered gates, perhaps some of the above recommendations may not be necessary to permit the safe operation of RCLs over these crossings. A diagnostic team, however, should make such determinations. FRA recognizes that camera-assisted remote operation of RCLs may not be a viable alternative at all highway-rail grade crossings.

4. Expansion of RCL Technology to Main Tracks

FRA's Notice of Safety Advisory 2001-01 was written to address RCL yard switching operations only. FRA never contemplated that this technology would be used in train operations on the main track. Once FRA became aware that these operations were migrating to main tracks, we asked the railroads to cease expansion until we had a chance to evaluate them. Therefore, only limited main track operations currently exist.

Technology: After becoming familiar with the current RCL technology, FRA realized the current systems in use by the major railroads have limitations when used outside the yard environment. For example, FRA's initial concern is that the current technology may not be suitable to control in-train forces during train movements. The speed control feature on the remote control transmitter (beltpack) was originally designed for yard switching operations. The speed control works like an automobile's cruise control. A speed is selected and the computer will increase locomotive power until the desired speed is reached. The computer will then automatically maintain the selected speed using locomotive power and brakes. When used for switching, i.e., limited number of cars on a yard-switching lead track with limited horsepower, the system works well. The system is designed to accelerate quickly to facilitate switching cars into classification tracks. When this system is used to haul trains, however, the speed control feature must be circumvented at times to control in-train forces. When starting a train, the computer begins the movement slowly for approximately 5-10 seconds, then rapidly applies more horsepower in short intervals to gain the desired speed. The computer is not programmed or designed to make train-handling decisions, i.e., to take into account the number of cars and tonnage that are in the train being moved or the topography of the track over which it is operating. Consequently, the computer attempts to start the train too quickly. If locomotive power is not applied gradually, excessive in-train forces could be generated. FRA has observed that some RCOs compensate for this feature by setting the speed control to the coast position (reduces pulling forces) periodically as the train is being started. If the locomotive's rapid acceleration rate is left unchanged, the train may separate due to excessive in-train forces. This is especially true if the locomotive consist is capable of developing high tractive effort. The system has little ability to apply locomotive power in a gradual conventional manner, since it was designed for rapid acceleration.

Another area of concern involves the RCL braking system, which is also primarily designed for yard switching movements. All locomotives are equipped with two braking systems, the locomotive brake (independent brake that only controls the brakes on the locomotive) and the automatic train brake (controls brakes on the locomotive and cars in the train). As the name implies, the independent brake operates the locomotive brakes independently of the automatic brakes. Light locomotive and switching movements are primarily controlled by the independent brake, whereas trains are primarily controlled by the automatic brake. The onboard computer primarily controls all movements by using the independent brake. The system is designed to react to speed changes within plus or minus .5 mph of the current speed selection. For example, if the speed control is set at 7 mph, the brakes will apply once the speed exceeds 7.5 mph and will release once the speed drops below 7.5 mph. Conversely, if the speed drops .5 mph below the set speed, the computer will direct the locomotive to increase power to maintain the selected speed, which will cause slack in the train. Since plus or minus fluctuations in speeds greater than .5 mph often occur as trains move over the main track, the independent brake will constantly apply and release and/or locomotive power will increase or decrease causing the train slack to run in and out as the train progresses. The longer and heavier the train, the more dramatic this slack action becomes. While the system is suitable for switching operations, it does not work well during train movements. Depending on locomotive horsepower and train size and train makeup, excessive slack action in the train could cause a derailment due to excessive in-train forces.

RCOs do have the ability to use the automatic brake to a limited degree, depending on software modifications to the system. The automatic brake system was originally designed to supplement the locomotive brakes when stopping heavy drafts of cars in yards. If the locomotive brake is fully applied and more braking effort is needed to control speed, the speed control feature will make a minimum reduction (7 psi) with the automatic brake. These actions are dependent upon the train air brake system being coupled and operative. Once the movement reaches the selected speed, the brakes are released. Again, this system works well when handling heavy drafts of cars in the yard from one track to another. This function is not desirable when controlling longer trains on the main track because the computer works faster than the train air brake system. For example, under certain track profiles (short down hill, up hill configurations), the system could apply and release the brakes before the brakes fully apply on the rear of a long train. This would create a situation where the brakes would be releasing on the head end of the train at the same time they are applying on the rear end. This condition could cause the train to pull apart.

After considering all the information above, FRA believes that, given sufficient training, an RCO could develop the skills to operate small trains on the main track over flat terrain for limited distances. However, given all the variables that exist, e.g., train tonnage, train length, locomotive horsepower, track terrain, etc., proper train handling could prove difficult for larger trains over greater distances.

Training: All the major railroad RCL training programs are two weeks long for railroad employees who have never operated a locomotive before. The two-week training period takes into account that the trainees are former conductors with significant railroad experience. Approximately 2-3 days are spent in the classroom, with the rest of the time spent in the field as

on-the-job training. RCOs receive little additional training in air brakes, train handling, signal recognition, track-train dynamics, etc. These are all subjects associated with the fundamentals of main track operations, regardless of speed or distance. Starting or stopping a train at low speeds is normally the time that in-train forces can be the greatest. Extreme care must be taken during these times. Yard transfer and local freight work also expose RCOs to a large number of signal aspects and configurations found in multi-terminal areas. RCOs should be as knowledgeable in these areas as conventional or traditional engineers. Therefore, RCOs should have the same classroom training as any other train service engineer on the railroad (an average of 4-6 weeks).

The current RCL systems and their corresponding training programs in use today are designed for yard switching operations. They are not designed to effectively conduct train operations on the main track. Moreover, the RCOs are not receiving adequate training commensurate with the knowledge an engineer in a conventional railroad operation would need to perform the same duties.

FRA's Findings and Recommendations on RCL Main Track Operations

Many problems discussed earlier can be eliminated by designing the beltpacks to possess the same functions and gages found on a typical locomotive control stand. This would enable the RCOs to comply with current air brake and train handling rules.

However, in applying the current RCL speed control technology to main track operations, FRA believes limitations should be placed on horsepower and train size to eliminate or reduce excessive in-train forces. This is an established practice in the industry, since most railroads already have equipment restrictions for various reasons. Additionally, if the railroads are utilizing speed control technology, special air brake and train handling rules should be developed to govern RCOs when they handle trains using this technology on the main track. Additionally, railroads must carefully evaluate the locations where RCL operations can be conducted safely on the main track and must also closely monitor and manage these operations to ensure that the restrictions placed on these movements are properly ed.

Concerning the training of RCOs, this process is regulated by FRA under 49 CFR Part 240, Qualification and Certification of Locomotive Engineers. After careful review of the proposed RCL main track operations, FRA will require that all RCOs must have the same classroom curriculum training as traditional locomotive engineers if they are to conduct movments on the main track that require a brake test under Part 232. (The only exception will be for minimal RCL operations that extend onto the main track for distances not to exceed one mile). The practical or on-the-job training time will be decided by the type of movements to be made, but in no event will it be less than 120 hours of actual operating experience. These requirements are predicated on current RCL speeds not exceeding 15 mph. If speeds are increased, FRA will require that all RCOs receive the same training as traditional locomotive engineers.

Equipment Failure Issues

In 2004, FRA found that 34 RCL locomotive systems on one railroad had the speed control sensors mounted improperly. The sensors where mounted on the locomotive truck that is

secured by a handbrake. The handbrake is similar to a parking brake on an automobile. When the locomotive is left unattended, the handbrake is applied to ensure that the locomotive will not roll away if the air brakes malfunction. The speed sensor determines locomotive speed by calculating wheel revolution. There is a chance, with the handbrake applied, that the wheel with the speed sensor applied would fail to rotate and slide. Since the wheel fails to rotate, the speed sensor would not detect motion, prompting the computer to supply more power to begin movement, when, in fact, the locomotive is already in motion. This causes the RCL to accelerate beyond the desired speed. This problem was corrected by the application of a second sensor on a non-hand brake truck. The two sensors compare speed. If variances occur, the RCL movement will come to a stop.

On this same railroad, ground-wire problems were also discovered on non-powered RCL equipment. When this equipment's control cable was plugged into a powered unit, the powered unit unintentionally moved forward. The wiring problem was corrected on all affected equipment.

New-Hire Training

As stated in the Interim Report, the current majority of RCOs in this country were experienced train service employees before they began RCL training. They were familiar with railroad safety and operating rules and they were also familiar with the intricacies of working within busy classification yards before they became certified RCOs. This experience is extremely important in maintaining a safe working environment. Many railroads are experiencing a large influx of new, inexperienced workers into rail operations. FRA seeks assurance that these new workers will be afforded the traditional breaking-in periods when learning their jobs, especially RCO jobs.

Since many yards are operated exclusively by RCLs, conductor trainees are more apt to be confronted with the necessity to operate RCLs early in the yard-switching phase of training. Accordingly, FRA believes adequate time should be spent learning one job before moving on to the other. Because trainees will be spending longer time in yards learning RCL operations, they should be extended additional time to learn their other duties and responsibilities related to local and through-freight service. FRA intends to monitor this situation closely and will consider additional modification to existing training programs if it becomes evident that additional training is required. FRA strongly encourages rail labor and management to work closely together to ensure that adequate training is provided to new-hires to enable them to perform their jobs safely.

Special Studies

Electromagnetic Field Emissions

The FRA and the Volpe Center sent a request for information to the major RCL equipment suppliers in mid-January 2004, seeking specific information on RCL equipment characteristics, operating performance, and test data or other documentation of regulatory compliance with the Federal Communications Commission (FCC) Radio Frequency (RF) emissions and exposure

safety standards. Four major manufacturers/suppliers of RCL systems to U.S. railroads responded by mid-April; they provided FCC certification and other test data to document regulatory compliance with FCC Electromagnetic Interference (EMI) safety requirements applicable to RCLs. Compliance testing was performed by laboratories certified by the FCC for this purpose, or by noted experts on RF human-exposure safety.

This Phase 1 report analyzes the RCL test data provided to the Volpe Center, complemented by technical information available on the internet, to verify industry compliance with the FCC regulatory and licensing requirements for portable, mobile, and stationary RF emitters. Potential RCL operational safety issues and hazard scenarios related to EMI, Electromagnetic Compatibility (EMC), and Radio Frequency Radiation (RFR) are identified and summarized based on the review of available information on their occurrence. Additionally, the laboratory test configurations for RF emissions by RCL components were evaluated to assess their sufficiency and adequacy in simulating realistic field conditions. All applicable EMI and RF safety standards and guidelines (FRA, AAR, international, and national) were also reviewed and are cited for reference.

The four major RCL suppliers meet the FCC's EMI and RF safety regulatory requirements. They have adequately demonstrated RF safety compliance through the standardized tests performed on at least one RCL component (usually the operator control unit (OCU); in one case a locomotive control unit (LCU) or repeater power unit (RPU)). Only one LCU was tested for RF emissions as an FCC mobile device, and only one RPU antenna was tested as a fixed transmitter. All four RCL systems received FCC Grants of Equipment Authorization to operate in their selected frequency bands and modes.

RF emissions and human-exposure test data are only available for individual RCL components; the body-worn OCU subsystem was tested for compliance with the stricter public FCC Maximum Permissible Exposure (MPE) limits, using test procedures for portable devices (with less than 20 cm separation from the human body). Since all OCUs are low-power emitters (typically, 0.7 watts) and transmit intermittently, if the RF energy radiated and the heat absorbed in the human body satisfy these stricter public standards, they are well below and certainly satisfy the 5 times higher occupational-exposure safety limits.

Since an RCL system includes an OCU, several LCUs, and wayside RPU transceivers used to enhance intercommunication signals, tests performed to date do not reflect actual real RF exposure levels in railroad switching yards. Other sources of exposure beyond the scope of the present study, such as emissions from the portable 2-way radios and other communication devices carried by railroad yard workers and the urban RF background, would confound the results that might be gained from personal exposure monitoring to determine the exposures due to the RCL system.

RCL Signal System Integrity

An evaluation of the security of an RCL system requires that it be placed in the context of its vulnerabilities and threats. The security threats to a system can be extensive, and are the result of the exploitation of system environmental, technical, and human vulnerabilities. Because of

the wide range of threats that can be brought to bear against microprocessor-based wireless systems, it is often more practical to discuss threats in terms of groupings of system vulnerabilities, and to do so in terms of the vulnerabilities' impact on an authorized user's access to data. One such set of vulnerability groupings includes the denial of service, data disclosure, data manipulation, masquerading, data replay, and repudiation. Although RCL systems are not affected by many of the threats common to the majority of more traditional microprocessor-based systems that utilize wireless communications, the implications of an unprotected vulnerability can still be severe. For systems used to control heavy industrial equipment, the result may not just be a breach of security, but could result in injury or death. Such breaches are not just hypothetical. The Government Accountability Office has reported successful attacks, although without injury or deaths, on industrial control systems.[1]

Protection against security threats and, by default, protection of vulnerabilities is provided by security services. Just as there are alternative classifications for vulnerabilities, there are alternative classifications for security services. One of the most commonly used classification groupings of security services is "authentication, confidentiality, integrity, non-repudiation, availability, and accountability." Using both open-source and vendor-provider information of the four most commonly used RCL systems, FRA evaluated these systems' ability to provide these security services. These security services were then compared against the respective system vulnerabilities.

Our evaluation showed that the systems all experienced similar vulnerabilities, and provided similar corresponding security services to protect those vulnerabilities. With one major exception, we believe that the current RCL implementations provide sufficient security services to protect against immediate vulnerabilities and attacks, and that no further action is required now to enhance security. In the event of an attempted exploitation of vulnerability, the current security services generally provide functionality to stop locomotive movements. Additionally, the RCLs are equipped with manual emergency-shutdown push buttons on each side of the RCL. These buttons allow anyone close to the locomotive to immediately shut the locomotive down in the event of vulnerability exploitation.

The major exception where we believe that current RCL implementations do not provide adequate security services is in the area of access control. Railroads store their RCL equipment on their property. Once physical access has been gained to the RCL equipment, RCL systems operations can be undertaken by any user whether that user is authorized or not. Although current procedural controls attempt to limit RCL control unit and locomotive access to qualified and authorized personnel, they do not provide positive protection against unauthorized third party use of the equipment. RCL operations could be undertaken after the theft of one of the railroads' own RCL control units or substitution of a compatible alternative. This is due to the inability of an existing RCL system to individually identify and restrict use of an RCL system to

[1]" CRITICAL INFRASTRUCTURE PROTECTION - Challenges and Efforts to Secure Control Systems" Statement of Robert F. Dacey, Director, Information Security Issues, United States General Accounting Office, GAO Testimony Before the Subcommittee on Technology Information Policy, Intergovernmental Relations and the Census, House Committee on Government Reform, 23 March 2004.

a properly authorized set of individuals, and subsequently provide for auditable individual accountability of actions. Positive access control can easily be provided through one or more of three techniques: allowing RCL system use only after the user has provided something known to the individual (such as a pin); something possessed by the individual (such as a key access card); or something inherent to the individual (like a fingerprint), depending upon the level of security desired.

- *FRA strongly recommends the addition of access control capability to the RCL control unit and/or the RCL Locomotive Unit*

One specific technique for providing multiple security services is encryption, which can protect transmissions from unauthorized access and disclosure. Other cryptographic techniques, such as authentication and digital signatures, can protect against spoofing and forgeries. Cryptography is usually a rather inexpensive technology to deploy. Although the cost of developing new cryptographic algorithms can be significant, the marginal cost, in terms of direct expense and performance impact, of adding cryptographic security using existing algorithms, can be quite low. With modern programmable microprocessors, it is possible to implement encryption functions entirely in software with little or no performance impact. However, it should be noted that cryptography can be oversold as the solution to all security problems or to threats that do not exist.

The introduction of cryptography adds an additional complicating issue of key management. In cryptographic systems, the key refers to a value used by an algorithm to alter information so that a person having a copy of the corresponding key can only view it. Key management is the secure administration of keys to provide them to users when and where they are needed.

In the past, encryption systems were based on symmetrical keys, where everyone used the same key for encryption and decryption. Recently, people have adopted public key systems, where keys come in matched pairs, i.e., one part that is distributable to the public without compromising the second part that is private and never distributed beyond its owner. With symmetrical key cryptography, key management quickly becomes unwieldy beyond very small numbers of keys, while public key systems introduce complex systems for arranging chains of trust about the validity of the public key. Failure to adequately address key management can compromise the security of the entire system.

- *FRA recommends that the manufacturers prepare future RCL designs to support rapid implementation of symmetric and/or asymmetric key cryptography with the associated key management infrastructures should there be a significant or rapid change in the threat environment.*

Our analysis strongly suggests, however, that the current RCL system-security services are adequate for known vulnerabilities and that current RCL systems do not warrant the imposition of a cryptosystem and its associated key management infrastructure at this time.

Finally, many important interdependencies exist that are often unique to a specific organization or system environment that are not captured in a general analysis as conducted for this study. Local interdependencies can cause wide deviations from the results of a general study. Even for a general case analysis, the environments in which the systems operate are dynamic; technology and users, data, risks, and security requirements are ever changing. These issues make it necessary to reassess periodically the security of systems, and can rapidly result in major changes in the assessment of the condition of the security of a system.

- *FRA recommends a site-specific security analysis be undertaken prior to the implementation and activation of any RCL system*

- *FRA recommends periodic revaluation of RCL system security*

Technical Issues

Potential human-factors technical issues related to RCL operations and tasks:

1. Task overload:

The potential exists for task overload, and resultant loss of situational awareness or errors, due to the increase in tasks and responsibilities that come with RCL operations, in addition to regular switchman tasks and responsibilities. An RCO is responsible for not only his/her safety, car handling and switching (switchman tasks), but also the control of the RCL to make the moves (RCO task). RCOs now conduct more tasks than either a locomotive engineer or switchman did previously. These tasks may include: operating a radio; operating the beltpack, including interpretation of beltpack control positions, displays, and warning information; lining switches; observing the path and progress of the RCL and cut of cars; mounting, dismounting, and riding equipment; walking and staying free of rolling equipment; reading a switch list; and holding a lantern or flashlight (night-time operation). RCOs must also consider the logistics of their switch moves, such as any special handling of a car; how far into a track cars must be shoved or kicked; whether air needs to be bled from cars; whether and how many hand brakes must be set; and a yardmaster's requirement to get in the clear for a train entering or leaving the yard. In remote control zones, RCOs also are additionally responsible for keeping track of who enters and exits the zone. Further, there may be a temptation to add more tasks to the RCOs job to further "help" him/her, e.g., the provision of remote camera views and remote power switch controls, as well as the possible increase in responsibility and tasks that would come with a reduction of crew size from two to three individuals to one individual. As a means of trying to manage the large number of tasks, an RCO may focus exclusively on one or a few tasks and ignore all other tasks, leading to channelized attention. Channelized attention can lead to a situation where the RCO ignores important information in the operating environment, and can result in a reduction in the RCO's situational awareness. The increase in RCO tasks can also lead to operator error due to a misunderstanding, loss/lack of attention, or distraction brought on by the high number of task demands.

2. Reduction in RCO situational awareness.

The potential exists for a reduction in RCO situational awareness due to the added tasks and responsibilities that RCL operations have over conventional switching or locomotive engineering; the lack of kinesthetic (feel) and potentially visual and aural feedback received by the RCO due to the remote control of the RCL and cut of cars; and the degree of automation of the RCL system. These are discussed in detail below.

Reduction in bodily situational awareness. Railroad yards are hostile, dynamic environments where employees, who are continuously moving about, are placed in constant contact with moving cars, locomotives, and trains. It is paramount that these employees maintain a high degree of awareness of their body and its position relative to their immediate surroundings at all times while in the yard to ensure their own safety. The additional tasks and responsibilities related to RCL operation on top of those required of conventional switching operations (i.e., task overload) have the potential to overwhelm or distract the RCO, thereby capturing the RCO's attention, even if only momentarily, and reducing his/her awareness of their surroundings.

Reduction in RCL situational awareness. Given remote operation of an RCL and cut of cars, and the extent to which the level of automation and authority of the RCL system is conveyed to the RCO, the RCO may not know precisely what is happening regarding the RCL and cut of cars that he/she is controlling at every moment. Automation refers to the level of tasks performed by the RCL system (compared with the tasks required of the RCO), while authority refers to the extent to which the RCL system and, separately, the RCO can control the RCL system. A situation where there is a high degree of automation without operator feedback can lead to unexpected or unexplained actions by the RCL. For example, an RCL may apply an undesired emergency brake application for no apparent reason to the RCO. As identified in Foster-Miller's RCL operations human factors research, RCL operations potentially introduce several specific types of reduced RCL situational awareness:

Loss of locomotive orientation awareness. The RCO may forget, or may not know, the locomotive orientation (i.e., the particular direction the RCL is moving) due to his or her location away from the RCL, and thus may initiate a movement in the wrong direction.

Lack of RCL response feedback. If an RCO is on the ground in a position where he/she cannot see or hear the RCL, he/she may not be aware of how the locomotive is responding to the command given to the beltpack or OCU to speed up or slow down. This problem is exacerbated by communication delays between the beltpack and the RCL.

Loss of movement awareness. An RCO on the ground does not have the kinesthetic feedback that was provided to the engineer or RCO onboard, so he/she may not "feel" dragging equipment or a derailed car, a break in the cut of cars, or even a collision. This problem is exacerbated if the RCO is positioned where he/she cannot hear or see the RCL or part of the cut of cars.

3. RCO training/preparation/experience.
The combination of increase in new hires with no prior railroad experience (especially switching experience) and self-reported and observed (via Foster-Miller research) inadequacies in RCO training and preparation have the potential to be problematic and may lead to RCO errors, as well as accidents/incidents due to a lack of knowledge or understanding of RCL operations, including switching operations. Two examples of lack of preparation and training include a lack of knowledge about critical characteristics of a yard (presence of a signal), and unrecognized beltpack error messages. Training problems were noted in the following areas:

- *Lack of training for a specific move to be made or specific area of a yard.*

- *Inadequate on-the-job training.* This includes a lack of consistency and structure in the training, and a lack of preparation for those that provide training.

- *Insufficient amount of hands-on training.* Some RCOs have noted that they did not receive enough hands-on training with the beltpack before becoming qualified as an RCO.

4. Inadvertent/accidental activation of the RCD.
Inadvertent activation of beltpack controls was noted in the focus group research and has been implicated in past RCL-related accidents. Furthermore, Foster-Miller observes that there are some potentially problematic interface design issues that may lead to operator errors in controlling the RCL. Some of these interface design issues include similarity and proximity of various controls (i.e., two or more controls that have different functions that may look the same, or may be shaped the same, and/or may be positioned close together) that may lead to an operator error.

Configuration Management (Revision Control)
The RCL technology that is being used today is first generation and continues to evolve as railroads evaluate its capabilities. As with the introduction of new technology into any industry, problems are noted or new features become desirable and the technology hardware and/or software is modified. During the initial implementation of RCLs, operating features were changed or modified after the initial training on the equipment had taken place. Under these circumstances, especially with the large railroad systems today, it is imperative that railroads have a system in place to keep their employees up to date during periods of change. This will aid operational safety by eliminating any surprises the employees may encounter in their operation of the equipment.

Conclusions and Recommendations

First, FRA notes that this report is based on technology currently on the Nation's railroads. As this technology develops, it will require further evaluation. Regarding the current use of RCL technology in classification yards, FRA believes these operations can be conducted safely, provided employees are properly trained for the duties they are expected to perform and provided railroads maintain proper oversight during these operations. FRA based its valuation of

this technology in two areas: 1) the current technology's capabilities and 2) the training requirements associated with its operation. The following are FRA's recommendations on each.

1. RCL Technology - The current technology (speed control equipped) is safe and suitable for use in railroad switching yards. However, FRA believes that expansion of this technology to the main track cannot be conducted safely without restrictions on locomotive horsepower, train length, and as mentioned previously, a speed restriction not to exceed 15 mph. FRA encourages that the individual railroads work together to develop consistent standards in this area. FRA believes this will ensure safety and allow the railroads to fully explore the applications of new technology and apply it to their systems.

2. Training for RCL Operations - The current training programs appear sufficient for conducting yard switching operations. However, additional training will be required if railroads wish to extend these operations to the main track. Since FRA regulates the training of individuals who operate locomotives and trains (49 CFR Part 240), FRA is requiring that all RCOs, who operate trains requiring brake tests under 49 CFR Part 232 on the main track beyond a distance of one (1) mile, receive the same classroom training as conventional train service engineers. Regarding on-the-job training, FRA is requiring that each RCO have a minimum of 120 hours of actual documented hands-on operating experience. Depending on track profile and distance, training may need to be increased. The 120-hour training period considers the large influx of new hires into the industry, who will be required to learn and perform many duties in a short period with little or no experience. Examples include railroad safety and operating rules; switchman, trainman, and conductor duties and responsibilities; engineer duties and responsibilities (RCO) and, in many areas, the physical characteristics of multiple-division terminals that may represent 1,000 miles of railroad.

Current Operations: As stated above, some RCL operations migrated to the main track during the beginning of the implementation period. When this was discovered by FRA, the railroads were asked to discontinue further main track implementation until FRA could evaluate this aspect of their operations. To address these existing operations, railroads will be given notice that employees, who are currently operating beyond the limits specified, are to be retrained. While these employees received on-the-job training to some degree, they never received the fundamental classroom training that engineers receive to perform the same duties. Additionally, these employees should be trained on formal RCL train-handling rules and instructions.

Finally, FRA will monitor these operations as they evolve, and will take whatever action is necessary to ensure employee and public safety. The railroad industry is rapidly changing as it adopts new technology and explores new ways of doing business. FRA is committed to work closely with rail labor and management during this process.

Supporting Documentation

This report is supplemented with supporting documentation, consisting of:

1) FRA RCL and Conventional Switching Accident/Incident Data. These pages contain the

data FRA relied upon to arrive at the various occurrence rates discussed in the report.

2) Special Studies by Foster-Miller, Inc. To understand the safety implications of RCL operations, the FRA contracted with Foster-Miller Inc., to undertake a multi-study program of research into RCL operations in early 2002, just as RCL operations began on a large scale in the U.S. The FRA sponsored three separate reports:

    1) Human Factors Root Cause Analysis of Accidents/Incidents Involving Remote Control Locomotive Operations.
    2) Remote Control Locomotive Operations: Results of Focus Groups with Remote Control Operators in the U.S. and Canada.
    3) A Comparative Risk Assessment of Remote Control Locomotive Operations Versus Conventional Yard Switching Operations.

This supporting documentation contains the summaries of those research studies, which generally support FRA's conclusions about RCL operations. FRA recommends that the rail industry closely review the findings of these reports and adopt the recommendations where applicable. The reports are currently under review and will be posted on FRA's website.

Table 1-1
Comparison RCL and Convention Switching Related Train Accidents – Number of Accidents, Yard Switching Miles, and Accident Rates On Yard and Industry Tracks - For The Period December 2003 Through December 2004

Railroads	Accidents				Yard Switching Miles			Accident Rates	
	RCL Op.	Conv. Op.	Total	% RCL Op.	RCL Op.	Conv. Op.	Total	RCL Op.	Conv. Op.
Grand Total	474	1,410	1,884	25.2	21,392,572	49,218,974	70,611,546	22.16	28.65
Alton & Southern Rwy [ALS]	13	1	14	92.9	661,117	431,315	1,092,432	19.66	2.32
Arkansas & Missouri RR Co. [AM]	-	-	-	-	728	27,049	27,777	-	-
BNSF Rwy Co. [BNSF]	116	317	433	26.8	5,026,175	9,708,587	14,734,762	23.08	32.65
Belt Rwy Co. Of Chicago [BRC]	16	5	21	76.2	473,995	40,478	514,473	33.76	123.52
Brandywine Valley RR Co. [BVRY]	-	-	-	-	845	51,025	51,870	-	-
California Northern RR Co. [CFNR]	-	-	-	-	4,457	7,687	12,144	-	-
Consolidated Grain & Barge Co. [CGBX]	-	-	-	-	27,839	-	27,839	-	-
Central Midland Rwy Co. [CMR]	-	-	-	-	460	27,454	27,914	-	-
Consolidated Rail Corp. [CRSH]	3	29	32	9.4	93,796	1,875,632	1,969,428	31.98	15.46
CSX Transportation [CSX]	66	285	351	18.8	4,851,944	8,127,775	12,979,719	13.60	35.06
Elgin, Joliet & Eastern Rwy Co. [EJE]	-	14	14	-	44,936	233,372	278,308	0.00	59.99
Florida East Coast Rwy Co. [FEC]	-	10	10	-	10,321	421,838	432,159	0.00	23.71
Finger Lakes Rwy Corp. [FGLK]	-	-	-	-	12,177	3,729	15,906	-	-
Illinois Central RR Co. [IC]	2	19	21	9.5	66,541	2,559,672	2,626,213	30.06	7.42
Indiana Rail Road Co. [INRD]	-	-	-	-	26,914	21,697	48,611	-	-
Indiana Southern RR Co., Inc. [ISRR]	-	-	-	-	1,208	17,112	18,320	-	-
Jefferson Warrior RR [JEFW]	-	-	-	-	9,230	394	9,624	-	-
Kansas City Southern Rwy Co. [KCS]	14	76	90	15.6	339,451	934,253	1,273,704	41.24	81.35
Louisiana & Delta RR [LDRR]	-	-	-	-	122	20,477	20,599	-	-
Lake Term. RR Co. [LT]	-	-	-	-	2,022	7	2,029	-	-
Minnesota, Dakota & Western Rwy Co. [MDW]	-	-	-	-	14,951	18,827	33,778	-	-
Mckeesport Connecting RR Co. [MKC]	-	-	-	-	16,287	582	16,869	-	-
Montreal, Maine and Atlantic Rwy, Ltd. [MMA]	-	2	2	-	5,350	100,797	106,147	0.00	19.84
Montana Rail Link [MRL]	2	7	9	22.2	280,059	218,782	498,841	7.14	32.00
Nebraska Central RR [NCRC]	1	1	2	50.0	2,312	20,597	22,909	432.53	48.55
Norfolk Southern Corp. [NS]	11	196	207	5.3	866,592	13,070,316	13,936,908	12.69	15.00
Portland & Western RR, Inc. [PNWR]	-	1	1	-	10,714	77,402	88,116	0.00	12.92
Puget Sound & Pacific RR Co. [PSAP]	-	-	-	-	838	3,301	4,139	-	-
Pennsylvania Southwestern RR, Inc. [PSWR]	-	-	-	-	67,323	5,190	72,513	-	-
San Luis & Rio Grande RR [SLRG]	-	-	-	-	1,499	5,499	6,998	-	-
Terminal RR Association Of St. Louis [TRRA]	2	3	5	40.0	12,760	662,863	675,623	156.74	4.53
Union Pacific RR Co. [UP]	227	424	651	34.9	8,335,826	8,580,862	16,916,688	27.23	49.41
Union RR Co. [URR]	-	6	6	-	8,712	126,804	135,516	0.00	47.32
Vermont Rwy, Inc. [VTR]	-	1	1	-	291	25,664	25,955	0.00	38.97
Wisconsin Central Ltd. [WC]	1	11	12	8.3	71,148	1,459,612	1,530,760	14.06	7.54
Wheeling & Lake Erie Rwy Co. [WE]	-	1	1	-	15,398	261,020	276,418	0.00	3.83
Willamette & Pacific RR, Inc. [WPRR]	-	1	1	-	25,040	62,835	87,875	0.00	15.91
Western RR Co. [WRRC]	-	-	-	-	3,194	8,468	11,662	-	-

Rates are cases per million yard switching miles for the two types of operations

Table 1-2
Comparison of Train Accidents in RCL vs. Conventional Switching Operation
By Month, Type of Track, Major Cause and Type of Accident - Grand Totals and by Railroads
Selected Railroads On Yard and Industry Tracks
For The Period December 2003 Through December 2004

	Accidents		Operation					
			RCL			Conventional		
			Average Damages to			Average Damages to		
	RCL	Conventional	Total	Equipment	Track	Total	Equipment	Track
**Total Accidents	474	1,410	51,692	23,429	28,263	36,435	23,342	13,093
--Year/Month	38	120	42,987	21,642	21,345	38,517	25,978	12,539
2003, 12								
2004, 01	21	113	38,971	29,231	9,740	38,132	26,505	11,628
2004, 02	41	111	39,674	30,102	9,571	35,661	22,858	12,804
2004, 03	37	100	36,828	23,946	12,882	26,804	18,584	8,220
2004, 04	36	101	26,084	17,819	8,265	31,939	20,609	11,329
2004, 05	42	114	40,081	24,475	15,607	35,892	20,395	15,497
2004, 06	38	135	56,088	20,412	35,676	39,408	22,553	16,855
2004, 07	34	108	23,550	14,158	9,392	29,884	19,511	10,372
2004, 08	43	106	37,368	29,057	8,312	50,959	36,512	14,448
2004, 09	32	94	35,838	24,480	11,358	34,071	23,722	10,349
2004, 10	46	96	179,075	22,213	156,862	45,853	25,086	20,767
2004, 11	31	98	38,358	24,634	13,724	38,166	23,116	15,051
2004, 12	35	114	37,888	22,975	14,913	27,995	18,178	9,818
--Type Track	463	1,172	52,491	23,682	28,809	37,023	23,396	13,627
Yard								
Industry	11	238	18,036	12,756	5,280	33,538	23,076	10,461
--Primary Cause	21	81	65,069	31,036	34,033	36,839	18,993	17,846
Equipment Defects								
Human Factors	286	648	36,039	25,985	10,054	32,303	24,085	8,218
Miscellaneous	61	203	32,985	21,196	11,789	41,560	27,318	14,242
Signal and Train Control	31	24	45,757	15,250	30,507	20,455	12,656	7,799
Track Defects	75	454	125,305	16,750	108,555	40,813	21,845	18,968
--Type Accident	257	1,051	64,353	18,813	45,540	36,949	20,832	16,117
Derailment								
Head on collision	1	3	61,518	34,500	27,018	19,404	19,404	0
Rear end collision	.	3	.	.	.	141,946	127,324	14,622
Side collision	74	60	38,003	29,604	8,399	38,798	33,361	5,438
Raking collision	12	20	49,004	34,177	14,827	25,334	24,238	1,096
Broken train collision	1	2	19,948	19,948	0	22,352	21,852	500
Obstruction impact	2	7	14,546	5,090	9,456	23,735	23,592	143
Explosion/detonation	.	2	.	.	.	25,625	25,175	450
Fire/violent rupture	.	1	.	.	.	15,000	0	15,000
Other impact	124	239	35,225	28,477	6,748	28,567	25,016	3,552
Other event	3	22	28,107	24,575	3,532	96,204	84,251	11,953

Table 1-3
Comparison of Train Accidents in RCL vs. Conventional Switching Operation
By States, Displaying Number of Accidents and Average Damage Costs
Selected Railroads on Yard And Industry Tracks For The Period December 2003 Through December 2004

State	Accidents		Operation					
			RCL			Conventional		
			Average Damages to			Average Damages to		
	RCL	Conventional	Total	Equipment	Track	Total	Equipment	Track
Alabama	13	30	59,741	47,617	12,124	25,227	18,991	6,235
Arizona	.	18	.	.	.	30,128	16,915	13,214
Arkansas	38	28	26,333	12,963	13,370	35,778	6,088	29,689
California	24	77	40,652	16,597	24,055	46,401	22,583	23,818
Colorado	14	27	32,681	30,865	1,816	38,232	25,324	12,908
Delaware	.	3	.	.	.	17,391	12,176	5,215
Dist Of Columbia	.	1	.	.	.	7,400	7,400	0
Florida	3	36	13,267	13,233	33	19,487	16,497	2,990
Georgia	10	45	29,321	28,541	780	22,715	20,557	2,159
Idaho	.	16	.	.	.	51,580	25,484	26,096
Illinois	74	109	129,716	26,942	102,774	28,570	19,075	9,495
Indiana	1	44	164,338	156,338	8,000	22,282	18,377	3,905
Iowa	3	35	12,104	9,482	2,622	22,119	12,072	10,047
Kansas	19	46	41,353	33,876	7,477	56,510	24,827	31,683
Kentucky	11	31	20,973	20,727	245	44,723	38,491	6,232
Louisiana	6	66	12,203	12,038	166	37,110	19,742	17,368
Maine	.	2	.	.	.	14,315	10,592	3,723
Maryland	10	20	19,732	17,002	2,730	16,213	12,450	3,763
Massachusetts	.	9	.	.	.	17,780	16,524	1,256
Michigan	2	8	33,500	8,200	25,300	13,009	11,656	1,353
Minnesota	15	21	35,345	13,859	21,486	51,419	20,858	30,561
Mississippi	.	31	.	.	.	55,295	50,674	4,621
Missouri	12	37	38,101	25,738	12,363	32,562	16,081	16,481
Montana	3	13	24,427	11,727	12,700	45,248	33,594	11,654
Nebraska	41	39	49,645	20,983	28,662	30,378	16,873	13,505
Nevada	.	9	.	.	.	60,087	34,850	25,238
New Jersey	3	33	34,706	34,306	400	30,332	24,550	5,782
New Mexico	4	14	17,284	17,284	0	23,477	17,901	5,576
New York	4	33	34,620	24,495	10,125	21,437	17,877	3,559
North Carolina	12	16	25,170	24,374	796	32,300	28,332	3,968
North Dakota	2	4	7,015	3,565	3,450	77,876	32,133	45,743
Ohio	6	65	22,661	20,436	2,225	22,449	19,576	2,873
Oklahoma	3	33	105,340	88,873	16,467	41,328	22,687	18,642
Oregon	20	40	31,085	12,250	18,835	38,731	18,415	20,316
Pennsylvania	1	63	46,400	45,400	1,000	26,282	21,019	5,264
South Carolina	2	23	14,268	14,168	100	37,981	34,750	3,231
South Dakota	.	5	.	.	.	36,409	18,099	18,310
Tennessee	12	34	64,796	41,910	22,886	29,566	23,533	6,034
Texas	73	140	39,441	23,840	15,601	45,431	23,864	21,568
Utah	10	10	66,709	22,368	44,341	41,204	10,649	30,556
Vermont	.	1	.	.	.	1,000	0	1,000
Virginia	.	19	.	.	.	98,895	95,690	3,204
Washington	18	26	26,666	16,026	10,640	48,091	27,566	20,524
West Virginia	.	7	.	.	.	16,645	16,330	314
Wisconsin	.	19	.	.	.	60,632	43,143	17,489
Wyoming	5	24	25,695	16,827	8,868	62,477	45,035	17,442
Total	474	1,410	51,692	23,429	28,263	36,435	23,342	13,093

Table 1-4
Comparison of Train Accident Causes In RCL Operation vs. Conventional Operation
Specific Causes within each Major Cause Area
Selected Railroads on Yard and Industry Tracks
For The Period December 2003 Through December 2004

Causes		Accidents		Total
		Conventional	RCL	
	Grand Total	1,410	474	1,884
Human Factors	Switch improperly lined	127	46	173
	Shoving movement, absence of man	87	52	139
	Shoving movement, failure to control	23	28	51
	Switch previously run through	34	5	39
	Cars left foul	31	7	38
	Fail to secure car hnd brk -rr emp	21	14	35
	Fail to apply suff. hand brakes -rr emp	23	10	33
	Passed couplers	19	14	33
	Buff/slack action excess, trn handling	26	6	32
	Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	14	14	28
	Kicking or dropping cars, inadequate precautions	18	4	22
	Switch not latched or locked	18	2	20
	Instruction to trn/yd crew improper	11	7	18
	Derail, failure to apply or remove	13	5	18
	Other general switching rules	8	8	16
	Failure to couple	9	6	15
	Fail to apply car hnd brks -rr emp	13	2	15
	Coupling speed excessive	11	2	13
	Car(s) shoved out & left out of clear	11	2	13
	Buff/slack action excess, trn make-up	6	4	10
	Failure to stretch cars before shoving	5	5	10
	Failure to secure engine- rr empl	7	2	9
	Switch movement, excessive speed	3	5	8
	Use of brakes, other	4	3	7
	Other train operation/human factors	4	3	7
	Retarder, improper manual operation	6	1	7
	Independent brake, improper use	7	.	7
	Failure to stop train in clear	3	3	6
	Radio communication, failure to comply	5	1	6
	Excessive horsepower	6	.	6
	Lat DB force on curve xcess trn hndlng	6	.	6
	Other train handling/makeup	2	3	5
	Skate, failure to remove or place	.	5	5
	Manual intervention of classification yard automatic control system modes by operator	3	2	5
	Movement without authority - rr emp	4	1	5
	Humping or cutting off in motion equipment susceptible to damage, or to cause damage to other equipment	2	2	4
	Speed, other	3	1	4
	Improper train make-up	3	1	4
	Fail to release hand brk - rr emp	1	3	4
	Lat drawbar force-short/long car combo	4	.	4
	Spring Swtch not clear before reverse	4	.	4
	Fail to allow air brks to release	4	.	4
	Lat DB force on curve excess, make-up	4	.	4
	Fail to ctrl car spd use hnd brk-r emp	2	1	3
	Failure to comply with restricted speed	2	1	3
	Human factors -motive power & equipment	3	.	3
	Throttle (power), improper use	3	.	3
	Fixed signal (other than automatic block or interlocking signal), failure to comply.	1	1	2
	Absence of fixed signal (Blue Signal)	1	1	2
	Automatic brake, insufficient	1	1	2
	Fail to secure equip - not rr emp	2	.	2

Table 1-4
Comparison of Train Accident Causes In RCL Operation vs. Conventional Operation
Specific Causes within each Major Cause Area
Selected Railroads on Yard and Industry Tracks
For The Period December 2003 Through December 2004

Causes		Accidents		Total
		Conventional	RCL	
	Dynamic brake, too rapid adjustment	2	.	2
	Moving cars-load ramp,etc, not in pos	2	.	2
	Radio comm., failure to give/receive	2	.	2
	Fail to comply with trn order, etc.	2	.	2
	Other main track authority causes	.	1	1
	Switch improperly lined, radio controlled	.	1	1
	Failure to actuate off independent brk	1	.	1
	Improper train make-up at init term	1	.	1
	Fail to cut-out brake valves-loco	1	.	1
	Failure to comply with failed equipment detector warning or with applicable train inspection rules.	1	.	1
	Radio communication, improper	1	.	1
	Improper train inspection	1	.	1
	Dynamic brake, excessive	1	.	1
	Bottling the Air	1	.	1
	Retarder yard skate improperly applied	1	.	1
	Train outside yd limits(nonblk),exc spd	1	.	1
	Automatic brake, excessive	1	.	1
	Use of switches, other	1	.	1
	Total	648	286	934
Track Defects	Wide gage(defective/missing crossties)	143	14	157
	Switch point worn or broken	46	10	56
	Transverse/compound fissure	41	4	45
	Switch damaged or out of adjustment	21	4	25
	Head and web sep(outside jt bar limit)	19	4	23
	Switch pt gap(btwn swt pt & stock rail)	18	5	23
	Detail fracture - shelling/head check	19	1	20
	Broken base of rail	16	2	18
	Vertical split head	12	2	14
	Wide gage(spikes/other rail fasteners)	8	3	11
	Roadbed settled or soft	9	2	11
	Cross level of track irregular(joints)	10	.	10
	Switch (hand op) stand mechanism defect	7	2	9
	Cross level track irreg.(not at joints)	8	1	9
	Defective or missing crossties	5	3	8
	Oth frog, switch, trk appliance defect	7	1	8
	Wide gage (due to worn rails)	5	2	7
	Other rail and joint bar defects	5	1	6
	Mismatched rail-head contour	3	3	6
	Wide gage(loose,broke, etc, gage rods)	3	2	5
	Stock rail worn, broken, disconnected	5	.	5
	Other track geometry defects	5	.	5
	Horizontal split head	2	1	3
	Head & web separation-in jt bar limit	3	.	3
	Switch out of adj. insuff. anchoring	3	.	3
	Engineering design or construction	3	.	3
	Superelevation improper, excessive,etc.	3	.	3
	Retarder yard skate defective	.	2	2
	Trk alignmnt irreg-not buckled/sunkink	1	1	2
	Retarder worn, broken, malfunctioning	1	1	2
	Spring/power swtch mech. malfunction	1	1	2
	Joint bar broken (insulated)	1	1	2
	Joint bar broken (noninsulated)	2	.	2
	Bolt hole crack or break	2	.	2
	Swtch connect/operate rod broke/defect	2	.	2
	Switch rod worn, bent, broken, etc.	2	.	2
	Washout/rain/slide/etc. dmg -track	2	.	2

Table 1-4
Comparison of Train Accident Causes In RCL Operation vs. Conventional Operation
Specific Causes within each Major Cause Area
Selected Railroads on Yard and Industry Tracks
For The Period December 2003 Through December 2004

Causes		Accidents		Total
		Conventional	RCL	
	Track alignment irreg(buckled/sunkink)	2	.	2
	Joint bolts, broken, or missing	2	.	2
	Defect/missing spike-oth rail fastener	.	1	1
	Deviate frm uniform top of rail profile	.	1	1
	Other way and structure defect	1	.	1
	Broken weld (field)	1	.	1
	Worn rail	1	.	1
	Derail, defective	1	.	1
	Flangeway clogged	1	.	1
	Turnout frog(self guarded)-worn/broken	1	.	1
	Other roadbed defects	1	.	1
	Total	454	75	529
Miscellaneous	Harmonic rock off, etc.	38	17	55
	Passed couplers (automated classification yard)	16	19	35
	Auto hump retarder failed to slow car	18	6	24
	Vandalism of track or track appliances	22	.	22
	Fail by non-rr empto control spd of car	17	.	17
	Lading chains/straps fouling switches	. 9	3	12
	Snow,ice,mud,gravel,coal,etc. on trk	11	1	12
	Yard skate slid and failed to stop car	7	5	12
	Obj/equip on/fouling track, other	7	5	12
	Other miscellaneous causes	10	1	11
	Interference(not vandals)with RR op.	10	.	10
	Extreme wind velocity	7	1	8
	Load shifted	3	1	4
	Other extreme environmental conditions	4	.	4
	Improperly loaded car	4	.	4
	Track damage caused by non-railroad interference with track structure	4	.	4
	Investigation complete, cause could not be determined	2	1	3
	Cause under investigation	2	1	3
	Vandalism of on-track equipment	3	.	3
	Object/equipment (mtr veh) on track	2	.	2
	Load fell from car	2	.	2
	Miscellaneous loading procedures	2	.	2
	Extreme environmental - FLOOD	2	.	2
	Overloaded car	1	.	1
	Total	203	61	264
Equipment Defects	Truck bolster stiff	13	2	15
	Oth coupler/draft system defects-car	6	4	10
	Worn Flange	9	.	9
	Side bearing clearance insufficient	5	2	7
	Truck bolster stiff (failure to slew)	5	1	6
	Center sill broken or bent	6	.	6
	Draft gear/mechanism broke/defective	2	2	4
	Other truck component defects, (CAR)	3	.	3
	Damaged flange or tread (build up)	3	.	3
	Coupler mismatch, high/low	1	1	2
	Draft sill broken or bent	1	1	2
	Coupler carrier broken or defective	.	2	2
	Brake valve malf. (stuck brake, etc.)	1	1	2
	Other LOCO defects	2	.	2
	Hand brk broken or defective	2	.	2
	Knuckle broken or defective	2	.	2
	Bottom outlet door attachment defect	2	.	2
	Other brake defects, cars	2	.	2
	Worn flange (LOCO)	2	.	2

Table 1-4
Comparison of Train Accident Causes In RCL Operation vs. Conventional Operation
Specific Causes within each Major Cause Area
Selected Railroads on Yard and Industry Tracks
For The Period December 2003 Through December 2004

Causes		Accidents		Total
		Conventional	RCL	
	Defective snubbing	.	1	1
	Air hose uncoupled or burst	.	1	1
	Other brake defects, (LOCO)	.	1	1
	Center plate broken or defective	.	1	1
	Coupler shank broken/defective	.	1	1
	Loose wheel	1	.	1
	Coupler drawhead broke/defect-loco	1	.	1
	Broken brake pipe/connections (LOCO)	1	.	1
	Side bearing(s) broken	1	.	1
	Other body defects, (CAR)	1	.	1
	Other wheel defects (CAR)	1	.	1
	Ctr plate disengaged from truck	1	.	1
	Broken flange (LOCO)	1	.	1
	Broken rim	1	.	1
	Side bearing clearance excessive	1	.	1
	Journal (roller bearing) overheating	1	.	1
	Broke/bent axle btwn wheel seats-loco	1	.	1
	Oth brk component dmg,worn,broke,etc.	1	.	1
	Rigging down or dragging	1	.	1
	Total	81	21	102
Signal and Train Control	Class yd auto ctrl sys retarder fail	10	13	23
	Power switch failure	3	6	9
	Classyard autocontrol sys switch fail	3	5	8
	Classification yard automatic control system - Inadequate/insufficient control	4	3	7
	Other signal failures	2	2	4
	Remote control transmitter, loss of communication.	.	1	1
	Other communication equipment failure	.	1	1
	Power device interlocking failure	1	.	1
	Radio controlled switch communication failure	1	.	1
	Total	24	31	55

Table 1-5
Railroad/Location Distribution of Train Accidents Involving RCL Operations
Selected Railroads on Yard And Industry Tracks. For The Period December 2003 Through December 2004

		Total	Primary Cause of Accident				
			Equip.	Human	Misc.	Track	Signal
Alton & Southern Rwy [ALS]	EAST ST LOUIS, Illinois	13	2	7	3	1	.
	Total	13	2	7	3	1	.
BNSF Rwy Co. [BNSF]	BIRMINGHAM, Alabama	3	.	2	.	1	.
	BARSTOW, California	10	1	5	1	2	1
	SAN BERNARDINO, California	1	.	1	.	.	.
	DENVER, Colorado	7	.	7	.	.	.
	CICERO, Illinois	1	.	1	.	.	.
	GALESBURG, Illinois	7	1	2	3	1	.
	LOGISTICS PARK, Illinois	2	.	2	.	.	.
	KANSAS CITY, Kansas	8	1	3	2	1	1
	FRIDLEY, Minnesota	3	.	1	.	2	.
	MINNEAPOLIS, Minnesota	2	.	1	1	.	.
	NORTHTOWN, Minnesota	4	.	1	1	1	1
	ST ANTHONY, Minnesota	1	.	1	.	.	.
	ST PAUL, Minnesota	1	.	1	.	.	.
	ST PAUL PARK, Minnesota	1	.	.	.	1	.
	WILLMAR, Minnesota	3	.	3	.	.	.
	KANSAS CITY, Missouri	3	.	1	1	1	.
	ST LOUIS, Missouri	1	.	1	.	.	.
	GREAT FALLS, Montana	1	.	1	.	.	.
	ALLIANCE, Nebraska	1	.	1	.	.	.
	LINCOLN, Nebraska	8	.	3	2	1	2
	BELEN, New Mexico	3	.	3	.	.	.
	CLOVIS, New Mexico	1	.	1	.	.	.
	GRAND FORKS, North Dakota	1	.	1	.	.	.
	MANDAN, North Dakota	1	.	1	.	.	.
	OKLAHOMA CITY, Oklahoma	1	.	1	.	.	.
	TULSA, Oklahoma	2	.	2	.	.	.
	MEMPHIS, Tennessee	10	2	4	1	.	3
	ALLIANCE, Texas	1	.	1	.	.	.
	AMARILLO, Texas	6	1	5	.	.	.
	AMARILLO S YARD, Texas	4	.	4	.	.	.
	HASLET, Texas	1	.	1	.	.	.
	TEMPLE, Texas	1	.	1	.	.	.
	INTERBAY, Washington	1	.	1	.	.	.
	PARKWATER, Washington	1	.	1	.	.	.
	PASCO, Washington	9	.	1	2	5	1
	SEATTLE, Washington	4	1	2	1	.	.
	SPOKANE, Washington	1	.	1	.	.	.
	Total	116	7	69	15	16	9
Belt Rwy Co. Of Chicago [BRC]	BEDFORD PARK, Illinois	15	.	9	3	1	2
	CHICAGO, Illinois	1	.	.	.	1	.
	Total	16	.	9	3	2	2
Consolidated Rail Corp. [CRSH]	CAMDEN, New Jersey	3	.	3	.	.	.
	Total	3	.	3	.	.	.
CSX Transportation [CSX]	BIRMINGHAM, Alabama	4	.	4	.	.	.
	MONTGOMERY, Alabama	2	.	2	.	.	.
	BALDWIN, Florida	1	.	1	.	.	.
	JACKSONVILLE, Florida	1	.	1	.	.	.
	PENSACOLA, Florida	1	.	1	.	.	.

Table 1-5
Railroad/Location Distribution of Train Accidents Involving RCL Operations
Selected Railroads on Yard And Industry Tracks. For The Period December 2003 Through December 2004

		Total	Primary Cause of Accident				
			Equip.	Human	Misc.	Track	Signal
	ATLANTA, Georgia	4	.	4	.	.	.
	SAVANNAH, Georgia	1	.	1	.	.	.
	WAYCROSS, Georgia	4	1	2	1	.	.
	RIVERDALE, Illinois	4	.	4	.	.	.
	EVANSVILLE, Indiana	1	.	1	.	.	.
	LOUISVILLE, Kentucky	9	.	4	4	.	1
	RUSSELL, Kentucky	1	.	1	.	.	.
	RV CABIN, Kentucky	1	.	1	.	.	.
	BALTIMORE, Maryland	1	.	.	.	1	.
	CUMBERLAND, Maryland	9	.	3	4	2	.
	BUFFALO, New York	1	.	.	.	1	.
	DEWITT, New York	1	.	.	.	1	.
	FEURA BUSH, New York	1	.	1	.	.	.
	SELKIRK, New York	1	.	1	.	.	.
	HAMLET, North Carolina	5	.	4	1	.	.
	ROCKY MOUNT, North Carolina	7	.	7	.	.	.
	CINCINNATI, Ohio	1	.	1	.	.	.
	CLEVELAND, Ohio	1	.	1	.	.	.
	COLUMBUS, Ohio	1	.	1	.	.	.
	WALBRIDGE, Ohio	1	.	.	1	.	.
	FLORENCE, South Carolina	1	.	1	.	.	.
	NORTH CHARLESTON, South Carolina	1	.	1	.	.	.
	Total	66	1	48	11	5	1
Illinois Central RR Co. [IC]	MEMPHIS, Tennessee	2	.	2	.	.	.
	Total	2	.	2	.	.	.
Kansas City Southern Rwy Co. [KCS]	KANSAS CITY, Missouri	2	.	2	.	.	.
	BATON ROUGE, Louisiana	1	.	1	.	.	.
	METAIRIE, Louisiana	1	.	1	.	.	.
	SHREVEPORT, Louisiana	3	.	2	.	1	.
	PORT ARTHUR, Texas	5	.	4	.	1	.
	WYLIE, Texas	2	.	2	.	.	.
	Total	14	.	12	.	2	.
Montana Rail Link [MRL]	LAUREL, Montana	2	.	1	.	1	.
	Total	2	.	1	.	1	.
Nebraska Central RR [NCRC]	NORFOLK, Nebraska	1	.	1	.	.	.
	Total	1	.	1	.	.	.
Norfolk Southern Corp. [NS]	BIRMINGHAM, Alabama	4	.	2	1	.	1
	MACON, Georgia	1	.	1	.	.	.
	DECATUR, Illinois	2	.	2	.	.	.
	TAYLOR, Michigan	1	.	1	.	.	.
	EVENDALE, Ohio	1	.	.	.	1	.
	IRONVILLE, Ohio	1	.	.	.	1	.
	ENOLA, Pennsylvania	1	.	.	.	.	1
	Total	11	.	6	1	2	2
Terminal RR Association Of St. Louis [TRRA]	MADISON, Illinois	1	.	1	.	.	.
	VENICE, Illinois	1	.	.	1	.	.
	Total	2	.	1	1	.	.
Union Pacific RR Co. [UP]	DENVER, Colorado	7	.	6	1	.	.
	KANSAS CITY, Kansas	8	.	3	.	5	.
	KANSAS CITY, Missouri	6	.	4	2	.	.

Table 1-5
Railroad/Location Distribution of Train Accidents Involving RCL Operations
Selected Railroads on Yard And Industry Tracks. For The Period December 2003 Through December 2004

		Total	Primary Cause of Accident				
			Equip.	Human	Misc.	Track	Signal
	NORTH LITTLE ROCK, Arkansas	12	.	7	1	3	1
	PINE BLUFF, Arkansas	26	1	8	6	9	2
	FRESNO, California	1	.	1	.	.	.
	MILPITAS, California	1	.	1	.	.	.
	ROSEVILLE, California	6	.	5	1	.	.
	SACRAMENTO, California	1	.	.	.	1	.
	SAN JOSE, California	1	.	.	.	1	.
	STOCKTON, California	1	.	1	.	.	.
	WARM SPRINGS, California	1	.	.	.	1	.
	WEST SACRAMENTO, California	1	1	.	.	.	.
	DOLTON, Illinois	1	.	1	.	.	.
	MELROSE PARK, Illinois	2	1	1	.	.	.
	NORTHLAKE, Illinois	18	2	10	3	1	2
	PROVISO, Illinois	4	.	.	1	3	.
	ROCHELLE, Illinois	2	.	2	.	.	.
	DES MOINES, Iowa	3	1	2	.	.	.
	ARMOURDALE, Kansas	1	.	1	.	.	.
	WICHITA, Kansas	2	.	2	.	.	.
	LIVONIA, Louisiana	1	.	1	.	.	.
	NORTH PLATTE, Nebraska	31	2	13	6	6	4
	BROOKLYN, Oregon	1	.	1	.	.	.
	EUGENE, Oregon	3	.	3	.	.	.
	HERMISTON, Oregon	9	.	2	1	4	2
	PORTLAND, Oregon	7	.	6	.	1	.
	ARLINGTON, Texas	3	.	2	.	1	.
	DALLAS, Texas	4	.	4	.	.	.
	FORT WORTH, Texas	3	.	2	1	.	.
	FT WORTH, Texas	2	.	.	1	1	.
	FT. WORTH, Texas	1	.	1	.	.	.
	HOUSTON, Texas	20	1	10	2	4	3
	LAPORTE, Texas	5	.	3	.	2	.
	SAN ANTONIO, Texas	15	2	8	1	2	2
	OGDEN, Utah	4	.	4	.	.	.
	SALT LAKE CITY, Utah	6	.	5	.	.	1
	FIFE, Washington	2	.	2	.	.	.
	CHEYENNE, Wyoming	1	.	1	.	.	.
	GREEN RIVER, Wyoming	4	.	3	.	1	.
	Total	227	11	126	27	46	17
Wisconsin Central Ltd. [WC]	ESCANABA, Michigan	1	.	1	.	.	.
	Total	1	.	1	.	.	.

Equip. = Equipment (on-track), Misc. = Miscellaneous

Table 1-6
Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order
For The Period December 2003 Through December 2004

Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
1	12/01/2003	CSX	LOUISVILLE	KY	Other impact	Yard/Switch	Human-Shoving movement, absence of man	14,184	14,184	0
2	12/01/2003	TRRA	MADISON	IL	Other impact	Yard/Switch	Human-Shoving movement, failure to control	20,000	20,000	0
3	12/02/2003	BNSF	PASCO	WA	Derailment	Yard/Switch	Track-Switch damaged or out of adjustment	11,041	10,041	1,000
4	12/03/2003	BNSF	GALESBURG	IL	Derailment	Yard/Switch	Misc-Lading chains/straps fouling switches	25,500	7,500	18,000
5	12/03/2003	BNSF	SEATTLE	WA	Derailment	Yard/Switch	Equipment-Truck bolster stiff	26,138	18,138	8,000
6	12/03/2003	UP	ROSEVILLE	CA	Side collision	Yard/Switch	Human-Shoving movement, absence of man	72,331	50,331	22,000
6	12/03/2003	UP	ROSEVILLE	CA	Side collision	Yard/Switch	Human-Shoving movement, absence of man	3,781	3,781	0
7	12/03/2003	UP	SACRAMENTO	CA	Derailment	Yard/Switch	Track-Wide gage(defective/missing crossties)	10,198	9,798	400
8	12/05/2003	CSX	ROCKY MOUNT	NC	Other impact	Single Car	Human-Fail to apply suff. hand brakes -rr emp	15,050	15,050	0
9	12/06/2003	UP	HERMISTON	OR	Derailment	Yard/Switch	Track-Wide gage (due to worn rails)	13,173	4,835	8,338
10	12/07/2003	BNSF	BIRMINGHAM	AL	Other impact	Yard/Switch	Human-Fail to apply suff. hand brakes -rr emp	18,374	18,374	0
10	12/07/2003	BNSF	BIRMINGHAM	AL	Other impact	Yard/Switch	Human-Fail to apply suff. hand brakes -rr emp	123,200	23,200	100,000
11	12/07/2003	UP	NORTHLAKE	IL	Derailment	Yard/Switch	Track-Head and web sep(outside jt bar limit)	9,968	7,768	2,200
12	12/08/2003	BNSF	MEMPHIS	TN	Derailment	Yard/Switch	Signal-Classyard autocontrol sys switch fail	6,929	2,429	4,500
13	12/09/2003	BNSF	KANSAS CITY	KS	Other impact	Yard/Switch	Human-Switch improperly lined	13,590	13,590	0
13	12/09/2003	BNSF	KANSAS CITY	KS	Other impact	Yard/Switch	Human-Switch improperly lined	51,956	51,956	0
14	12/10/2003	BNSF	PASCO	WA	Derailment	Yard/Switch	Track-Switch damaged or out of adjustment	48,275	47,775	500
15	12/10/2003	BNSF	NORTHTOWN	MN	Derailment	Yard/Switch	Misc-Snow,ice,mud,gravel,coal,etc. on trk	13,500	8,500	5,000
16	12/11/2003	CSX	SELKIRK	NY	Derailment	Single Car	Human-Other main track authority causes	19,956	19,956	0
17	12/11/2003	NS	BIRMINGHAM	AL	Derailment	Yard/Switch	Misc-Obj/equip on/fouling track, other	12,250	4,000	8,250
18	12/13/2003	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Misc-Harmonic rock off, etc.	24,354	17,000	7,354
19	12/14/2003	BNSF	SEATTLE	WA	Derailment	Yard/Switch	Human-Buff/slack action excess, trn make-up	7,300	5,000	2,300
20	12/14/2003	BNSF	DENVER	CO	Derailment	Yard/Switch	Human-Humping or cutting off in motion equipment susceptible to damage, or to cause damage to other equipment	0	0	0
20	12/14/2003	BNSF	DENVER	CO	Derailment	Yard/Switch	Human-Humping or cutting off in motion equipment susceptible to damage, or to cause damage to other equipment	13,472	6,072	7,400
21	12/15/2003	CSX	ROCKY MOUNT	NC	Derailment	Yard/Switch	Human-Buff/slack action excess, trn handling	8,150	8,000	150
22	12/15/2003	UP	NORTH PLATTE	NE	Side collision	Yard/Switch	Human-Shoving movement, absence of man	10,000	10,000	0
22	12/15/2003	UP	NORTH PLATTE	NE	Side collision	Yard/Switch	Human-Shoving movement, absence of man	1,400	1,400	0
23	12/16/2003	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Misc-Harmonic rock off, etc.	61,899	26,641	35,258
24	12/17/2003	UP	NORTH PLATTE	NE	Derailment	Light Loco(s)	Human-Switch improperly lined	7,270	0	7,270
25	12/21/2003	BNSF	GALESBURG	IL	Derailment	Yard/Switch	Track-Wide gage(loose,broke, etc, gage rods)	431,019	124,519	306,500
26	12/21/2003	BNSF	NORTHTOWN	MN	Other impact	Yard/Switch	Track-Retarder yard skate defective	44,605	42,605	2,000

Table 1-6
Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order
For The Period December 2003 Through December 2004

Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
26	12/21/2003	BNSF	NORTHTOWN	MN	Other impact	Cut of Cars	Track-Retarder yard skate defective	500	500	0
27	12/21/2003	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Misc-Harmonic rock off, etc.	92,917	15,323	77,594
28	12/22/2003	BNSF	NORTHTOWN	MN	Other impact	Yard/Switch	Human-Switch improperly lined	7,340	7,340	0
28	12/22/2003	BNSF	NORTHTOWN	MN	Other impact	Yard/Switch	Human-Switch improperly lined	7,500	7,500	0
29	12/23/2003	UP	NORTH LITTLE ROCK	AR	Side collision	Yard/Switch	Human-Shoving movement, absence of man	24,529	6,607	17,922
29	12/23/2003	UP	NORTH LITTLE ROCK	AR	Side collision	Yard/Switch	Human-Shoving movement, absence of man	13,017	13,017	0
30	12/26/2003	CSX	HAMLET	NC	Other impact	Cut of Cars	Misc-Yard skate slid and failed to stop car	65,802	65,802	0
31	12/28/2003	BNSF	GREAT FALLS	MT	Derailment	Yard/Switch	Human-Switch improperly lined	9,345	9,345	0
32	12/28/2003	BNSF	MINNEAPOLIS	MN	Other impact	Light Loco(s)	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	12,010	12,010	0
32	12/28/2003	BNSF	MINNEAPOLIS	MN	Other impact	Yard/Switch	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	3,000	2,500	500
33	12/28/2003	UP	PINE BLUFF	AR	Derailment	Yard/Switch	Track-Transverse/compound fissure	21,936	15,089	6,847
34	12/29/2003	ALS	EAST ST LOUIS	IL	Side collision	Yard/Switch	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	22,000	22,000	0
34	12/29/2003	ALS	EAST ST LOUIS	IL	Side collision	Yard/Switch	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	408	0	408
35	12/29/2003	BNSF	BARSTOW	CA	Derailment	Yard/Switch	Track-Vertical split head	21,987	15,687	6,300
36	12/29/2003	UP	HOUSTON	TX	Derailment	Yard/Switch	Track-Transverse/compound fissure	24,981	18,281	6,700
37	12/29/2003	UP	HERMISTON	OR	Derailment	Yard/Switch	Track-Wide gage(spikes/other rail fasteners)	58,643	5,223	53,420
38	12/30/2003	BNSF	PASCO	WA	Derailment	Yard/Switch	Track-Detail fracture - shelling/head check	108,715	13,715	95,000
39	01/06/2004	CSX	LOUISVILLE	KY	Other impact	Single Car	Misc-Auto hump retarder failed to slow car	18,843	18,843	0
40	01/07/2004	CSX	HAMLET	NC	Derailment	Yard/Switch	Human-Failure to stop train in clear	25,736	19,236	6,500
41	01/08/2004	UP	GREEN RIVER	WY	Derailment	Yard/Switch	Human-Coupling speed excessive	47,541	46,463	1,078
41	01/08/2004	UP	GREEN RIVER	WY	Derailment	Single Car	Human-Coupling speed excessive	1,632	1,632	0
42	01/10/2004	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Human-Other train handling/makeup	90,507	54,331	36,176
42	01/10/2004	UP	NORTH PLATTE	NE	Derailment	Freight Train	Human-Other train handling/makeup	45,576	45,576	0
43	01/12/2004	BNSF	AMARILLO	TX	Other impact	Yard/Switch	Human-Shoving movement, absence of man	40,858	22,858	18,000
43	01/12/2004	BNSF	AMARILLO	TX	Other impact	Freight Train	Human-Shoving movement, absence of man	81,734	81,734	0
44	01/13/2004	BNSF	GALESBURG	IL	Other impact	Yard/Switch	Human-Shoving movement, failure to control	3,352	3,352	0

Table 1-6
Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order
For The Period December 2003 Through December 2004

Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
44	01/13/2004	BNSF	GALESBURG	IL	Other impact	Yard/Switch	Human-Shoving movement, failure to control	15,000	12,000	3,000
45	01/14/2004	BNSF	SEATTLE	WA	Derailment	Yard/Switch	Misc-Harmonic rock off, etc.	8,000	6,000	2,000
46	01/14/2004	CRSH	CAMDEN	NJ	Other impact	Single Car	Human-Passed couplers	15,319	15,319	0
47	01/15/2004	UP	PINE BLUFF	AR	Derailment	Yard/Switch	Human-Buff/slack action excess, trn make-up	16,235	3,723	12,512
48	01/16/2004	BNSF	BARSTOW	CA	Raking collision	Yard/Switch	Human-Humping or cutting off in motion equipment susceptible to damage, or to cause damage to other equipment	6,300	6,300	0
48	01/16/2004	BNSF	BARSTOW	CA	Raking collision	Yard/Switch	Human-Humping or cutting off in motion equipment susceptible to damage, or to cause damage to other equipment	9,000	9,000	0
49	01/16/2004	UP	ARLINGTON	TX	Derailment	Yard/Switch	Human-Failure to stretch cars before shoving	11,195	11,195	0
49	01/16/2004	UP	ARLINGTON	TX	Derailment	Single Car	Human-Failure to stretch cars before shoving	836	836	0
50	01/17/2004	CSX	CUMBERLAND	MD	Derailment	Yard/Switch	Human-Instruction to trn/yd crew improper	19,150	19,150	0
51	01/17/2004	CSX	LOUISVILLE	KY	Other impact	Yard/Switch	Misc-Auto hump retarder failed to slow car	29,442	28,942	500
52	01/17/2004	UP	PINE BLUFF	AR	Derailment	Yard/Switch	Track-Defective or missing crossties	18,898	1,000	17,898
53	01/18/2004	BNSF	AMARILLO	TX	Raking collision	Yard/Switch	Human-Kicking or dropping cars, inadequate precautions	7,579	7,579	0
54	01/19/2004	CSX	ROCKY MOUNT	NC	Other impact	Yard/Switch	Human-Shoving movement, absence of man	9,728	9,328	400
55	01/23/2004	UP	PORTLAND	OR	Other event	Yard/Switch	Human-Car(s) shoved out & left out of clear	10,597	0	10,597
56	01/24/2004	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Human-Switch improperly lined	87,676	100	87,576
57	01/25/2004	CSX	BALTIMORE	MD	Derailment	Yard/Switch	Track-Switch (hand op) stand mechanism defect	16,254	15,954	300
58	01/26/2004	CSX	EVANSVILLE	IN	Other impact	Yard/Switch	Human-Other general switching rules	164,338	156,338	8,000
59	01/27/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Human-Cars left foul	2,541	2,541	0
59	01/27/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Human-Cars left foul	14,527	14,527	0
60	02/01/2004	BNSF	TULSA	OK	Raking collision	Yard/Switch	Human-Use of brakes, other	62,500	60,000	2,500
60	02/01/2004	BNSF	TULSA	OK	Raking collision	Freight Train	Human-Use of brakes, other	70,000	70,000	0
61	02/03/2004	CSX	CUMBERLAND	MD	Other impact	Yard/Switch	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	16,410	16,410	0
62	02/04/2004	CSX	RIVERDALE	IL	Derailment	Yard/Switch	Human-Failure to stop train in clear	102,993	102,993	0
63	02/05/2004	CSX	WAYCROSS	GA	Derailment	Yard/Switch	Human-Switch improperly lined	48,968	48,768	200
64	02/05/2004	CSX	BIRMINGHAM	AL	Other impact	Yard/Switch	Human-Switch movement, excessive speed	13,025	13,025	0
65	02/05/2004	TRRA	VENICE	IL	Derailment	Light Loco(s)	Misc-Auto hump retarder failed to slow car	11,000	11,000	0
66	02/06/2004	UP	HERMISTON	OR	Side collision	Yard/Switch	Human-Switch improperly lined	8,693	7,802	891

Table 1-6
Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order
For The Period December 2003 Through December 2004

Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
66	02/06/2004	UP	HERMISTON	OR	Side collision	Freight Train	Human-Switch improperly lined	36,200	36,200	0
67	02/07/2004	CSX	CUMBERLAND	MD	Derailment	Yard/Switch	Misc-Obj/equip on/fouling track, other	48,253	31,753	16,500
68	02/09/2004	BNSF	ST LOUIS	MO	Derailment	Yard/Switch	Human-Fail to secure car hnd brk -rr emp	23,622	22,422	1,200
69	02/09/2004	CSX	BUFFALO	NY	Derailment	Yard/Switch	Track-Oth frog, switch, trk appliance defect	95,586	56,586	39,000
70	02/09/2004	KCS	METAIRIE	LA	Other impact	Yard/Switch	Human-Shoving movement, absence of man	12,000	12,000	0
71	02/09/2004	KCS	SHREVEPORT	LA	Derailment	Light Loco(s)	Track-Switch point worn or broken	7,924	7,838	86
72	02/09/2004	UP	PINE BLUFF	AR	Other impact	Yard/Switch	Human-Switch improperly lined	2,227	2,227	0
72	02/09/2004	UP	PINE BLUFF	AR	Other impact	Cut of Cars	Human-Switch improperly lined	15,120	8,778	6,342
73	02/12/2004	BNSF	PASCO	WA	Derailment	Yard/Switch	Track-Wide gage(defective/missing crossties)	28,850	25,850	3,000
74	02/12/2004	CSX	RIVERDALE	IL	Derailment	Yard/Switch	Human-Switch previously run through	37,078	34,078	3,000
75	02/13/2004	UP	NORTHLAKE	IL	Side collision	Yard/Switch	Human-Switch improperly lined	32,532	30,048	2,484
75	02/13/2004	UP	NORTHLAKE	IL	Side collision	Freight Train	Human-Switch improperly lined	32,005	32,005	0
76	02/13/2004	UP	DOLTON	IL	Other impact	Yard/Switch	Human-Passed couplers	15,920	800	15,120
76	02/13/2004	UP	DOLTON	IL	Other impact	Cut of Cars	Human-Passed couplers	2,200	2,200	0
76	02/13/2004	UP	DOLTON	IL	Other impact	Cut of Cars	Human-Passed couplers	200	200	0
77	02/15/2004	BRC	BEDFORD PARK	IL	Other impact	Yard/Switch	Signal-Power switch failure	9,581	9,581	0
77	02/15/2004	BRC	BEDFORD PARK	IL	Other impact	Yard/Switch	Signal-Power switch failure	114	114	0
78	02/15/2004	UP	NORTH PLATTE	NE	Obstruction impact	Yard/Switch	Misc-Obj/equip on/fouling track, other	16,678	7,047	9,631
79	02/15/2004	UP	NORTH PLATTE	NE	Other impact	Yard/Switch	Signal-Class yd auto ctrl sys retarder fail	13,155	13,055	100
79	02/15/2004	UP	NORTH PLATTE	NE	Other impact	Cut of Cars	Signal-Class yd auto ctrl sys retarder fail	1,132	1,132	0
80	02/16/2004	UP	PORTLAND	OR	Derailment	Yard/Switch	Track-Wide gage(defective/missing crossties)	30,380	3,635	26,745
81	02/16/2004	CSX	WAYCROSS	GA	Derailment	Yard/Switch	Equipment-Oth coupler/draft system defects-car	28,200	23,200	5,000
82	02/17/2004	UP	PINE BLUFF	AR	Other impact	Yard/Switch	Human-Shoving movement, absence of man	1,996	1,996	0
82	02/17/2004	UP	PINE BLUFF	AR	Other impact	Cut of Cars	Human-Shoving movement, absence of man	26,211	8,948	17,263
83	02/17/2004	UP	SAN ANTONIO	TX	Derailment	Yard/Switch	Track-Switch pt gap(btwn swt pt & stock rail)	10,789	10,000	789
84	02/18/2004	UP	PINE BLUFF	AR	Derailment	Yard/Switch	Track-Broken base of rail	39,593	695	38,898
85	02/19/2004	BNSF	KANSAS CITY	KS	Derailment	Yard/Switch	Misc-Harmonic rock off, etc.	170,077	150,077	20,000
86	02/19/2004	CSX	CUMBERLAND	MD	Derailment	Yard/Switch	Human-Other train handling/makeup	35,340	30,840	4,500
87	02/19/2004	KCS	PORT ARTHUR	TX	Derailment	Yard/Switch	Human-Derail, failure to apply or remove	30,807	30,000	807
88	02/19/2004	UP	GREEN RIVER	WY	Derailment	Yard/Switch	Track-Wide gage(defective/missing crossties)	20,416	803	19,613
89	02/20/2004	UP	NORTH LITTLE ROCK	AR	Other impact	Yard/Switch	Human-Passed couplers	453	453	0

Table 1-6
Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order
For The Period December 2003 Through December 2004

Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
89	02/20/2004	UP	NORTH LITTLE ROCK	AR	Other impact	Single Car	Human-Passed couplers	12,469	226	12,243
90	02/21/2004	BNSF	MINNEAPOLIS	MN	Derailment	Yard/Switch	Misc-Passed couplers (automated classification yard)	7,600	1,000	6,600
91	02/21/2004	CSX	CUMBERLAND	MD	Derailment	Cut of Cars	Misc-Passed couplers (automated classification yard)	6,821	6,321	500
92	02/21/2004	UP	NORTH LITTLE ROCK	AR	Side collision	Light Loco(s)	Human-Shoving movement, absence of man	8,230	3,918	4,312
92	02/21/2004	UP	NORTH LITTLE ROCK	AR	Side collision	Yard/Switch	Human-Shoving movement, absence of man	9,340	9,340	0
93	02/23/2004	UP	NORTHLAKE	IL	Side collision	Yard/Switch	Human-Shoving movement, failure to control	6,655	5,827	828
93	02/23/2004	UP	NORTHLAKE	IL	Side collision	Yard/Switch	Human-Shoving movement, failure to control	57,111	57,111	0
94	02/24/2004	BNSF	KANSAS CITY	KS	Derailment	Yard/Switch	Equipment-Defective snubbing	118,433	68,153	50,280
95	02/25/2004	BNSF	AMARILLO	TX	Side collision	Yard/Switch	Human-Shoving movement, failure to control	25,735	13,195	12,540
95	02/25/2004	BNSF	AMARILLO	TX	Side collision	Yard/Switch	Human-Shoving movement, failure to control	2,980	2,980	0
96	02/25/2004	UP	PINE BLUFF	AR	Side collision	Light Loco(s)	Human-Failure to secure engine- rr empl	935	935	0
96	02/25/2004	UP	PINE BLUFF	AR	Side collision	Yard/Switch	Human-Failure to secure engine- rr empl	8,338	2,888	5,450
97	02/26/2004	CSX	BIRMINGHAM	AL	Side collision	Yard/Switch	Human-Failure to secure engine- rr empl	43,040	20,040	23,000
97	02/26/2004	CSX	BIRMINGHAM	AL	Side collision	Cut of Cars	Human-Failure to secure engine- rr empl	20,916	20,916	0
97	02/26/2004	CSX	BIRMINGHAM	AL	Side collision	Freight Train	Human-Failure to secure engine- rr empl	58,689	58,689	0
98	02/26/2004	UP	PINE BLUFF	AR	Other impact	Yard/Switch	Misc-Passed couplers (automated classification yard)	100	100	0
98	02/26/2004	UP	PINE BLUFF	AR	Other impact	Cut of Cars	Misc-Passed couplers (automated classification yard)	38,600	0	38,600
98	02/26/2004	UP	PINE BLUFF	AR	Other impact	Single Car	Misc-Passed couplers (automated classification yard)	3,811	3,811	0
98	02/26/2004	UP	PINE BLUFF	AR	Other impact	Single Car	Misc-Passed couplers (automated classification yard)	200	200	0
98	02/26/2004	UP	PINE BLUFF	AR	Other impact	Single Car	Misc-Passed couplers (automated classification yard)	200	200	0
98	02/26/2004	UP	PINE BLUFF	AR	Other impact	Single Car	Misc-Passed couplers (automated classification yard)	253	253	0
98	02/26/2004	UP	PINE BLUFF	AR	Other impact	Single Car	Misc-Passed couplers (automated classification yard)	340	340	0
99	02/27/2004	BNSF	PASCO	WA	Derailment	Yard/Switch	Track-Trk alignmnt irreg-not buckled/sunkink	10,300	6,100	4,200
100	02/27/2004	CSX	LOUISVILLE	KY	Derailment	Yard/Switch	Human-Shoving movement, absence of man	27,300	27,100	200
101	03/01/2004	BRC	BEDFORD PARK	IL	Derailment	Yard/Switch	Misc-Harmonic rock off, etc.	22,278	16,198	6,080
102	03/01/2004	CSX	RV CABIN	KY	Other impact	Yard/Switch	Human-Switch improperly lined	23,007	23,007	0
103	03/01/2004	UP	PINE BLUFF	AR	Other impact	Yard/Switch	Signal-Classification yard automatic control system - Inadequate/insufficient control	558	558	0
103	03/01/2004	UP	PINE BLUFF	AR	Other impact	Cut of Cars	Signal-Classification yard automatic control system - Inadequate/insufficient control	10,988	4,674	6,314
104	03/03/2004	BNSF	AMARILLO	TX	Derailment	Yard/Switch	Human-Kicking or dropping cars, inadequate precautions	11,695	11,695	0
105	03/04/2004	WC	ESCANABA	MI	Derailment	Yard/Switch	Human-Switch improperly lined	10,900	10,500	400

Table 1-6
Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order
For The Period December 2003 Through December 2004

Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
106	03/05/2004	ALS	EAST ST LOUIS	IL	Derailment	Yard/Switch	Equipment-Truck bolster stiff (failure to slew)	11,445	2,800	8,645
107	03/05/2004	ALS	EAST ST LOUIS	IL	Derailment	Yard/Switch	Human-Buff/slack action excess, trn handling	96,696	29,450	67,246
108	03/05/2004	CSX	WALBRIDGE	OH	Derailment	Yard/Switch	Misc-Extreme wind velocity	12,500	11,500	1,000
109	03/05/2004	UP	ROSEVILLE	CA	Derailment	Yard/Switch	Human-Switch improperly lined	149,190	1,190	148,000
110	03/06/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Misc-Passed couplers (automated classification yard)	22,037	92	21,945
110	03/06/2004	UP	NORTHLAKE	IL	Other impact	Cut of Cars	Misc-Passed couplers (automated classification yard)	2,144	2,144	0
111	03/08/2004	CSX	CLEVELAND	OH	Derailment	Yard/Switch	Human-Switch not latched or locked	26,856	25,356	1,500
112	03/10/2004	UP	ARLINGTON	TX	Other impact	Yard/Switch	Human-Shoving movement, absence of man	70,574	68,024	2,550
112	03/10/2004	UP	ARLINGTON	TX	Other impact	Cut of Cars	Human-Shoving movement, absence of man	45,353	45,353	0
112	03/10/2004	UP	ARLINGTON	TX	Other impact	Freight Train	Human-Shoving movement, absence of man	2,500	2,500	0
113	03/10/2004	UP	NORTH LITTLE ROCK	AR	Derailment	Yard/Switch	Track-Switch point worn or broken	26,888	16,819	10,069
114	03/13/2004	UP	ROSEVILLE	CA	Other impact	Light Loco(s)	Human-Other general switching rules	2,500	2,500	0
114	03/13/2004	UP	ROSEVILLE	CA	Other impact	Yard/Switch	Human-Other general switching rules	26,041	25,541	500
115	03/14/2004	BRC	BEDFORD PARK	IL	Side collision	Yard/Switch	Human-Switch improperly lined	3,950	3,950	0
115	03/14/2004	BRC	BEDFORD PARK	IL	Side collision	Yard/Switch	Human-Switch improperly lined	14,040	14,040	0
116	03/14/2004	UP	DENVER	CO	Side collision	Yard/Switch	Human-Shoving movement, failure to control	7,219	7,219	0
116	03/14/2004	UP	DENVER	CO	Side collision	Freight Train	Human-Shoving movement, failure to control	7,563	7,563	0
117	03/14/2004	UP	PINE BLUFF	AR	Derailment	Yard/Switch	Equipment-Coupler mismatch, high/low	14,742	7,872	6,870
118	03/15/2004	BNSF	FRIDLEY	MN	Derailment	Yard/Switch	Track-Wide gage (loose, broke, etc, gage rods)	14,000	8,000	6,000
119	03/15/2004	UP	HERMISTON	OR	Derailment	Yard/Switch	Track-Other rail and joint bar defects	20,046	46	20,000
120	03/17/2004	UP	HOUSTON	TX	Other impact	Yard/Switch	Human-Fail to secure car hnd brk -rr emp	9,080	9,080	0
120	03/17/2004	UP	HOUSTON	TX	Other impact	Single Car	Human-Fail to secure car hnd brk -rr emp	3,000	3,000	0
121	03/17/2004	UP	NORTH LITTLE ROCK	AR	Other impact	Yard/Switch	Human-Shoving movement, failure to control	18,844	4,744	14,100
121	03/17/2004	UP	NORTH LITTLE ROCK	AR	Other impact	Yard/Switch	Human-Shoving movement, failure to control	4,095	4,095	0
122	03/17/2004	UP	ROCHELLE	IL	Derailment	Light Loco(s)	Human-Fixed signal (other than automatic block or interlocking signal), failure to comply.	15,971	15,011	960
123	03/18/2004	NCRC	NORFOLK	NE	Other impact	Yard/Switch	Human-Failure to stretch cars before shoving	87,681	87,681	0
124	03/21/2004	CSX	RUSSELL	KY	Other impact	Yard/Switch	Human-Cars left foul	17,500	17,500	0
125	03/22/2004	BNSF	PASCO	WA	Obstruction impact	Yard/Switch	Misc-Lading chains/straps fouling switches	12,413	3,133	9,280
126	03/22/2004	NS	BIRMINGHAM	AL	Side collision	Light Loco(s)	Human-Shoving movement, absence of man	20,000	20,000	0

Table 1-6
Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order
For The Period December 2003 Through December 2004

Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
126	03/22/2004	NS	BIRMINGHAM	AL	Side collision	Yard/Switch	Human-Shoving movement, absence of man	140,544	140,168	376
127	03/22/2004	UP	SALT LAKE CITY	UT	Side collision	Light Loco(s)	Human-Shoving movement, absence of man	4,100	4,100	0
127	03/22/2004	UP	SALT LAKE CITY	UT	Side collision	Yard/Switch	Human-Shoving movement, absence of man	15,874	874	15,000
128	03/23/2004	BNSF	PARKWATER	WA	Derailment	Light Loco(s)	Human-Shoving movement, failure to control	11,000	3,000	8,000
128	03/23/2004	BNSF	PARKWATER	WA	Derailment	Light Loco(s)	Human-Shoving movement, failure to control	6,000	6,000	0
129	03/23/2004	BRC	BEDFORD PARK	IL	Derailment	Yard/Switch	Human-Switch previously run through	13,815	4,150	9,665
130	03/23/2004	KCS	BATON ROUGE	LA	Other impact	Yard/Switch	Human-Cars left foul	8,558	8,500	58
131	03/25/2004	UP	HOUSTON	TX	Derailment	Yard/Switch	Signal-Classyard autocontrol sys switch fail	31,145	1,145	30,000
132	03/27/2004	BNSF	KANSAS CITY	KS	Derailment	Yard/Switch	Signal-Classyard autocontrol sys switch fail	17,100	17,000	100
133	03/27/2004	CSX	COLUMBUS	OH	Derailment	Yard/Switch	Human-Fail to apply suff. hand brakes -rr emp	8,739	8,439	300
134	03/27/2004	UP	SAN ANTONIO	TX	Side collision	Yard/Switch	Human-Shoving movement, absence of man	1,828	1,380	448
134	03/27/2004	UP	SAN ANTONIO	TX	Side collision	Yard/Switch	Human-Shoving movement, absence of man	6,401	6,401	0
135	03/29/2004	BNSF	GALESBURG	IL	Other impact	Yard/Switch	Equipment-Oth coupler/draft system defects-car	227,181	147,181	80,000
136	03/29/2004	UP	BROOKLYN	OR	Derailment	Yard/Switch	Human-Fail to secure car hnd brk -rr emp	8,670	7,635	1,035
136	03/29/2004	UP	BROOKLYN	OR	Derailment	Cut of Cars	Human-Fail to secure car hnd brk -rr emp	6,006	6,006	0
137	03/31/2004	CSX	NORTH CHARLESTON	SC	Other impact	Yard/Switch	Human-Failure to couple	11,385	11,185	200
138	04/01/2004	BNSF	AMARILLO S YARD	TX	Derailment	Yard/Switch	Human-Switch movement, excessive speed	25,200	19,600	5,600
139	04/03/2004	UP	SALT LAKE CITY	UT	Derailment	Yard/Switch	Human-Other general switching rules	62,436	694	61,742
140	04/05/2004	UP	LAPORTE	TX	Derailment	Yard/Switch	Human-Switch improperly lined	10,636	8,136	2,500
141	04/06/2004	UP	PINE BLUFF	AR	Other impact	Light Loco(s)	Human-Shoving movement, absence of man	6,587	6,587	0
141	04/06/2004	UP	PINE BLUFF	AR	Other impact	Yard/Switch	Human-Shoving movement, absence of man	4,508	4,508	0
142	04/07/2004	BNSF	GALESBURG	IL	Derailment	Yard/Switch	Misc-Harmonic rock off, etc.	9,446	5,446	4,000
143	04/07/2004	UP	GREEN RIVER	WY	Derailment	Yard/Switch	Human-Passed couplers	24,729	19,929	4,800
143	04/07/2004	UP	GREEN RIVER	WY	Derailment	Yard/Switch	Human-Passed couplers	973	973	0
144	04/07/2004	UP	HOUSTON	TX	Derailment	Yard/Switch	Human-Switch improperly lined	41,695	695	41,000
145	04/09/2004	BNSF	PASCO	WA	Derailment	Yard/Switch	Misc-Lading chains/straps fouling switches	14,137	7,137	7,000
146	04/09/2004	BNSF	BARSTOW	CA	Derailment	Yard/Switch	Human-Cars left foul	14,900	11,400	3,500
147	04/09/2004	UP	KANSAS CITY	KS	Derailment	Yard/Switch	Track-Switch pt gap(btwn swt pt & stock rail)	42,759	38,259	4,500
148	04/10/2004	BNSF	TEMPLE	TX	Side collision	Yard/Switch	Human-Fail to apply suff. hand brakes -rr emp	38,520	26,420	12,100
148	04/10/2004	BNSF	TEMPLE	TX	Side collision	Yard/Switch	Human-Fail to apply suff. hand brakes -rr emp	5,400	5,400	0

Table 1-6
Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order
For The Period December 2003 Through December 2004

Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
149	04/10/2004	BNSF	TULSA	OK	Side collision	Yard/Switch	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	66,000	20,000	46,000
149	04/10/2004	BNSF	TULSA	OK	Side collision	Freight Train	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	105,320	105,320	0
150	04/10/2004	KCS	PORT ARTHUR	TX	Derailment	Yard/Switch	Human-Switch improperly lined	34,908	28,000	6,908
151	04/11/2004	UP	KANSAS CITY	MO	Derailment	Yard/Switch	Human-Skate, failure to remove or place	43,042	8,042	35,000
152	04/13/2004	UP	NORTH LITTLE ROCK	AR	Derailment	Yard/Switch	Misc-Investigation complete, cause could not be determined	9,302	7,114	2,188
153	04/14/2004	BNSF	WILLMAR	MN	Derailment	Yard/Switch	Human-Fail to secure car hnd brk -rr emp	27,400	27,400	0
153	04/14/2004	BNSF	WILLMAR	MN	Derailment	Single Car	Human-Fail to secure car hnd brk -rr emp	9,200	9,200	0
154	04/15/2004	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Misc-Harmonic rock off, etc.	10,071	7,248	2,823
155	04/16/2004	KCS	PORT ARTHUR	TX	Side collision	Light Loco(s)	Human-Speed, other	2,500	2,500	0
155	04/16/2004	KCS	PORT ARTHUR	TX	Side collision	Yard/Switch	Human-Speed, other	15,000	15,000	0
156	04/16/2004	KCS	SHREVEPORT	LA	Side collision	Yard/Switch	Human-Shoving movement, absence of man	15,774	15,000	774
156	04/16/2004	KCS	SHREVEPORT	LA	Side collision	Yard/Switch	Human-Shoving movement, absence of man	2,000	2,000	0
157	04/16/2004	UP	NORTHLAKE	IL	Derailment	Yard/Switch	Signal-Power switch failure	9,678	6,253	3,425
158	04/17/2004	CSX	ATLANTA	GA	Other impact	Yard/Switch	Human-Switch improperly lined	32,811	32,311	500
159	04/17/2004	KCS	WYLIE	TX	Other impact	Freight Train	Human-Fail to apply suff. hand brakes -rr emp	22,000	22,000	0
160	04/18/2004	BNSF	AMARILLO S YARD	TX	Side collision	Yard/Switch	Human-Car(s) shoved out & left out of clear	6,100	6,100	0
160	04/18/2004	BNSF	AMARILLO S YARD	TX	Side collision	Cut of Cars	Human-Car(s) shoved out & left out of clear	822	822	0
161	04/18/2004	BNSF	LINCOLN	NE	Derailment	Yard/Switch	Signal-Class yd auto ctrl sys retarder fail	33,975	3,975	30,000
162	04/18/2004	CSX	CUMBERLAND	MD	Derailment	Yard/Switch	Misc-Auto hump retarder failed to slow car	7,293	7,293	0
163	04/18/2004	UP	KANSAS CITY	KS	Other impact	Light Loco(s)	Human-Coupling speed excessive	27,000	27,000	0
163	04/18/2004	UP	KANSAS CITY	KS	Other impact	Yard/Switch	Human-Coupling speed excessive	1,000	1,000	0
164	04/22/2004	CSX	FEURA BUSH	NY	Derailment	Yard/Switch	Human-Derail, failure to apply or remove	8,682	8,682	0
165	04/22/2004	UP	NORTH PLATTE	NE	Side collision	Yard/Switch	Human-Switch improperly lined	20,206	20,206	0
165	04/22/2004	UP	NORTH PLATTE	NE	Side collision	Freight Train	Human-Switch improperly lined	0	0	0
166	04/23/2004	BNSF	KANSAS CITY	MO	Other impact	Yard/Switch	Human-Shoving movement, failure to control	16,067	16,067	0
166	04/23/2004	BNSF	KANSAS CITY	MO	Other impact	Yard/Switch	Human-Shoving movement, failure to control	1,200	1,200	0

Table 1-6
Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order
For The Period December 2003 Through December 2004

Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
167	04/23/2004	BNSF	DENVER	CO	Other impact	Light Loco(s)	Human-Shoving movement, absence of man	1,000	1,000	0
167	04/23/2004	BNSF	DENVER	CO	Other impact	Freight Train	Human-Shoving movement, absence of man	9,373	9,373	0
168	04/24/2004	BNSF	BARSTOW	CA	Side collision	Light Loco(s)	Human-Shoving movement, failure to control	4,000	4,000	0
168	04/24/2004	BNSF	BARSTOW	CA	Side collision	Yard/Switch	Human-Shoving movement, failure to control	4,350	4,000	350
169	04/24/2004	UP	HERMISTON	OR	Other impact	Yard/Switch	Signal-Class yd auto ctrl sys retarder fail	5,584	4,990	594
169	04/24/2004	UP	HERMISTON	OR	Other impact	Cut of Cars	Signal-Class yd auto ctrl sys retarder fail	1,189	1,189	0
170	04/25/2004	BNSF	KANSAS CITY	KS	Side collision	Light Loco(s)	Human-Shoving movement, failure to control	1,500	300	1,200
170	04/25/2004	BNSF	KANSAS CITY	KS	Side collision	Freight Train	Human-Shoving movement, failure to control	44,766	44,766	0
171	04/26/2004	BNSF	DENVER	CO	Derailment	Yard/Switch	Human-Switch movement, excessive speed	8,746	6,746	2,000
172	04/27/2004	NS	DECATUR	IL	Derailment	Yard/Switch	Human-Switch improperly lined	22,395	7,217	15,178
173	04/28/2004	BNSF	KANSAS CITY	KS	Derailment	Yard/Switch	Track-Retarder worn, broken, malfunctioning	6,850	3,000	3,850
174	05/02/2004	ALS	EAST ST LOUIS	IL	Side collision	Yard/Switch	Human-Switch improperly lined	35,148	34,700	448
175	05/03/2004	BNSF	AMARILLO	TX	Side collision	Yard/Switch	Equipment-Side bearing clearance insufficient	19,868	7,868	12,000
175	05/03/2004	BNSF	AMARILLO	TX	Side collision	Cut of Cars	Equipment-Side bearing clearance insufficient	61,305	61,305	0
176	05/04/2004	UP	PINE BLUFF	AR	Other impact	Yard/Switch	Misc-Passed couplers (automated classification yard)	200	200	0
176	05/04/2004	UP	PINE BLUFF	AR	Other impact	Single Car	Misc-Passed couplers (automated classification yard)	6,112	1,640	4,472
176	05/04/2004	UP	PINE BLUFF	AR	Other impact	Single Car	Misc-Passed couplers (automated classification yard)	615	615	0
177	05/05/2004	CSX	HAMLET	NC	Derailment	Yard/Switch	Human-Switch improperly lined	52,600	52,100	500
178	05/06/2004	BNSF	BARSTOW	CA	Side collision	Yard/Switch	Human-Shoving movement, failure to control	550	300	250
178	05/06/2004	BNSF	BARSTOW	CA	Side collision	Freight Train	Human-Shoving movement, failure to control	8,400	8,400	0
179	05/09/2004	BNSF	MEMPHIS	TN	Raking collision	Yard/Switch	Human-Shoving movement, failure to control	11,100	9,000	2,100
179	05/09/2004	BNSF	MEMPHIS	TN	Raking collision	Yard/Switch	Human-Shoving movement, failure to control	6,000	6,000	0
180	05/09/2004	UP	DALLAS	TX	Other impact	Yard/Switch	Human-Fail to apply suff. hand brakes -rr emp	16,918	13,918	3,000
180	05/09/2004	UP	DALLAS	TX	Other impact	Cut of Cars	Human-Fail to apply suff. hand brakes -rr emp	5,366	5,366	0
181	05/09/2004	UP	HOUSTON	TX	Derailment	Yard/Switch	Track-Switch point worn or broken	16,797	14,997	1,800
182	05/09/2004	UP	NORTHLAKE	IL	Other event	Yard/Switch	Equipment-Draft sill broken or bent	42,795	42,795	0
183	05/10/2004	BNSF	SPOKANE	WA	Derailment	Yard/Switch	Human-Passed couplers	8,000	3,500	4,500
184	05/10/2004	KCS	KANSAS CITY	MO	Side collision	Yard/Switch	Human-Failure to couple	15,521	15,285	236
184	05/10/2004	KCS	KANSAS CITY	MO	Side collision	Yard/Switch	Human-Failure to couple	7,852	7,852	0
185	05/11/2004	UP	PROVISO	IL	Other impact	Yard/Switch	Misc-Passed couplers (automated classification yard)	2,338	1,174	1,164

Table 1-6
Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order
For The Period December 2003 Through December 2004

Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
185	05/11/2004	UP	PROVISO	IL	Other impact	Cut of Cars	Misc-Passed couplers (automated classification yard)	8,629	8,629	0
186	05/12/2004	CSX	LOUISVILLE	KY	Derailment	Yard/Switch	Signal-Class yd auto ctrl sys retarder fail	12,100	11,500	600
187	05/12/2004	BNSF	SAN BERNARDINO	CA	Derailment	Yard/Switch	Human-Improper train make-up	21,150	20,200	950
188	05/14/2004	BRC	BEDFORD PARK	IL	Side collision	Yard/Switch	Human-Fail to secure car hnd brk -rr emp	17,102	17,102	0
188	05/14/2004	BRC	BEDFORD PARK	IL	Side collision	Yard/Switch	Human-Fail to secure car hnd brk -rr emp	148	148	0
189	05/15/2004	CRSH	CAMDEN	NJ	Derailment	Yard/Switch	Human-Shoving movement, absence of man	13,483	13,083	400
189	05/15/2004	CRSH	CAMDEN	NJ	Derailment	Single Car	Human-Shoving movement, absence of man	770	770	0
189	05/15/2004	CRSH	CAMDEN	NJ	Derailment	Single Car	Human-Shoving movement, absence of man	5,387	5,387	0
190	05/15/2004	CSX	LOUISVILLE	KY	Derailment	Yard/Switch	Misc-Passed couplers (automated classification yard)	14,050	13,050	1,000
191	05/15/2004	UP	SALT LAKE CITY	UT	Side collision	Yard/Switch	Human-Other general switching rules	68,647	355	68,292
191	05/15/2004	UP	SALT LAKE CITY	UT	Side collision	Yard/Switch	Human-Other general switching rules	2,000	2,000	0
192	05/18/2004	BNSF	ST PAUL PARK	MN	Derailment	Yard/Switch	Track-Switch point worn or broken	10,832	4,832	6,000
193	05/18/2004	UP	KANSAS CITY	MO	Derailment	Yard/Switch	Misc-Harmonic rock off, etc.	123,224	92,824	30,400
194	05/18/2004	UP	WICHITA	KS	Other impact	Yard/Switch	Human-Fail to secure car hnd brk -rr emp	29,311	17,921	11,390
194	05/18/2004	UP	WICHITA	KS	Other impact	Cut of Cars	Human-Fail to secure car hnd brk -rr emp	11,097	11,097	0
195	05/19/2004	ALS	EAST ST LOUIS	IL	Side collision	Yard/Switch	Human-Switch improperly lined	40,660	5,200	35,460
195	05/19/2004	ALS	EAST ST LOUIS	IL	Side collision	Yard/Switch	Human-Switch improperly lined	18,000	18,000	0
196	05/19/2004	BNSF	GALESBURG	IL	Derailment	Yard/Switch	Misc-Passed couplers (automated classification yard)	125,465	9,200	116,265
197	05/19/2004	UP	WICHITA	KS	Derailment	Yard/Switch	Human-Derail, failure to apply or remove	13,314	13,264	50
198	05/20/2004	KCS	PORT ARTHUR	TX	Derailment	Yard/Switch	Track-Wide gage(defective/missing crossties)	7,213	3,229	3,984
199	05/20/2004	UP	FT. WORTH	TX	Side collision	Light Loco(s)	Human-Cars left foul	2,000	2,000	0
199	05/20/2004	UP	FT. WORTH	TX	Side collision	Yard/Switch	Human-Cars left foul	6,500	6,500	0
200	05/20/2004	UP	PINE BLUFF	AR	Side collision	Yard/Switch	Human-Shoving movement, failure to control	45,037	42,577	2,460
200	05/20/2004	UP	PINE BLUFF	AR	Side collision	Yard/Switch	Human-Shoving movement, failure to control	31,738	31,738	0
201	05/21/2004	UP	NORTH LITTLE ROCK	AR	Side collision	Yard/Switch	Human-Switch improperly lined	57,640	22,640	35,000
201	05/21/2004	UP	NORTH LITTLE ROCK	AR	Side collision	Yard/Switch	Human-Switch improperly lined	24,478	24,478	0
202	05/21/2004	UP	WEST SACRAMENTO	CA	Derailment	Yard/Switch	Equipment-Truck bolster stiff	62,497	18,933	43,564
203	05/23/2004	BRC	BEDFORD PARK	IL	Side collision	Yard/Switch	Human-Use of brakes, other	6,984	6,984	0
203	05/23/2004	BRC	BEDFORD PARK	IL	Side collision	Yard/Switch	Human-Use of brakes, other	6,960	6,960	0
204	05/24/2004	BNSF	GALESBURG	IL	Other impact	Yard/Switch	Human-Manual intervention of classification yard automatic control system modes by operator	12,500	12,500	0
205	05/24/2004	BNSF	ST PAUL	MN	Derailment	Yard/Switch	Human-Switch improperly lined	33,200	7,200	26,000

Table 1-6
Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order
For The Period December 2003 Through December 2004

Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
206	05/24/2004	KCS	SHREVEPORT	LA	Side collision	Yard/Switch	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	6,077	6,002	75
206	05/24/2004	KCS	SHREVEPORT	LA	Side collision	Yard/Switch	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	4,487	4,487	0
207	05/24/2004	UP	SAN ANTONIO	TX	Derailment	Yard/Switch	Track-Transverse/compound fissure	6,886	6,438	448
208	05/26/2004	ALS	EAST ST LOUIS	IL	Other impact	Yard/Switch	Track-Retarder yard skate defective	65,100	65,100	0
208	05/26/2004	ALS	EAST ST LOUIS	IL	Other impact	Cut of Cars	Track-Retarder yard skate defective	977	600	377
209	05/27/2004	UP	PORTLAND	OR	Derailment	Light Loco(s)	Human-Switch improperly lined	9,381	8,760	621
210	05/27/2004	UP	HERMISTON	OR	Derailment	Yard/Switch	Signal-Class yd auto ctrl sys retarder fail	36,241	1,241	35,000
211	05/29/2004	CSX	PENSACOLA	FL	Side collision	Yard/Switch	Human-Fail to secure car hnd brk -rr emp	0	0	0
211	05/29/2004	CSX	PENSACOLA	FL	Side collision	Freight Train	Human-Fail to secure car hnd brk -rr emp	21,700	21,700	0
212	05/30/2004	BNSF	LINCOLN	NE	Raking collision	Yard/Switch	Human-Other train handling/makeup	130,500	20,500	110,000
212	05/30/2004	BNSF	LINCOLN	NE	Raking collision	Freight Train	Human-Other train handling/makeup	45,363	45,363	0
213	05/30/2004	UP	PINE BLUFF	AR	Other impact	Yard/Switch	Misc-Yard skate slid and failed to stop car	13,887	6,537	7,350
213	05/30/2004	UP	PINE BLUFF	AR	Other impact	Yard/Switch	Misc-Yard skate slid and failed to stop car	20,080	20,080	0
214	05/31/2004	BNSF	LINCOLN	NE	Derailment	Yard/Switch	Human-Switch previously run through	19,685	12,485	7,200
215	05/31/2004	BNSF	MEMPHIS	TN	Derailment	Yard/Switch	Equipment-Air hose uncoupled or burst	161,304	79,184	82,120
216	06/02/2004	UP	FT WORTH	TX	Derailment	Yard/Switch	Track-Wide gage(defective/missing crossties)	13,702	11,402	2,300
217	06/02/2004	UP	HERMISTON	OR	Other impact	Yard/Switch	Human-Radio communication, failure to comply	7,280	7,280	0
217	06/02/2004	UP	HERMISTON	OR	Other impact	Yard/Switch	Human-Radio communication, failure to comply	492	492	0
218	06/05/2004	BNSF	WILLMAR	MN	Other impact	Yard/Switch	Human-Switch movement, excessive speed	16,000	16,000	0
219	06/07/2004	UP	LAPORTE	TX	Derailment	Yard/Switch	Track-Head and web sep(outside jt bar limit)	80,324	79,403	921
220	06/09/2004	CSX	ROCKY MOUNT	NC	Other impact	Yard/Switch	Human-Fail to secure car hnd brk -rr emp	22,333	21,833	500
221	06/10/2004	BNSF	MEMPHIS	TN	Derailment	Yard/Switch	Human-Buff/slack action excess, trn handling	89,748	26,929	62,819
222	06/10/2004	UP	HOUSTON	TX	Derailment	Yard/Switch	Equipment-Draft gear/mechanism broke/defective	146,538	27,038	119,500
223	06/10/2004	UP	NORTH PLATTE	NE	Derailment	Light Loco(s)	Track-Roadbed settled or soft	66,499	3,500	62,999
224	06/10/2004	UP	PROVISO	IL	Derailment	Yard/Switch	Track-Head and web sep(outside jt bar limit)	18,500	3,000	15,500
225	06/11/2004	BRC	BEDFORD PARK	IL	Side collision	Yard/Switch	Human-Skate, failure to remove or place	2,721	2,506	215
225	06/11/2004	BRC	BEDFORD PARK	IL	Side collision	Cut of Cars	Human-Skate, failure to remove or place	5,493	5,193	300

Table 1-6
Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order
For The Period December 2003 Through December 2004

Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
226	06/11/2004	NS	TAYLOR	MI	Side collision	Yard/Switch	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	56,100	5,900	50,200
226	06/11/2004	NS	MELVINDALE	MI	Side collision	Freight Train	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	3,500	3,500	0
227	06/11/2004	UP	PROVISO	IL	Derailment	Yard/Switch	Track-Wide gage(defective/missing crossties)	9,460	9,046	414
228	06/11/2004	UP	PROVISO	IL	Derailment	Yard/Switch	Track-Switch pt gap(btwn swt pt & stock rail)	8,973	4,932	4,041
228	06/11/2004	UP	PROVISO	IL	Derailment	Cut of Cars	Track-Switch pt gap(btwn swt pt & stock rail)	100	100	0
229	06/12/2004	BNSF	BARSTOW	CA	Derailment	Yard/Switch	Track-Defect/missing spike-oth rail fastener	113,003	20,603	92,400
230	06/13/2004	UP	HOUSTON	TX	Derailment	Light Loco(s)	Track-Wide gage(defective/missing crossties)	71,000	24,000	47,000
231	06/13/2004	UP	NORTH PLATTE	NE	Side collision	Yard/Switch	Human-Automatic brake, insufficient	8,000	3,000	5,000
231	06/13/2004	UP	NORTH PLATTE	NE	Side collision	Freight Train	Human-Automatic brake, insufficient	34,710	34,710	0
232	06/13/2004	UP	SAN ANTONIO	TX	Derailment	Yard/Switch	Equipment-Center plate broken or defective	153,243	32,215	121,028
233	06/14/2004	BNSF	LINCOLN	NE	Raking collision	Yard/Switch	Misc-Other miscellaneous causes	3,000	3,000	0
233	06/14/2004	BNSF	LINCOLN	NE	Raking collision	Yard/Switch	Misc-Other miscellaneous causes	6,958	6,958	0
234	06/16/2004	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Track-Defective or missing crossties	93,786	15,303	78,483
235	06/16/2004	UP	SALT LAKE CITY	UT	Derailment	Yard/Switch	Signal-Classyard autocontrol sys switch fail	215,683	833	214,850
236	06/17/2004	BNSF	NORTHTOWN	MN	Derailment	Yard/Switch	Signal-Power switch failure	125,862	8,500	117,362
237	06/17/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Human-Fail to secure car hnd brk -rr emp	18,509	17,708	801
237	06/17/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Human-Fail to secure car hnd brk -rr emp	12,254	12,254	0
238	06/18/2004	UP	PINE BLUFF	AR	Derailment	Yard/Switch	Track-Defective or missing crossties	7,998	900	7,098
239	06/19/2004	BNSF	BARSTOW	CA	Derailment	Yard/Switch	Equipment-Oth coupler/draft system defects-car	80,650	35,650	45,000
239	06/19/2004	BNSF	BARSTOW	CA	Derailment	Yard/Switch	Equipment-Oth coupler/draft system defects-car	100	100	0
240	06/19/2004	UP	SAN ANTONIO	TX	Side collision	Yard/Switch	Human-Kicking or dropping cars, inadequate precautions	16,803	1,803	15,000
240	06/19/2004	UP	SAN ANTONIO	TX	Side collision	Cut of Cars	Human-Kicking or dropping cars, inadequate precautions	3,172	3,172	0
241	06/20/2004	MRL	LAUREL	MT	Raking collision	Yard/Switch	Human-Shoving movement, absence of man	22,835	22,835	0
241	06/20/2004	MRL	LAUREL	MT	Raking collision	Yard/Switch	Human-Shoving movement, absence of man	31,000	1,000	30,000
242	06/21/2004	CSX	CUMBERLAND	MD	Derailment	Yard/Switch	Misc-Harmonic rock off, etc.	19,096	16,096	3,000
243	06/22/2004	UP	MELROSE PARK	IL	Derailment	Yard/Switch	Equipment-Coupler carrier broken or defective	52,761	15,651	37,110

Table 1-6
Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order
For The Period December 2003 Through December 2004

Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
244	06/23/2004	BNSF	MEMPHIS	TN	Derailment	Yard/Switch	Human-Instruction to trn/yd crew improper	99,240	58,760	40,480
245	06/25/2004	BNSF	AMARILLO S YARD	TX	Other impact	Yard/Switch	Human-Absence of fixed signal (Blue Signal)	103,801	103,801	0
245	06/25/2004	BNSF	AMARILLO S YARD	TX	Other impact	Freight Train	Human-Absence of fixed signal (Blue Signal)	7,018	6,018	1,000
246	06/26/2004	BNSF	MEMPHIS	TN	Derailment	Yard/Switch	Equipment-Other brake defects, (LOCO)	23,095	15,077	8,018
247	06/26/2004	BNSF	FRIDLEY	MN	Derailment	Yard/Switch	Track-Deviate frm uniform top of rail profile	120,500	16,500	104,000
248	06/26/2004	UP	DALLAS	TX	Other impact	Yard/Switch	Human-Passed couplers	15,389	14,589	800
248	06/26/2004	UP	DALLAS	TX	Other impact	Yard/Switch	Human-Passed couplers	4,402	4,402	0
249	06/27/2004	UP	FT WORTH	TX	Derailment	Yard/Switch	Misc-Passed couplers (automated classification yard)	26,490	1,490	25,000
250	06/27/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Human-Other train operation/human factors	11,224	11,224	0
250	06/27/2004	UP	NORTHLAKE	IL	Other impact	Cut of Cars	Human-Other train operation/human factors	18,697	17,662	1,035
251	06/28/2004	UP	PINE BLUFF	AR	Other impact	Yard/Switch	Misc-Passed couplers (automated classification yard)	898	898	0
251	06/28/2004	UP	PINE BLUFF	AR	Other impact	Single Car	Misc-Passed couplers (automated classification yard)	7,449	3,484	3,965
252	06/29/2004	UP	DALLAS	TX	Derailment	Yard/Switch	Human-Buff/slack action excess, trn handling	22,013	20,813	1,200
253	06/29/2004	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Human-Switch improperly lined	36,448	92	36,356
254	07/01/2004	BRC	BEDFORD PARK	IL	Derailment	Yard/Switch	Human-Passed couplers	8,298	1,638	6,660
255	07/01/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Equipment-Brake valve malf. (stuck brake, etc.)	7,166	50	7,116
255	07/01/2004	UP	NORTHLAKE	IL	Other impact	Single Car	Equipment-Brake valve malf. (stuck brake, etc.)	253	253	0
256	07/01/2004	UP	WARM SPRINGS	CA	Derailment	Yard/Switch	Track-Cross level track irreg.(not at joints)	41,000	16,000	25,000
257	07/02/2004	UP	FIFE	WA	Derailment	Yard/Switch	Human-Passed couplers	10,732	9,490	1,242
258	07/03/2004	BNSF	BARSTOW	CA	Other impact	Yard/Switch	Misc-Passed couplers (automated classification yard)	11,368	10,868	500
258	07/03/2004	BNSF	BARSTOW	CA	Other impact	Cut of Cars	Misc-Passed couplers (automated classification yard)	2,600	2,600	0
259	07/03/2004	UP	NORTH LITTLE ROCK	AR	Derailment	Yard/Switch	Track-Wide gage(defective/missing crossties)	40,272	11,612	28,660
260	07/03/2004	UP	DES MOINES	IA	Derailment	Yard/Switch	Human-Passed couplers	14,204	9,704	4,500
261	07/06/2004	UP	OGDEN	UT	Other impact	Yard/Switch	Human-Fail to apply suff. hand brakes -rr emp	50,169	45,669	4,500
261	07/06/2004	UP	OGDEN	UT	Other impact	Cut of Cars	Human-Fail to apply suff. hand brakes -rr emp	4,620	4,620	0
262	07/07/2004	KCS	KANSAS CITY	MO	Other impact	Yard/Switch	Human-Failure to couple	44,021	44,000	21
262	07/07/2004	KCS	KANSAS CITY	MO	Other impact	Cut of Cars	Human-Failure to couple	2,500	2,500	0
263	07/07/2004	UP	SAN ANTONIO	TX	Derailment	Yard/Switch	Human-Passed couplers	13,082	12,410	672
264	07/09/2004	BNSF	BARSTOW	CA	Side collision	Yard/Switch	Signal-Class yd auto ctrl sys retarder fail	2,000	2,000	0
264	07/09/2004	BNSF	BARSTOW	CA	Side collision	Yard/Switch	Signal-Class yd auto ctrl sys retarder fail	7,500	7,000	500
265	07/09/2004	UP	NORTH PLATTE	NE	Derailment	Light Loco(s)	Human-Shoving movement, failure to control	14,715	10,915	3,800

Table 1-6
Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order
For The Period December 2003 Through December 2004

Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
266	07/11/2004	BNSF	DENVER	CO	Derailment	Yard/Switch	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	10,500	10,500	0
266	07/11/2004	BNSF	DENVER	CO	Derailment	Freight Train	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	16,711	16,711	0
267	07/11/2004	BNSF	FRIDLEY	MN	Derailment	Yard/Switch	Human-Skate, failure to remove or place	8,100	1,800	6,300
268	07/14/2004	BNSF	LINCOLN	NE	Derailment	Yard/Switch	Signal-Class yd auto ctrl sys retarder fail	57,872	6,872	51,000
269	07/14/2004	BRC	BEDFORD PARK	IL	Derailment	Yard/Switch	Human-Cars left foul	1,746	1,366	380
269	07/14/2004	BRC	BEDFORD PARK	IL	Derailment	Cut of Cars	Human-Cars left foul	4,980	4,980	0
270	07/15/2004	BNSF	MANDAN	ND	Derailment	Yard/Switch	Human-Passed couplers	7,229	6,729	500
271	07/15/2004	UP	PINE BLUFF	AR	Other impact	Yard/Switch	Signal-Other signal failures	7,020	7,020	0
271	07/15/2004	UP	PINE BLUFF	AR	Other impact	Cut of Cars	Signal-Other signal failures	5,209	5,209	0
272	07/16/2004	UP	HOUSTON	TX	Derailment	Yard/Switch	Misc-Harmonic rock off, etc.	7,061	5,319	1,742
273	07/17/2004	CSX	BALDWIN	FL	Side collision	Yard/Switch	Human-Cars left foul	8,000	8,000	0
274	07/17/2004	UP	PINE BLUFF	AR	Other impact	Yard/Switch	Misc-Yard skate slid and failed to stop car	15,411	15,411	0
274	07/17/2004	UP	PINE BLUFF	AR	Other impact	Single Car	Misc-Yard skate slid and failed to stop car	4,231	4,231	0
275	07/19/2004	CSX	ROCKY MOUNT	NC	Other impact	Cut of Cars	Human-Fail to secure car hnd brk -rr emp	33,318	33,318	0
276	07/20/2004	UP	DENVER	CO	Derailment	Yard/Switch	Human-Derail, failure to apply or remove	7,196	5,161	2,035
277	07/20/2004	UP	HOUSTON	TX	Derailment	Yard/Switch	Track-Mismatched rail-head contour	27,684	1,284	26,400
278	07/21/2004	UP	KANSAS CITY	KS	Derailment	Yard/Switch	Track-Switch point worn or broken	35,128	12,128	23,000
279	07/23/2004	UP	HERMISTON	OR	Derailment	Yard/Switch	Misc-Harmonic rock off, etc.	43,070	18,070	25,000
280	07/24/2004	ALS	EAST ST LOUIS	IL	Derailment	Yard/Switch	Misc-Harmonic rock off, etc.	52,872	26,000	26,872
281	07/24/2004	BNSF	MEMPHIS	TN	Derailment	Yard/Switch	Signal-Classyard autocontrol sys switch fail	9,191	7,991	1,200
282	07/24/2004	KCS	WYLIE	TX	Derailment	Freight Train	Human-Passed couplers	7,690	7,690	0
283	07/27/2004	CSX	FLORENCE	SC	Other impact	Yard/Switch	Human-Instruction to trn/yd crew improper	17,150	17,150	0
284	07/27/2004	UP	HOUSTON	TX	Derailment	Yard/Switch	Signal-Power switch failure	30,175	3,968	26,207
285	07/28/2004	ALS	EAST ST LOUIS	IL	Head on collision	Yard/Switch	Human-Shoving movement, failure to control	61,518	34,500	27,018
285	07/28/2004	ALS	EAST ST LOUIS	IL	Head on collision	Yard/Switch	Human-Shoving movement, failure to control	0	0	0
286	07/31/2004	BNSF	BIRMINGHAM	AL	Derailment	Yard/Switch	Track-Head and web sep(outside jt bar limit)	30,612	12,126	18,486
287	07/31/2004	BNSF	CLOVIS	NM	Derailment	Yard/Switch	Human-Shoving movement, absence of man	19,015	19,015	0
288	08/01/2004	CRSH	CAMDEN	NJ	Raking collision	Yard/Switch	Human-Switch improperly lined	47,222	46,422	800
288	08/01/2004	CRSH	CAMDEN	NJ	Raking collision	Yard/Switch	Human-Switch improperly lined	21,938	21,938	0

Table 1-6
Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order
For The Period December 2003 Through December 2004

Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
289	08/01/2004	UP	HOUSTON	TX	Side collision	Yard/Switch	Human-Shoving movement, failure to control	81,582	1,982	79,600
289	08/01/2004	UP	HOUSTON	TX	Side collision	Yard/Switch	Human-Shoving movement, failure to control	13,652	13,652	0
290	08/01/2004	UP	EUGENE	OR	Side collision	Yard/Switch	Human-Shoving movement, absence of man	49,085	46,597	2,488
290	08/01/2004	UP	EUGENE	OR	Side collision	Yard/Switch	Human-Shoving movement, absence of man	6,380	6,380	0
291	08/02/2004	UP	SAN ANTONIO	TX	Derailment	Yard/Switch	Signal-Power switch failure	71,636	1,676	69,960
292	08/03/2004	CSX	MONTGOMERY	AL	Side collision	Yard/Switch	Human-Shoving movement, absence of man	4,300	3,500	800
292	08/03/2004	CSX	MONTGOMERY	AL	Side collision	Freight Train	Human-Shoving movement, absence of man	3,997	3,997	0
293	08/03/2004	KCS	PORT ARTHUR	TX	Derailment	Yard/Switch	Human-Failure to couple	13,743	13,500	243
294	08/04/2004	IC	MEMPHIS	TN	Other impact	Cut of Cars	Human-Switch movement, excessive speed	16,000	16,000	0
295	08/04/2004	UP	KANSAS CITY	KS	Derailment	Yard/Switch	Human-Switch improperly lined	13,300	8,300	5,000
296	08/05/2004	UP	ROSEVILLE	CA	Other impact	Yard/Switch	Human-Shoving movement, absence of man	8,214	7,835	379
296	08/05/2004	UP	ROSEVILLE	CA	Other impact	Single Car	Human-Shoving movement, absence of man	4,775	4,775	0
297	08/06/2004	CSX	RIVERDALE	IL	Other impact	Yard/Switch	Human-Shoving movement, failure to control	27,751	27,451	300
298	08/06/2004	UP	DENVER	CO	Derailment	Yard/Switch	Human-Fail to apply suff. hand brakes -rr emp	35,549	35,549	0
298	08/06/2004	UP	DENVER	CO	Derailment	Freight Train	Human-Fail to apply suff. hand brakes -rr emp	18,514	18,514	0
299	08/08/2004	UP	NORTH PLATTE	NE	Other impact	Light Loco(s)	Human-Shoving movement, failure to control	4,500	4,500	0
299	08/08/2004	UP	NORTH PLATTE	NE	Other impact	Light Loco(s)	Human-Shoving movement, failure to control	4,500	4,500	0
300	08/09/2004	CSX	CINCINNATI	OH	Other impact	Single Car	Human-Failure to couple	11,246	11,246	0
301	08/09/2004	CSX	BIRMINGHAM	AL	Other impact	Yard/Switch	Human-Shoving movement, failure to control	100,800	100,000	800
301	08/09/2004	CSX	BIRMINGHAM	AL	Other impact	Yard/Switch	Human-Shoving movement, failure to control	30,000	30,000	0
302	08/11/2004	BNSF	CICERO	IL	Side collision	Yard/Switch	Human-Switch improperly lined	9,500	6,500	3,000
302	08/11/2004	BNSF	CICERO	IL	Side collision	Yard/Switch	Human-Switch improperly lined	8,000	8,000	0
303	08/11/2004	UP	KANSAS CITY	KS	Derailment	Yard/Switch	Track-Switch damaged or out of adjustment	26,523	25,323	1,200
304	08/11/2004	UP	NORTH PLATTE	NE	Other impact	Yard/Switch	Misc-Auto hump retarder failed to slow car	7,500	5,000	2,500
304	08/11/2004	UP	NORTH PLATTE	NE	Other impact	Cut of Cars	Misc-Auto hump retarder failed to slow car	7,000	7,000	0
305	08/13/2004	UP	KANSAS CITY	KS	Other impact	Yard/Switch	Human-Shoving movement, absence of man	22,570	22,070	500
306	08/14/2004	BNSF	LOGISTICS PARK	IL	Derailment	Yard/Switch	Human-Fail to apply car hnd brks -rr emp	29,300	27,800	1,500
306	08/14/2004	BNSF	LOGISTICS PARK	IL	Derailment	Cut of Cars	Human-Fail to apply car hnd brks -rr emp	2,200	2,200	0
307	08/14/2004	UP	NORTH LAKE	IL	Other impact	Light Loco(s)	Human-Failure to stretch cars before shoving	125,000	125,000	0
307	08/14/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Human-Failure to stretch cars before shoving	16,040	16,040	0
307	08/14/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Human-Failure to stretch cars before shoving	15,106	8,159	6,947
308	08/15/2004	BNSF	MEMPHIS	TN	Derailment	Yard/Switch	Signal-Other signal failures	132,782	132,782	0

Table 1-6
Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order
For The Period December 2003 Through December 2004

Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
309	08/15/2004	UP	DES MOINES	IA	Other impact	Yard/Switch	Human-Other general switching rules	15,001	13,756	1,245
309	08/15/2004	UP	DES MOINES	IA	Other impact	Yard/Switch	Human-Other general switching rules	50	50	0
310	08/16/2004	CSX	ROCKY MOUNT	NC	Derailment	Cut of Cars	Human-Fail to secure car hnd brk -rr emp	37,500	37,000	500
311	08/16/2004	UP	KANSAS CITY	MO	Derailment	Yard/Switch	Human-Skate, failure to remove or place	16,380	1,380	15,000
312	08/17/2004	UP	NORTH PLATTE	NE	Other impact	Yard/Switch	Human-Fail to secure car hnd brk -rr emp	5,348	5,348	0
312	08/17/2004	UP	NORTH PLATTE	NE	Other impact	Single Car	Human-Fail to secure car hnd brk -rr emp	2,039	2,039	0
313	08/18/2004	BNSF	ST ANTHONY	MN	Derailment	Yard/Switch	Human-Switch improperly lined	52,525	10,000	42,525
314	08/19/2004	NS	ENOLA	PA	Other impact	Yard/Switch	Signal-Classification yard automatic control system - Inadequate/insufficient control	46,400	45,400	1,000
315	08/19/2004	UP	PINE BLUFF	AR	Derailment	Yard/Switch	Track-Mismatched rail-head contour	60,460	22,628	37,832
315	08/19/2004	UP	PINE BLUFF	AR	Derailment	Cut of Cars	Track-Mismatched rail-head contour	7,227	7,227	0
316	08/20/2004	BNSF	ALLIANCE	NE	Derailment	Yard/Switch	Human-Shoving movement, absence of man	18,700	15,800	2,900
317	08/20/2004	UP	DENVER	CO	Side collision	Yard/Switch	Human-Shoving movement, absence of man	218	218	0
317	08/20/2004	UP	DENVER	CO	Side collision	Yard/Switch	Human-Shoving movement, absence of man	37,065	37,065	0
318	08/20/2004	UP	DENVER	CO	Derailment	Yard/Switch	Human-Shoving movement, failure to control	11,506	11,506	0
318	08/20/2004	UP	DENVER	CO	Derailment	Yard/Switch	Human-Shoving movement, failure to control	3,034	3,034	0
319	08/20/2004	UP	FIFE	WA	Derailment	Yard/Switch	Human-Switch previously run through	47,976	19,976	28,000
320	08/22/2004	UP	PINE BLUFF	AR	Derailment	Yard/Switch	Track-Switch point worn or broken	56,598	18,766	37,832
321	08/24/2004	BNSF	WILLMAR	MN	Other impact	Yard/Switch	Human-Failure to couple	15,300	15,300	0
321	08/24/2004	BNSF	WILLMAR	MN	Other impact	Yard/Switch	Human-Failure to couple	1,200	1,200	0
322	08/24/2004	UP	SAN ANTONIO	TX	Broken train collision	Yard/Switch	Equipment-Coupler carrier broken or defective	19,948	19,948	0
323	08/25/2004	UP	LAPORTE	TX	Other impact	Light Loco(s)	Human-Shoving movement, absence of man	40,668	40,668	0
323	08/25/2004	UP	LAPORTE	TX	Other impact	Yard/Switch	Human-Shoving movement, absence of man	15,694	15,694	0
324	08/26/2004	CSX	SAVANNAH	GA	Derailment	Yard/Switch	Human-Shoving movement, absence of man	12,000	12,000	0
325	08/26/2004	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Track-Wide gage(defective/missing crossties)	12,929	1,304	11,625
326	08/28/2004	CSX	JACKSONVILLE	FL	Derailment	Yard/Switch	Human-Switch improperly lined	10,100	10,000	100
327	08/28/2004	UP	LAPORTE	TX	Derailment	Yard/Switch	Human-Switch improperly lined	13,767	11,767	2,000
328	08/30/2004	UP	PORTLAND	OR	Derailment	Yard/Switch	Human-Shoving movement, absence of man	9,800	9,386	414
328	08/30/2004	UP	PORTLAND	OR	Derailment	Yard/Switch	Human-Shoving movement, absence of man	6,863	6,863	0
329	08/30/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Human-Use of brakes, other	25,000	25,000	0
329	08/30/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Human-Use of brakes, other	592	592	0
330	08/31/2004	UP	PORTLAND	OR	Other impact	Yard/Switch	Human-Fail to secure car hnd brk -rr emp	7,939	7,525	414
330	08/31/2004	UP	PORTLAND	OR	Other impact	Single Car	Human-Fail to secure car hnd brk -rr emp	6,811	6,811	0
331	09/02/2004	UP	PINE BLUFF	AR	Derailment	Yard/Switch	Track-Horizontal split head	23,275	1,200	22,075
332	09/02/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Misc-Passed couplers (automated classification yard)	673	673	0

Table 1-6
Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order
For The Period December 2003 Through December 2004

Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
332	09/02/2004	UP	NORTHLAKE	IL	Other impact	Cut of Cars	Misc-Passed couplers (automated classification yard)	20,547	20,547	0
333	09/03/2004	UP	PINE BLUFF	AR	Other impact	Yard/Switch	Human-Fail to apply suff. hand brakes -rr emp	6,101	6,101	0
333	09/03/2004	UP	PINE BLUFF	AR	Other impact	Cut of Cars	Human-Fail to apply suff. hand brakes -rr emp	3,785	3,785	0
334	09/04/2004	UP	KANSAS CITY	KS	Derailment	Yard/Switch	Track-Wide gage(defective/missing crossties)	8,362	6,862	1,500
335	09/04/2004	UP	ROCHELLE	IL	Side collision	Yard/Switch	Human-Shoving movement, absence of man	1,200	1,200	0
335	09/04/2004	UP	ROCHELLE	IL	Side collision	Freight Train	Human-Shoving movement, absence of man	10,642	10,642	0
336	09/05/2004	CSX	HAMLET	NC	Derailment	Cut of Cars	Human-Fail to release hand brk - rr emp	11,650	11,650	0
337	09/06/2004	UP	DENVER	CO	Derailment	Yard/Switch	Human-Shoving movement, absence of man	15,749	15,128	621
337	09/06/2004	UP	DENVER	CO	Derailment	Cut of Cars	Human-Shoving movement, absence of man	13,178	13,178	0
338	09/11/2004	BNSF	BELEN	NM	Other impact	Yard/Switch	Human-Shoving movement, absence of man	3,800	3,800	0
338	09/11/2004	BNSF	BELEN	NM	Other impact	Yard/Switch	Human-Shoving movement, absence of man	7,990	7,990	0
339	09/11/2004	BNSF	BELEN	NM	Other impact	Light Loco(s)	Human-Shoving movement, failure to control	15,941	15,941	0
339	09/11/2004	BNSF	BELEN	NM	Other impact	Cut of Cars	Human-Shoving movement, failure to control	1,900	1,900	0
340	09/12/2004	BNSF	DENVER	CO	Raking collision	Yard/Switch	Human-Kicking or dropping cars, inadequate precautions	5,170	5,170	0
340	09/12/2004	BNSF	DENVER	CO	Raking collision	Yard/Switch	Human-Kicking or dropping cars, inadequate precautions	7,900	7,900	0
341	09/12/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Misc-Passed couplers (automated classification yard)	38,951	38,951	0
341	09/12/2004	UP	NORTHLAKE	IL	Other impact	Cut of Cars	Misc-Passed couplers (automated classification yard)	36,316	36,316	0
342	09/12/2004	UP	DES MOINES	IA	Derailment	Yard/Switch	Equipment-Oth coupler/draft system defects-car	7,057	4,937	2,120
343	09/14/2004	UP	FORT WORTH	TX	Derailment	Yard/Switch	Human-Buff/slack action excess, trn make-up	30,639	14,139	16,500
344	09/14/2004	UP	EUGENE	OR	Derailment	Yard/Switch	Human-Switch previously run through	89,430	33,952	55,478
345	09/16/2004	UP	SAN ANTONIO	TX	Derailment	Yard/Switch	Human-Fail to ctrl car spd use hnd brk-r emp	91,414	69,262	22,152
346	09/18/2004	BNSF	DENVER	CO	Raking collision	Light Loco(s)	Human-Shoving movement, absence of man	6,100	6,100	0
346	09/18/2004	BNSF	DENVER	CO	Raking collision	Yard/Switch	Human-Shoving movement, absence of man	18,000	18,000	0
347	09/18/2004	UP	PORTLAND	OR	Other impact	Light Loco(s)	Human-Shoving movement, failure to control	7,979	7,358	621
347	09/18/2004	UP	PORTLAND	OR	Other impact	Single Car	Human-Shoving movement, failure to control	100	100	0
348	09/20/2004	NS	DECATUR	IL	Derailment	Yard/Switch	Human-Switch improperly lined	7,350	5,700	1,650
349	09/20/2004	UP	NORTH PLATTE	NE	Other impact	Yard/Switch	Human-Fail to release hand brk - rr emp	14,929	14,929	0
349	09/20/2004	UP	NORTH PLATTE	NE	Other impact	Single Car	Human-Fail to release hand brk - rr emp	6,885	6,885	0
350	09/21/2004	ALS	EAST ST LOUIS	IL	Other impact	Yard/Switch	Human-Other train operation/human factors	186,170	4,500	181,670
350	09/21/2004	ALS	EAST ST LOUIS	IL	Other impact	Cut of Cars	Human-Other train operation/human factors	93,698	93,698	0

Table 1-6
Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order
For The Period December 2003 Through December 2004

Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
351	09/21/2004	UP	MELROSE PARK	IL	Other impact	Yard/Switch	Human-Fail to apply suff. hand brakes -rr emp	984	570	414
351	09/21/2004	UP	MELROSE PARK	IL	Other impact	Yard/Switch	Human-Fail to apply suff. hand brakes -rr emp	12,414	12,414	0
352	09/22/2004	CSX	WAYCROSS	GA	Side collision	Yard/Switch	Human-Shoving movement, failure to control	8,000	8,000	0
352	09/22/2004	CSX	WAYCROSS	GA	Side collision	Yard/Switch	Human-Shoving movement, failure to control	6,000	6,000	0
353	09/22/2004	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Track-Wide gage(spikes/other rail fasteners)	20,512	10,500	10,012
354	09/23/2004	UP	SAN ANTONIO	TX	Other impact	Yard/Switch	Human-Failure to stretch cars before shoving	30,815	6,924	23,891
354	09/23/2004	UP	SAN ANTONIO	TX	Other impact	Cut of Cars	Human-Failure to stretch cars before shoving	69,547	69,547	0
355	09/24/2004	UP	LAPORTE	TX	Derailment	Yard/Switch	Track-Wide gage (due to worn rails)	22,768	17,871	4,897
356	09/24/2004	UP	HOUSTON	TX	Other impact	Yard/Switch	Human-Shoving movement, absence of man	63,564	61,564	2,000
356	09/24/2004	UP	HOUSTON	TX	Other impact	Yard/Switch	Human-Shoving movement, absence of man	27,594	27,594	0
357	09/26/2004	UP	MILPITAS	CA	Side collision	Yard/Switch	Human-Movement without authority - rr emp	658	658	0
357	09/26/2004	UP	MILPITAS	CA	Side collision	Yard/Switch	Human-Movement without authority - rr emp	10,846	10,346	500
358	09/28/2004	UP	NORTH LITTLE ROCK	AR	Derailment	Yard/Switch	Signal-Class yd auto ctrl sys retarder fail	17,075	2,075	15,000
359	09/28/2004	UP	SALT LAKE CITY	UT	Derailment	Yard/Switch	Human-Shoving movement, absence of man	3,725	3,725	0
359	09/28/2004	UP	SALT LAKE CITY	UT	Derailment	Yard/Switch	Human-Shoving movement, absence of man	12,066	12,066	0
360	09/29/2004	UP	HOUSTON	TX	Other impact	Yard/Switch	Human-Shoving movement, absence of man	27,765	25,425	2,340
360	09/29/2004	UP	HOUSTON	TX	Other impact	Yard/Switch	Human-Shoving movement, absence of man	1,684	1,684	0
361	09/29/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Human-Shoving movement, absence of man	3,268	3,268	0
361	09/29/2004	UP	NORTHLAKE	IL	Other impact	Cut of Cars	Human-Shoving movement, absence of man	5,508	5,508	0
362	09/30/2004	BNSF	ALLIANCE	TX	Derailment	Yard/Switch	Human-Passed couplers	9,129	9,129	0
363	10/01/2004	CSX	CUMBERLAND	MD	Derailment	Yard/Switch	Track-Wide gage(defective/missing crossties)	7,175	6,675	500
364	10/01/2004	UP	GREEN RIVER	WY	Other impact	Light Loco(s)	Human-Shoving movement, absence of man	10,350	10,000	350
364	10/01/2004	UP	GREEN RIVER	WY	Other impact	Cut of Cars	Human-Shoving movement, absence of man	3,900	3,900	0
365	10/02/2004	BRC	CHICAGO	IL	Derailment	Yard/Switch	Track-Switch (hand op) stand mechanism defect	6461085	21,085	6440000
366	10/02/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Signal-Class yd auto ctrl sys retarder fail	307	0	307
366	10/02/2004	UP	NORTHLAKE	IL	Other impact	Cut of Cars	Signal-Class yd auto ctrl sys retarder fail	7,596	7,596	0
367	10/03/2004	CSX	BIRMINGHAM	AL	Other impact	Yard/Switch	Human-Shoving movement, absence of man	10,800	10,000	800
367	10/03/2004	CSX	BIRMINGHAM	AL	Other impact	Yard/Switch	Human-Shoving movement, absence of man	50,000	50,000	0
368	10/04/2004	BNSF	BARSTOW	CA	Derailment	Yard/Switch	Human-Derail, failure to apply or remove	7,016	6,236	780
369	10/06/2004	NS	BIRMINGHAM	AL	Derailment	Yard/Switch	Signal-Remote control transmitter, loss of communication.	23,000	23,000	0
370	10/07/2004	BNSF	PASCO	WA	Derailment	Yard/Switch	Signal-Classification yard automatic control system - Inadequate/insufficient control	21,780	21,780	0
370	10/07/2004	BNSF	PASCO	WA	Derailment	Cut of Cars	Signal-Classification yard automatic control system - Inadequate/insufficient control	1,691	1,691	0

Table 1-6
Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order
For The Period December 2003 Through December 2004

Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
371	10/07/2004	BRC	BEDFORD PARK	IL	Other impact	Single Car	Misc-Load shifted	9,060	8,650	410
371	10/07/2004	BRC	BEDFORD PARK	IL	Other impact	Single Car	Misc-Load shifted	100	100	0
372	10/08/2004	BNSF	LINCOLN	NE	Side collision	Yard/Switch	Human-Shoving movement, failure to control	36,957	26,957	10,000
372	10/08/2004	BNSF	LINCOLN	NE	Side collision	Freight Train	Human-Shoving movement, failure to control	35,000	35,000	0
372	10/08/2004	BNSF	LINCOLN	NE	Side collision	Freight Train	Human-Shoving movement, failure to control	60,391	60,391	0
373	10/08/2004	BRC	BEDFORD PARK	IL	Other impact	Single Car	Signal-Class yd auto ctrl sys retarder fail	10,710	10,000	710
373	10/08/2004	BRC	BEDFORD PARK	IL	Other impact	Single Car	Signal-Class yd auto ctrl sys retarder fail	200	200	0
374	10/09/2004	BNSF	PASCO	WA	Derailment	Yard/Switch	Human-Switch not latched or locked	64,133	47,133	17,000
375	10/09/2004	CSX	LOUISVILLE	KY	Other impact	Yard/Switch	Misc-Auto hump retarder failed to slow car	15,275	15,075	200
376	10/09/2004	MRL	LAUREL	MT	Derailment	Yard/Switch	Track-Spring/power swtch mech. malfunction	10,100	2,000	8,100
377	10/10/2004	UP	EUGENE	OR	Derailment	Light Loco(s)	Human-Switch improperly lined	77,890	2,890	75,000
378	10/12/2004	BNSF	OKLAHOMA CITY	OK	Other impact	Yard/Switch	Human-Other general switching rules	10,100	9,200	900
378	10/12/2004	BNSF	OKLAHOMA CITY	OK	Other impact	Cut of Cars	Human-Other general switching rules	2,100	2,100	0
379	10/12/2004	UP	NORTH LITTLE ROCK	AR	Side collision	Yard/Switch	Human-Other train operation/human factors	8,504	5,195	3,309
379	10/12/2004	UP	NORTH LITTLE ROCK	AR	Side collision	Yard/Switch	Human-Other train operation/human factors	12,857	12,857	0
380	10/12/2004	UP	OGDEN	UT	Derailment	Yard/Switch	Human-Switch improperly lined	110,079	76,479	33,600
381	10/13/2004	CSX	ATLANTA	GA	Side collision	Yard/Switch	Human-Switch improperly lined	60,000	60,000	0
381	10/13/2004	CSX	ATLANTA	GA	Side collision	Yard/Switch	Human-Switch improperly lined	41,000	41,000	0
382	10/13/2004	UP	SAN ANTONIO	TX	Derailment	Yard/Switch	Human-Other general switching rules	99,727	1,727	98,000
383	10/14/2004	ALS	EAST ST LOUIS	IL	Derailment	Yard/Switch	Misc-Harmonic rock off, etc.	14,500	14,500	0
384	10/14/2004	BNSF	BIRMINGHAM	AL	Other impact	Yard/Switch	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	8,300	3,300	5,000
384	10/14/2004	BNSF	BIRMINGHAM	AL	Other impact	Freight Train	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	12,652	12,652	0
385	10/14/2004	CSX	ATLANTA	GA	Side collision	Yard/Switch	Human-Switch improperly lined	3,687	3,487	200
385	10/14/2004	CSX	ATLANTA	GA	Side collision	Yard/Switch	Human-Switch improperly lined	15,000	15,000	0
386	10/14/2004	UP	STOCKTON	CA	Derailment	Yard/Switch	Human-Switch improperly lined	50,600	1,200	49,400
387	10/15/2004	UP	NORTH LITTLE ROCK	AR	Derailment	Yard/Switch	Human-Switch improperly lined	9,834	9,834	0
388	10/16/2004	UP	SAN ANTONIO	TX	Derailment	Yard/Switch	Signal-Power switch failure	8,702	2,092	6,610
388	10/16/2004	UP	SAN ANTONIO	TX	Derailment	Cut of Cars	Signal-Power switch failure	1,580	1,580	0

Table 1-6
Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order
For The Period December 2003 Through December 2004

Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
389	10/17/2004	BNSF	KANSAS CITY	MO	Derailment	Yard/Switch	Track-Switch point worn or broken	12,700	9,700	3,000
390	10/18/2004	NS	IRONVILLE	OH	Derailment	Yard/Switch	Track-Mismatched rail-head contour	15,250	14,700	550
391	10/18/2004	UP	CHEYENNE	WY	Other impact	Yard/Switch	Human-Shoving movement, absence of man	18,600	100	18,500
391	10/18/2004	UP	CHEYENNE	WY	Other impact	Single Car	Human-Shoving movement, absence of man	334	334	0
392	10/21/2004	BNSF	MEMPHIS	TN	Derailment	Yard/Switch	Misc-Passed couplers (automated classification yard)	7,001	4,601	2,400
393	10/21/2004	UP	PINE BLUFF	AR	Other impact	Yard/Switch	Misc-Passed couplers (automated classification yard)	2,827	2,827	0
393	10/21/2004	UP	PINE BLUFF	AR	Other impact	Cut of Cars	Misc-Passed couplers (automated classification yard)	5,386	299	5,087
393	10/21/2004	UP	PINE BLUFF	AR	Other impact	Single Car	Misc-Passed couplers (automated classification yard)	299	299	0
394	10/22/2004	UP	NORTH LITTLE ROCK	AR	Derailment	Yard/Switch	Track-Switch point worn or broken	44,524	12,524	32,000
395	10/22/2004	UP	NORTH PLATTE	NE	Other impact	Yard/Switch	Signal-Class yd auto ctrl sys retarder fail	145,720	16,464	129,256
395	10/22/2004	UP	NORTH PLATTE	NE	Other impact	Cut of Cars	Signal-Class yd auto ctrl sys retarder fail	28,216	28,216	0
396	10/22/2004	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Signal-Class yd auto ctrl sys retarder fail	50,184	184	50,000
397	10/23/2004	UP	HOUSTON	TX	Side collision	Yard/Switch	Human-Shoving movement, absence of man	63,888	62,888	1,000
397	10/23/2004	UP	HOUSTON	TX	Side collision	Yard/Switch	Human-Shoving movement, absence of man	29,138	29,138	0
398	10/23/2004	UP	HERMISTON	OR	Derailment	Yard/Switch	Track-Switch point worn or broken	23,353	738	22,615
399	10/23/2004	UP	SALT LAKE CITY	UT	Derailment	Yard/Switch	Human-Switch improperly lined	46,773	1,648	45,125
400	10/24/2004	ALS	EAST ST LOUIS	IL	Other impact	Yard/Switch	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	2,000	2,000	0
400	10/24/2004	ALS	EAST ST LOUIS	IL	Other impact	Yard/Switch	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	13,000	13,000	0
401	10/25/2004	CSX	RIVERDALE	IL	Derailment	Yard/Switch	Human-Switch improperly lined	8,922	8,222	700
402	10/26/2004	NS	EVENDALE	OH	Derailment	Yard/Switch	Track-Transverse/compound fissure	47,075	37,075	10,000
402	10/26/2004	NS	EVENDALE	OH	Derailment	Yard/Switch	Track-Transverse/compound fissure	14,300	14,300	0
403	10/28/2004	BNSF	AMARILLO S YARD	TX	Other impact	Yard/Switch	Human-Shoving movement, absence of man	15,830	15,830	0
403	10/28/2004	BNSF	AMARILLO S YARD	TX	Other impact	Yard/Switch	Human-Shoving movement, absence of man	34,933	26,960	7,973
404	10/29/2004	BRC	BEDFORD PARK	IL	Raking collision	Yard/Switch	Track-Wide gage(defective/missing crossties)	7,558	6,358	1,200
404	10/29/2004	BRC	BEDFORD PARK	IL	Raking collision	Cut of Cars	Track-Wide gage(defective/missing crossties)	34,420	3,200	31,220
405	10/29/2004	CSX	ATLANTA	GA	Side collision	Yard/Switch	Human-Shoving movement, failure to control	1,000	1,000	0
405	10/29/2004	CSX	ATLANTA	GA	Side collision	Yard/Switch	Human-Shoving movement, failure to control	7,632	7,632	0
406	10/29/2004	UP	SAN JOSE	CA	Derailment	Yard/Switch	Track-Roadbed settled or soft	114,162	18,113	96,049
407	10/30/2004	CSX	CUMBERLAND	MD	Derailment	Yard/Switch	Track-Vertical split head	21,527	19,527	2,000

Table 1-6
Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order
For The Period December 2003 Through December 2004

Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
408	10/31/2004	UP	FORT WORTH	TX	Derailment	Yard/Switch	Human-Instruction to trn/yd crew improper	26,582	20,782	5,800
408	10/31/2004	UP	FORT WORTH	TX	Derailment	Cut of Cars	Human-Instruction to trn/yd crew improper	564	564	0
409	11/02/2004	BNSF	GRAND FORKS	ND	Derailment	Yard/Switch	Human-Passed couplers	6,800	400	6,400
410	11/03/2004	BNSF	SEATTLE	WA	Side collision	Yard/Switch	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	14,000	14,000	0
410	11/03/2004	BNSF	SEATTLE	WA	Side collision	Yard/Switch	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	9,500	9,000	500
411	11/03/2004	UP	DALLAS	TX	Derailment	Yard/Switch	Human-Switch improperly lined	93,905	77,905	16,000
412	11/03/2004	UP	KANSAS CITY	KS	Derailment	Yard/Switch	Track-Switch damaged or out of adjustment	7,899	4,899	3,000
413	11/04/2004	UP	OGDEN	UT	Derailment	Yard/Switch	Human-Shoving movement, failure to control	13,623	13,323	300
414	11/06/2004	ALS	EAST ST LOUIS	IL	Derailment	Yard/Switch	Equipment-Side bearing clearance insufficient	28,572	15,600	12,972
415	11/07/2004	BNSF	BELEN	NM	Other impact	Yard/Switch	Human-Shoving movement, absence of man	12,325	12,325	0
415	11/07/2004	BNSF	BELEN	NM	Other impact	Yard/Switch	Human-Shoving movement, absence of man	8,166	8,166	0
416	11/08/2004	CSX	ROCKY MOUNT	NC	Other impact	Single Car	Human-Switch improperly lined	9,200	9,200	0
417	11/09/2004	UP	HOUSTON	TX	Side collision	Yard/Switch	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	0	0	0
417	11/09/2004	UP	HOUSTON	TX	Side collision	Yard/Switch	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	7,007	7,007	0
418	11/10/2004	UP	ROSEVILLE	CA	Derailment	Yard/Switch	Misc-Passed couplers (automated classification yard)	13,012	2,012	11,000
419	11/11/2004	UP	KANSAS CITY	MO	Side collision	Yard/Switch	Misc-Yard skate slid and failed to stop car	32,924	32,924	0
419	11/11/2004	UP	KANSAS CITY	MO	Side collision	Yard/Switch	Misc-Yard skate slid and failed to stop car	7,495	7,495	0
420	11/11/2004	UP	OGDEN	UT	Other impact	Yard/Switch	Human-Fail to secure car hnd brk -rr emp	28,179	28,179	0
420	11/11/2004	UP	OGDEN	UT	Other impact	Yard/Switch	Human-Fail to secure car hnd brk -rr emp	29,115	29,115	0
421	11/13/2004	BNSF	AMARILLO	TX	Side collision	Yard/Switch	Human-Other general switching rules	6,453	5,953	500
421	11/13/2004	BNSF	AMARILLO	TX	Side collision	Freight Train	Human-Other general switching rules	1,371	1,371	0
422	11/14/2004	CSX	LOUISVILLE	KY	Derailment	Yard/Switch	Human-Shoving movement, absence of man	15,500	15,500	0
423	11/14/2004	UP	DENVER	CO	Derailment	Yard/Switch	Misc-Obj/equip on/fouling track, other	185,263	171,893	13,370
424	11/14/2004	UP	PORTLAND	OR	Derailment	Yard/Switch	Human-Failure to stretch cars before shoving	40,426	3,000	37,426
425	11/14/2004	UP	SAN ANTONIO	TX	Derailment	Yard/Switch	Misc-Obj/equip on/fouling track, other	46,522	1,450	45,072
426	11/15/2004	IC	MEMPHIS	TN	Other impact	Yard/Switch	Human-Failure to comply with restricted speed	25,500	24,000	1,500
426	11/15/2004	IC	MEMPHIS	TN	Other impact	Freight Train	Human-Failure to comply with restricted speed	42,650	42,650	0
427	11/15/2004	UP	FORT WORTH	TX	Derailment	Yard/Switch	Misc-Passed couplers (automated classification yard)	7,485	2,485	5,000

Table 1-6
Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order
For The Period December 2003 Through December 2004

Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
428	11/17/2004	BNSF	KANSAS CITY	KS	Other impact	Yard/Switch	Human-Instruction to trn/yd crew improper	8,900	8,900	0
428	11/17/2004	BNSF	KANSAS CITY	KS	Other impact	Yard/Switch	Human-Instruction to trn/yd crew improper	9,400	7,900	1,500
429	11/18/2004	BNSF	KANSAS CITY	KS	Derailment	Yard/Switch	Misc-Passed couplers (automated classification yard)	85,554	70,554	15,000
429	11/18/2004	BNSF	KANSAS CITY	KS	Derailment	Cut of Cars	Misc-Passed couplers (automated classification yard)	7,824	7,824	0
430	11/18/2004	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Equipment-Coupler shank broken/defective	26,336	6,336	20,000
431	11/18/2004	UP	NORTH PLATTE	NE	Side collision	Yard/Switch	Equipment-Draft gear/mechanism broke/defective	100	100	0
431	11/18/2004	UP	NORTH PLATTE	NE	Side collision	Yard/Switch	Equipment-Draft gear/mechanism broke/defective	46,720	1,364	45,356
432	11/21/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Human-Retarder, improper manual operation	18,264	18,057	207
432	11/21/2004	UP	NORTHLAKE	IL	Other impact	Cut of Cars	Human-Retarder, improper manual operation	110	110	0
433	11/22/2004	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Human-Switch improperly lined	19,137	18,887	250
434	11/27/2004	UP	ARMOURDALE	KS	Side collision	Yard/Switch	Human-Skate, failure to remove or place	5,193	5,193	0
434	11/27/2004	UP	ARMOURDALE	KS	Side collision	Yard/Switch	Human-Skate, failure to remove or place	6,308	6,308	0
435	11/28/2004	BNSF	HASLET	TX	Derailment	Yard/Switch	Human-Fail to apply car hnd brks -rr emp	8,800	8,800	0
435	11/28/2004	BNSF	HASLET	TX	Derailment	Yard/Switch	Human-Fail to apply car hnd brks -rr emp	5,200	5,200	0
436	11/28/2004	UP	PINE BLUFF	AR	Derailment	Yard/Switch	Track-Joint bar broken (insulated)	31,848	848	31,000
437	11/28/2004	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Signal-Class yd auto ctrl sys retarder fail	172,175	26,047	146,128
438	11/28/2004	UP	SAN ANTONIO	TX	Side collision	Yard/Switch	Human-Shoving movement, absence of man	27,715	21,459	6,256
438	11/28/2004	UP	SAN ANTONIO	TX	Side collision	Yard/Switch	Human-Shoving movement, absence of man	2,944	2,944	0
439	11/28/2004	UP	SAN ANTONIO	TX	Side collision	Yard/Switch	Human-Shoving movement, absence of man	11,697	4,993	6,704
439	11/28/2004	UP	SAN ANTONIO	TX	Side collision	Yard/Switch	Human-Shoving movement, absence of man	1,989	1,989	0
440	12/01/2004	NS	MACON	GA	Side collision	Light Loco(s)	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	6,400	6,400	0
440	12/01/2004	NS	MACON	GA	Side collision	Yard/Switch	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	12,200	11,800	400
441	12/01/2004	UP	ARLINGTON	TX	Derailment	Yard/Switch	Track-Wide gage(spikes/other rail fasteners)	22,735	2,935	19,800
442	12/03/2004	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Track-Switch pt gap(btwn swt pt & stock rail)	80,740	40,237	40,503
443	12/04/2004	UP	HOUSTON	TX	Derailment	Yard/Switch	Misc-Harmonic rock off, etc.	29,939	598	29,341
444	12/05/2004	BNSF	LINCOLN	NE	Derailment	Yard/Switch	Track-Wide gage(defective/missing crossties)	26,380	9,800	16,580
445	12/05/2004	UP	KANSAS CITY	MO	Side collision	Yard/Switch	Human-Shoving movement, absence of man	18,000	18,000	0
445	12/05/2004	UP	KANSAS CITY	MO	Side collision	Yard/Switch	Human-Shoving movement, absence of man	5,650	5,650	0
446	12/06/2004	CSX	MONTGOMERY	AL	Side collision	Yard/Switch	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	0	0	0
446	12/06/2004	CSX	MONTGOMERY	AL	Side collision	Freight Train	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	24,530	24,530	0

Table 1-6
Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order
For The Period December 2003 Through December 2004

Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
447	12/08/2004	CSX	HAMLET	NC	Side collision	Light Loco(s)	Human-Shoving movement, failure to control	6,000	5,000	1,000
447	12/08/2004	CSX	HAMLET	NC	Side collision	Freight Train	Human-Shoving movement, failure to control	4,974	4,974	0
448	12/09/2004	BNSF	LINCOLN	NE	Derailment	Cut of Cars	Misc-Yard skate slid and failed to stop car	8,680	180	8,500
449	12/09/2004	BNSF	MEMPHIS	TN	Derailment	Yard/Switch	Human-Buff/slack action excess, trn handling	147,010	77,518	69,492
450	12/09/2004	CSX	DEWITT	NY	Derailment	Yard/Switch	Track-Switch point worn or broken	14,257	12,757	1,500
451	12/09/2004	UP	FRESNO	CA	Derailment	Yard/Switch	Human-Switch improperly lined, radio controlled	15,000	5,000	10,000
452	12/11/2004	CSX	LOUISVILLE	KY	Derailment	Cut of Cars	Human-Instruction to trn/yd crew improper	43,500	43,300	200
453	12/11/2004	UP	HOUSTON	TX	Derailment	Yard/Switch	Human-Buff/slack action excess, trn make-up	80,124	4,624	75,500
454	12/11/2004	UP	HOUSTON	TX	Other impact	Yard/Switch	Human-Shoving movement, failure to control	37,066	1,266	35,800
454	12/11/2004	UP	HOUSTON	TX	Other impact	Yard/Switch	Human-Shoving movement, failure to control	5,932	5,932	0
455	12/12/2004	BNSF	LOGISTICS PARK	IL	Side collision	Yard/Switch	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	66,000	41,000	25,000
455	12/12/2004	BNSF	LOGISTICS PARK	IL	Side collision	Freight Train	Human-Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	27,000	27,000	0
456	12/12/2004	UP	KANSAS CITY	MO	Derailment	Yard/Switch	Human-Buff/slack action excess, trn handling	81,811	19,311	62,500
457	12/12/2004	UP	PINE BLUFF	AR	Other impact	Yard/Switch	Human-Shoving movement, absence of man	4,656	4,656	0
457	12/12/2004	UP	PINE BLUFF	AR	Other impact	Yard/Switch	Human-Shoving movement, absence of man	9,419	9,419	0
458	12/13/2004	BNSF	INTERBAY	WA	Other impact	Yard/Switch	Human-Switch improperly lined	3,000	3,000	0
458	12/13/2004	BNSF	INTERBAY	WA	Other impact	Cut of Cars	Human-Switch improperly lined	7,000	7,000	0
459	12/13/2004	NS	BIRMINGHAM	AL	Raking collision	Yard/Switch	Human-Failure to stop train in clear	17,600	17,500	100
459	12/13/2004	NS	BIRMINGHAM	AL	Raking collision	Yard/Switch	Human-Failure to stop train in clear	10,000	10,000	0
460	12/14/2004	UP	PINE BLUFF	AR	Derailment	Light Loco(s)	Track-Broken base of rail	6,391	6,391	0
460	12/14/2004	UP	PINE BLUFF	AR	Derailment	Yard/Switch	Track-Broken base of rail	41,768	24,659	17,109
461	12/15/2004	CSX	WAYCROSS	GA	Derailment	Yard/Switch	Misc-Passed couplers (automated classification yard)	10,309	8,809	1,500
462	12/15/2004	UP	LIVONIA	LA	Side collision	Yard/Switch	Human-Instruction to trn/yd crew improper	12,200	12,200	0
462	12/15/2004	UP	LIVONIA	LA	Side collision	Yard/Switch	Human-Instruction to trn/yd crew improper	4,200	4,200	0
463	12/16/2004	BRC	BEDFORD PARK	IL	Other impact	Cut of Cars	Human-Fail to release hand brk - rr emp	10,584	9,164	1,420
464	12/18/2004	ALS	EAST ST LOUIS	IL	Derailment	Yard/Switch	Misc-Harmonic rock off, etc.	83,512	51,600	31,912
465	12/18/2004	BRC	BEDFORD PARK	IL	Other impact	Cut of Cars	Misc-Cause under investigation	19,424	19,424	0
466	12/18/2004	UP	NORTH PLATTE	NE	Side collision	Yard/Switch	Human-Shoving movement, absence of man	33,799	5,312	28,487
466	12/18/2004	UP	NORTH PLATTE	NE	Side collision	Yard/Switch	Human-Shoving movement, absence of man	5,000	5,000	0

Table 1-6
Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order
For The Period December 2003 Through December 2004

Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
467	12/20/2004	BRC	BEDFORD PARK	IL	Other event	Yard/Switch	Human-Manual intervention of classification yard automatic control system modes by operator	30,929	30,929	0
468	12/20/2004	UP	HOUSTON	TX	Other impact	Yard/Switch	Signal-Other communication equipment failure	10,512	5,512	5,000
468	12/20/2004	UP	HOUSTON	TX	Other impact	Yard/Switch	Signal-Other communication equipment failure	18,219	18,219	0
469	12/20/2004	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Track-Switch pt gap(btwn swt pt & stock rail)	33,017	28,591	4,426
470	12/22/2004	BNSF	DENVER	CO	Other impact	Yard/Switch	Human-Shoving movement, absence of man	5,000	5,000	0
470	12/22/2004	BNSF	DENVER	CO	Other impact	Yard/Switch	Human-Shoving movement, absence of man	13,514	13,514	0
471	12/26/2004	BNSF	KANSAS CITY	MO	Derailment	Yard/Switch	Misc-Harmonic rock off, etc.	15,558	14,558	1,000
472	12/26/2004	UP	ROSEVILLE	CA	Derailment	Yard/Switch	Human-Switch improperly lined	75,965	55,965	20,000
473	12/27/2004	UP	HOUSTON	TX	Side collision	Yard/Switch	Human-Shoving movement, absence of man	4,425	3,450	975
473	12/27/2004	UP	HOUSTON	TX	Side collision	Yard/Switch	Human-Shoving movement, absence of man	8,293	8,293	0
474	12/31/2004	UP	NORTHLAKE	IL	Side collision	Yard/Switch	Human-Shoving movement, absence of man	30,625	16,730	13,895
474	12/31/2004	UP	NORTHLAKE	IL	Side collision	Yard/Switch	Human-Shoving movement, absence of man	37,220	37,220	0

1/ Damages are reportable damage under 49 CFR Part 225, and is limited to damage to railroad on-track equipment and track.

Table 2-1
Comparison of Train Accidents Involving Hazardous Material in RCL vs. Conventional Operation
Selected Railroads on Yard and Industry Tracks
For The Period December 2003 Through December 2004
The Number of People Evacuated Includes Precautionary Evacuations Where No Release

		Train Accidents Involving Transportation of Hazardous Materials				Number of			
		Count	HM Cars Damaged	HM Cars Releasing	People Evacuated	Cars Carrying	Cars Damaged	Cars Releasing	People Evacuated
--Totals--	RCL	136	76	4	1	1,181	156	5	140
	Conv.	357	182	9	3	3,453	428	11	2,107
	**Total	493	258	13	4	4,634	584	16	2,247
--Type Track		134	75	4	1	1,166	155	5	140
Yard	RCL								
	Conv.	330	164	6	2	3,223	383	7	2,103
Industry	RCL	2	1	0	0	15	1	0	0
	Conv.	27	18	3	1	230	45	4	4
--Type Accident		69	44	2	0	484	88	2	0
Derailment	RCL								
	Conv.	248	127	5	2	2,548	325	6	2,103
Rear end collision	Conv.	2	1	1	1	19	4	1	4
Side collision	RCL	24	11	1	0	269	17	1	0
	Conv.	21	9	0	0	170	12	0	0
Raking collision	RCL	7	5	0	0	50	8	0	0
	Conv.	4	2	0	0	25	6	0	0
Broken train collision	Conv.	1	1	1	0	1	1	1	0
Highway-rail impact	Conv.	1	0	0	0	9	0	0	0
Obstruction impact	Conv.	1	0	0	0	15	0	0	0
Explosion/detonation	Conv.	1	1	0	0	47	4	0	0
Other impact	RCL	36	16	1	1	378	43	2	140
	Conv.	73	38	1	0	592	71	1	0
Other event	Conv.	5	3	1	0	27	5	2	0
--Primary Cause		6	4	0	0	52	11	0	0
Equipment	RCL								
	Conv.	22	11	1	0	239	24	1	8
Human	RCL	82	42	3	1	699	71	4	140
	Conv.	189	98	3	2	1,932	219	4	24
Miscellaneous	RCL	17	9	0	0	85	18	0	0
	Conv.	52	23	2	0	303	48	3	0
Signal	RCL	12	7	0	0	154	15	0	0
	Conv.	8	5	1	1	29	9	1	2,075
Track	RCL	19	14	1	0	191	41	1	0
	Conv.	86	45	2	0	950	128	2	0

RCL = Remote control locomotive, Conv. = Conventional switching
The first of counts is the number of events, the second set is the count of hazmat cars in consists
Followed by the consequences to them in the incident and the impact on persons in the area

Table 2-2
Listing of RCL Train Accidents Involving the Release of Hazardous Materials In Chronological Order
On Yard And Industry Tracks
For The Period December 2003 Through December 2004

Date	RR	Nearest Station/ City	ST	Type Accident	Equipment	Cars Carrying	Cars Damage	Cars Releasing	Cause
12/28/2003	UP	PINE BLUFF	AR	Derailment	Yard/Switch	1	1	1	Track-Transverse/compound fissure
05/05/2004	CSX	HAMLET	NC	Derailment	Yard/Switch	29	3	1	Human-Switch improperly lined
09/21/2004	ALS	EAST ST LOUIS	IL	Other impact	Cut of Cars	3	2	2	Human-Other train operation/human factors
10/08/2004	BNSF	LINCOLN	NE	Side collision	Yard/Switch	4	1	1	Human-Shoving movement, failure to control
						37	7	5	

All consists shown if more than one transporting hazmat in single accident

Table 3-1
Comparison of Employee on Duty RCL and Convention Switching Related Injuries
Number of Injuries, Yard Switching Miles Operated, and Injury Rates – Grand Totals and by Railroads
On Yard and Industry Tracks
For The Period December 2003 Through December 2004
(Transportation Crafts Only)

Railroads	Cases				Yard Switching Miles			Injury Rates	
	RCL Op.	Conv. Op.	Total	% RCL Op.	RCL Op.	Conv. Op.	Total	RCL Op.	Conv. Op.
Grand Total	137	925	1,062	12.9	21,392,572	49,218,974	70,611,546	6.40	18.79
Alton & Southern Rwy [ALS]	4	1	5	80.0	661,117	431,315	1,092,432	6.05	2.32
Arkansas & Missouri RR Co. [AM]	-	-	-	-	728	27,049	27,777	-	-
BNSF Rwy Co. [BNSF]	28	152	180	15.6	5,026,175	9,708,587	14,734,762	5.57	15.66
Belt Rwy Co. Of Chicago [BRC]	7	-	7	100.0	473,995	40,478	514,473	14.77	-
Brandywine Valley RR Co. [BVRY]	-	1	1	0.0	845	51,025	51,870	-	19.60
California Northern RR Co. [CFNR]	-	-	-	-	4,457	7,687	12,144	-	-
Consolidated Grain & Barge Co. [CGBX]	-	-	-	-	27,839	-	27,839	-	-
Central Midland Rwy Co. [CMR]	-	1	1	0.0	460	27,454	27,914	-	36.42
Consolidated Rail Corp. [CRSH]	-	12	12	0.0	93,796	1,875,632	1,969,428	-	6.40
CSX Transportation [CSX]	20	274	294	6.8	4,851,944	8,127,775	12,979,719	4.12	33.71
Elgin, Joliet & Eastern Rwy Co. [EJE]	-	10	10	0.0	44,936	233,372	278,308	-	42.85
Florida East Coast Rwy Co. [FEC]	1	6	7	14.3	10,321	421,838	432,159	96.89	14.22
Finger Lakes Rwy Corp. [FGLK]	1	-	1	100.0	12,177	3,729	15,906	82.12	-
Illinois Central RR Co. [IC]	-	32	32	0.0	66,541	2,559,672	2,626,213	-	12.50
Indiana Rail Road Co. [INRD]	1	-	1	100.0	26,914	21,697	48,611	37.16	-
Indiana Southern RR Co., Inc. [ISRR]	-	-	-	-	1,208	17,112	18,320	-	-
Jefferson Warrior RR [JEFW]	-	1	1	0.0	9,230	394	9,624	-	2538.07
Kansas City Southern Rwy Co. [KCS]	-	47	47	0.0	339,451	934,253	1,273,704	-	50.31
Louisiana & Delta RR [LDRR]	-	1	1	0.0	122	20,477	20,599	-	48.84
Lake Term. RR Co. [LT]	-	-	-	-	2,022	7	2,029	-	-
Minnesota, Dakota & Western Rwy Co. [MDW]	-	1	1	0.0	14,951	18,827	33,778	-	53.12
Mckeesport Connecting RR Co. [MKC]	-	-	-	-	16,287	582	16,869	-	-
Montreal, Maine and Atlantic Rwy, Ltd. [MMA]	-	-	-	-	5,350	100,797	106,147	-	-
Montana Rail Link [MRL]	5	9	14	35.7	280,059	218,782	498,841	17.85	41.14
Nebraska Central RR [NCRC]	-	-	-	-	2,312	20,597	22,909	-	-
Norfolk Southern Corp. [NS]	1	113	114	0.9	866,592	13,070,316	13,936,908	1.15	8.65
Portland & Western RR, Inc. [PNWR]	-	-	-	-	10,714	77,402	88,116	-	-
Puget Sound & Pacific RR Co. [PSAP]	-	-	-	-	838	3,301	4,139	-	-
Pennsylvania Southwestern RR, Inc. [PSWR]	-	-	-	-	67,323	5,190	72,513	-	-
San Luis & Rio Grande RR [SLRG]	-	-	-	-	1,499	5,499	6,998	-	-
Terminal RR Association Of St. Louis [TRRA]	-	2	2	0.0	12,760	662,863	675,623	-	3.02
Union Pacific RR Co. [UP]	69	228	297	23.2	8,335,826	8,580,862	16,916,688	8.28	26.57
Union RR Co. [URR]	-	8	8	0.0	8,712	126,804	135,516	-	63.09
Vermont Rwy, Inc. [VTR]	-	-	-	-	291	25,664	25,955	-	-
Wisconsin Central Ltd. [WC]	-	23	23	0.0	71,148	1,459,612	1,530,760	-	15.76
Wheeling & Lake Erie Rwy Co. [WE]	-	2	2	0.0	15,398	261,020	276,418	-	7.66
Willamette & Pacific RR, Inc. [WPRR]	-	1	1	0.0	25,040	62,835	87,875	-	15.91
Western RR Co. [WRRC]	-	-	-	-	3,194	8,468	11,662	-	-

Table 3-2
Comparison of Employee on Duty RCL and Conventional Switching Related Injuries
By Month, Type Injury, and Crafts
On Yard and Industry Tracks
For The Period December 2003 Through December 2004
(Transportation Crafts Only)

	Nonfatal		Fatalities		Total Cases	
	RCL	Conventional	RCL	Conventional	RCL	Conventional
Total	135	921	2	4	137	925
--YEAR/MONTH---	12	74	1	.	13	74
2003 12						
2004 01	11	88	.	1	11	89
2004 02	15	72	.	.	15	72
2004 03	12	76	.	.	12	76
2004 04	7	59	.	.	7	59
2004 05	7	68	.	1	7	69
2004 06	15	84	.	.	15	84
2004 07	14	64	.	.	14	64
2004 08	9	81	.	.	9	81
2004 09	9	64	1	.	10	64
2004 10	9	49	.	2	9	51
2004 11	10	77	.	.	10	77
2004 12	5	65	.	.	5	65
--INJURIES---	.	.	2	4	2	4
****Fatal						
Bruise/contusion	20	136	.	.	20	136
Occupational Illness	1	7	.	.	1	7
Crushing injury	.	4	.	.	.	4
Sprain/Strain,arm/hand	5	55	.	.	5	55
Sprain/Strain,leg/foot	25	188	.	.	25	188
Sprain/Strain,head/face	4	29	.	.	4	29
Sprain/Strain,torso	36	248	.	.	36	248
Sprain/Strain, other	.	6	.	.	.	6
Cut/abrasion	12	63	.	.	12	63
Puncture wound	1	9	.	.	1	9
Electric shock/burn	.	1	.	.	.	1
Other burn	.	3	.	.	.	3
Dislocation	3	11	.	.	3	11
Fracture,arm/hand	7	32	.	.	7	32
Fracture,leg/foot	3	27	.	.	3	27
Fracture,torso	3	14	.	.	3	14
Rupture/tear, tendon, etc.	2	12	.	.	2	12
Gunshot/knife wound	.	1	.	.	.	1
Animal/snake/insect bite	2	5	.	.	2	5
Dental related	2	2	.	.	2	2
Amputation,arm/hand	.	4	.	.	.	4
Amputation,leg/foot	3	3	.	.	3	3
Object in eye	2	10	.	.	2	10
Hernia	.	11	.	.	.	11
Concussion	.	5	.	.	.	5
Internal injury	.	1	.	.	.	1
Skin reaction	.	3	.	.	.	3
One-time exp. to noise	1	2	.	.	1	2
Unspecified injury	3	29	.	.	3	29
Total	135	921	2	4	137	925
--CRAFT---	.	1	.	.	.	1
Transportation, train and engine (miscellaneous)						
Switchtenders	.	12	.	.	.	12
Outside hostlers	.	5	.	.	.	5
Outside hostler helpers	.	4	.	.	.	4
Road freight conductors (through freight)	4	140	.	.	4	140
Road freight conductors (local and way freight)	.	105	.	.	.	105

Table 3-2
Comparison of Employee on Duty RCL and Conventional Switching Related Injuries
By Month, Type Injury, and Crafts
On Yard and Industry Tracks
For The Period December 2003 Through December 2004
(Transportation Crafts Only)

	Nonfatal		Fatalities		Total Cases	
	RCL	Conventional	RCL	Conventional	RCL	Conventional
Road freight brakemen and flagmen (through freight)	.	12	.	.	.	12
Road freight brakemen and flagmen (local and way freight)	.	100	.	2	.	102
Yard conductors and yard foremen	3	166	.	2	3	168
Yard brakemen and yard helpers	2	161	.	.	2	161
Road passenger engineers and motormen	.	1	.	.	.	1
Road freight engineers (through freight)	2	88	.	.	2	88
Road freight engineers (local and way freight)	1	52	.	.	1	52
Yard engineers	1	73	.	.	1	73
Road freight firemen and helpers (through freight)	.	1	.	.	.	1
Remote control locomotive operator -operating	51	.	1	.	52	.
Remote control locomotive operator - not operating	71	.	1	.	72	.

Table 3-3
Comparison of Employee on Duty RCL and Conventional Switching Related Casualties – By States
On Yard and Industry Tracks
For The Period December 2003 Through December 2004
(Transportation Crafts Only)

	Nonfatal		Fatalities		Total Cases	
	RCL	Conventional	RCL	Conventional	RCL	Conventional
Total	135	921	2	4	137	925
Alabama	1	23	.	.	1	23
Arizona	1	15	.	.	1	15
Arkansas	4	11	.	.	4	11
California	9	38	.	.	9	38
Colorado	7	19	.	.	7	19
Delaware	.	2	.	.	.	2
Florida	2	32	.	.	2	32
Georgia	1	34	.	.	1	34
Idaho	.	13	.	.	.	13
Illinois	20	78	.	1	20	79
Indiana	2	23	.	1	2	24
Iowa	.	22	.	.	.	22
Kansas	4	10	.	.	4	10
Kentucky	2	29	.	.	2	29
Louisiana	1	50	.	.	1	50
Maryland	2	6	.	.	2	6
Massachusetts	.	2	.	.	.	2
Michigan	.	16	.	.	.	16
Minnesota	5	9	.	.	5	9
Mississippi	.	20	.	.	.	20
Missouri	4	23	.	.	4	23
Montana	5	19	.	.	5	19
Nebraska	9	24	.	.	9	24
Nevada	.	7	.	.	.	7
New Jersey	.	7	.	.	.	7
New Mexico	1	3	1	.	2	3
New York	1	12	.	.	1	12
North Carolina	3	20	.	.	3	20
North Dakota	3	3	.	.	3	3
Ohio	7	87	.	.	7	87
Oklahoma	1	12	.	.	1	12
Oregon	8	11	.	.	8	11
Pennsylvania	.	32	.	1	.	33
South Carolina	.	20	.	.	.	20
Tennessee	3	37	.	.	3	37
Texas	18	67	1	1	19	68
Utah	5	7	.	.	5	7
Virginia	.	11	.	.	.	11
Washington	2	19	.	.	2	19
West Virginia	.	15	.	.	.	15
Wisconsin	2	26	.	.	2	26
Wyoming	2	7	.	.	2	7

Table 3-4
Comparison of Employee on Duty RCL and Conventional Switching Related Casualties
By Location of Injured Employee at Time of Injury
On Yard and Industry Tracks
For The Period December 2003 Through December 2004 (Transportation Crafts Only)

	Nonfatal		Fatalities		Total Cases	
	RCL	Conventional	RCL	Conventional	RCL	Conventional
Total	135	921	2	4	137	925
--LOCATION---	28	205	.	2	28	207
Alongside of on-track equipment on ground						
In cab or on walkways of locomotive	19	186	.	.	19	186
Beside track	28	147	.	.	28	147
On side of car	22	105	.	1	22	106
On end of car	9	76	1	.	10	76
Between cars/locomotives	6	39	.	.	6	39
Between tracks	9	35	.	1	9	36
Other location on locomotive	4	40	.	.	4	40
In/operating vehicle	1	15	.	.	1	15
On track	1	13	1	.	2	13
On ladder	3	10	.	.	3	10
Other location	1	10	.	.	1	10
At work station	1	10	.	.	1	10
On platform	1	9	.	.	1	9
On stairs	1	6	.	.	1	6
On highway-rail crossing	1	5	.	.	1	5
In car	.	2	.	.	.	2
Under locomotive	.	2	.	.	.	2
Depot	.	2	.	.	.	2
In elevator	.	1	.	.	.	1
On other rail crossing	.	1	.	.	.	1
Under car	.	1	.	.	.	1
Locomotive, on top of	.	1	.	.	.	1
-- MOTORIZED EQUIPMENT?---	24	192	.	.	24	192
Freight car(s) - standing						
Did not involve on-track/other equipment	25	180	.	.	25	180
Freight train - standing	15	159	.	.	15	159
Locomotive(s) - standing	.	145	.	.	.	145
Freight car(s) - moving	25	93	.	2	25	95
Freight train - moving	4	70	.	2	4	72
Locomotive(s) - moving	.	52	.	.	.	52
Locomotive(s), remote control - moving	24	.	2	.	26	.
Locomotive(s), remote control - standing	16	.	.	.	16	.
Van (passenger)	.	9	.	.	.	9
Taxi/commercial vehicle	1	8	.	.	1	8
Automobile	.	3	.	.	.	3
Van (utility)	.	2	.	.	.	2
Truck	.	2	.	.	.	2
Passenger car(s) - standing	.	1	.	.	.	1
Other on-track equipment - standing	.	1	.	.	.	1
Passenger train - moving	.	1	.	.	.	1
Camp car - moving	.	1	.	.	.	1
Off road vehicle - industrial	1	.	.	.	1	.
Passenger car(s) - moving	.	1	.	.	.	1
Other on-track equipment - moving	.	1	.	.	.	1

Table 3-5
Comparison Of Employee On Duty RCL and Convention Switching Related Injuries
By Physical Act the Injured Employee was Involved in at time of injury
On Yard And Industry Tracks
For The Period December 2003 Through December 2004 (Transportation Crafts Only)

Activity	Accidents				Accident Rate		
	RCL Op.	Conv. Op.	Total	% RCL Op.	RCL Op.	Conv. Op.	Combined
Grand Total	137	925	1,062	12.9	6.40	18.79	15.04
Walking	36	213	249	14.5	1.68	4.33	3.53
Riding	26	98	124	21.0	1.22	1.99	1.76
Getting off	11	63	74	14.9	0.51	1.28	1.05
Lining switches	7	56	63	11.1	0.33	1.14	0.89
Handbrakes, applying	3	45	48	6.3	0.14	0.91	0.68
Sitting	8	39	47	17.0	0.37	0.79	0.67
Standing	7	34	41	17.1	0.33	0.69	0.58
Handbrakes, releasing	3	34	37	8.1	0.14	0.69	0.52
Operating	1	34	35	2.9	0.05	0.69	0.50
Pulling pin lifter/operating uncoupling	11	22	33	33.3	0.51	0.45	0.47
Getting on	0	24	24	0.0	0.00	0.49	0.34
Stepping down	1	23	24	4.2	0.05	0.47	0.34
Jumping from	2	20	22	9.1	0.09	0.41	0.31
Descending	2	18	20	10.0	0.09	0.37	0.28
Coupling air hose	1	18	19	5.3	0.05	0.37	0.27
Climbing over/on	3	12	15	20.0	0.14	0.24	0.21
Adjusting drawbar	2	11	13	15.4	0.09	0.22	0.18
Closing	0	12	12	0.0	0.00	0.24	0.17
Opening	0	12	12	0.0	0.00	0.24	0.17
Lifting other material	0	11	11	0.0	0.00	0.22	0.16
Stepping over	0	11	11	0.0	0.00	0.22	0.16
Opening/closing angle cock	1	8	9	11.1	0.05	0.16	0.13
Pulling	0	9	9	0.0	0.00	0.18	0.13
Stepping up	0	9	9	0.0	0.00	0.18	0.13
Stepped on	1	8	9	11.1	0.05	0.16	0.13
Ascending	0	8	8	0.0	0.00	0.16	0.11
Adjusting coupler	4	3	7	57.1	0.19	0.06	0.10
Bending, stooping	0	7	7	0.0	0.00	0.14	0.10
Getting out	0	7	7	0.0	0.00	0.14	0.10
Crossing over	0	6	6	0.0	0.00	0.12	0.08
Adjusting, other	0	4	4	0.0	0.00	0.08	0.06
Running	0	4	4	0.0	0.00	0.08	0.06
Handling, other	0	3	3	0.0	0.00	0.06	0.04
Inspecting	0	3	3	0.0	0.00	0.06	0.04
Lifting equipment (tools, parts, etc.)	0	3	3	0.0	0.00	0.06	0.04
Uncoupling air hose	0	3	3	0.0	0.00	0.06	0.04
Derail, applying	1	2	3	33.3	0.05	0.04	0.04
Derail, removing	1	2	3	33.3	0.05	0.04	0.04
Other (Narrative must be provided)	0	3	3	0.0	0.00	0.06	0.04
Replacing	0	3	3	0.0	0.00	0.06	0.04
Crossing between	2	0	2	100.0	0.09	0.00	0.03
Driving (motor vehicle, forklift, etc.)	0	2	2	0.0	0.00	0.04	0.03
Handling car parts	1	1	2	50.0	0.05	0.02	0.03
Reaching	0	2	2	0.0	0.00	0.04	0.03
Handbrakes, other	0	2	2	0.0	0.00	0.04	0.03
Applying rail anchor/fastener	0	1	1	0.0	0.00	0.02	0.01
Cleaning	0	1	1	0.0	0.00	0.02	0.01

Table 3-5
Comparison Of Employee On Duty RCL and Convention Switching Related Injuries
By Physical Act the Injured Employee was Involved in at time of injury
On Yard And Industry Tracks
For The Period December 2003 Through December 2004 (Transportation Crafts Only)

Activity	Accidents				Accident Rate		
	RCL Op.	Conv. Op.	Total	% RCL Op.	RCL Op.	Conv. Op.	Combined
Coupling electric cables	0	1	1	0.0	0.00	0.02	0.01
Cutting vegetation	0	1	1	0.0	0.00	0.02	0.01
Fueling	0	1	1	0.0	0.00	0.02	0.01
Handling locomotive parts	0	1	1	0.0	0.00	0.02	0.01
Jumping onto	1	0	1	100.0	0.05	0.00	0.01
Lining, other	0	1	1	0.0	0.00	0.02	0.01
Repairing	0	1	1	0.0	0.00	0.02	0.01
Using hand tool	1	0	1	100.0	0.05	0.00	0.01
Using, other	0	1	1	0.0	0.00	0.02	0.01
Getting in	0	1	1	0.0	0.00	0.02	0.01
Moving	0	1	1	0.0	0.00	0.02	0.01
Servicing	0	1	1	0.0	0.00	0.02	0.01
Sanding	0	1	1	0.0	0.00	0.02	0.01

Table 3-6
Summary of Employee on Duty Injuries to RCL Operators While Riding on Side or End of Cars
And When Operating the RCL
On Yard and Industry Tracks
For The Period December 2003 Through December 2004 (Transportation Crafts Only)

Job Remote control locomotive operator –operating				Inj
Location 1	Location 2	Event	Activity	1
On side of car	Freight car(s) - standing	Overexertion	Climbing over/on	
			Handbrakes, applying	1
	Freight car(s) - moving	Struck by object	Jumping from	1
		Struck against object	Riding	1
		Sudden/unexpected movement of on-track equipment	Riding	1
		Slipped, fell, stumbled, other	Riding	1
		Slack adjustment during switching operation	Riding	2
	Locomotive(s), remote control - standing	Slipped,fell,stumbled,etc. due to object,ballast, spike, etc.	Getting off	1
	Locomotive(s), remote control - moving	Struck by object	Riding	1
		Slipped, fell, stumbled, other	Riding	1
On end of car	Freight car(s) - moving	Struck by on-track equipment	Walking	1
		Caught, crushed, pinched, other	Riding	1
			Total	13

Table 3-7
Summary Of Employee On Duty Injuries to RCL Operators While Riding on Side or End of Cars
And Not Operating the RCL
On Yard And Industry Tracks
For The Period December 2003 Through December 2004 (Transportation Crafts Only)

Job Remote control locomotive operator - not operating				Inj	Kld
Location 1	Location 2	Event	Activity	1	.
On side of car	Freight train - moving	Lost balance	Riding		
		Overexertion	Pulling pin lifter/operating uncoupling	1	.
	Freight car(s) - standing	Defective/malfunctioning equipment	Getting off	1	.
	Freight car(s) - moving	Sudden/unexpected movement of on-track equipment	Getting off	1	.
		Slipped, fell, stumbled, other	Riding	1	.
		Slack adjustment during switching operation	Riding	1	.
	Locomotive(s), remote control - standing	Slipped, fell, stumbled, etc. due to object, ballast, spike, etc.	Crossing between	1	.
	Locomotive(s), remote control - moving	Struck against object	Riding	1	.
		Slipped, fell, stumbled, other	Riding	1	.
			Descending	1	.
On end of car	Freight car(s) - standing	Overexertion	Pulling pin lifter/operating uncoupling	1	.
			Handbrakes, releasing	1	.
		Slipped, fell, stumbled, etc. due to climatic condition	Crossing between	1	.
		Caught, crushed, pinched, other	Handbrakes, releasing	1	.
		Slipped, fell, stumbled, other	Climbing over/on	1	.
	Freight car(s) - moving	Overexertion	Handbrakes, applying	1	.
	Locomotive(s), remote control - standing	Struck by falling object	Adjusting coupler	1	.
	Locomotive(s), remote control - moving	Derailment	Riding	.	1
Total				17	1

Table 3-8
Listing of Casualties to Employees on Duty Associated with Remote Control Operations
On Yard and Industry Tracks
For The Period December 2003 Through December 2004

Nbr	Date	RR	County	State	Condition	General activity	Job Title	Days Absent	Days Restricted	Age
1	12/01/2003	BNSF	SPOKANE	WA	Bruise/contusion, rib/ribcage	Slipped, fell, stumbled, etc. due to climatic condition, Walking	Remote control locomotive operator - not operating	0	0	48
2	12/03/2003	CSX	UNICOI	TN	Sprain/strain, ankle	Slipped,fell,stumbled,etc. due to object,ballast, spike, etc., Walking	Yard conductors and yard foremen	31	0	26
3	12/07/2003	UP	BEXAR	TX	Fatality	Struck by Own Remote Control Locomotive, Walking	Remote control locomotive operator - operating	0	0	37
4	12/15/2003	BNSF	HENNEPIN	MN	Bruise/contusion, lower back	Struck by object, Jumping from	Remote control locomotive operator - operating	180	0	40
5	12/15/2003	CSX	GREENUP	KY	Amputation, lower leg	Lost balance, Riding	Remote control locomotive operator - operating	180	0	29
6	12/20/2003	UP	PULASKI	AR	Amputation, foot (general)	Slipped, fell, stumbled, other, Riding	Remote control locomotive operator - not operating	180	0	42
7	12/21/2003	UP	MULTNOMAH	OR	Bruise/contusion, hips	Slipped,fell,stumbled,etc. due to object,ballast, spike, etc., Getting off	Remote control locomotive operator - not operating	13	0	58
8	12/23/2003	BRC	COOK	IL	Rupture/tear, upper arm	Overexertion, Pulling pin lifter/operating uncoupling	Yard brakemen and yard helpers	121	0	44
9	12/23/2003	UP	DENVER	CO	Bruise/contusion, knee	Slipped,fell,stumbled,etc. due to object,ballast, spike, etc., Walking	Remote control locomotive operator - operating	0	0	39
10	12/28/2003	UP	MULTNOMAH	OR	Sprain/strain, knee	Bodily function/sudden movement, e.g.,sneezing,twisting, Getting off	Remote control locomotive operator - not operating	158	14	46
11	12/29/2003	UP	JACKSON	MO	Sprain/strain, shoulder	Slack adjustment during switching operation, Riding	Remote control locomotive operator - operating	0	10	47
12	12/29/2003	UP	COOK	IL	Sprain/strain, shoulder	Slack adjustment during switching operation, Riding	Remote control locomotive operator - operating	180	0	26
13	12/31/2003	UP	UMATILLA	OR	Sprain/strain, knee	Slipped, fell, stumbled, etc. due to climatic condition, Walking	Remote control locomotive operator - not operating	22	0	54
14	01/01/2004	BNSF	SAN BERNARDINO	CA	Fracture, rib/ribcage	Slack adjustment during switching operation, Riding	Remote control locomotive operator - not operating	0	12	49

Table 3-8
Listing of Casualties to Employees on Duty Associated with Remote Control Operations
On Yard and Industry Tracks
For The Period December 2003 Through December 2004

Nbr	Date	RR	County	State	Condition	General activity	Job Title	Days Absent	Days Restricted	Age
15	01/02/2004	BNSF	LA CROSSE	WI	Fracture, lower arm	Slipped, fell, stumbled, etc. due to climatic condition, Crossing between	Remote control locomotive operator - not operating	27	153	54
16	01/05/2004	MRL	MISSOULA	MT	Sprain/strain, knee	Slipped,fell,stumbled,etc. due to object,ballast, spike, etc., Stepped on	Yard conductors and yard foremen	50	0	45
17	01/08/2004	UP	COOK	IL	Sprain/strain, upper back	Slipped, fell, stumbled, other, Riding	Remote control locomotive operator - operating	180	0	31
18	01/10/2004	CSX	BALTIMORE	MD	Sprain/strain, lower back	Overexertion, Handbrakes, releasing	Remote control locomotive operator - not operating	180	0	31
19	01/14/2004	UP	TARRANT	TX	Sprain/strain, knee	Slipped, fell, stumbled, other, Getting off	Remote control locomotive operator - not operating	25	0	43
20	01/17/2004	BNSF	LA CROSSE	WI	Dental related	Slipped,fell,stumbled,etc. due to object,ballast, spike, etc., Getting off	Remote control locomotive operator - operating	0	0	29
21	01/22/2004	BNSF	BOX BUTTE	NE	Cut/abrasion, head/face	Slipped, fell, stumbled, other, Riding	Remote control locomotive operator - not operating	2	0	50
22	01/23/2004	CSX	RICHMOND	NC	Sprain/strain, lower back	Overexertion, Lining switches	Remote control locomotive operator - not operating	180	0	25
23	01/29/2004	CSX	HILLSBOROUGH	FL	Sprain/strain, genitalia	Overexertion, Lining switches	Remote control locomotive operator - not operating	129	0	55
24	01/30/2004	ALS	ST CLAIR	IL	Sprain/strain, lower back	Slipped, fell, stumbled, etc. due to climatic condition, Walking	Remote control locomotive operator - operating	1	0	34
25	02/04/2004	MRL	MISSOULA	MT	Sprain/strain, shoulder	Slipped, fell, stumbled, etc. due to climatic condition, Walking	Remote control locomotive operator - operating	4	0	54
26	02/04/2004	UP	SALT LAKE	UT	Bruise/contusion, upper arm	Struck by Other Remote Control Locomotive, Standing	Road freight conductors (through freight)	25	0	43
27	02/05/2004	BNSF	GRAND FORKS	ND	Misc. repeated trauma condition	Struck by object, Riding	Remote control locomotive operator - operating	13	76	38
28	02/09/2004	UP	TARRANT	TX	Bruise/contusion, elbow	Slipped, fell, stumbled, etc. due to climatic condition, Pulling pin lifter/operating uncoupling	Remote control locomotive operator - not operating	80	0	50

Table 3-8
Listing of Casualties to Employees on Duty Associated with Remote Control Operations
On Yard and Industry Tracks
For The Period December 2003 Through December 2004

Nbr	Date	RR	County	State	Condition	General activity	Job Title	Days Absent	Days Restricted	Age
29	02/15/2004	CSX	JEFFERSON	AL	Bruise/contusion, hips	Struck by on-track equipment, Standing	Remote control locomotive operator - not operating	25	0	47
30	02/15/2004	UP	WYANDOTTE	KS	Sprain/strain, upper back	Collision - between on track equipment, Sitting	Road freight conductors (through freight)	9	0	45
31	02/15/2004	UP	WYANDOTTE	KS	Sprain/strain, upper back	Collision - between on track equipment, Sitting	Road freight engineers (through freight)	71	0	56
32	02/16/2004	UP	PULASKI	AR	Fracture, toes	Struck by falling object, Adjusting coupler	Remote control locomotive operator - operating	180	0	30
33	02/17/2004	BNSF	SAN JOAQUIN	CA	Cut/abrasion, knee	Slipped, fell, stumbled, other, Walking	Yard conductors and yard foremen	96	0	38
34	02/17/2004	CSX	HAMILTON	OH	Sprain/strain, shoulder	Overexertion, Adjusting coupler	Remote control locomotive operator - not operating	180	0	48
35	02/18/2004	BRC	COOK	IL	Sprain/strain, wrist	Overexertion, Jumping onto	Yard brakemen and yard helpers	0	42	58
36	02/18/2004	UP	BEXAR	TX	Cut/abrasion, thumb/finger	Caught, crushed, pinched, other, Derail, applying	Remote control locomotive operator - not operating	126	0	50
37	02/20/2004	CSX	NASH	NC	Cut/abrasion, eye	Rubbed, abraded, etc., Riding	Remote control locomotive operator - operating	6	0	33
38	02/25/2004	BNSF	SNOHOMISH	WA	Fracture, rib/ribcage	Slipped, fell, stumbled, other, Walking	Remote control locomotive operator - operating	49	0	58
39	02/26/2004	BNSF	KNOX	IL	Amputation, foot (general)	Struck by on-track equipment, Walking	Remote control locomotive operator - operating	180	0	56
40	03/05/2004	BNSF	LUBBOCK	TX	Sprain/strain, lower back	Slipped,fell,stumbled,etc. due to object,ballast, spike, etc., Crossing between	Remote control locomotive operator - not operating	7	46	27
41	03/07/2004	UP	LINCOLN	NE	Fracture, thumb/finger	Defective/malfunctioning equipment, Pulling pin lifter/operating uncoupling	Remote control locomotive operator - operating	0	14	35
42	03/11/2004	CSX	WOOD	OH	Object in eye	Blowing/falling debris, Descending	Remote control locomotive operator - not operating	1	0	25
43	03/11/2004	CSX	WOOD	OH	Bruise/contusion, multiple	Slipped,fell,stumbled,etc. due to object,ballast, spike, etc., Walking	Remote control locomotive operator - not operating	180	0	34

Table 3-8
Listing of Casualties to Employees on Duty Associated with Remote Control Operations
On Yard and Industry Tracks
For The Period December 2003 Through December 2004

Nbr	Date	RR	County	State	Condition	General activity	Job Title	Days Absent	Days Restricted	Age
44	03/13/2004	BNSF	ANOKA	MN	Rupture/tear, knee	Overexertion, Climbing over/on	Remote control locomotive operator - operating	155	0	47
45	03/13/2004	CSX	HAMILTON	OH	Sprain/strain, genitalia	Overexertion, Adjusting drawbar	Remote control locomotive operator - not operating	10	0	39
46	03/19/2004	UP	JACKSON	MO	Sprain/strain, knee	Slipped,fell,stumbled,etc. due to object,ballast, spike, etc., Walking	Remote control locomotive operator - not operating	14	0	37
47	03/22/2004	UP	SALT LAKE	UT	Sprain/strain, upper arm	Slack action, draft, compressive buff/coupling, Riding	Remote control locomotive operator - not operating	177	0	37
48	03/23/2004	UP	LINCOLN	NE	Sprain/strain, knee	Lost balance, Walking	Remote control locomotive operator - not operating	19	19	32
49	03/24/2004	BNSF	LANCASTER	NE	Fracture, thumb/finger	Caught, crushed, pinched, other, Riding	Remote control locomotive operator - operating	0	65	44
50	03/29/2004	UP	WEBB	TX	Sprain/strain, upper leg	Overexertion, Climbing over/on	Remote control locomotive operator - not operating	15	0	41
51	03/30/2004	UP	ALAMEDA	CA	Dislocation, elbow	Overexertion, Handbrakes, applying	Remote control locomotive operator - operating	124	0	60
52	04/02/2004	UP	WEBB	TX	Sprain/strain, neck	Collision/impact - auto, truck, bus, van, etc., Riding	Remote control locomotive operator - not operating	45	0	32
53	04/06/2004	UP	DENVER	CO	Sprain/strain, lower arm	Struck against object, Riding	Remote control locomotive operator - operating	116	35	28
54	04/11/2004	CSX	HAMILTON	OH	Sprain/strain, elbow	Sudden/unexpected movement of on-track equipment, Getting off	Remote control locomotive operator - not operating	57	0	33
55	04/11/2004	UP	DAKOTA	MN	Sprain/strain, upper back	Overexertion, Lining switches	Remote control locomotive operator - operating	63	0	40
56	04/17/2004	CSX	WOOD	OH	Sprain/strain, lower back	Collision - between on track equipment, Jumping from	Remote control locomotive operator - operating	16	7	25
57	04/22/2004	UP	SALT LAKE	UT	Unspecified injury, upper back	Sudden/unexpected movement of on-track equipment, Riding	Remote control locomotive operator - operating	98	0	57

Table 3-8
Listing of Casualties to Employees on Duty Associated with Remote Control Operations
On Yard and Industry Tracks
For The Period December 2003 Through December 2004

Nbr	Date	RR	County	State	Condition	General activity	Job Title	Days Absent	Days Restricted	Age
58	04/29/2004	UP	BEXAR	TX	Sprain/strain, lower back	Lost balance, Riding	Remote control locomotive operator - not operating	56	0	37
59	05/16/2004	CSX	JEFFERSON	KY	Sprain/strain, knee	Slipped,fell,stumbled,etc. due to object,ballast, spike, etc., Walking	Remote control locomotive operator - not operating	83	0	35
60	05/19/2004	BNSF	SAN BERNARDINO	CA	Bruise/contusion, foot (general)	Struck by falling object, Adjusting coupler	Remote control locomotive operator - not operating	9	5	31
61	05/19/2004	UP	UMATILLA	OR	Sprain/strain, neck	Slipped, fell, stumbled, other, Walking	Remote control locomotive operator - not operating	70	0	44
62	05/20/2004	UP	JEFFERSON	AR	Bruise/contusion, upper back	Derailment, Riding	Remote control locomotive operator - not operating	25	0	30
63	05/21/2004	UP	MARICOPA	AZ	Sprain/strain, upper back	Slipped,fell,stumbled,etc. due to object,ballast, spike, etc., Walking	Remote control locomotive operator - operating	180	0	26
64	05/26/2004	UP	WEBB	TX	Sprain/strain, ankle	Slipped,fell,stumbled,etc. due to irregular surface, Pulling pin lifter/operating uncoupling	Remote control locomotive operator - not operating	33	0	26
65	05/28/2004	BNSF	CLAY	MN	Cut/abrasion, skull	Struck against object, Riding	Remote control locomotive operator - not operating	0	0	51
66	06/01/2004	MRL	YELLOWSTONE	MT	Bruise/contusion, ear	Slack action, draft, compressive buff/coupling, Getting off	Yard engineers	15	4	34
67	06/02/2004	BNSF	LANCASTER	NE	Cut/abrasion, thumb/finger	Sudden/unexpected movement of material, Handling car parts	Remote control locomotive operator - operating	11	41	54
68	06/07/2004	BRC	COOK	IL	Sprain/strain, ankle	Slipped,fell,stumbled,etc. due to object,ballast, spike, etc., Walking	Remote control locomotive operator - operating	37	0	37
69	06/11/2004	UP	WYANDOTTE	KS	Sprain/strain, knee	Slipped,fell,stumbled,etc. due to irregular surface, Lining switches	Remote control locomotive operator - not operating	9	0	44
70	06/11/2004	UP	COOK	IL	Bruise/contusion, knee	Slack action, draft, compressive buff/coupling, Sitting	Remote control locomotive operator - operating	143	0	23
71	06/13/2004	BNSF	DENVER	CO	Cut/abrasion, head/face	Struck by Own Remote Control Locomotive, Standing	Remote control locomotive operator - not operating	0	0	57

Table 3-8
Listing of Casualties to Employees on Duty Associated with Remote Control Operations
On Yard and Industry Tracks
For The Period December 2003 Through December 2004

Nbr	Date	RR	County	State	Condition	General activity	Job Title	Days Absent	Days Restricted	Age
72	06/14/2004	UP	YOLO	CA	One-time exposure to noise	Exposure to noise - single incident, Opening/closing angle cock	Remote control locomotive operator - operating	180	0	59
73	06/16/2004	CSX	ALLEGANY	MD	Sprain/strain, ankle	Slipped,fell,stumbled,etc. due to object,ballast, spike, etc., Walking	Remote control locomotive operator - operating	20	0	56
74	06/21/2004	UP	ALAMEDA	CA	Sprain/strain, lower back	Struck by Other Remote Control Locomotive, Sitting	Road freight conductors (through freight)	6	0	25
75	06/21/2004	UP	ALAMEDA	CA	Sprain/strain, lower back	Struck by Other Remote Control Locomotive, Sitting	Road freight engineers (through freight)	180	0	49
76	06/22/2004	BRC	COOK	IL	Sprain/strain, lower back	Overexertion, Lining switches	Remote control locomotive operator - not operating	39	0	49
77	06/23/2004	BRC	COOK	IL	Bruise/contusion, mouth/teeth	Sudden/Unexpected Movement of tools, Using hand tool	Remote control locomotive operator - not operating	6	0	28
78	06/23/2004	UP	ALAMEDA	CA	Sprain/strain, wrist	Overexertion, Lining switches	Remote control locomotive operator - operating	180	0	50
79	06/25/2004	UP	LARAMIE	WY	Puncture wound, foot (general)	Stepped on object, Walking	Remote control locomotive operator - not operating	0	0	54
80	06/29/2004	UP	LARAMIE	WY	Sprain/strain, knee	Slipped, fell, stumbled, etc. due to climatic condition, Walking	Remote control locomotive operator - operating	150	0	51
81	07/01/2004	UP	DENVER	CO	Sprain/strain, ankle	Slipped,fell,stumbled,etc. due to object,ballast, spike, etc., Walking	Remote control locomotive operator - not operating	1	0	29
82	07/04/2004	UP	DU PAGE	IL	Fracture, upper arm	Caught Between Equipment, Standing	Remote control locomotive operator - operating	180	0	31
83	07/08/2004	BRC	COOK	IL	Bruise/contusion, abdomen	Slipped,fell,stumbled,etc. due to irregular surface, Walking	Remote control locomotive operator - operating	24	0	29
84	07/08/2004	UP	BEXAR	TX	Sprain/strain, upper back	Slipped,fell,stumbled,etc. due to object,ballast, spike, etc., Walking	Remote control locomotive operator - not operating	95	0	52
85	07/12/2004	ALS	ST CLAIR	IL	Object in eye	Blowing/falling debris, Riding	Remote control locomotive operator - operating	9	0	27

Table 3-8
Listing of Casualties to Employees on Duty Associated with Remote Control Operations
On Yard and Industry Tracks
For The Period December 2003 Through December 2004

Nbr	Date	RR	County	State	Condition	General activity	Job Title	Days Absent	Days Restricted	Age
86	07/12/2004	UP	BEXAR	TX	Sprain/strain, upper back	Derailment, Riding	Remote control locomotive operator - operating	109	0	57
87	07/13/2004	BNSF	VALENCIA	NM	Bruise/contusion, lower back	Other impacts - on track equipment, Sitting	Remote control locomotive operator - not operating	0	8	38
88	07/15/2004	UP	COOK	IL	Sprain/strain, upper back	Overexertion, Handbrakes, applying	Remote control locomotive operator - operating	47	0	33
89	07/19/2004	BNSF	KANDIYOHI	MN	Sprain/strain, lower back	Overexertion, Handbrakes, releasing	Remote control locomotive operator - not operating	0	0	36
90	07/22/2004	UP	DENVER	CO	Animal/snake/insect bite, lower a	Bitten/stung by bee, spider, other insect, Standing	Remote control locomotive operator - not operating	0	0	32
91	07/25/2004	BNSF	SHELBY	TN	Animal/snake/insect bite, finger	Bitten/stung by bee, spider, other insect, Sitting	Remote control locomotive operator - not operating	8	0	43
92	07/27/2004	FEC	ST LUCIE	FL	Fracture, ankle area	Slipped, fell, stumbled, other, Riding	Remote control locomotive operator - not operating	167	0	23
93	07/28/2004	ALS	ST CLAIR	IL	Sprain/strain, lower back	Collision - between on track equipment, Operating	Remote control locomotive operator - operating	34	0	48
94	07/28/2004	UP	MULTNOMAH	OR	Bruise/contusion, upper leg	Struck by object, Derail, removing	Remote control locomotive operator - not operating	12	0	32
95	08/01/2004	CSX	DAVIDSON	TN	Sprain/strain, ankle	Slipped,fell,stumbled,etc. due to object,ballast, spike, etc., Walking	Remote control locomotive operator - not operating	8	0	28
96	08/05/2004	UP	HARRIS	TX	Unspecified injury, upper arm	Bitten/stung by bee, spider, other insect, Walking	Remote control locomotive operator - operating	0	0	33
97	08/08/2004	CSX	NASH	NC	Fracture, rib/ribcage	Slipped, fell, stumbled, other, Getting off	Remote control locomotive operator - not operating	180	0	30
98	08/15/2004	UP	UMATILLA	OR	Unspecified injury, upper arm	Bitten/stung by bee, spider, other insect, Walking	Remote control locomotive operator - operating	0	0	51
99	08/20/2004	BNSF	WYANDOTTE	KS	Dental related	Missed handhold, grabiron, step, etc., Getting off	Remote control locomotive operator - not operating	0	0	56

Table 3-8
Listing of Casualties to Employees on Duty Associated with Remote Control Operations
On Yard and Industry Tracks
For The Period December 2003 Through December 2004

Nbr	Date	RR	County	State	Condition	General activity	Job Title	Days Absent	Days Restricted	Age
100	08/25/2004	FGLK	ONONDAGA	NY	Dislocation, multiple	Slipped,fell,stumbled,etc. due to object,ballast, spike, etc., Getting off	Remote control locomotive operator - operating	4	28	37
101	08/25/2004	UP	BEXAR	TX	Sprain/strain, lower back	Slipped,fell,stumbled,etc. due to object,ballast, spike, etc., Walking	Remote control locomotive operator - not operating	76	0	54
102	08/28/2004	UP	DALLAS	TX	Sprain/strain, knee	Slipped, fell, stumbled, other, Stepping down	Remote control locomotive operator - not operating	172	5	34
103	08/30/2004	UP	LINCOLN	NE	Sprain/strain, upper leg	Overexertion, Pulling pin lifter/operating uncoupling	Remote control locomotive operator - not operating	44	0	38
104	09/02/2004	BNSF	CURRY	NM	Fatality	Derailment, Riding	Remote control locomotive operator - not operating	0	0	26
105	09/06/2004	UP	BEXAR	TX	Sprain/strain, shoulder	Slipped,fell,stumbled,etc. due to object,ballast, spike, etc., Walking	Remote control locomotive operator - not operating	54	0	38
106	09/09/2004	UP	HARRIS	TX	Bruise/contusion, chest	Slipped,fell,stumbled,etc. due to irregular surface, Walking	Remote control locomotive operator - not operating	64	0	50
107	09/10/2004	BNSF	EL PASO	TX	Sprain/strain, knee	Slipped, fell, stumbled, other, Walking	Remote control locomotive operator - operating	150	30	55
108	09/15/2004	UP	JACKSON	MO	Sprain/strain, ankle	Slipped,fell,stumbled,etc. due to object,ballast, spike, etc., Walking	Remote control locomotive operator - not operating	166	0	54
109	09/19/2004	UP	COOK	IL	Fracture, thumb/finger	Caught, crushed, pinched, other, Handbrakes, releasing	Remote control locomotive operator - not operating	32	95	30
110	09/22/2004	ALS	ST CLAIR	IL	Sprain/strain, lower back	Defective/malfunctioning equipment, Getting off	Remote control locomotive operator - not operating	39	0	57
111	09/22/2004	UP	MULTNOMAH	OR	Bruise/contusion, shoulder	Slack adjustment during switching operation, Riding	Remote control locomotive operator - not operating	0	0	53
112	09/24/2004	NS	HENRY	GA	Sprain/strain, lower leg	Lost balance, Riding	Road freight conductors (through freight)	158	0	42
113	09/28/2004	CSX	VANDERBURGH	IN	Sprain/strain, knee	Slipped, fell, stumbled, other, Walking	Road freight engineers (local and way freight)	59	0	34

Table 3-8
Listing of Casualties to Employees on Duty Associated with Remote Control Operations
On Yard and Industry Tracks
For The Period December 2003 Through December 2004

Nbr	Date	RR	County	State	Condition	General activity	Job Title	Days Absent	Days Restricted	Age
114	10/01/2004	BNSF	DENVER	CO	Cut/abrasion, eye area	Slipped,fell,stumbled,etc. due to object,ballast, spike, etc., Pulling pin lifter/operating uncoupling	Remote control locomotive operator - operating	0	0	52
115	10/06/2004	UP	DALLAS	TX	Fracture, upper leg	Slipped,fell,stumbled,etc. due to irregular surface, Walking	Remote control locomotive operator - operating	139	0	35
116	10/11/2004	UP	WEBER	UT	Sprain/strain, ankle	Stepped on object, Getting off	Remote control locomotive operator - operating	30	0	39
117	10/15/2004	INRD	MARION	IN	Sprain/strain, chest	Overexertion, Lining switches	Remote control locomotive operator - not operating	0	10	56
118	10/23/2004	UP	LINCOLN	NE	Sprain/strain, shoulder	Struck by on-track equipment, Standing	Remote control locomotive operator - not operating	128	0	39
119	10/24/2004	UP	UMATILLA	OR	Cut/abrasion, upper leg	Collision - between on track equipment, Riding	Remote control locomotive operator - operating	34	0	32
120	10/26/2004	UP	HARRIS	TX	Fracture, thumb/finger	Caught, crushed, pinched, other, Pulling pin lifter/operating uncoupling	Remote control locomotive operator - operating	0	5	35
121	10/28/2004	CSX	HAMILTON	OH	Bruise/contusion, neck	Struck against object, Walking	Remote control locomotive operator - not operating	0	0	27
122	10/30/2004	MRL	YELLOWSTONE	MT	Sprain/strain, lower back	Overexertion, Handbrakes, applying	Remote control locomotive operator - not operating	4	0	45
123	11/01/2004	UP	JACKSON	MO	Sprain/strain, shoulder	Overexertion, Pulling pin lifter/operating uncoupling	Remote control locomotive operator - operating	8	0	24
124	11/05/2004	UP	JEFFERSON	AR	Cut/abrasion, foot (general)	Caught Between Equipment, Adjusting coupler	Remote control locomotive operator - operating	10	0	56
125	11/06/2004	BNSF	KERN	CA	Sprain/strain, neck	Slipped, fell, stumbled, other, Descending	Remote control locomotive operator - not operating	19	0	28
126	11/13/2004	UP	LINCOLN	NE	Sprain/strain, shoulder	Overexertion, Pulling pin lifter/operating uncoupling	Remote control locomotive operator - not operating	13	0	27
127	11/15/2004	MRL	MISSOULA	MT	Bruise/contusion, knee	Ran into object/equipment, Walking	Remote control locomotive operator - operating	1	0	31

Table 3-8
Listing of Casualties to Employees on Duty Associated with Remote Control Operations
On Yard and Industry Tracks
For The Period December 2003 Through December 2004

Nbr	Date	RR	County	State	Condition	General activity	Job Title	Days Absent	Days Restricted	Age
128	11/22/2004	CSX	VERMILION	IL	Sprain/strain, lower back	Overexertion, Coupling air hose	Remote control locomotive operator - not operating	45	0	33
129	11/24/2004	BNSF	TULSA	OK	Sprain/strain, lower leg	Struck by thrown or propelled object, Standing	Remote control locomotive operator - not operating	0	70	41
130	11/24/2004	BNSF	MORTON	ND	Sprain/strain, lower back	Sudden/unexpected movement of on-track equipment, Riding	Remote control locomotive operator - operating	1	122	25
131	11/28/2004	UP	WEBER	UT	Cut/abrasion, head/face	Slipped, fell, stumbled, other, Riding	Remote control locomotive operator - operating	16	0	46
132	11/30/2004	UP	DENVER	CO	Sprain/strain, knee	Slipped, fell, stumbled, etc. due to climatic condition, Walking	Remote control locomotive operator - not operating	58	32	58
133	12/09/2004	UP	COOK	IL	Dislocation, shoulder	Slipped, fell, stumbled, other, Climbing over/on	Remote control locomotive operator - not operating	0	30	24
134	12/10/2004	BRC	COOK	IL	Sprain/strain, neck	Slack action, draft, compressive buff/coupling, Sitting	Remote control locomotive operator - not operating	0	0	40
135	12/14/2004	UP	POINTE COUPEE	LA	Sprain/strain, upper back	Overexertion, Adjusting drawbar	Remote control locomotive operator - not operating	0	0	33
136	12/25/2004	BNSF	GRAND FORKS	ND	Cut/abrasion, knee	Slipped, fell, stumbled, other, Pulling pin lifter/operating uncoupling	Remote control locomotive operator - operating	0	36	54
137	12/27/2004	UP	LINCOLN	NE	Fracture, thumb/finger	Caught in/compressed by other machinery, Pulling pin lifter/operating uncoupling	Remote control locomotive operator - not operating	63	0	43

Table 4-1
Comparison RCL and Convention Switching Related Highway-Rail Grade Crossing Accidents
Number of Accidents, Yard Switching Miles Operated, and Accident Rates
On Yard And Industry Tracks
For The Period December 2003 Through December 2004

Railroads	Accidents				Yard Switching Miles			Accident Rates	
	RCL Op.	Conv. Op.	Total	% RCL Op.	RCL Op.	Conv. Op.	Total	RCL Op.	Conv. Op.
Grand Total	16	284	300	5.3	21,392,572	49,218,974	70,611,546	0.75	5.77
Alton & Southern Rwy [ALS]	-	-	-	-	661,117	431,315	1,092,432	-	-
Arkansas & Missouri RR Co. [AM]	-	-	-	-	728	27,049	27,777	-	-
BNSF Rwy Co. [BNSF]	6	51	57	10.5	5,026,175	9,708,587	14,734,762	1.19	5.25
Belt Rwy Co. Of Chicago [BRC]	-	1	-	-	473,995	40,478	514,473	-	24.70
Brandywine Valley RR Co. [BVRY]	-	-	-	-	845	51,025	51,870	-	-
California Northern RR Co. [CFNR]	-	-	-	-	4,457	7,687	12,144	-	-
Consolidated Grain & Barge Co. [CGBX]	-	1	-	-	27,839	0	27,839	-	-
Central Midland Rwy Co. [CMR]	-	-	-	-	460	27,454	27,914	-	-
Consolidated Rail Corp. [CRSH]	-	16	-	-	93,796	1,875,632	1,969,428	-	8.53
CSX Transportation [CSX]	1	33	34	2.9	4,851,944	8,127,775	12,979,719	0.21	4.06
Elgin, Joliet & Eastern Rwy Co. [EJE]	-	6	-	-	44,936	233,372	278,308	-	25.71
Florida East Coast Rwy Co. [FEC]	-	-	-	-	10,321	421,838	432,159	-	-
Finger Lakes Rwy Corp. [FGLK]	-	-	-	-	12,177	3,729	15,906	-	-
Illinois Central RR Co. [IC]	-	5	-	-	66,541	2,559,672	2,626,213	-	1.95
Indiana Rail Road Co. [INRD]	-	-	-	-	26,914	21,697	48,611	-	-
Indiana Southern RR Co., Inc. [ISRR]	-	-	-	-	1,208	17,112	18,320	-	-
Jefferson Warrior RR [JEFW]	-	-	-	-	9,230	394	9,624	-	-
Kansas City Southern Rwy Co. [KCS]	-	18	-	-	339,451	934,253	1,273,704	-	19.27
Louisiana & Delta RR [LDRR]	-	-	-	-	122	20,477	20,599	-	-
Lake Term.RR Co.[LT]	-	-	-	-	2,022	7	2,029	-	-
Minnesota, Dakota & Western Rwy Co. [MDW]	-	-	-	-	14,951	18,827	33,778	-	-
Mckeesport Connecting RR Co. [MKC]	-	-	-	-	16,287	582	16,869	-	-
Montreal, Maine and Atlantic Rwy, Ltd. [MMA]	-	-	-	-	5,350	100,797	106,147	-	-
Montana Rail Link [MRL]	-	4	-	-	280,059	218,782	498,841	-	18.28
Nebraska Central RR [NCRC]	-	-	-	-	2,312	20,597	22,909	-	-
Norfolk Southern Corp. [NS]	-	71	-	-	866,592	13,070,316	13,936,908	-	5.43
Portland & Western RR, Inc. [PNWR]	-	-	-	-	10,714	77,402	88,116	-	-
Puget Sound & Pacific RR Co. [PSAP]	-	-	-	-	838	3,301	4,139	-	-
Pennsylvania Southwestern RR, Inc. [PSWR]	-	-	-	-	67,323	5,190	72,513	-	-
San Luis & Rio Grande RR [SLRG]	-	-	-	-	1,499	5,499	6,998	-	-
Terminal RR Association Of St. Louis [TRRA]	-	1	-	-	12,760	662,863	675,623	-	1.51
Union Pacific RR Co. [UP]	9	62	71	12.7	8,335,826	8,580,862	16,916,688	1.08	7.23
Union RR Co. [URR]	-	-	-	-	8,712	126,804	135,516	-	-
Vermont Rwy, Inc. [VTR]	-	1	-	-	291	25,664	25,955	-	38.97
Wisconsin Central Ltd. [WC]	-	13	-	-	71,148	1,459,612	1,530,760	-	8.91
Wheeling & Lake Erie Rwy Co. [WE]	-	-	-	-	15,398	261,020	276,418	-	-
Willamette & Pacific RR, Inc. [WPRR]	-	1	-	-	25,040	62,835	87,875	-	15.91
Western RR Co. [WRRC]	-	-	-	-	3,194	8,468	11,662	-	-

Rates are accidents per million yard switching miles for the two types of operations

Table 4-2
Listing of Highway-Rail Grade Crossing Accidents Related to RCL Use
On Yard And Industry Tracks
For The Period December 2003 Through December 2004

Nbr	Date	Railroad	State	City	Xing Id	RR equipment	Type Equipment	Type Track	Kld	Inj
1	12//10/2003	UP	CA	WEST SACRAMENTO	687533J	Train pulling-RCL	Light Loco(s)	Industry	0	0
2	01//09/2004	UP	IL	CHICAGO HTS	862640E	Train standing-RCL	Yard/Switch	Industry	0	0
3	01//16/2004	BNSF	NE		RRYARD	Train pulling-RCL	Yard/Switch	Yard	0	0
4	02//08/2004	UP	WA	SEATTLE	809515C	Train pulling-RCL	Yard/Switch	Yard	0	0
5	03//10/2004	CSX	MI	DETROIT	234248J	Train pulling-RCL	Freight Train	Industry	0	0
6	03//19/2004	UP	KS	KANSAS CITY	429475G	Train pushing-RCL	Yard/Switch	Industry	0	0
7	05//19/2004	UP	TX	GRAND PRAIRIE	906677V	Train pushing-RCL	Freight Train	Industry	0	0
8	06//01/2004	BNSF	NM		RRYARD	Train pulling-RCL	Yard/Switch	Yard	0	0
9	08//02/2004	UP	CA	MILPITAS	833901Y	Train pushing-RCL	Yard/Switch	Industry	0	0
10	08//21/2004	UP	NE	NORTH PLATTE	RRYARD	Train pushing-RCL	Yard/Switch	Yard	0	0
11	10//09/2004	BNSF	TN		663417C	Train pulling-RCL	Yard/Switch	Yard	0	1
12	11//21/2004	BNSF	MN	MINNEAPOLIS	061227K	Train pushing-RCL	Yard/Switch	Industry	0	0
13	11//28/2004	BNSF	WA	SEATTLE	101136S	Train pushing-RCL	Yard/Switch	Yard	0	0
14	11//30/2004	BNSF	WA	SEATTLE	096448L	Train pulling-RCL	Yard/Switch	Yard	0	0
15	12//21/2004	UP	CA	BENICIA	751516S	Train pushing-RCL	Yard/Switch	Yard	0	0
16	12//22/2004	UP	AR	PINE BLUFF	748338E	Train pushing-RCL	Yard/Switch	Industry	0	0

Special Studies: Foster-Miller Inc.

To understand the safety implications of RCL operations, the FRA contracted with Foster-Miller Inc., to undertake a multi-study program of research into RCL operations in early 2002, just as RCL operations began on a large scale in the U.S. The FRA sponsored three separate efforts:

4) A comparative risk assessment of RCL and conventional yard switching operations.
5) Focus groups with RCOs to identify safety issues and best practices.
6) A root cause analysis of RCL-involved train accidents/incidents.

The following are summaries of those research studies. FRA recommends that the rail industry closely review the findings and recommendations in these reports, where applicable.

1. Probabilistic Risk Assessment

The objectives of this research study were to: select one or more operationally relevant and suitable human reliability assessment techniques, apply these techniques to both RCL operations and conventional yard switching operations, and evaluate the relative safety of RCL operations compared with conventional operations. These objectives were designed to provide FRA with a better understanding of RCL operations generally, and assess the relative safety of RCL operations compared with conventional yard switching operations, which RCL operations are supplanting.

Key Findings: This study found a difference between RCL and conventional methods of yard switching operations, with RCL operations being somewhat less reliable, i.e., more risky. Due to a variety of methodological shortcomings, however, results should be considered preliminary.

2. Focus-Group Sessions

Focus groups with RCOs provided a forum to gather information about operator experiences with RCL operations, to identify safety issues, lessons learned, and best practices from those who are most familiar with RCL operations and equipment. Focus groups also provided a means to solicit suggestions on how to improve RCL operations.

The focus groups provide a snapshot taken in the very early stages of RCL implementation in the U.S. railroad industry. As such, some of the issues that have been identified will have already been addressed by the time this report is published. Furthermore, the RCOs who participated in the focus groups were not statistically sampled to be representative of all RCOs in the U.S. or Canada. Thus, while these RCOs provide significant insights into RCL operational issues, the results may not be representative of all RCL operations or all RCO experiences.

The specific objectives of this research project were to:

- Gather information on operator experiences with RCL operations.
- Discern existing RCL operations-related safety issues.
- Identify RCL operations "lessons learned" and "best practices."
- Solicit suggestions for how to improve RCL operations.

To obtain a broad picture of RCL operations, it was important to look at a wide array of RCL operational experiences. Several criteria were established to help tap into a range of RCO experiences across the U.S. and Canada. These criteria included:

- Identify focus group locations (cities) where RCL operations had been implemented by at least two railroads.
- Identify at least one focus group city east of the Mississippi River and one west of the Mississippi River.
- Conduct focus groups with both switchmen and engineers. "Switchmen" generically refers to all train service employees. Depending on the railroad, these employees include switchmen, groundmen, trainmen, conductors, brakemen, yard foremen, or helpers.
- Conduct at least one set of focus groups in Canada, where RCL operations have been used in some locations for over a decade.

These criteria were used to establish the focus groups and enabled researchers to examine a diverse cross-section of RCO experiences in the U.S. and Canada.

Focus groups provide a qualitative approach to studying RCL operations. The advantages of focus groups are found in the richness or quality of information gathered, and the broad range and depth of information and insights, sometimes unanticipated, that can be obtained from participants. Focus groups tap participants' experiences, opinions, and attitudes toward a topic, and are well suited to examine RCO experiences and identify industry best practices.

Seventy-eight RCOs participated in 12 focus groups. Participating RCOs came from seven different railroads–six Class I railroads and one regional railroad. Of the 78 RCOs, four were women. The average age of participating RCOs was 40 (range 23-58).

Focus group questions concentrated around five major issues:

1. Implementation of RCL operations.
2. RCO training.
3. Current RCL operations and safety.
4. Switchman/engineer experience.
5. Other-than-yard RCL operations.

For each topic, RCO concerns, lessons learned, "best practices," and suggested improvements were identified. No attempt was made to validate any statements made by RCOs, however. Furthermore, the views, concerns, lessons learned, "best practices," and suggested improvements to RCL operations documented in this report are based on the opinions and perceptions of the RCOs who participated in the focus groups, and should not be attributed to FRA or others who aided in the conduct of this research. Some of the key themes that emerged from the focus groups include:

RCO training

The RCOs identified a number of perceived shortcomings in how they are trained, and they reported a variety of methods of RCO training. Many felt that two weeks of training was inadequate to fully prepare them, given the added responsibilities and qualitative change to the nature of the job from a switchman or engineer to an RCO. Focus group results suggest that railroads spend too much time in the classroom teaching the mechanics of how to operate the beltpacks and not enough time for on-the-job (OJT) instruction on how to switch cars safely and efficiently in RCL operations. Training for some RCOs did not cover all types of operations (e.g., the use of the automatic train air brake system) or expose trainees to all locations within a yard or terminal in which the RCO was expected to operate. According to RCOs, the need to share equipment or inadequate access to operating the RCD during OJT resulted in some receiving less than 40 hours of OJT. Separately, a number of RCOs reported receiving unknown or unrecognized beltpack error messages. Training on how to conduct daily locomotive inspections was also identified as inadequate.

The importance of prior railroad experience in learning to become an RCO
According to RCOs, experience as either a switchman or engineer helps individuals perform RCL operations. Engineers primarily noted that their engineer training and experience has helped them in train handling (e.g., how combinations of tonnage, track grade, train speed, and air pressure in the brake pipe, affect train performance); however, their engineer experience did not help them with the mechanics of operating the beltpack. Switchmen generally felt that their experience on the ground helped them to understand switching and track configurations, which enabled these RCOs to move about the yard and switch safely while learning how to operate the beltpacks and control the RCL. Both engineers and switchmen felt that without experience as either a switchman or engineer, learning how to operate an RCL would be very difficult.

Other operating employees and managers should have a greater understanding of RCL operations
The RCOs felt that other operating employees and management personnel have only a limited understanding of RCL operations. RCOs felt that those who make RCL-related policy decisions (e.g., procedures, rules, equipment acquisition) have insufficient knowledge to fully support RCL operations and RCO crews. This has resulted in few rules, little guidance on what to do in unusual circumstances, changing and sometimes problematic practices and procedures, cuts of cars that are as long as the RCZ (rather than smaller to allow movement within the RCZ), poor communications between RCOs not familiar with RCL operations and procedures. This is a concern since anyone who works around RCL operations must be familiar with relevant rules and operating procedures, especially since point protection may not be provided in some RCL operations. RCZs in particular can be a very hazardous location if other employees do not know what the operating procedures and rules are for entering the zone. For example, often when a zone is established, another employee must contact the responsible RCO to obtain permission to enter the zone. However, it is possible for someone to enter the zone without notifying the RCO. As one RCO explained, a yardmaster once tried to "deactivate" an RCO's zone, creating the potential for two separate individuals to operate in the same zone without knowledge of the other.

The reliance of non-crewmembers to carry out some RCO crew functions

The RCOs noted occasions where a non-crewmember, generally a yardmaster, provides point protection, lines switches, or checks the status of a derail for an RCO crew. Several potential problems may result. First, the potential for miscommunication or misunderstanding exists between the two parties regarding an activity or status of equipment. Further, a yardmaster may be occupied with his or her other responsibilities, and may not give the task the attention it requires, or may be distracted and give an incorrect answer to a question by an RCO (e.g., "is the move lined?"). The result may be that the task does not get completed or there is an error in task execution. Further, the RCO crew may have no way of determining that there is a problem until it is too late.

Reliability of RCL equipment
The RCOs reported several types of reliability problems associated with the RCL equipment, including communication failures between the beltpack and on-board control computer; frequent error messages; delays in RCL responses; updates to some, but not all, RCL equipment; and RCL overspeed (the RCL operates at a speed greater than that selected by the RCO). This lack of reliability was a major source of frustration for RCOs, and has the potential to create a hazardous situation when there is a need for the RCL to respond and stop immediately. Furthermore, a lack of reliability can instill mistrust in the equipment.

Limited control over the RCL
The RCOs described the RCL's train control as "herky-jerky," whereby the locomotive constantly cycles or "hunts" between accelerating and braking. This creates a very rough and non-fluid motion. This poor train control, combined with delays in RCL response, makes train handling difficult for RCOs, especially when small travel distances are required.

One of the RCD safety features can be bypassed inadvertently
Some RCOs described a situation where it is possible to initiate a move by inadvertently (or intentionally) moving the speed selector from the Stop position to any speed selection while the RCL is moving. In this situation, there is no requirement for two deliberate inputs to initiate an RCL movement, as there is when the cut of cars is to be moved from a stopped position. In other words, this safety feature is bypassed in this condition. Further, the RCLs bell does not ring in this situation, whereas it does ring when a move is initiated from a stop. Thus, an RCO may not be aware of the change in speed selector status, creating a potentially hazardous situation.

The frequent inadvertent activation of the beltpack controls
Inadvertent activation of control switches was noted to be a frequent problem for RCOs. Causes of inadvertent activation include the location of switches, bumping into rail equipment from mounting or dismounting equipment, and the use of thick gloves in wintertime. Often an RCO may not be aware of the activation and change in RCL actuation. At a minimum, this can be a nuisance; at worst, it can create a potentially hazardous situation if the RCL accelerates without the RCO's knowledge or goes into an emergency brake application while the RCO is riding the RCL (there may not be any advance warning to the RCO that the RCL is going to brake).

RCO situational awareness
RCO focus groups identified three specific types of situation awareness that can be lost when the RCO is not in the immediate vicinity of the RCL. First, RCOs may lose awareness of the

locomotive's orientation (i.e., which direction the locomotive is moving) on the track. Second, RCOs may not be aware of RCL movement or its response to a beltpack command. Third, an RCO may not be aware that his or her movement may have broken in two or that cars may be dragging.

FRA oversight
A number of RCOs feel that FRA is not concerned about RCL operations, given the technical problems RCOs have experienced, the lack of FRA involvement at the local level, and the lack of Federal regulations. Further, several RCOs felt that the FRA does not know much about RCL operations. This perceived lack of understanding and lack of involvement has led some RCOs to conclude the FRA is not in a position to approve the railroads' RCL operations programs.

Other-than-yard operations
A few RCOs were comfortable with the prospect of taking the RCL out onto the main track. However, a majority of RCOs was not comfortable, citing among their main reasons that they felt the equipment is currently too unreliable, and they lack the required knowledge and skills to operate on the main track. Equipment reliability problems (e.g., delays in RCL braking response) can be amplified on the main track where heavy trains are traveling at high speeds, and it may be necessary at any time to stop short of an absolute signal, highway-rail grade crossing, or other unanticipated hazard.

RCO-recommended practices:
a) Improve RCO training
RCOs had numerous suggestions for ways to improve RCO training. These suggestions centered around three main areas of training: the trainers, training procedures, and training content. Concerning the trainers, RCOs suggested that railroads should employ instructors who have as much experience and knowledge of RCL operations as possible, since these individuals will be able to impart information beyond the mechanics of operating the beltpack. Further, railroads should provide formal "train-the-trainer" courses, so that training is as effective as possible. As far as training procedures, some suggested improvements include increasing the amount of OJT, which should cover the entire range of locations, operations, and configurations of cuts of cars that RCOs will encounter on the job. The RCOs should also have a minimum amount of operating experience as a switchman or engineer before becoming an RCO. Other employees who can be expected to interact or work with RCOs should also receive some awareness training of RCL operations to increase their understanding of how to work with and around RCOs. Regarding training content, major suggestions include incorporating train-handling methods, familiarity with and knowledge of basic locomotive systems, and safe operating practices that inform RCOs what they can and cannot do. Currently, much of the content of RCO training programs focuses on the mechanics of operating the beltpacks rather than on handling cuts of cars using RCL equipment.

b) Improve RCL equipment
A number of suggestions were made regarding how to improve RCL equipment, including the beltpack and computer system. Several of the most frequently cited suggested improvements include prevention of inadvertent activation of RCD controls, more reliable and responsive equipment (e.g., the RCL's brakes should respond sooner to operator input), and additional

control over, and feedback from, the RCL (e.g., some type of indication regarding whether or not the RCL is moving, and if so, in what direction).

c) Improve RCL procedures
Several suggestions were made to improve RCL operating procedures. One of the more significant suggestions requires RCOs to protect the point at all times, especially given the variety of operating practices found in any one yard and the confusion that appears to exist among different employees that work around RCL operations. A few other common procedural improvements that were recommended include familiarity training for those who work around RCL operations, and more frequent maintenance of RCL equipment.

d) Standardize operating practices
Given RCO suggestions for standardized practices, and the apparent confusion among some railroad operating employees regarding what an employee can or cannot do near an RCO crew, there appears to be a need for more standardization of practices and more education to ensure railroad employees are familiar with safe operating practices. A few RCOs suggested that RCL operations should be regulated by the FRA to enforce standardization of RCL-related terms, rules, and procedures among and within railroads.

e) Improve railroad facilities in support of RCL operations
Suggested improvements include providing additional information to an RCO about a cut of car's proximity to a derail; increased maintenance of switches and switch leads; smaller ballast to walk on; and additional yard lighting.

f) Make adjustments for other-than-yard operations
The RCOs identified three core areas where RCL operations should be improved before any railroad considers taking RCL operations out beyond a railroad yard. The three areas of improvement are: 1) more extensive training; 2) more reliable RCL equipment; and 3) more information on, and control over, the RCL and consist. Specific areas that the training must address include train handling, air brakes, locomotive systems and troubleshooting, communications protocols, and territory familiarization. Concerning reliable equipment, RCOs explained that the RCL's brakes should respond reliably and quickly, i.e., as responsively as a conventionally operated locomotive. The biggest concern voiced was that the RCL, as it currently performs, may not stop when and where it is necessary to stop, such as in the case of an absolute signal, or a vehicle stuck at a highway-rail grade crossing. Last, RCOs wanted more information about the train (e.g., air pressure status, brake release status, and locomotive electrical amperage reading), as well as more control over the RCL (e.g., access to dynamic brakes). Essentially, RCOs wanted as much control over, and knowledge of, the RCL and the cars they will handle, as engineers do when operating a locomotive conventionally.

3. Root Cause Analysis (RCA)
The following are the highlights of the results of the Root Cause Analysis of six RCL-involved accidents/incidents that occurred between May 1-October 31, 2004.
The specific objectives of this research project were to:

- Understand the circumstances that contribute to RCL-involved accidents/incidents (collisions, derailments, and employee injuries) in railroad yards.
- Identify individual, organizational, technological, and situational factors that contribute to RCL operations safety.
- Determine the applicability and validity of a selected human-error taxonomy or schematic to railroad operations.

This research was supported by all of the key stakeholders: the FRA, railroad management, and rail labor organizations. To obtain stakeholder buy-in, a meeting was held at FRA headquarters in Washington, D.C., in December 2003. Participation included representatives from the railroad industry, rail labor, FRA, and National Transportation Safety Board (NTSB). During the meeting, the research objectives, study design, and data collection methods were presented and discussed, and stakeholder issues were addressed. All seven Class I freight railroads (Canadian National Railroad's and Canadian Pacific Railway's participation was limited to their U.S. operations), the Montana Rail Link, and the Florida East Coast Railway subsequently agreed to participate, as did several relevant labor unions, including the United Transportation Union and the Brotherhood of Locomotive Engineers and Trainmen.

After conducting the stakeholder meeting, RCA data collection methods and materials were developed, and a process for the analysis was formalized. RCA is a method of accident/incident investigation (i.e., data collection) and analysis that enables investigators or researchers to identify individual, organizational, technological, and situational factors that contributed to an accident/incident. A guiding principle behind RCA is that accidents/incidents are not solely caused by *one* event; rather, *multiple* factors play a role in every accident/incident. RCA is a process used to methodically and objectively shed light on these contributing factors, many of which are otherwise difficult to find.

The Human Factors Analysis and Classification System (HFACS) was selected to provide the theoretical backbone to the RCA, given its logical structure and scientifically valid approach to human error within "systems." Though HFACS has been used as a retrospective tool to organize accident/incident investigation findings, it was also designed to guide accident/incident investigations to ensure that appropriate and adequate human factors-related information is collected. To date, though, HFACS has not been applied in this prospective manner.

The HFACS, based on a well-known and accepted model of human error, depicts errors at four different levels, beginning with the operator and moving upward in the organization. For each level, HFACS identifies a number of major error types. Some error types are further divided into specific causal categories. The HFACS contains 19 different error types or causal categories. It was initially developed and used as a classification system for organizing aviation accident investigation findings. Some minor changes were made to HFACS to optimize its relevancy to the railroad industry. Among the changes were revisions to the terminology and the addition of a fifth top-level category. The new HFACS-RR (Railroad) categories were: operator acts, preconditions for operator acts, supervisory factors, organizational factors, and outside factors. The new HFACS-RR taxonomy contains 23 unique error types and causal categories.

The use of a theoretically-driven RCA approach, based on a modified version of HFACS, ensures that the causal factors identified during an investigation go beyond "what" happened to "why" an error occurred. Researchers used the RCA philosophy, combined with the HFACS-RR structure, to guide data collection and analysis for the six RCL accidents/incidents. A number of data collection tools were developed, including interview questionnaires, a checklist of items to request from the railroad, and a series of decision trees designed around HFACS-RR.

Between May 1 and October 31, 2004, participating railroads were asked to notify the researchers within 24 hours, or the next business day, of the occurrence of all FRA-reportable collisions, derailments, and employee injuries that involved the movement of on-track equipment and that involved RCL yard operations. Collisions and derailments that involve the operation of on-track equipment and that meet certain reporting thresholds are types of *train accidents*, while employee injuries that involve the movement of on-track equipment that meet certain reporting thresholds are types of *train incidents*, per FRA reporting definitions. During this six-month data collection period, six of these accidents/incidents were examined in greater detail using the RCA methods and paper-based tools developed for this study. Selection criteria and guidelines were established to aid in identifying six accidents/incidents to examine further.

When an accident/incident was selected for RCA, the researchers worked with the participating railroad point-of-contact to arrange to travel to the accident/incident site as soon as possible, generally within one to two days of notification. Separately, the point-of-contact from the union that represented the crewmembers involved in the accident/incident was contacted to help begin to arrange interviews with the crewmembers. Interviews were conducted privately with crewmembers; railroad officers were not present.

Researchers spent two to three days on-site collecting interview data and railroad-provided records, logs, and reports for each RCL accident/incident. Due to privacy concerns, medical-related data were not collected. Usually, at least one follow-up telephone conversation was required to collect additional data or clarify an issue. Accident/incident data were de-identified to protect the identities of the individuals and railroads that participated, since the focus of the study was on the entire railroad industry and overall RCL operations, not on a particular practice on one railroad or by one individual.

An analysis of each RCA accident/incident case study was structured in a hierarchical fashion, whereby first, the top-level contributing factors were identified. Then, for each top-level contributing factor, a number of more specific contributing factors were identified. In addition to including a brief explanation for why the contributing factor was considered important and relevant, each lower-level contributing factor was mapped to an HFACS-RR error type or causal category. An assessment was made in terms of the researchers' confidence in each contributing factor based on the data that support each finding. However, no effort was made to assess the relative importance of one contributing factor over another. Thus, all factors were considered equal regarding their contribution to the accident/incident.

Participating railroads and unions were given an opportunity to review each accident/incident case study for which they were involved. Comments were either incorporated into the report or, if there was still disagreement between the researchers' findings and those of the reviewer, the

alternative viewpoint was included in the case study beneath the original finding. For alternative viewpoints, authors' responses are also provided.

Sixty-seven RCL accidents/incidents were reported to the contractor by participating railroads from May 1 to October 31, 2004. Of the 67 accidents/incidents, 54 were collisions or derailments (train accidents), and 13 were employee injuries not associated with a reportable collision or derailment (i.e., train incident). Train accident cause-code data for collisions and derailments were available for 44 of the accidents; 64 percent of these were associated with human factors cause codes. An analysis of all 67 accidents/incidents by time of day reveals that almost half of the 67 accidents/incidents (30) occurred between midnight and 8 a.m., roughly corresponding to third-shift work. The greatest number of accidents/incidents in any one month occurred in August, when 16 accidents/incidents were reported (24 percent of the total number of accidents/incidents). These data should be interpreted with caution, however, since exposure data were not collected.

Of the six accidents/incidents that were further examined, three were collisions, two were derailments, and one was an employee on-the-job injury. Forty-six contributing factors were identified for the six case studies; of these, 36 were *probable contributing factors* and 10 were *possible contributing factors*. Two to thirteen contributing factors were identified for each accident/incident.

Key themes that emerged from the RCL accident/incident analysis are:

- The loss of situational awareness was a major factor in five of the six accidents/incidents. Further analysis suggests that RCL technology facilitated this loss of awareness in four of these five accidents/incidents by enabling RCOs to control their cuts of cars away (i.e., remotely) from the point of movement.
- Six HFACS-RR categories (26 percent) were associated with 92 percent of probable contributing factors. They were: 1) the technological environment; 2) skill-based errors; 3) organizational process; 4) inadequate supervision; 5) decision errors; and 6) resource management.
- Eight probable contributing factors were associated with the technological environment. Four of the eight factors were related to one or more RCOs control of a movement from a physical location away from the RCL and/or cut of cars. Three factors (all were associated with one accident/incident) focused on the failure of the pullback protection system technology as part of the overall RCL system. One contributing factor was associated with the physical characteristics of the beltpack itself.
- Seven skill-based errors were identified among the 36 probable contributing factors; a majority of these were attention failures by the RCO, facilitated by the use of RCL technology.
- Organizational process was identified six times among the 36 probable contributing factors, and all six were related to inadequate practices and procedures governing RCL operations and the use of the RCL technology, including the pullback protection system.
- Inadequate supervision was identified five times among the 36 probable contributing factors; four of the five were related to some aspect of RCO training.

- Four decision errors were identified among the 36 probable contributing factors; half related to decisions made with regard to controlling a cut of cars.
- Three probable contributing factors were associated with resource management issues. One was related to staffing, while the other two were equipment-related.
- Two specific factors that were identified—inadequate staffing and pairing inexperienced crewmembers—may be significant RCL safety issues in the future, given industry-wide staffing shortages.
- An analysis of operator work-schedule history and sleep-habits information suggests that two RCOs may have been operating with compromised alertness.

Based on analyses of contributing factors for the six RCL accidents/incidents, four critical safety issues were identified. They are:

- *Loss of RCO situational awareness.* This loss was identified as a factor in five of the six RCL accidents/incidents analyzed.
- *Insufficient RCO training.* Insufficient training was directly implicated as a contributing factor among the RCL accidents/incidents. Improved training may also mitigate some of the skill-based and decision errors that were identified.
- *Inadequate staffing and pairing of inexperienced crewmembers.* Though these factors were identified as contributing to only one of the six RCL accidents/incidents analyzed in the study, given the current industry shortage of switchmen and engineers, these may be significant safety issues in the future, especially when combined with insufficient training.
- *Inadequate practices and procedures governing RCL operations and the use of the RCL technology, including the pullback protection system.* Inadequate practices and procedures were identified as contributing factors in several RCL accidents/incidents. Given that operating rules and practices govern virtually all aspects of railroad operations, inadequate practices and procedures can have significant consequences.

Last, several future research and development studies are recommended to address these safety issues. They include:

- Analyze FRA RCL accident/incident data.
- Develop RCO training "best practices."
- Develop RCO training objectives.
- Develop RCL operations "best practices."

Key findings:
This section first presents some top-level findings from the overall study. Next are the key themes that emerged from the RCA, as well as the critical safety issues that were identified. It is important to note that within each RCA, a host of key findings are identified (contributing factors). The factors are all important, and the key findings discussed are not intended to lessen the importance of the individual findings from each individual case study. Furthermore, only six RCAs were conducted; thus, the sample size on which these key findings are based is limited.

The overall findings from the study include:

- Sixty-seven RCL accidents/incidents were reported from May 1 to October 31, 2004.
- Of the 67 accidents/incidents, 54 were collisions or derailments, and 13 were injuries not due to a reportable collision or derailment.
- Twenty-eight (64 percent) of the 44 RCL train accidents for which train-accident cause-code data were provided were associated with *human factors* cause codes.
- Almost half of the 67 accidents/incidents, 30, occurred between midnight and 8 a.m.
- The largest number of accidents/incidents in any one month (16, or 24 percent) occurred in August.
- Of the six accidents/incidents that were further examined, three were collisions, two were derailments, and one was an employee on-the-job injury.
- Forty-six contributing factors were identified for the six case studies; of these, 36 were *probable contributing factors* and 10 were *possible contributing factors*.
- Two to thirteen contributing factors were identified for each accident/incident.
- The HFACS-RR taxonomy of human errors was able to support the collection and analysis of railroad accident/incident contributing factors. Given that only minor edits were made to the original HFACS taxonomy, it appears that HFACS-RR is a valid approach to supporting railroad accident/incident investigations.