Final Report

Safety of Remote Control Locomotive (RCL) Operations

Federal Railroad Administration
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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 within six months with preliminary findings (including initial accident statistics), 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.

The FRA has completed the RCL safety assessment. Based on the data collected from December 2003 through December 2004 (this period begins where the interim report period ended), RCL and conventional train accident rates were virtually identical for those major railroads that made extensive use of both types of operations. For the industry as a whole, RCL train accident rates were approximately 25 per cent higher than the train accident rates for conventional switching operations, i.e., 22.42 vs. 17.89 accidents per million yard switching miles (MYSM). The higher rate for RCL operations is largely because the railroad that historically has had the lowest human factor train accident rate relies almost exclusively on conventional switching. Employee injury rates were approximately 20 percent lower for RCL operations than for conventional switching operations, i.e., 6.49 vs. 8.14/MYSM, an effect that may be in part attributable to crew size.

The study shows that, when comparing all railroads, RCL operations result in more train accidents than conventional operations. This result, which is different than our preliminary finding, appears to be based on two factors: First, because the larger data sample taken for the final report provided a more complete picture of comparisons and contrasts, FRA has introduced enhanced programming methodology to eliminate accidents involving through and local freight trains that derailed while entering or leaving a yard or industry track. Additionally, injuries to crew members of through and local freight trains that occurred in a yard or on industry tracks were also excluded. Second, a closer look at the data indicate that approximately 85 percent of the yard switching miles were generated by only three (BNSF, CSX, and UP) of the 38 railroads evaluated. A comparison of accident rates for these three railroads indicates a rate of

24.09/MYSM for RCL operations and a rate of 24.52/MYSM for conventional operations. A comparison of injury rates for the three railroads indicates a rate of 6.58/MYSM for RCL operations and a rate of 9.54/MYSM for conventional operations. FRA believes that the accident and injury data developed from this enhanced methodology results in a better representation of the relative safety of the two modes of switching operations.

During the assessment period, two fatalities occurred involving RCL operations, and two fatalities occurred involving conventional operations under comparable circumstances.

The FRA has regulated RCL operations as part of crosscutting programs applicable to both RCL and conventional operations, including oversight of railroad operating rules, locomotive engineer qualification and certification, inspection of locomotives, and accident/incident reporting (49 CFR Parts 217, 240, 229, and 225). Currently, only requirements for accident/incident reporting contain provisions specific to RCL operations, although RCL-specific actions have been taken under other regulatory programs (in particular, review and approval of RCL operator training and qualification).

As explained above, on those major railroads where RCL technology has been extensively utilized, safety performance has been roughly equivalent to that of conventional switching. While this record does not provide a basis for singling out RCL for further regulation, neither does it exclude the need for further attention in appropriate contexts. As FRA has explained in the National Rail Safety Action Plan (May 16, 2005 at page 3), "[h]uman factors constitute the largest category of train accidents, accounting for 38 percent of all train accidents over the last five years." If the promise of RCL—better control of switching movements—were being realized, human factor train accidents would have fallen significantly over previous years as RCL operations have become more prevalent. Instead, human factor-caused events have remained the most prominent category of train accidents. Although personal injury rates have continued to fall for ground employees in switching service, individual RCL-related events clearly indicate the potential for loss of life.

On May 18, 2005, the Railroad Safety Advisory Committee (RSAC) accepted a task to consider further actions that might be taken to reduce human-factors-caused train accidents and employee injuries in switching operations. An Operating Rules Working Group was formed and began its work in July of 2005, with a report required on initial recommendations by February 2006. FRA clearly indicated its desire to receive recommendations addressing, in mandatory form, compliance with the principal railroad operating rules for which compliance is unacceptable today, including proper handling of switches, protection of the point in shoving movements, and leaving cars in the clear (not "out to foul"). Better compliance with these rules in both conventional switching and RCL operations could dramatically reduce human factor train accidents and also better protect the safety of employees working in yards and terminals. The Operating Rules Working Group reported to the full RSAC in February that it was not able to reach consensus on recommendations for regulatory action. However, in the course of the working group activity FRA developed and refined a discussion draft that is presently being incorporated into a Notice of Proposed Rulemaking (NPRM) scheduled for publication not later than September of 2006. The RSAC has requested to play a further role in finalizing this rulemaking after receipt of public comments.

The FRA is also concerned that railroads have experimented with the use of RCL technology to accomplish movements that require use of automatic brakes (train air brakes). RCL technology is suitable for making up and breaking up trains in yards, and it could also be used for picking up and dropping off cars at industries. However, with limited exceptions involving the movement of short trains over short distances, it is not properly configured for main track operations or even for movement of very long or heavy drafts of cars where train air brakes are a necessity. Nor, in FRA's view, would there be any safety merit in modifying RCL devices to control the throttle and train air brakes for over-the-road service, since (1) some degree of latency would be experienced between commands issued and commands executed, introducing further challenges in train handling, (2) loss of communication due to interference or other reasons would result in a penalty brake application that itself could result in a derailment, and (3) in any event, the person controlling the movement would need to be in the cab to enjoy protection from both normal and crash-related hazards. FRA understands that this issue is complicated by the constraints of collective bargaining agreements and an arbitration award, but FRA believes that all parties to the collective bargaining process have an overriding responsibility to provide for work rules that serve the interest of safety.

In a letter dated September 9, 2005, addressed to the Association of American Railroads and the American Short Line and Regional Railroad Association, FRA expressed its concerns related to RCL main track operations. FRA stressed the need for appropriate training of all remote control operators assigned to train movements on main track and the need to apply operational restrictions related to train length, tonnage and route conditions. As this report was being finalized, FRA remained in communication with the associations and a major freight railroad regarding current justifications for main track operating practices and regarding plans for potential enhancement of RCL technologies. FRA will pursue these dialogues aggressively to ensure that applications of RCL technology are consistent with the safety of railroad operations.

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 remote control transmitter (RCT or beltpack) that is worn around the waist of the switchmen on the ground. The RCT 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 *Safety Advisory 2001-01* in the Federal Register (66 FR 10340) 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 the 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 alleged noncompliance with the regulations 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, the Safety Advisory emphasized the applicability of the current Federal locomotive inspection 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 49 CFR 229.23. Thus, the Safety Advisory served the purpose of publishing FRA's position that existing Federal regulations 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 six 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-mentioned 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. BNSF, CSX, UP, KCS, NS, and Conrail have defined these duties as follows:

> A C*ertified 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.

The 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 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 their accident/incident database information to FRA. Accident/incident reporting is regulated under 49 CFR Part 225. Prior to January 1, 2006, railroads reported any event that caused damage to on-track equipment and track structure above the monetary threshold of $6,700. Effective January 1, 2006, the threshold was increased to $7,700. 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 of December 2003 through December 2004 was 22.42 accidents per MYSM. The accident rate for conventional operations was 17.89/MYSM. As previously noted, the difference in accident rates is largely because the railroad that historically has had the lowest human factor train accident rate relies almost exclusively on conventional switching. However, the accident rate for both types of operations is virtually identical for those major railroads that made extensive use of both types of operations.

Appendix 1 to this report contains the data FRA used for the accident/incident rates. It is important to note that the reportable rail equipment accidents/incidents 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 tables show accident data by major cause classification and human-factors accident rates.

Major Cause Classification	RCL	Conventional	Total	% Total Accidents	% RCL	% Conventional
Human Factors	285	466	751	55.3%	38%	62%
Track Defects	75	200	275	20.2%	27%	73%
Miscellaneous	61	148	209	15.4%	29%	71%
Mechanical	21	48	69	5.1%	30%	70%
Signal & Communications	31	24	55	4.0%	56%	44%
Total	473	886	1,359	100.00%		

Human Factors Accident Rates	Accidents	Yard-Switching-Miles	Rate/MYSM
RCL	285	21,097,583	13.51
Conventional	466	49,513,963	9.41
Total	751	70,611,546	10.64

The tables show that the highest single, major cause category for rail equipment accidents is human factor, which account for more than one-half of all rail equipment accidents. The next highest major cause category is track defects, which account for approximately one-fifth of all rail equipment accidents. The other three major cause categories (miscellaneous causes, mechanical, and signal and communications) account for the remainder of all rail equipment accidents.

Where human factors are concerned, RCL accident rates overall are higher than conventional operations, i.e., 13.51 for RCL vs. 9.41 for conventional/MYSM. Although the human factor caused accident rate for RCL is higher**,** 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.

The FRA has tasked the RSAC with addressing these human factor causes and has indicated an intention to propose regulations that will establish firm responsibility for compliance, whether in the context of conventional or RCL operations.

One reported accident involved a transmitter signal failure; however, the failure was not in the communication between 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 transponders in the track bed at various intervals. These transponders 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 it's 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 recommends 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. Additionally, FRA recommends that the railroads incorporate a form of redundancy into this system. FRA notes that Global Positioning System (GPS) mapping has been used for this purpose, i.e, the locomotive is geographically tracked by satellite and prevented from traveling past predetermined boundaries.

Injuries: The employee injury rate for RCL operations was 6.49 injuries per MYSM. The injury rate for conventional switching operations was 8.14 per MYSM. These rates indicate that injuries occur less often during RCL operations. One obvious reason for 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.

> Note: All of the data presented in this report was provided to the Operating Rules Working Group of the RSAC during the summer of 2005 for its consideration. One party to that discussion has called attention to the fact that injury data is typically normalized by 200,000 work hours, rather than by using MYSM. FRA agrees that use of 200,000 work hours is preferable; however, during the period this report was prepared FRA did not have access to work hour data disaggregated in the manner that would have been required to perform this analysis. FRA is exploring options for pursuing work hour data that would be more suitable for this purpose.

Fatalities: Two fatalities occurred during the evaluation period for RCL operations. For conventional operations, two fatalities occurred. In the interest of safety, FRA has included a belief description of each fatality in Appendix 3 to this report. It is FRA's hope that this information may heighten railroad employees' awareness of the dangers associated with their day-to-day duties.

RCL Effects on Highway-Rail Grade Crossing Safety

Federal regulations (49 CFR 225.19(b)) require railroads to report all highway-rail grade crossing accidents to FRA. An evaluation of this data indicates that 197 crossing accidents occurred on yard and industrial tracks during the assessment period. Of those, 183 related to conventional operations and 14 related to RCL operations. There were no fatalities and one injury associated with the 14 RCL-involved accidents. The crossing accident rate for RCL operations is 0.66 accidents per MYSM, and the rate for conventional operations is 3.70 accidents per MYSM. The data indicate that RCL operations are no less safe than conventional operations.

Accidents Involving Hazardous Materials

During the 13-month assessment period, 1,359 train accidents occurred on yard or industry tracks. Of these, 343 involved the movement of hazardous materials, and nine (9) involved the release of hazardous materials, four (4) during RCL operations and five (5) during conventional operations. When weighing the data by allocated switching-miles, the hazmat-release accident rate for RCL (.19) is higher than for conventional (.10), but the absolute numbers of releases are small in relation to the exposure. FRA believes that addressing operating rules compliance for both conventional and RCL operations will be the most productive strategy for favorably addressing this issue. It should be noted that coupling speed has been a major factor in hazardous materials exposure over the year, and use of RCL technology continues to have promise for prevention of over-speed coupling by placing control in the hands of the employee closest to the cars being coupled.

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 pose no more threat to the public than conventional operations do.

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. However, the removal of a crewmember from the locomotive cab posed a problem for the rail industry. 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. Under such rules, RCOs 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 rules. An RCZ is a designated area in which 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

The 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 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 ladder 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.

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, 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.

The FRA was concerned that the added responsibilities of operating a locomotive while riding the side of a car could distract a RCOs situational awareness; however, the data appear to indicate otherwise. The data show that 124 injuries occurred involving riding the sides and ends of cars during the assessment period. Of those, 94 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.

The FRA is recommending that when new speed control technology is used, 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, in those cases in which RCL systems 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. As discussed earlier (p.10), 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 (RCZ).

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.

The 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.

The 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.

The 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 railroads' 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.

The 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.

Please be advised that on April 27, 2005, FRA received from the State of California a petition for rulemaking on this subject. The petition requested that FRA initiate a rulemaking "to formally approve and establish rules affecting RCL operations by railroads over public highway-rail at-grade crossings" similar to those identified here and in FRA's interim report. Per FRA's procedures, we reviewed and denied this petition. [The docket is accessible at http://dms.dot.gov/, and the docket # is FRA-2005-21094].

4. Expansion of RCL Technology to Main Tracks

FRA's 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. FRA divided its evaluation of these operations into two areas: technology and training.

Technology

After becoming familiar with the current RCL technology, FRA realized the systems in use by the major railroads have limitations when used outside the yard environment. For example, FRA's initial concern was that the current technology might not be suitable to control in-train forces during train movements. The speed control feature on the remote control transmitter 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 five to ten 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 the train is operating. Consequently, the computer will attempt 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. Separation is likely 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, as 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 air brake systems, the locomotive or independent air brake (which controls the air brakes on only the locomotive) and the automatic train air brake (which controls the air brakes on both the locomotive and the cars in the train). As the name implies, the independent air brake operates the locomotive brakes independently of the automatic air brakes. Light locomotive and switching movements are primarily controlled by the independent air brake, whereas trains are primarily controlled by the automatic air brake. The onboard computer controls all movements initially by using the independent air brake. The system is designed to react to speed changes within plus or minus 0.5 miles per hour (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 0.5 mph below the set speed, the computer will direct the locomotive to increase power to maintain the selected speed, which will cause slack action in the train. Since plus or minus fluctuations in speeds greater than 0.5 mph often occur as trains move over the main track, the independent air brake will constantly apply and release, 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, train size, and train makeup, excessive slack action in the train could cause a derailment due to excessive in-train forces.

The RCOs have the ability to use the automatic air brake to a limited degree, depending on software modifications to the system. The RCL automatic air brake system was originally designed to supplement the locomotive air brakes when stopping heavy drafts of cars in yards. If the locomotive air brake is fully applied and more braking effort is needed to control speed, the speed control feature will make an additional predetermined brake application with the automatic brake. (The automatic air brake system can be used only if the cars being handled have the air hoses coupled between them and the cars are charged with air.) Once the movement slows to the selected speed, the brakes are released. Again, this system works well when handling heavy drafts of cars from one track to another in the yard. 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 downhill, uphill track 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 excessive in-train forces.

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), proper train handling could prove difficult for larger trains over greater distances.

In dialogue with the industry, the FRA has questioned whether further modification of RCL technology could overcome these limitations while providing a level of safety equal to that of conventional operations on the main line. FRA is concerned that—under the best of circumstances—signal latency between the beltpack and the RCL would introduce an additional, and unnecessary, element of delay between initiation and execution of commands by the operator. The delay when giving commands to the RCL may interfere with train handling calculations and decisions, and that is one reason why FRA has taken a conservative view of the acceptable train length this current RCL equipment should handle. Moreover, the "fail-safe" feature that acts to stop the locomotive, when command signal interference ("No Com") is experienced, denies the RCO adequate control over the train movement. For example, there have been incidents in yards where the RCL suddenly stopped because of communication failure and caused a section of the cars being handled to break away. In one instance these cars rolled into the side of a train, causing a derailment. To have such occurrences on high-speed main tracks could prove catastrophic. FRA recognizes that penalty brake applications can and do occur to engineers during conventional main track operations. However, the engineers have the ability to immediately respond to these situations with considerably more controls than those afforded to RCOs. Importantly, there is no sound reason to introduce additional causes of undesired air brake applications.

FRA Review of Training Programs

All the major railroad RCL training programs provide a minimum of two weeks of training for railroad employees with no previous experience operating a locomotive. The two-week training period takes into account that the trainees are former conductors with significant railroad experience. Approximately two to three days are spent in the classroom, with the remainder 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 subject areas as conventional engineers. Consequently, FRA believes that RCOs should receive additional training if they operate on main tracks.

In FRA's interim report to Congress, FRA recognized how the major railroads defined the duties of an RCO in the programs filed with FRA and noted that these programs, as understood by FRA, did not contemplate extensive movements on main track. Interim Report at 4. In hindsight, it is clear that some railroads take a broader view of the description of RCO duties;

and it is therefore appropriate to review their locomotive engineer training programs to determine that required competencies are being addressed.

Accordingly, FRA will, as necessary, reopen review of railroad RCO training programs where it is clear that the railroad is committed to non-incidental main line movements. In initiating this review, FRA will apply the following criteria:

1. RCOs should be required to have the same or the equivalent level of classroom training as that provided for conventional train service engineers on each railroad. Examples of necessary training will likely 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-terminal transfer routes.
2. Regarding on-the-job (OJT) training, each RCO should have a minimum of 120 hours of actual, documented hands-on operating experience. (Note: FRA is willing to consider a railroad's amended program that credits previously worked hours for those RCOs who have worked main track assignments prior to the implementation of the minimum OJT training requirement). As with all training, railroads should remain flexible and provide more than the minimum of OJT training when necessary; e.g., if the track profile is difficult or the distance poses specific issues, OJT training should be increased on a case-by-case basis.

Although this review will include an opportunity for the railroad to suggest modifications of these criteria as applied to their specific circumstances, FRA will expect substantial improvements to existing RCO training programs where non-incidental main line operations are contemplated.

Recommended Restrictions on Non-Incidental Main Track Movements

In FRA's September 2005 letter to the industry associations, FRA recommended the following course of action for those railroads that voluntarily choose to conduct RCL operations outside of yard switching operations. In recognition of the existing and inherent technological limitations discussed in this letter, FRA strongly suggested that each railroad should establish standard operating procedures that limit RCL movements outside of yard switching operations. At a minimum, we recommended that the following limitations should apply to all RCL movements requiring brake tests under 49 C.F.R. Part 232:

a. Locomotive consist should not exceed 3000 horsepower, utilizing no more than eight (8) axles.
b. Train length should not exceed 1000 feet (approximately 20 car lengths).
c. Train speed should not exceed 15 mph.
d. Operations should be prohibited on any grade of 0.5 percent or greater that extends for more than ¼ of a mile.

These criteria have the status of recommendations and as such are subject to discussion and adaptation. A major freight railroad has presented to FRA its alternative limiting conditions for RCL train movements, and FRA is awaiting additional technical information that would permit

the agency to determine the reasonableness of those conditions. The same railroad has brought to FRA's attention additional plans for refining RCL technology that would actively involve the electronic control system in train handling decisions. Again, FRA has responded with further questions related to the intended application of the technology and issues of user interface. As these discussions unfold, it will be necessary to determine that reasonable limits are being set in practice; or FRA will have to consider more definitive action.

In summary, FRA has concluded that current RCL technology has limited application to main track operations. It is clear that current RCL systems and training programs are designed for yard switching operations and that enhanced training must be provided where non-incidental main line operations are contemplated. Even where RCOs are properly trained and qualified for main line operations, FRA recommends that railroads adopt operational restrictions that reflect the inherent limitations of a system configured for yard operations that rely upon radio-frequency transmission of safety-critical commands.

FRA recognizes that railroads will continue to explore more ambitious application of inter-related technologies while striving for safe and efficient means of delivering rail service. In that regard, FRA notes that rigorous safety analysis of the kind required under the final rule for Processor-Based Signal and Train Control Systems (49 CFR part 236, subpart H) must be applied to these new approaches if success is to be achieved, both from the point of view of safety and quality of service.

Equipment Failure Issues

FRA found that this new technology is installed on many different types of older locomotives used in yard-switching service throughout the rail industry. Consequently, malfunctions due to various wiring schemes have occurred. However, aside from isolated incidents, FRA is not aware of any persistent anomalies in the technology that warrant special attention at the current time.

In 2004, FRA found that 34 RCL locomotive systems on one railroad had the speed control sensors mounted improperly. The sensors were 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 then 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. FRA recommends that any employee with less than one year in train service should be considered a new-hire for special training purposes.

Since many yards are operated exclusively with 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. RCL training should be a supplement to traditional conductor training programs and should not be subtracted from them. 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.

New Electronic Systems and 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.

On February 22, 2006, the RSAC accepted a task for review and revision of the Locomotive Safety Standards (49 CFR part 229). This task includes consideration of the need for safety standards addressing locomotive electronic systems, including RCL functions. The new RSAC working group will be asked to consider safety requirements for these systems, including verification and validation of new systems and configuration management over the product life cycle.

Special Studies

Electromagnetic Field Emissions

The FRA and the John A. Volpe National Transportation Systems Center, an organization within the U.S. Department of Transportation's Research and Innovative Technology Administration, sent a request for information to the major RCL equipment suppliers to U.S. railroads 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 and/or suppliers of RCL systems responded by mid-April, 2004. They provided a response letter, accompanied by FCC certification and other test data to document RCL compliance with applicable FCC Electromagnetic Interference (EMI) emissions and human exposure safety regulatory requirements. Compliance testing on RF emissions to prevent EMI was performed for the suppliers by laboratories certified by the FCC for this purpose, and by noted experts on RF human-exposure safety, respectively.

To verify industry compliance with the FCC regulatory and licensing requirements for RCL system components classified as portable, mobile, and stationary RF emitters, the Volpe Center analyzed the FCC regulations, RCL test data, and FCC license applications provided. Limited test data was complemented with technical information available on the internet. Potential RCL operational safety issues and hazard scenarios related to EMI, Electromagnetic Compatibility (EMC), and Radio Frequency Radiation (RFR) were 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, in order to assess their sufficiency and adequacy in simulating realistic RCL field railroad operating conditions. All applicable EMI and RF safety regulations (FCC) and voluntary international and national standards and industry guidelines (FRA, AAR, and the Institute of Electrical and Electronics Engineers (IEEE)) were also reviewed and referenced.

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

The RF emissions and human-exposure test data were 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, the industry tests performed to date do not reflect actual broadband 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, or transceiver installations on-site and the urban RF background, could enhance and confound the results that might be gained from any personal exposure monitoring to determine the exposure levels due to the body-worn 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,

[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.

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. It should be noted, however, that non-RCL locomotives are equally vulnerable in this regard. 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. (It should be noted that conventional locomotives are equally vulnerable in this regard.) 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 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 only a person having a copy of the corresponding key can 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

Human Factors Issues

The FRA believes the following items warrant close attention as RCL technology continues to evolve. These areas are inherent to RCL operations:

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 remote control transmitter (RCT or 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 RCO's 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 reason apparent to the RCO. As identified in Foster-Miller's RCL operations human factor 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 reported that they did not receive enough hands-on training with the beltpack before becoming qualified as an RCO.

4. Inadvertent/accidental activation of the Beltpack

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.**General human factors references for further reading**

General human factors

Salvendy, G. (Ed.). 1997. *Handbook of human factors and ergonomics* (2nd edition). New York, NY: Wiley.

Vicente, K. (2004). *The human factor: Revolutionizing the way people live with technology*. New York, NY: Routledge.

Task overload / workload

Wickens, C. (1992). *Engineering psychology and human performance. Second edition*. New York, NY: HarperCollins. 364-411.

Hancock, P. and Desmond, P. (Eds.) (2001). *Stress, workload, and fatigue*. Mahwah NJ:

Lawrence Erlbaum Associates. 267-450.

Situation awareness
Endsley, M. & Garland, D. (Eds.) (2000). *Situation awareness analysis and measurement*. Mahwah, NJ: Lawrence Erlbaum Associates.

Automation
Sheridan, T. (1992). *Telerobotics, automation, and human supervisory control*. Cambridge, MA: MIT Press.
Sheridan, T. (1997). Supervisory control. In G. Salvendy (Ed.), *Handbook of human factors and ergonomics* (2nd ed.) New York, NY: Wiley. 1295-1327.
Sarter, N., Woods, D., & Billings, C. (1997). Automation Surprises. In G. Salvendy (Ed.), *Handbook of human factors and ergonomics* (2nd ed.). New York, NY: Wiley. 1926-1943.
Parasuraman, R., and Riley, V. (1997). Humans and automation: Use, misuse, disuse, abuse. *Human Factors*, 39(2), 230-253.

Interface design
Norman, D. (2002). *The psychology of everyday things*. New York, NY: Basic Books.

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 believes strongly that remote control technology should not be expanded beyond yard switching operations, with limited exceptions that involve short distances, limited tonnage and grades, and with appropriate attention to training of RCOs assigned to these trains

The RCL operations are susceptible to the same safety challenges that accompany conventional switching operations. Employees need to observe the railroad operating rules, which must be sufficient to safeguard the operations and which must be applied rigorously by railroad employees and supervisors. As part of the National Rail Safety Action Plan, FRAis preparing an NPRM to more clearly set forth requirements with respect to operating rules and rules compliance for the safety of conventional and RCL operations. FRA is working with individual railroads to ensure that programs of testing and training are appropriate to the actual duties of RCOs. Further, as part of its review of the Locomotive Safety Standards, the RSAC will consider possible further improvements in the processes for introduction of new locomotive control technologies that affect vital and other safety-relevant functions. Finally, results of research summarized in this report will be disseminated to industry groups, and FRA will urge that they be considered as railroads develop best practices for the future in consultation with employee organizations.

Supporting Documentation

This report is supplemented with three appendices:

1) Appendix 1 - FRA RCL and Conventional Switching Accident/Incident Data. This appendix contains the data FRA relied upon to arrive at the various occurrence rates discussed in the report.

2) Appendix 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:

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

    This appendix 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 full reports are currently under review and will be posted on FRA's website upon completion.

3) Appendix 3 - Description of RCL and Conventional Switching Operation Employee Fatalities.

Appendix 1 - FRA RCL and Conventional Switching Accident/Incident Data

Table 1-1
Comparison - RCL and Conventional Switching Related Train Accidents on Yard and Industry Tracks
Accident Rates for the Industry and Individual Railroads
For the Period December 2003 through December 2004

Railroads	Accidents				Yard Switching Miles			Accident Rate	
	RCL Op.	Conv. Op.	Total	% RCL Op.	RCL Op.	Conv. Op.	Total	RCL Op.	Conv. Op.
Grand Total	473	886	1,359	34.8	21,097,583	49,513,963	70,611,546	22.42	17.89
Alton & Southern Rwy [ALS]	13	-	13	100.0	661,117	431,315	1,092,432	19.66	0.00
Arkansas & Missouri RR Co. [AM]	-	-	-	-	728	27,049	27,777	-	-
BNSF Rwy Co. [BNSF]	116	175	291	39.9	5,026,175	9,708,587	14,734,762	23.08	18.03
Belt Rwy Co. Of Chicago [BRC]	16	4	20	80.0	473,995	40,478	514,473	33.76	98.82
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]	67	160	227	29.5	4,851,944	8,127,775	12,979,719	13.81	19.69
Elgin, Joliet & Eastern Rwy Co. [EJE]	-	11	11	-	44,936	233,372	278,308	0.00	47.14
Florida East Coast Rwy Co. [FEC]	-	5	5	-	10,321	421,838	432,159	0.00	11.85
Finger Lakes Rwy Corp. [FGLK]	-	-	-	-	12,177	3,729	15,906	-	-
Illinois Central RR Co. [IC]	2	9	11	18.2	66,541	2,559,672	2,626,213	30.06	3.52
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]	12	32	44	27.3	339,451	934,253	1,273,704	35.35	34.25
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]	-	1	1	-	5,350	100,797	106,147	0.00	9.92
Montana Rail Link [MRL]	2	3	5	40.0	280,059	218,782	498,841	7.14	13.71
Nebraska Central RR [NCRC]	1	-	1	100.0	2,312	20,597	22,909	432.53	0.00
Norfolk Southern Corp. [NS]	11	125	136	8.1	866,592	13,070,316	13,936,908	12.69	9.56
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	1	3	66.7	12,760	662,863	675,623	156.74	1.51
Union Pacific RR Co. [UP]	227	320	547	41.5	8,040,837	8,875,851	16,916,688	28.23	36.05
Union RR Co. [URR]	-	2	2	-	8,712	126,804	135,516	0.00	15.77
Vermont Rwy, Inc. [VTR]	-	-	-	-	291	25,664	25,955	-	-
Wisconsin Central Ltd. [WC]	1	8	9	11.1	71,148	1,459,612	1,530,760	14.06	5.48
Wheeling & Lake Erie Rwy Co. [WE]	-	-	-	-	15,398	261,020	276,418	-	-
Willamette & Pacific RR, Inc. [WPRR]	-	-	-	-	25,040	62,835	87,875	-	-
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 1-2
Comparison of Train Accidents in RCL virus Conventional Operation
by Month, Type of Track, Major Causes, and Type of Accident
for the Period December 2003 through December 2004

			Operation					
			RCL			Conventional		
			Average Damage to			Average Damages to		
	RCL	Conventional	Total	Equipment	Track	Total	Equipment	Track
**Total Accidents	473	886	38,157	23,436	14,721	33,890	22,607	11,283
--Year/Month								
2003, 12	38	62	42,987	21,642	21,345	34,735	20,997	13,739
2004, 01	21	70	38,971	29,231	9,740	37,430	28,213	9,217
2004, 02	41	78	39,674	30,102	9,571	31,273	21,666	9,606
2004, 03	37	60	36,828	23,946	12,882	23,489	16,432	7,057
2004, 04	36	74	25,741	17,470	8,270	26,961	20,260	6,702
2004, 05	42	68	40,081	24,475	15,607	27,528	15,852	11,676
2004, 06	38	84	56,088	20,412	35,676	34,635	19,370	15,264
2004, 07	33	73	24,030	14,354	9,676	29,844	21,377	8,468
2004, 08	43	58	37,368	29,057	8,312	60,801	47,375	13,426
2004, 09	32	66	35,838	24,480	11,358	30,100	22,473	7,627
2004, 10	46	51	39,214	22,213	17,001	49,469	25,681	23,789
2004, 11	31	64	38,358	24,634	13,724	35,196	20,245	14,951
2004, 12	35	78	37,888	22,975	14,913	27,701	18,929	8,772
--Type Track								
Yard	462	749	38,636	23,690	14,946	34,093	22,951	11,142
Industry	11	137	18,036	12,756	5,280	32,779	20,731	12,048
--Primary Cause								
Equipment Defects	21	48	65,069	31,036	34,033	33,352	18,609	14,743
Human Factors	285	466	36,095	26,005	10,090	30,057	23,684	6,373
Miscellaneous	61	148	32,985	21,196	11,789	43,989	28,764	15,224
Signal and Train Control	31	24	45,757	15,250	30,507	22,419	11,911	10,507
Track Defects	75	200	39,523	16,750	22,773	36,853	17,787	19,066
--Type Accident								
Derailment	257	585	39,327	18,820	20,508	34,688	19,371	15,318
Head on collision	1	2	61,518	34,500	27,018	25,357	25,357	0
Rear end collision	.	1	.	.	.	19,500	19,500	0
Side collision	74	53	38,003	29,604	8,399	28,343	24,475	3,867
Raking collision	12	18	49,004	34,177	14,827	24,865	23,731	1,134
Broken train collision	1	2	19,948	19,948	0	22,352	21,852	500
Obstruction impact	2	5	14,546	5,090	9,456	24,472	24,272	200
Explosion/detonation	.	1	.	.	.	24,589	24,189	400
Fire/violent rupture	.	1	.	.	.	15,000	0	15,000
Other impact	123	204	35,333	28,530	6,803	27,695	24,544	3,150
Other event	3	14	28,107	24,575	3,532	132,682	121,966	10,716

Table 1-3
Comparison of Damage Sustained in RCL Operation vs Conventional Operation – by States
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	16	59,741	47,617	12,124	30,619	21,109	9,510
Arizona	.	13	.	.	.	23,348	16,437	6,911
Arkansas	38	18	26,333	12,963	13,370	35,582	5,746	29,836
California	24	51	40,652	16,597	24,055	37,647	16,063	21,585
Colorado	14	15	32,681	30,865	1,816	31,575	19,358	12,218
Delaware	.	2	.	.	.	12,064	12,064	0
Florida	4	13	12,357	12,282	75	15,276	10,109	5,166
Georgia	10	26	29,321	28,541	780	20,542	18,842	1,700
Idaho	.	13	.	.	.	58,071	28,458	29,613
Illinois	74	75	42,776	26,942	15,834	25,926	20,062	5,864
Indiana	1	38	164,338	156,338	8,000	22,817	19,404	3,413
Iowa	3	24	12,104	9,482	2,622	22,134	13,812	8,322
Kansas	19	32	41,353	33,876	7,477	50,230	19,681	30,550
Kentucky	11	15	20,973	20,727	245	42,245	36,898	5,347
Louisiana	6	45	12,203	12,038	166	35,398	18,785	16,613
Maine	.	1	.	.	.	7,425	6,000	1,425
Maryland	10	9	19,732	17,002	2,730	13,495	11,651	1,844
Massachusetts	.	2	.	.	.	21,800	21,800	0
Michigan	2	7	33,500	8,200	25,300	13,482	13,319	163
Minnesota	15	8	35,345	13,859	21,486	42,652	34,015	8,638
Mississippi	.	12	.	.	.	23,303	21,306	1,997
Missouri	12	22	38,101	25,738	12,363	35,136	17,562	17,575
Montana	3	4	24,427	11,727	12,700	38,936	31,424	7,513
Nebraska	41	27	49,645	20,983	28,662	28,623	17,315	11,308
Nevada	.	9	.	.	.	60,087	34,850	25,238
New Jersey	3	30	34,706	34,306	400	32,005	25,910	6,094
New Mexico	4	10	17,284	17,284	0	23,287	19,467	3,820
New York	4	20	34,620	24,495	10,125	17,453	16,638	815
North Carolina	12	10	25,170	24,374	796	27,577	26,642	935
North Dakota	2	1	7,015	3,565	3,450	7,310	7,310	0
Ohio	6	42	22,661	20,436	2,225	19,439	17,020	2,419
Oklahoma	3	23	105,340	88,873	16,467	44,849	24,762	20,087
Oregon	20	17	31,085	12,250	18,835	31,051	13,640	17,411
Pennsylvania	1	37	46,400	45,400	1,000	25,330	22,030	3,300
South Carolina	2	17	14,268	14,168	100	45,562	42,044	3,518
South Dakota	.	1	.	.	.	29,367	29,367	0
Tennessee	12	20	64,796	41,910	22,886	28,329	22,156	6,173
Texas	71	96	40,134	24,093	16,040	39,455	23,842	15,614
Utah	10	7	66,709	22,368	44,341	34,259	11,652	22,607
Virginia	.	12	.	.	.	138,681	137,327	1,354
Washington	18	14	26,666	16,026	10,640	37,925	22,570	15,356
West Virginia	.	2	.	.	.	26,057	25,557	500
Wisconsin	.	14	.	.	.	50,468	36,796	13,672
Wyoming	5	16	25,695	16,827	8,868	55,654	36,378	19,276
Total	473	886	38,157	23,436	14,721	33,890	22,607	11,283

Table 1-4
Comparison of Train Accidents in RCL and Conventional Operation by Specific Causes
within each Major Cause Classification
Selected Railroads on Yard And Industry Tracks
For The Period December 2003 Through December 2004

Causes		Accidents		Total
		Conventional	RCL	
	Grand Total	886	473	1,359
Human Factors	Switch improperly lined	90	46	136
	Shoving movement, absence of man	70	53	123
	Shoving movement, failure to control	17	28	45
	Passed couplers	18	13	31
	Failure to secure car hand brake - railroad employee	17	14	31
	Cars left foul	22	7	29
	Failure to comply with restricted speed or its equivalent not in connection with a block or interlocking signal.	13	14	27
	Fail to apply sufficient hand brakes - railroad employee	18	9	27
	Switch previously run through	21	5	26
	Kicking or dropping cars, inadequate precautions	18	4	22
	Buff/slack action excess, train handling	11	6	17
	Other general switching rules	8	8	16
	Instruction to train/yard crew improper	8	7	15
	Derail, failure to apply or remove	9	5	14
	Failure to couple	8	6	14
	Fail to apply car hand brakes - railroad employee	12	2	14
	Car(s) shoved out & left out of clear	11	2	13
	Failure to secure engine- railroad employee	7	2	9
	Switch not latched or locked	7	2	9
	Coupling speed excessive	6	2	8
	Failure to stretch cars before shoving	3	5	8
	Buff/slack action excess, train make-up	3	4	7
	Switch movement, excessive speed	2	5	7
	Other train operation/human factors	4	3	7
	Retarder, improper manual operation	6	1	7
	Use of brakes, other	3	3	6
	Failure to stop train in clear	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
	Radio communication, failure to comply	4	1	5
	Humping or cutting off in motion equipment susceptible to damage, or to cause damage to other equipment	2	2	4
	Other train handling/makeup	1	3	4
	Fail to release hand brake - railroad employee	1	3	4
	Movement without authority - railroad employee	2	1	3
	Fail to control car speed using hand brake - railroad employee	2	1	3
	Failure to comply with restricted speed	2	1	3
	Later drawbar force-short/long car combination	3	.	3
	Human factors - motive power and equipment	3	.	3
	Lateral drawbar force on curve excess, make-up	3	.	3
	Excessive horsepower	3	.	3
	Fixed signal (other than automatic block or interlocking signal), failure to comply.	1	1	2
	Speed, other	1	1	2
	Improper train make-up	1	1	2
	Absence of fixed signal (Blue Signal)	1	1	2
	Spring Switch not clear before reverse	2	.	2
	Failure to secure equip - not railroad employee	2	.	2
	Failure to allow air brakes to release	2	.	2
	Lateral drawbar force on curve excessive train handling	2	.	2
	Independent brake, improper use	2	.	2

Table 1-4
Comparison of Train Accidents in RCL and Conventional Operation by Specific Causes
within each Major Cause Classification
Selected Railroads on Yard And Industry Tracks
For The Period December 2003 Through December 2004

	Causes	Accidents		Total
		Conventional	RCL	
	Other main track authority causes	.	1	1
	Automatic brake, insufficient	.	1	1
	Switch improperly lined, radio controlled	.	1	1
	Failure to actuate off independent brake	1	.	1
	Failure to cut-out brake valves - locomotive	1	.	1
	Dynamic brake, too rapid adjustment	1	.	1
	Radio communication, improper	1	.	1
	Improper train inspection	1	.	1
	Bottling the Air	1	.	1
	Fail to comply with train order, etc.	1	.	1
	Retarder yard skate improperly applied	1	.	1
	Throttle (power), improper use	1	.	1
	Total	466	285	751
Track Defects	Wide gage(defective/missing crossties)	63	14	77
	Switch point worn or broken	20	10	30
	Transverse/compound fissure	16	4	20
	Switch damaged or out of adjustment	10	4	14
	Head and web separation outside joint bar limit)	9	4	13
	Switch point between switch point and stock rail)	5	5	10
	Detail fracture - shelling/head check	8	1	9
	Cross level track irregular (not at joints)	6	1	7
	Cross level of track irregular (joints)	7	.	7
	Vertical split head	4	2	6
	Defective or missing crossties	3	3	6
	Broken base of rail	4	2	6
	Switch (hand operated) stand mechanism defect	3	2	5
	Other frog, switch, track appliance defect	4	1	5
	Mismatched rail-head contour	2	3	5
	Wide gage (loose, broke, etc, gage rods)	2	2	4
	Wide gage (spikes/other rail fasteners)	1	3	4
	Other rail and joint bar defects	3	1	4
	Wide gage (due to worn rails)	1	2	3
	Roadbed settled or soft	1	2	3
	Other track geometry defects	3	.	3
	Joint bolts, broken, or missing	3	.	3
	Retarder yard skate defective	.	2	2
	Track alignment irregular - not buckled/sunkink	1	1	2
	Retarder worn, broken, malfunctioning	1	1	2
	Horizontal split head	1	1	2
	Spring/power switch mechanism malfunction	1	1	2
	Joint bar broken (insulated)	1	1	2
	Switch out of adjustment insufficient anchoring	2	.	2
	Joint bar broken (non-insulated)	2	.	2
	Bolt hole crack or break	2	.	2
	Superelevation improper, excessive, etc.	2	.	2
	Engineering design or construction	2	.	2
	Track alignment irregular (buckled/sunkink)	2	.	2
	Defect/missing spike-other rail fastener	.	1	1
	Deviate from uniform top of rail profile	.	1	1
	Broken weld (field)	1	.	1
	Washout/rain/slide/etc. damage to track	1	.	1
	Derail, defective	1	.	1

Table 1-4
Comparison of Train Accidents in RCL and Conventional Operation by Specific Causes
within each Major Cause Classification
Selected Railroads on Yard And Industry Tracks
For The Period December 2003 Through December 2004

	Causes	Accidents		Total
		Conventional	RCL	
	Head & web separation-in joint bar limit	1	.	1
	Other roadbed defects	1	.	1
	Total	200	75	275
Miscellaneous	Passed couplers (automated classification yard)	17	19	36
	Harmonic rock off, etc.	18	17	35
	Automatic hump retarder failed to slow car	18	6	24
	Failure by non-railroad employee to control speed of car	13	.	13
	Yard skate slid and failed to stop car	7	5	12
	Vandalism of track or track appliances	12	.	12
	Lading chains/straps fouling switches	8	3	11
	Object/equipment on/fouling track, other	6	5	11
	Other miscellaneous causes	9	1	10
	Extreme wind velocity	7	1	8
	Interference (not vandals) with railroad operation	8	.	8
	Snow, ice, mud, gravel, coal, etc. on track	6	1	7
	Other extreme environmental conditions	4	.	4
	Investigation complete, cause could not be determined	2	1	3
	Improperly loaded car	3	.	3
	Load shifted	1	1	2
	Cause under investigation	1	1	2
	Track damage caused by non-railroad interference with track structure	2	.	2
	Vandalism of on-track equipment	2	.	2
	Extreme environmental - FLOOD	2	.	2
	Object/equipment (motor vehicle) on track	1	.	1
	Load fell from car	1	.	1
	Total	148	61	209
Equipment Defects	Other coupler/draft system defects-car	5	4	9
	Truck bolster stiff	3	2	5
	Truck bolster stiff (failure to slew)	4	1	5
	Side bearing clearance insufficient	3	2	5
	Draft gear/mechanism broke/defective	2	2	4
	Center sill broken or bent	4	.	4
	Damaged flange or tread (build up)	3	.	3
	Worn Flange	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 malfunction (stuck brake, etc.)	1	1	2
	Hand brake broken or defective	2	.	2
	Knuckle broken or defective	2	.	2
	Defective snubbing	.	1	1
	Air hose uncoupled or burst	.	1	1
	Other brake defects, (locomotive)	.	1	1
	Center plate broken or defective	.	1	1
	Coupler shank broken/defective	.	1	1
	Loose wheel	1	.	1
	Other locomotive defects	1	.	1
	Bottom outlet door attachment defect	1	.	1
	Side bearing(s) broken	1	.	1
	Other body defects, (car)	1	.	1
	Other brake defects, cars	1	.	1
	Other wheel defects (car)	1	.	1

Table 1-4
Comparison of Train Accidents in RCL and Conventional Operation by Specific Causes
within each Major Cause Classification
Selected Railroads on Yard And Industry Tracks
For The Period December 2003 Through December 2004

	Causes	Accidents		Total
		Conventional	RCL	
	Other truck component defects, (car)	1	.	1
	Broken flange (locomotive)	1	.	1
	Broken rim	1	.	1
	Side bearing clearance excessive	1	.	1
	Broke/bent axle between wheel seats-locomotive	1	.	1
	Other brake component damages, worn, broke, etc.	1	.	1
	Rigging down or dragging	1	.	1
	Total	48	21	69
Signal and Train Control	Classification yard automatic control system retarder failure	10	13	23
	Power switch failure	3	6	9
	Classification yard automatic control system switch failure	3	5	8
	Classification yard automatic control system - Inadequate/insufficient control	4	3	7
	Other signal failures	3	2	5
	Remote control transmitter, loss of communication.	.	1	1
	Other communication equipment failure	.	1	1
	Power device interlocking failure	1	.	1
	Total	24	31	55

Table 1-5
Summary of Train Accidents Involving RCL Operations by Locations within each Railroad
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	2	.	2	.	.	.
	PENSACOLA, Florida	1	.	1	.	.	.
	ATLANTA, Georgia	4	.	4	.	.	.

Table 1-5
Summary of Train Accidents Involving RCL Operations by Locations within each Railroad
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
	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	67	1	49	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	.
	Total	12	.	10	.	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	.	.
	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	.	.

Table 1-5
Summary of Train Accidents Involving RCL Operations by Locations within each Railroad
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
	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	Miscellaneous 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 sufficient hand brakes - railroad employee	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 sufficient hand brakes - railroad employee	18,374	18,374	0
10	12/07/2003	BNSF	BIRMINGHAM	AL	Other impact	Yard/Switch	Human-Fail to apply sufficient hand brakes - railroad employee	123,200	23,200	100,000
11	12/07/2003	UP	NORTHLAKE	IL	Derailment	Yard/Switch	Track-Head and web separation (outside joint bar limit)	9,968	7,768	2,200
12	12/08/2003	BNSF	MEMPHIS	TN	Derailment	Yard/Switch	Signal-Classification yard automatic control system switch failure	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	Miscellaneous -Snow, ice, mud, gravel, coal, etc. on track	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	Miscellaneous - object /equip on/fouling track, other	12,250	4,000	8,250
18	12/13/2003	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Miscellaneous -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, train 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, train 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	Miscellaneous - 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	Miscellaneous - 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	Miscellaneous - 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	Miscellaneous-automatic 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
43	01/12/2004	BNSF	AMARILLO	TX	Other impact	Yard/Switch	Human-Shoving movement, absence of man	40,858	22,858	18,000
44	01/13/2004	BNSF	GALESBURG	IL	Other impact	Yard/Switch	Human-Shoving movement, failure to control	3,352	3,352	0
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	Miscellaneous-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, train 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

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
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 train/yard crew improper	19,150	19,150	0
51	01/17/2004	CSX	LOUISVILLE	KY	Other impact	Yard/Switch	Miscellaneous-automatic 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
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)	Miscellaneous-automatic 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
67	02/07/2004	CSX	CUMBERLAND	MD	Derailment	Yard/Switch	Miscellaneous-object/equipment 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 hand brake – railroad employee	23,622	22,422	1,200
69	02/09/2004	CSX	BUFFALO	NY	Derailment	Yard/Switch	Track-other frog, switch, track 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

Table 1-6
Listing of RCL Related Train Accidents on Yard and Industry Tracks in Chronological Order
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Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
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	Miscellaneous–object/equip on/fouling track, other	16,678	7,047	9,631
79	02/15/2004	UP	NORTH PLATTE	NE	Other impact	Yard/Switch	Signal-Classification yard automatic control system retarder failure	13,155	13,055	100
79	02/15/2004	UP	NORTH PLATTE	NE	Other impact	Cut of Cars	Signal-Classification yard automatic control system retarder failure	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-other 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 (between switch point and 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	Miscellaneous-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
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	Miscellaneous-Passed couplers (automated classification yard)	7,600	1,000	6,600
91	02/21/2004	CSX	CUMBERLAND	MD	Derailment	Cut of Cars	Miscellaneous-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

Table 1-6
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Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
96	02/25/2004	UP	PINE BLUFF	AR	Side collision	Light Loco(s)	Human-Failure to secure engine-railroad employee	935	935	0
96	02/25/2004	UP	PINE BLUFF	AR	Side collision	Yard/Switch	Human-Failure to secure engine-railroad employee	8,338	2,888	5,450
97	02/26/2004	CSX	BIRMINGHAM	AL	Side collision	Yard/Switch	Human-Failure to secure engine-railroad employee	43,040	20,040	23,000
97	02/26/2004	CSX	BIRMINGHAM	AL	Side collision	Cut of Cars	Human-Failure to secure engine-railroad employee	20,916	20,916	0
98	02/26/2004	UP	PINE BLUFF	AR	Other impact	Yard/Switch	Miscellaneous-Passed couplers (automated classification yard)	100	100	0
98	02/26/2004	UP	PINE BLUFF	AR	Other impact	Cut of Cars	Miscellaneous-Passed couplers (automated classification yard)	38,600	0	38,600
98	02/26/2004	UP	PINE BLUFF	AR	Other impact	Single Car	Miscellaneous-Passed couplers (automated classification yard)	3,811	3,811	0
98	02/26/2004	UP	PINE BLUFF	AR	Other impact	Single Car	Miscellaneous-Passed couplers (automated classification yard)	200	200	0
98	02/26/2004	UP	PINE BLUFF	AR	Other impact	Single Car	Miscellaneous-Passed couplers (automated classification yard)	200	200	0
98	02/26/2004	UP	PINE BLUFF	AR	Other impact	Single Car	Miscellaneous-Passed couplers (automated classification yard)	253	253	0
98	02/26/2004	UP	PINE BLUFF	AR	Other impact	Single Car	Miscellaneous-Passed couplers (automated classification yard)	340	340	0
99	02/27/2004	BNSF	PASCO	WA	Derailment	Yard/Switch	Track-alignment irregular-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	Miscellaneous-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
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, train handling	96,696	29,450	67,246
108	03/05/2004	CSX	WALBRIDGE	OH	Derailment	Yard/Switch	Miscellaneous-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	Miscellaneous-Passed couplers (automated classification yard)	22,037	92	21,945
110	03/06/2004	UP	NORTHLAKE	IL	Other impact	Cut of Cars	Miscellaneous-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
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

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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
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 handbrake railroad employee	9,080	9,080	0
120	03/17/2004	UP	HOUSTON	TX	Other impact	Single Car	Human-Fail to secure car handbrake railroad employee	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	Miscellaneous-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
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-Classification yard automatic control system switch failure	31,145	1,145	30,000
132	03/27/2004	BNSF	KANSAS CITY	KS	Derailment	Yard/Switch	Signal-Classification yard automatic control system switch failure	17,100	17,000	100
133	03/27/2004	CSX	COLUMBUS	OH	Derailment	Yard/Switch	Human-Fail to apply sufficient hand brakes-railroad employee	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

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135	03/29/2004	BNSF	GALESBURG	IL	Other impact	Yard/Switch	Equipment-other 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 hand brake - railroad employee	8,670	7,635	1,035
136	03/29/2004	UP	BROOKLYN	OR	Derailment	Cut of Cars	Human-Fail to secure car hand brake - railroad employee	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	Miscellaneous-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	Miscellaneous-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 (between switch point and stock rail)	42,759	38,259	4,500
148	04/10/2004	BNSF	TEMPLE	TX	Side collision	Yard/Switch	Human-Fail to apply sufficient hand brake - railroad employee	38,520	26,420	12,100
148	04/10/2004	BNSF	TEMPLE	TX	Side collision	Yard/Switch	Human-Fail to apply sufficient hand brake - railroad employee	5,400	5,400	0
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
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	Miscellaneous-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 hand brake - railroad employee	27,400	27,400	0
153	04/14/2004	BNSF	WILLMAR	MN	Derailment	Single Car	Human-Fail to secure car hand brake - railroad employee	9,200	9,200	0
154	04/15/2004	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Miscellaneous-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

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158	04/17/2004	CSX	ATLANTA	GA	Other impact	Yard/Switch	Human-Switch improperly lined	32,811	32,311	500
159	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
159	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
160	04/18/2004	BNSF	LINCOLN	NE	Derailment	Yard/Switch	Signal-Classification yard automatic control system retarder failure	33,975	3,975	30,000
161	04/18/2004	CSX	CUMBERLAND	MD	Derailment	Yard/Switch	Miscellaneous-Automatic hump retarder failed to slow car	7,293	7,293	0
162	04/18/2004	UP	KANSAS CITY	KS	Other impact	Light Loco(s)	Human-Coupling speed excessive	27,000	27,000	0
162	04/18/2004	UP	KANSAS CITY	KS	Other impact	Yard/Switch	Human-Coupling speed excessive	1,000	1,000	0
163	04/19/2004	CSX	JACKSONVILLE	FL	Derailment	Yard/Switch	Human-Shoving movement, absence of man	9,629	9,429	200
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
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
167	04/23/2004	BNSF	DENVER	CO	Other impact	Light Loco(s)	Human-Shoving movement, absence of man	1,000	1,000	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-Classification yard automatic control system retarder failure	5,584	4,990	594
169	04/24/2004	UP	HERMISTON	OR	Other impact	Cut of Cars	Signal-Classification yard automatic control system retarder failure	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
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	Miscellaneous-Passed couplers (automated classification yard)	200	200	0
176	05/04/2004	UP	PINE BLUFF	AR	Other impact	Single Car	Miscellaneous-Passed couplers (automated classification yard)	6,112	1,640	4,472
176	05/04/2004	UP	PINE BLUFF	AR	Other impact	Single Car	Miscellaneous-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
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

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
180	05/09/2004	UP	DALLAS	TX	Other impact	Yard/Switch	Human-Fail to apply sufficient hand brakes - railroad employee	16,918	13,918	3,000
180	05/09/2004	UP	DALLAS	TX	Other impact	Cut of Cars	Human-Fail to apply sufficient hand brakes - railroad employee	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	Miscellaneous-Passed couplers (automated classification yard)	2,338	1,174	1,164
185	05/11/2004	UP	PROVISO	IL	Other impact	Cut of Cars	Miscellaneous-Passed couplers (automated classification yard)	8,629	8,629	0
186	05/12/2004	CSX	LOUISVILLE	KY	Derailment	Yard/Switch	Signal-Classification yard automatic control system retarder failure	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 hand brakes - railroad employee	17,102	17,102	0
188	05/14/2004	BRC	BEDFORD PARK	IL	Side collision	Yard/Switch	Human-Fail to secure car hand brakes - railroad employee	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	Miscellaneous-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	Miscellaneous-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 hand brakes - railroad employee	29,311	17,921	11,390
194	05/18/2004	UP	WICHITA	KS	Other impact	Cut of Cars	Human-Fail to secure car hand brakes - railroad employee	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	Miscellaneous-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

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
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
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-Classification yard automatic control system retarder failure	36,241	1,241	35,000
211	05/29/2004	CSX	PENSACOLA	FL	Side collision	Yard/Switch	Human-Fail to secure car hand brake - railroad employee	0	0	0
212	05/30/2004	BNSF	LINCOLN	NE	Raking collision	Yard/Switch	Human-Other train handling/makeup	130,500	20,500	110,000
213	05/30/2004	UP	PINE BLUFF	AR	Other impact	Yard/Switch	Miscellaneous-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	Miscellaneous-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 separation (outside joint bar limit)	80,324	79,403	921
220	06/09/2004	CSX	ROCKY MOUNT	NC	Other impact	Yard/Switch	Human-Fail to secure car hand brake - railroad employee	22,333	21,833	500
221	06/10/2004	BNSF	MEMPHIS	TN	Derailment	Yard/Switch	Human-Buff/slack action excess, train 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 separation (outside joint bar limit)	18,500	3,000	15,500

Table 1-6
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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
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
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
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 (between switch point and stock rail)	8,973	4,932	4,041
228	06/11/2004	UP	PROVISO	IL	Derailment	Cut of Cars	Track-Switch pt gap (between switch point and stock rail)	100	100	0
229	06/12/2004	BNSF	BARSTOW	CA	Derailment	Yard/Switch	Track-Defect/missing spike-other 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
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	Miscellaneous-Other miscellaneous causes	3,000	3,000	0
233	06/14/2004	BNSF	LINCOLN	NE	Raking collision	Yard/Switch	Miscellaneous-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-Classification yard automatic control system switch failure	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 hand brake - railroad employee	18,509	17,708	801
237	06/17/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Human-Fail to secure car hand brake - railroad employee	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-Other coupler/draft system defects-car	80,650	35,650	45,000
239	06/19/2004	BNSF	BARSTOW	CA	Derailment	Yard/Switch	Equipment-Other 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	Miscellaneous-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
244	06/23/2004	BNSF	MEMPHIS	TN	Derailment	Yard/Switch	Human-Instruction to train/yard 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
246	06/26/2004	BNSF	MEMPHIS	TN	Derailment	Yard/Switch	Equipment-Other brake defects, (Locomotive)	23,095	15,077	8,018
247	06/26/2004	BNSF	FRIDLEY	MN	Derailment	Yard/Switch	Track-Deviation from 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	Miscellaneous-Passed couplers (automated classification yard)	26,490	1,490	25,000

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Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
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	Miscellaneous-Passed couplers (automated classification yard)	898	898	0
251	06/28/2004	UP	PINE BLUFF	AR	Other impact	Single Car	Miscellaneous-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, train 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 malfunction (stuck brake, etc.)	7,166	50	7,116
255	07/01/2004	UP	NORTHLAKE	IL	Other impact	Single Car	Equipment-Brake valve malfunction (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	Miscellaneous-Passed couplers (automated classification yard)	11,368	10,868	500
258	07/03/2004	BNSF	BARSTOW	CA	Other impact	Cut of Cars	Miscellaneous-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 sufficient hand brakes – railroad employee	50,169	45,669	4,500
261	07/06/2004	UP	OGDEN	UT	Other impact	Cut of Cars	Human-Fail to apply sufficient hand brakes – railroad employee	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-Classification yard automatic control system retarder failure	2,000	2,000	0
264	07/09/2004	BNSF	BARSTOW	CA	Side collision	Yard/Switch	Signal-Classification yard automatic control system retarder failure	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
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
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-Classification yard automatic control system retarder failure	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	Miscellaneous-Harmonic rock off, etc.	7,061	5,319	1,742

Table 1-6
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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
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	Miscellaneous-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	Miscellaneous-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 hand brake – railroad employee	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	Miscellaneous-Harmonic rock off, etc.	43,070	18,070	25,000
280	07/24/2004	ALS	EAST ST LOUIS	IL	Derailment	Yard/Switch	Miscellaneous-Harmonic rock off, etc.	52,872	26,000	26,872
281	07/24/2004	BNSF	MEMPHIS	TN	Derailment	Yard/Switch	Signal-Classification yard automatic control system switch failure	9,191	7,991	1,200
282	07/27/2004	CSX	FLORENCE	SC	Other impact	Yard/Switch	Human-Instruction to train/yard crew improper	17,150	17,150	0
283	07/27/2004	UP	HOUSTON	TX	Derailment	Yard/Switch	Signal-Power switch failure	30,175	3,968	26,207
284	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
284	07/28/2004	ALS	EAST ST LOUIS	IL	Head on collision	Yard/Switch	Human-Shoving movement, failure to control	0	0	0
285	07/31/2004	BNSF	BIRMINGHAM	AL	Derailment	Yard/Switch	Track-Head and web separation (outside joint bar limit)	30,612	12,126	18,486
286	07/31/2004	BNSF	CLOVIS	NM	Derailment	Yard/Switch	Human-Shoving movement, absence of man	19,015	19,015	0
287	08/01/2004	CRSH	CAMDEN	NJ	Raking collision	Yard/Switch	Human-Switch improperly lined	47,222	46,422	800
287	08/01/2004	CRSH	CAMDEN	NJ	Raking collision	Yard/Switch	Human-Switch improperly lined	21,938	21,938	0
288	08/01/2004	UP	HOUSTON	TX	Side collision	Yard/Switch	Human-Shoving movement, failure to control	81,582	1,982	79,600
288	08/01/2004	UP	HOUSTON	TX	Side collision	Yard/Switch	Human-Shoving movement, failure to control	13,652	13,652	0
289	08/01/2004	UP	EUGENE	OR	Side collision	Yard/Switch	Human-Shoving movement, absence of man	49,085	46,597	2,488
289	08/01/2004	UP	EUGENE	OR	Side collision	Yard/Switch	Human-Shoving movement, absence of man	6,380	6,380	0
290	08/02/2004	UP	SAN ANTONIO	TX	Derailment	Yard/Switch	Signal-Power switch failure	71,636	1,676	69,960
291	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	KCS	PORT ARTHUR	TX	Derailment	Yard/Switch	Human-Failure to couple	13,743	13,500	243
293	08/04/2004	IC	MEMPHIS	TN	Other impact	Cut of Cars	Human-Switch movement, excessive speed	16,000	16,000	0
294	08/04/2004	UP	KANSAS CITY	KS	Derailment	Yard/Switch	Human-Switch improperly lined	13,300	8,300	5,000
295	08/05/2004	UP	ROSEVILLE	CA	Other impact	Yard/Switch	Human-Shoving movement, absence of man	8,214	7,835	379
295	08/05/2004	UP	ROSEVILLE	CA	Other impact	Single Car	Human-Shoving movement, absence of man	4,775	4,775	0
296	08/06/2004	CSX	RIVERDALE	IL	Other impact	Yard/Switch	Human-Shoving movement, failure to control	27,751	27,451	300
297	08/06/2004	UP	DENVER	CO	Derailment	Yard/Switch	Human-Fail to apply sufficient hand brakes - railroad employee	35,549	35,549	0
298	08/08/2004	UP	NORTH PLATTE	NE	Other impact	Light Loco(s)	Human-Shoving movement, failure to control	4,500	4,500	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
298	08/08/2004	UP	NORTH PLATTE	NE	Other impact	Light Loco(s)	Human-Shoving movement, failure to control	4,500	4,500	0
299	08/09/2004	CSX	CINCINNATI	OH	Other impact	Single Car	Human-Failure to couple	11,246	11,246	0
300	08/09/2004	CSX	BIRMINGHAM	AL	Other impact	Yard/Switch	Human-Shoving movement, failure to control	100,800	100,000	800
300	08/09/2004	CSX	BIRMINGHAM	AL	Other impact	Yard/Switch	Human-Shoving movement, failure to control	30,000	30,000	0
301	08/11/2004	BNSF	CICERO	IL	Side collision	Yard/Switch	Human-Switch improperly lined	9,500	6,500	3,000
301	08/11/2004	BNSF	CICERO	IL	Side collision	Yard/Switch	Human-Switch improperly lined	8,000	8,000	0
302	08/11/2004	UP	KANSAS CITY	KS	Derailment	Yard/Switch	Track-Switch damaged or out of adjustment	26,523	25,323	1,200
303	08/11/2004	UP	NORTH PLATTE	NE	Other impact	Yard/Switch	Miscellaneous-Automatic hump retarder failed to slow car	7,500	5,000	2,500
303	08/11/2004	UP	NORTH PLATTE	NE	Other impact	Cut of Cars	Miscellaneous-Automatic hump retarder failed to slow car	7,000	7,000	0
304	08/13/2004	UP	KANSAS CITY	KS	Other impact	Yard/Switch	Human-Shoving movement, absence of man	22,570	22,070	500
305	08/14/2004	BNSF	LOGISTICS PARK	IL	Derailment	Yard/Switch	Human-Fail to apply car hand brakes-railroad employee	29,300	27,800	1,500
305	08/14/2004	BNSF	LOGISTICS PARK	IL	Derailment	Cut of Cars	Human-Fail to apply car hand brakes-railroad employee	2,200	2,200	0
306	08/14/2004	UP	NORTH LAKE	IL	Other impact	Light Loco(s)	Human-Failure to stretch cars before shoving	125,000	125,000	0
306	08/14/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Human-Failure to stretch cars before shoving	16,040	16,040	0
306	08/14/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Human-Failure to stretch cars before shoving	15,106	8,159	6,947
307	08/15/2004	BNSF	MEMPHIS	TN	Derailment	Yard/Switch	Signal-Other signal failures	132,782	132,782	0
308	08/15/2004	UP	DES MOINES	IA	Other impact	Yard/Switch	Human-Other general switching rules	15,001	13,756	1,245
308	08/15/2004	UP	DES MOINES	IA	Other impact	Yard/Switch	Human-Other general switching rules	50	50	0
309	08/16/2004	CSX	ROCKY MOUNT	NC	Derailment	Cut of Cars	Human-Fail to secure car sufficient hand brakes-railroad employee	37,500	37,000	500
310	08/16/2004	UP	KANSAS CITY	MO	Derailment	Yard/Switch	Human-Skate, failure to remove or place	16,380	1,380	15,000
311	08/17/2004	UP	NORTH PLATTE	NE	Other impact	Yard/Switch	Human-Fail to secure car sufficient hand brakes-railroad employee	5,348	5,348	0
311	08/17/2004	UP	NORTH PLATTE	NE	Other impact	Single Car	Human-Fail to secure car sufficient hand brakes-railroad employee	2,039	2,039	0
312	08/18/2004	BNSF	ST ANTHONY	MN	Derailment	Yard/Switch	Human-Switch improperly lined	52,525	10,000	42,525
313	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
314	08/19/2004	UP	PINE BLUFF	AR	Derailment	Yard/Switch	Track-Mismatched rail-head contour	60,460	22,628	37,832
314	08/19/2004	UP	PINE BLUFF	AR	Derailment	Cut of Cars	Track-Mismatched rail-head contour	7,227	7,227	0
315	08/20/2004	BNSF	ALLIANCE	NE	Derailment	Yard/Switch	Human-Shoving movement, absence of man	18,700	15,800	2,900
316	08/20/2004	UP	DENVER	CO	Side collision	Yard/Switch	Human-Shoving movement, absence of man	218	218	0
316	08/20/2004	UP	DENVER	CO	Side collision	Yard/Switch	Human-Shoving movement, absence of man	37,065	37,065	0
317	08/20/2004	UP	DENVER	CO	Derailment	Yard/Switch	Human-Shoving movement, failure to control	11,506	11,506	0
317	08/20/2004	UP	DENVER	CO	Derailment	Yard/Switch	Human-Shoving movement, failure to control	3,034	3,034	0
318	08/20/2004	UP	FIFE	WA	Derailment	Yard/Switch	Human-Switch previously run through	47,976	19,976	28,000

Table 1-6
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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
319	08/22/2004	UP	PINE BLUFF	AR	Derailment	Yard/Switch	Track-Switch point worn or broken	56,598	18,766	37,832
320	08/24/2004	BNSF	WILLMAR	MN	Other impact	Yard/Switch	Human-Failure to couple	15,300	15,300	0
320	08/24/2004	BNSF	WILLMAR	MN	Other impact	Yard/Switch	Human-Failure to couple	1,200	1,200	0
321	08/24/2004	UP	SAN ANTONIO	TX	Broken train collision	Yard/Switch	Equipment-Coupler carrier broken or defective	19,948	19,948	0
322	08/25/2004	UP	LAPORTE	TX	Other impact	Light Loco(s)	Human-Shoving movement, absence of man	40,668	40,668	0
322	08/25/2004	UP	LAPORTE	TX	Other impact	Yard/Switch	Human-Shoving movement, absence of man	15,694	15,694	0
323	08/26/2004	CSX	SAVANNAH	GA	Derailment	Yard/Switch	Human-Shoving movement, absence of man	12,000	12,000	0
324	08/26/2004	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Track-Wide gage (defective/missing crossties)	12,929	1,304	11,625
325	08/28/2004	CSX	JACKSONVILLE	FL	Derailment	Yard/Switch	Human-Switch improperly lined	10,100	10,000	100
326	08/28/2004	UP	LAPORTE	TX	Derailment	Yard/Switch	Human-Switch improperly lined	13,767	11,767	2,000
327	08/30/2004	UP	PORTLAND	OR	Derailment	Yard/Switch	Human-Shoving movement, absence of man	9,800	9,386	414
327	08/30/2004	UP	PORTLAND	OR	Derailment	Yard/Switch	Human-Shoving movement, absence of man	6,863	6,863	0
328	08/30/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Human-Use of brakes, other	25,000	25,000	0
328	08/30/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Human-Use of brakes, other	592	592	0
329	08/31/2004	UP	PORTLAND	OR	Other impact	Yard/Switch	Human-Fail to secure car sufficient hand brakes - railroad employee	7,939	7,525	414
329	08/31/2004	UP	PORTLAND	OR	Other impact	Single Car	Human-Fail to secure car sufficient hand brakes - railroad employee	6,811	6,811	0
330	09/02/2004	UP	PINE BLUFF	AR	Derailment	Yard/Switch	Track-Horizontal split head	23,275	1,200	22,075
331	09/02/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Miscellaneous-Passed couplers (automated classification yard)	673	673	0
331	09/02/2004	UP	NORTHLAKE	IL	Other impact	Cut of Cars	Sufficient hand brakes-railroad employee Passed couplers (automated classification yard)	20,547	20,547	0
332	09/03/2004	UP	PINE BLUFF	AR	Other impact	Yard/Switch	Human-Fail to apply sufficient hand brakes-railroad employee	6,101	6,101	0
332	09/03/2004	UP	PINE BLUFF	AR	Other impact	Cut of Cars	Human-Fail to apply sufficient hand brakes-railroad employee	3,785	3,785	0
333	09/04/2004	UP	KANSAS CITY	KS	Derailment	Yard/Switch	Track-Wide gage (defective/missing crossties)	8,362	6,862	1,500
334	09/04/2004	UP	ROCHELLE	IL	Side collision	Yard/Switch	Human-Shoving movement, absence of man	1,200	1,200	0
335	09/05/2004	CSX	HAMLET	NC	Derailment	Cut of Cars	Human-Fail to release hand brakes-railroad employee	11,650	11,650	0
336	09/06/2004	UP	DENVER	CO	Derailment	Yard/Switch	Human-Shoving movement, absence of man	15,749	15,128	621
336	09/06/2004	UP	DENVER	CO	Derailment	Cut of Cars	Human-Shoving movement, absence of man	13,178	13,178	0
337	09/11/2004	BNSF	BELEN	NM	Other impact	Yard/Switch	Human-Shoving movement, absence of man	3,800	3,800	0
337	09/11/2004	BNSF	BELEN	NM	Other impact	Yard/Switch	Human-Shoving movement, absence of man	7,990	7,990	0
338	09/11/2004	BNSF	BELEN	NM	Other impact	Light Loco(s)	Human-Shoving movement, failure to control	15,941	15,941	0
338	09/11/2004	BNSF	BELEN	NM	Other impact	Cut of Cars	Human-Shoving movement, failure to control	1,900	1,900	0
339	09/12/2004	BNSF	DENVER	CO	Raking collision	Yard/Switch	Human-Kicking or dropping cars, inadequate precautions	5,170	5,170	0

Table 1-6
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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
339	09/12/2004	BNSF	DENVER	CO	Raking collision	Yard/Switch	Human-Kicking or dropping cars, inadequate precautions	7,900	7,900	0
340	09/12/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Miscellaneous-Passed couplers (automated classification yard)	38,951	38,951	0
340	09/12/2004	UP	NORTHLAKE	IL	Other impact	Cut of Cars	Miscellaneous-Passed couplers (automated classification yard)	36,316	36,316	0
341	09/12/2004	UP	DES MOINES	IA	Derailment	Yard/Switch	Equipment-Other coupler/draft system defects-car	7,057	4,937	2,120
342	09/14/2004	UP	FORT WORTH	TX	Derailment	Yard/Switch	Human-Buff/slack action excess, train make-up	30,639	14,139	16,500
343	09/14/2004	UP	EUGENE	OR	Derailment	Yard/Switch	Human-Switch previously run through	89,430	33,952	55,478
344	09/16/2004	UP	SAN ANTONIO	TX	Derailment	Yard/Switch	Human-Fail to control car speed use hand brake – railroad employee	91,414	69,262	22,152
345	09/18/2004	BNSF	DENVER	CO	Raking collision	Light Loco(s)	Human-Shoving movement, absence of man	6,100	6,100	0
345	09/18/2004	BNSF	DENVER	CO	Raking collision	Yard/Switch	Human-Shoving movement, absence of man	18,000	18,000	0
346	09/18/2004	UP	PORTLAND	OR	Other impact	Light Loco(s)	Human-Shoving movement, failure to control	7,979	7,358	621
346	09/18/2004	UP	PORTLAND	OR	Other impact	Single Car	Human-Shoving movement, failure to control	100	100	0
347	09/20/2004	NS	DECATUR	IL	Derailment	Yard/Switch	Human-Switch improperly lined	7,350	5,700	1,650
348	09/20/2004	UP	NORTH PLATTE	NE	Other impact	Yard/Switch	Human-Fail to release hand brake – railroad employee	14,929	14,929	0
348	09/20/2004	UP	NORTH PLATTE	NE	Other impact	Single Car	Human-Fail to release hand brake – railroad employee	6,885	6,885	0
349	09/21/2004	ALS	EAST ST LOUIS	IL	Other impact	Yard/Switch	Human-Other train operation/human factors	186,170	4,500	181,670
349	09/21/2004	ALS	EAST ST LOUIS	IL	Other impact	Cut of Cars	Human-Other train operation/human factors	93,698	93,698	0
350	09/21/2004	UP	MELROSE PARK	IL	Other impact	Yard/Switch	Human-Fail to apply sufficient hand brakes - railroad employee	984	570	414
350	09/21/2004	UP	MELROSE PARK	IL	Other impact	Yard/Switch	Human-Fail to apply sufficient hand brakes - railroad employee	12,414	12,414	0
351	09/22/2004	CSX	WAYCROSS	GA	Side collision	Yard/Switch	Human-Shoving movement, failure to control	8,000	8,000	0
351	09/22/2004	CSX	WAYCROSS	GA	Side collision	Yard/Switch	Human-Shoving movement, failure to control	6,000	6,000	0
352	09/22/2004	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Track-Wide gage (spikes/other rail fasteners)	20,512	10,500	10,012
353	09/23/2004	UP	SAN ANTONIO	TX	Other impact	Yard/Switch	Human-Failure to stretch cars before shoving	30,815	6,924	23,891
353	09/23/2004	UP	SAN ANTONIO	TX	Other impact	Cut of Cars	Human-Failure to stretch cars before shoving	69,547	69,547	0
354	09/24/2004	UP	LAPORTE	TX	Derailment	Yard/Switch	Track-Wide gage (due to worn rails)	22,768	17,871	4,897
355	09/24/2004	UP	HOUSTON	TX	Other impact	Yard/Switch	Human-Shoving movement, absence of man	63,564	61,564	2,000
355	09/24/2004	UP	HOUSTON	TX	Other impact	Yard/Switch	Human-Shoving movement, absence of man	27,594	27,594	0
356	09/26/2004	UP	MILPITAS	CA	Side collision	Yard/Switch	Human-Movement without authority - railroad employee	658	658	0
356	09/26/2004	UP	MILPITAS	CA	Side collision	Yard/Switch	Human-Movement without authority - railroad employee	10,846	10,346	500
357	09/28/2004	UP	NORTH LITTLE ROCK	AR	Derailment	Yard/Switch	Signal-Classification yard automatic control system retarder failure	17,075	2,075	15,000
358	09/28/2004	UP	SALT LAKE CITY	UT	Derailment	Yard/Switch	Human-Shoving movement, absence of man	3,725	3,725	0
358	09/28/2004	UP	SALT LAKE CITY	UT	Derailment	Yard/Switch	Human-Shoving movement, absence of man	12,066	12,066	0
359	09/29/2004	UP	HOUSTON	TX	Other impact	Yard/Switch	Human-Shoving movement, absence of man	27,765	25,425	2,340

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359	09/29/2004	UP	HOUSTON	TX	Other impact	Yard/Switch	Human-Shoving movement, absence of man	1,684	1,684	0
360	09/29/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Human-Shoving movement, absence of man	3,268	3,268	0
360	09/29/2004	UP	NORTHLAKE	IL	Other impact	Cut of Cars	Human-Shoving movement, absence of man	5,508	5,508	0
361	09/30/2004	BNSF	ALLIANCE	TX	Derailment	Yard/Switch	Human-Passed couplers	9,129	9,129	0
362	10/01/2004	CSX	CUMBERLAND	MD	Derailment	Yard/Switch	Track-Wide gage (defective/missing crossties)	7,175	6,675	500
363	10/01/2004	UP	GREEN RIVER	WY	Other impact	Light Loco(s)	Human-Shoving movement, absence of man	10,350	10,000	350
363	10/01/2004	UP	GREEN RIVER	WY	Other impact	Cut of Cars	Human-Shoving movement, absence of man	3,900	3,900	0
364	10/02/2004	BRC	CHICAGO	IL	Derailment	Yard/Switch	Track-Switch (hand op) stand mechanism defect	27,485	21,085	6,400
365	10/02/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Signal-Classification yard automatic control system retarder failure	307	0	307
365	10/02/2004	UP	NORTHLAKE	IL	Other impact	Cut of Cars	Signal-Classification yard automatic control system retarder failure	7,596	7,596	0
366	10/03/2004	CSX	BIRMINGHAM	AL	Other impact	Yard/Switch	Human-Shoving movement, absence of man	10,800	10,000	800
366	10/03/2004	CSX	BIRMINGHAM	AL	Other impact	Yard/Switch	Human-Shoving movement, absence of man	50,000	50,000	0
367	10/04/2004	BNSF	BARSTOW	CA	Derailment	Yard/Switch	Human-Derail, failure to apply or remove	7,016	6,236	780
368	10/06/2004	NS	BIRMINGHAM	AL	Derailment	Yard/Switch	Signal-Remote control transmitter, loss of communication.	23,000	23,000	0
369	10/07/2004	BNSF	PASCO	WA	Derailment	Yard/Switch	Signal-Classification yard automatic control system - Inadequate/insufficient control	21,780	21,780	0
369	10/07/2004	BNSF	PASCO	WA	Derailment	Cut of Cars	Signal-Classification yard automatic control system - Inadequate/insufficient control	1,691	1,691	0
370	10/07/2004	BRC	BEDFORD PARK	IL	Other impact	Single Car	Miscellaneous-Load shifted	9,060	8,650	410
370	10/07/2004	BRC	BEDFORD PARK	IL	Other impact	Single Car	Miscellaneous-Load shifted	100	100	0
371	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	BRC	BEDFORD PARK	IL	Other impact	Single Car	Signal-Classification yard automatic control system retarder failure	10,710	10,000	710
372	10/08/2004	BRC	BEDFORD PARK	IL	Other impact	Single Car	Signal-Classification yard automatic control system retarder failure	200	200	0
373	10/09/2004	BNSF	PASCO	WA	Derailment	Yard/Switch	Human-Switch not latched or locked	64,133	47,133	17,000
374	10/09/2004	CSX	LOUISVILLE	KY	Other impact	Yard/Switch	Miscellaneous-Automatic hump retarder failed to slow car	15,275	15,075	200
375	10/09/2004	MRL	LAUREL	MT	Derailment	Yard/Switch	Track-Spring/power switch mechanism malfunction	10,100	2,000	8,100
376	10/10/2004	UP	EUGENE	OR	Derailment	Light Loco(s)	Human-Switch improperly lined	77,890	2,890	75,000
377	10/12/2004	BNSF	OKLAHOMA CITY	OK	Other impact	Yard/Switch	Human-Other general switching rules	10,100	9,200	900
377	10/12/2004	BNSF	OKLAHOMA CITY	OK	Other impact	Cut of Cars	Human-Other general switching rules	2,100	2,100	0
378	10/12/2004	UP	NORTH LITTLE ROCK	AR	Side collision	Yard/Switch	Human-Other train operation/human factors	8,504	5,195	3,309
378	10/12/2004	UP	NORTH LITTLE ROCK	AR	Side collision	Yard/Switch	Human-Other train operation/human factors	12,857	12,857	0

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Acc Nbr	Date	RR	Nearest Station/City	ST	Type Accident	Equipment	Cause	Total Damage 1/	Equip Damage	Track Damage
379	10/12/2004	UP	OGDEN	UT	Derailment	Yard/Switch	Human-Switch improperly lined	110,079	76,479	33,600
380	10/13/2004	CSX	ATLANTA	GA	Side collision	Yard/Switch	Human-Switch improperly lined	60,000	60,000	0
380	10/13/2004	CSX	ATLANTA	GA	Side collision	Yard/Switch	Human-Switch improperly lined	41,000	41,000	0
381	10/13/2004	UP	SAN ANTONIO	TX	Derailment	Yard/Switch	Human-Other general switching rules	99,727	1,727	98,000
382	10/14/2004	ALS	EAST ST LOUIS	IL	Derailment	Yard/Switch	Miscellaneous-Harmonic rock off, etc.	14,500	14,500	0
383	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	CSX	ATLANTA	GA	Side collision	Yard/Switch	Human-Switch improperly lined	3,687	3,487	200
384	10/14/2004	CSX	ATLANTA	GA	Side collision	Yard/Switch	Human-Switch improperly lined	15,000	15,000	0
385	10/14/2004	UP	STOCKTON	CA	Derailment	Yard/Switch	Human-Switch improperly lined	50,600	1,200	49,400
386	10/15/2004	UP	NORTH LITTLE ROCK	AR	Derailment	Yard/Switch	Human-Switch improperly lined	9,834	9,834	0
387	10/16/2004	UP	SAN ANTONIO	TX	Derailment	Yard/Switch	Signal-Power switch failure	8,702	2,092	6,610
387	10/16/2004	UP	SAN ANTONIO	TX	Derailment	Cut of Cars	Signal-Power switch failure	1,580	1,580	0
388	10/17/2004	BNSF	KANSAS CITY	MO	Derailment	Yard/Switch	Track-Switch point worn or broken	12,700	9,700	3,000
389	10/18/2004	NS	IRONVILLE	OH	Derailment	Yard/Switch	Track-Mismatched rail-head contour	15,250	14,700	550
390	10/18/2004	UP	CHEYENNE	WY	Other impact	Yard/Switch	Human-Shoving movement, absence of man	18,600	100	18,500
390	10/18/2004	UP	CHEYENNE	WY	Other impact	Single Car	Human-Shoving movement, absence of man	334	334	0
391	10/21/2004	BNSF	MEMPHIS	TN	Derailment	Yard/Switch	Miscellaneous-Passed couplers (automated classification yard)	7,001	4,601	2,400
392	10/21/2004	UP	PINE BLUFF	AR	Other impact	Yard/Switch	Miscellaneous-Passed couplers (automated classification yard)	2,827	2,827	0
392	10/21/2004	UP	PINE BLUFF	AR	Other impact	Cut of Cars	Miscellaneous -Passed couplers (automated classification yard)	5,386	299	5,087
392	10/21/2004	UP	PINE BLUFF	AR	Other impact	Single Car	Miscellaneous-Passed couplers (automated classification yard)	299	299	0
393	10/22/2004	UP	NORTH LITTLE ROCK	AR	Derailment	Yard/Switch	Track-Switch point worn or broken	44,524	12,524	32,000
394	10/22/2004	UP	NORTH PLATTE	NE	Other impact	Yard/Switch	Signal-Classification yard automatic control system retarder failure	145,720	16,464	129,256
394	10/22/2004	UP	NORTH PLATTE	NE	Other impact	Cut of Cars	Signal-Classification yard automatic control system retarder failure	28,216	28,216	0
395	10/22/2004	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Signal-Classification yard automatic control system retarder failure	50,184	184	50,000
396	10/23/2004	UP	HOUSTON	TX	Side collision	Yard/Switch	Human-Shoving movement, absence of man	63,888	62,888	1,000
396	10/23/2004	UP	HOUSTON	TX	Side collision	Yard/Switch	Human-Shoving movement, absence of man	29,138	29,138	0
397	10/23/2004	UP	HERMISTON	OR	Derailment	Yard/Switch	Track-Switch point worn or broken	23,353	738	22,615
398	10/23/2004	UP	SALT LAKE CITY	UT	Derailment	Yard/Switch	Human-Switch improperly lined	46,773	1,648	45,125
399	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
399	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

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
400	10/25/2004	CSX	RIVERDALE	IL	Derailment	Yard/Switch	Human-Switch improperly lined	8,922	8,222	700
401	10/26/2004	NS	EVENDALE	OH	Derailment	Yard/Switch	Track-Transverse/compound fissure	47,075	37,075	10,000
401	10/26/2004	NS	EVENDALE	OH	Derailment	Yard/Switch	Track-Transverse/compound fissure	14,300	14,300	0
402	10/28/2004	BNSF	AMARILLO S YARD	TX	Other impact	Yard/Switch	Human-Shoving movement, absence of man	15,830	15,830	0
402	10/28/2004	BNSF	AMARILLO S YARD	TX	Other impact	Yard/Switch	Human-Shoving movement, absence of man	34,933	26,960	7,973
403	10/29/2004	BRC	BEDFORD PARK	IL	Raking collision	Yard/Switch	Track-Wide gage (defective/missing crossties)	7,558	6,358	1,200
403	10/29/2004	BRC	BEDFORD PARK	IL	Raking collision	Cut of Cars	Track-Wide gage (defective/missing crossties)	34,420	3,200	31,220
404	10/29/2004	CSX	ATLANTA	GA	Side collision	Yard/Switch	Human-Shoving movement, failure to control	1,000	1,000	0
404	10/29/2004	CSX	ATLANTA	GA	Side collision	Yard/Switch	Human-Shoving movement, failure to control	7,632	7,632	0
405	10/29/2004	UP	SAN JOSE	CA	Derailment	Yard/Switch	Track-Roadbed settled or soft	114,162	18,113	96,049
406	10/30/2004	CSX	CUMBERLAND	MD	Derailment	Yard/Switch	Track-Vertical split head	21,527	19,527	2,000
407	10/31/2004	UP	FORT WORTH	TX	Derailment	Yard/Switch	Human-Instruction to train/yard crew improper	26,582	20,782	5,800
407	10/31/2004	UP	FORT WORTH	TX	Derailment	Cut of Cars	Human-Instruction to train/yard crew improper	564	564	0
408	11/02/2004	BNSF	GRAND FORKS	ND	Derailment	Yard/Switch	Human-Passed couplers	6,800	400	6,400
409	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
409	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
410	11/03/2004	UP	DALLAS	TX	Derailment	Yard/Switch	Human-Switch improperly lined	93,905	77,905	16,000
411	11/03/2004	UP	KANSAS CITY	KS	Derailment	Yard/Switch	Track-Switch damaged or out of adjustment	7,899	4,899	3,000
412	11/04/2004	UP	OGDEN	UT	Derailment	Yard/Switch	Human-Shoving movement, failure to control	13,623	13,323	300
413	11/06/2004	ALS	EAST ST LOUIS	IL	Derailment	Yard/Switch	Equipment-Side bearing clearance insufficient	28,572	15,600	12,972
414	11/07/2004	BNSF	BELEN	NM	Other impact	Yard/Switch	Human-Shoving movement, absence of man	12,325	12,325	0
414	11/07/2004	BNSF	BELEN	NM	Other impact	Yard/Switch	Human-Shoving movement, absence of man	8,166	8,166	0
415	11/08/2004	CSX	ROCKY MOUNT	NC	Other impact	Single Car	Human-Switch improperly lined	9,200	9,200	0
416	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
416	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
417	11/10/2004	UP	ROSEVILLE	CA	Derailment	Yard/Switch	Miscellaneous-Passed couplers (automated classification yard)	13,012	2,012	11,000
418	11/11/2004	UP	KANSAS CITY	MO	Side collision	Yard/Switch	Miscellaneous-Yard skate slid and failed to stop car	32,924	32,924	0
418	11/11/2004	UP	KANSAS CITY	MO	Side collision	Yard/Switch	Miscellaneous-Yard skate slid and failed to stop car	7,495	7,495	0
419	11/11/2004	UP	OGDEN	UT	Other impact	Yard/Switch	Human-Fail to secure car hand brake - railroad employee	28,179	28,179	0
419	11/11/2004	UP	OGDEN	UT	Other impact	Yard/Switch	Human-Fail to secure car hand brake - railroad employee	29,115	29,115	0
420	11/13/2004	BNSF	AMARILLO	TX	Side collision	Yard/Switch	Human-Other general switching rules	6,453	5,953	500

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
421	11/14/2004	CSX	LOUISVILLE	KY	Derailment	Yard/Switch	Human-Shoving movement, absence of man	15,500	15,500	0
422	11/14/2004	UP	DENVER	CO	Derailment	Yard/Switch	Miscellaneous-Object/equipment on/fouling track, other	185,263	171,893	13,370
423	11/14/2004	UP	PORTLAND	OR	Derailment	Yard/Switch	Human-Failure to stretch cars before shoving	40,426	3,000	37,426
424	11/14/2004	UP	SAN ANTONIO	TX	Derailment	Yard/Switch	Miscellaneous-Object/equipment on/fouling track, other	46,522	1,450	45,072
425	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	UP	FORT WORTH	TX	Derailment	Yard/Switch	Miscellaneous-Passed couplers (automated classification yard)	7,485	2,485	5,000
427	11/17/2004	BNSF	KANSAS CITY	KS	Other impact	Yard/Switch	Human-Instruction to train/yard crew improper	8,900	8,900	0
427	11/17/2004	BNSF	KANSAS CITY	KS	Other impact	Yard/Switch	Human-Instruction to train/yard crew improper	9,400	7,900	1,500
428	11/18/2004	BNSF	KANSAS CITY	KS	Derailment	Yard/Switch	Miscellaneous-Passed couplers (automated classification yard)	85,554	70,554	15,000
428	11/18/2004	BNSF	KANSAS CITY	KS	Derailment	Cut of Cars	Miscellaneous-Passed couplers (automated classification yard)	7,824	7,824	0
429	11/18/2004	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Equipment-Coupler shank broken/defective	26,336	6,336	20,000
430	11/18/2004	UP	NORTH PLATTE	NE	Side collision	Yard/Switch	Equipment-Draft gear/mechanism broke/defective	100	100	0
430	11/18/2004	UP	NORTH PLATTE	NE	Side collision	Yard/Switch	Equipment-Draft gear/mechanism broke/defective	46,720	1,364	45,356
431	11/21/2004	UP	NORTHLAKE	IL	Other impact	Yard/Switch	Human-Retarder, improper manual operation	18,264	18,057	207
431	11/21/2004	UP	NORTHLAKE	IL	Other impact	Cut of Cars	Human-Retarder, improper manual operation	110	110	0
432	11/22/2004	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Human-Switch improperly lined	19,137	18,887	250
433	11/27/2004	UP	ARMOURDALE	KS	Side collision	Yard/Switch	Human-Skate, failure to remove or place	5,193	5,193	0
433	11/27/2004	UP	ARMOURDALE	KS	Side collision	Yard/Switch	Human-Skate, failure to remove or place	6,308	6,308	0
434	11/28/2004	BNSF	HASLET	TX	Derailment	Yard/Switch	Human-Fail to apply car hand brakes - railroad employee	8,800	8,800	0
434	11/28/2004	BNSF	HASLET	TX	Derailment	Yard/Switch	Human-Fail to apply car hand brakes - railroad employee	5,200	5,200	0
435	11/28/2004	UP	PINE BLUFF	AR	Derailment	Yard/Switch	Track-Joint bar broken (insulated)	31,848	848	31,000
436	11/28/2004	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Signal-Classification yard automatic control system retarder failure	172,175	26,047	146,128
437	11/28/2004	UP	SAN ANTONIO	TX	Side collision	Yard/Switch	Human-Shoving movement, absence of man	27,715	21,459	6,256
437	11/28/2004	UP	SAN ANTONIO	TX	Side collision	Yard/Switch	Human-Shoving movement, absence of man	2,944	2,944	0
438	11/28/2004	UP	SAN ANTONIO	TX	Side collision	Yard/Switch	Human-Shoving movement, absence of man	11,697	4,993	6,704
438	11/28/2004	UP	SAN ANTONIO	TX	Side collision	Yard/Switch	Human-Shoving movement, absence of man	1,989	1,989	0
439	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
439	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
440	12/01/2004	UP	ARLINGTON	TX	Derailment	Yard/Switch	Track-Wide gage (spikes/other rail fasteners)	22,735	2,935	19,800
441	12/03/2004	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Track-Switch pt gap (between switch point and stock rail)	80,740	40,237	40,503
442	12/04/2004	UP	HOUSTON	TX	Derailment	Yard/Switch	Miscellaneous-Harmonic rock off, etc.	29,939	598	29,341
443	12/05/2004	BNSF	LINCOLN	NE	Derailment	Yard/Switch	Track-Wide gage (defective/missing crossties)	26,380	9,800	16,580
444	12/05/2004	UP	KANSAS CITY	MO	Side collision	Yard/Switch	Human-Shoving movement, absence of man	18,000	18,000	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
444	12/05/2004	UP	KANSAS CITY	MO	Side collision	Yard/Switch	Human-Shoving movement, absence of man	5,650	5,650	0
445	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	12/08/2004	CSX	HAMLET	NC	Side collision	Light Loco(s)	Human-Shoving movement, failure to control	6,000	5,000	1,000
447	12/09/2004	BNSF	LINCOLN	NE	Derailment	Cut of Cars	Miscellaneous-Yard skate slid and failed to stop car	8,680	180	8,500
448	12/09/2004	BNSF	MEMPHIS	TN	Derailment	Yard/Switch	Human-Buff/slack action excess, train handling	147,010	77,518	69,492
449	12/09/2004	CSX	DEWITT	NY	Derailment	Yard/Switch	Track-Switch point worn or broken	14,257	12,757	1,500
450	12/09/2004	UP	FRESNO	CA	Derailment	Yard/Switch	Human-Switch improperly lined, radio controlled	15,000	5,000	10,000
451	12/11/2004	CSX	LOUISVILLE	KY	Derailment	Cut of Cars	Human-Instruction to train/yard crew improper	43,500	43,300	200
452	12/11/2004	UP	HOUSTON	TX	Derailment	Yard/Switch	Human-Buff/slack action excess, train make-up	80,124	4,624	75,500
453	12/11/2004	UP	HOUSTON	TX	Other impact	Yard/Switch	Human-Shoving movement, failure to control	37,066	1,266	35,800
453	12/11/2004	UP	HOUSTON	TX	Other impact	Yard/Switch	Human-Shoving movement, failure to control	5,932	5,932	0
454	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	UP	KANSAS CITY	MO	Derailment	Yard/Switch	Human-Buff/slack action excess, train handling	81,811	19,311	62,500
456	12/12/2004	UP	PINE BLUFF	AR	Other impact	Yard/Switch	Human-Shoving movement, absence of man	4,656	4,656	0
456	12/12/2004	UP	PINE BLUFF	AR	Other impact	Yard/Switch	Human-Shoving movement, absence of man	9,419	9,419	0
457	12/13/2004	BNSF	INTERBAY	WA	Other impact	Yard/Switch	Human-Switch improperly lined	3,000	3,000	0
457	12/13/2004	BNSF	INTERBAY	WA	Other impact	Cut of Cars	Human-Switch improperly lined	7,000	7,000	0
458	12/13/2004	NS	BIRMINGHAM	AL	Raking collision	Yard/Switch	Human-Failure to stop train in clear	17,600	17,500	100
458	12/13/2004	NS	BIRMINGHAM	AL	Raking collision	Yard/Switch	Human-Failure to stop train in clear	10,000	10,000	0
459	12/14/2004	UP	PINE BLUFF	AR	Derailment	Light Loco(s)	Track-Broken base of rail	6,391	6,391	0
459	12/14/2004	UP	PINE BLUFF	AR	Derailment	Yard/Switch	Track-Broken base of rail	41,768	24,659	17,109
460	12/15/2004	CSX	WAYCROSS	GA	Derailment	Yard/Switch	Miscellaneous-Passed couplers (automated classification yard)	10,309	8,809	1,500
461	12/15/2004	UP	LIVONIA	LA	Side collision	Yard/Switch	Human-Instruction to train/yard crew improper	12,200	12,200	0
461	12/15/2004	UP	LIVONIA	LA	Side collision	Yard/Switch	Human-Instruction to train/yard crew improper	4,200	4,200	0
462	12/16/2004	BRC	BEDFORD PARK	IL	Other impact	Cut of Cars	Human-Fail to release hand brake - railroad employee	10,584	9,164	1,420
463	12/18/2004	ALS	EAST ST LOUIS	IL	Derailment	Yard/Switch	Miscellaneous-Harmonic rock off, etc.	83,512	51,600	31,912
464	12/18/2004	BRC	BEDFORD PARK	IL	Other impact	Cut of Cars	Miscellaneous-Cause under investigation	19,424	19,424	0
465	12/18/2004	UP	NORTH PLATTE	NE	Side collision	Yard/Switch	Human-Shoving movement, absence of man	33,799	5,312	28,487
465	12/18/2004	UP	NORTH PLATTE	NE	Side collision	Yard/Switch	Human-Shoving movement, absence of man	5,000	5,000	0
466	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

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	UP	HOUSTON	TX	Other impact	Yard/Switch	Signal-Other communication equipment failure	10,512	5,512	5,000
467	12/20/2004	UP	HOUSTON	TX	Other impact	Yard/Switch	Signal-Other communication equipment failure	18,219	18,219	0
468	12/20/2004	UP	NORTH PLATTE	NE	Derailment	Yard/Switch	Track-Switch pt gap (between switch point and stock rail)	33,017	28,591	4,426
469	12/22/2004	BNSF	DENVER	CO	Other impact	Yard/Switch	Human-Shoving movement, absence of man	5,000	5,000	0
469	12/22/2004	BNSF	DENVER	CO	Other impact	Yard/Switch	Human-Shoving movement, absence of man	13,514	13,514	0
470	12/26/2004	BNSF	KANSAS CITY	MO	Derailment	Yard/Switch	Miscellaneous-Harmonic rock off, etc.	15,558	14,558	1,000
471	12/26/2004	UP	ROSEVILLE	CA	Derailment	Yard/Switch	Human-Switch improperly lined	75,965	55,965	20,000
472	12/27/2004	UP	HOUSTON	TX	Side collision	Yard/Switch	Human-Shoving movement, absence of man	4,425	3,450	975
472	12/27/2004	UP	HOUSTON	TX	Side collision	Yard/Switch	Human-Shoving movement, absence of man	8,293	8,293	0
473	12/31/2004	UP	NORTHLAKE	IL	Side collision	Yard/Switch	Human-Shoving movement, absence of man	30,625	16,730	13,895
473	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 and Conventional Operations
Selected Railroads on Yard And Industry Tracks
For the Period December 2003 through December 2004

		Train Accidents Involving Transportation of Hazmat				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.	207	115	5	1	1,543	241	6	2,075
	**Total	343	191	9	2	2,724	397	11	2,215
--Type Track									
Yard	RCL	134	75	4	1	1,166	155	5	140
	Conv.	191	105	4	1	1,417	221	4	2,075
Industry	RCL	2	1	0	0	15	1	0	0
	Conv.	16	10	1	0	126	20	2	0
--Type Accident									
Derailment	RCL	69	44	2	0	484	88	2	0
	Conv.	116	70	2	1	970	157	2	2,075
Side collision	RCL	24	11	1	0	269	17	1	0
	Conv.	18	7	0	0	97	10	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
Other impact	RCL	36	16	1	1	378	43	2	140
	Conv.	65	32	1	0	442	62	1	0
Other event	Conv.	3	3	1	0	8	5	2	0
--Primary Cause									
Equipment	RCL	6	4	0	0	52	11	0	0
	Conv.	7	4	1	0	15	5	1	0
Human	RCL	82	42	3	1	699	71	4	140
	Conv.	128	73	0	0	1,037	160	0	0
Miscellaneous	RCL	17	9	0	0	85	18	0	0
	Conv.	30	13	2	0	155	21	3	0
Signal	RCL	12	7	0	0	154	15	0	0
	Conv.	9	5	1	1	31	9	1	2,075
Track	RCL	19	14	1	0	191	41	1	0
	Conv.	33	20	1	0	305	46	1	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 each RCL Train Accident Involving the Release of Hazardous Material
In Chronological Order
On Yard And Industry Tracks - For the Period December 2003 through December 2004

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

Table 3-1
Comparison of Employee on Duty RCL and Convention Switching Related Injuries on Yard and Industry Tracks
Injury Rates for the Industry and Individual Railroads
For the Period December 2003 through December 2004 (Yard Switching Crafts Only)

Railroads	Cases				Yard Switching Miles			Injury Rate	
	RCL Op.	Conv. Op.	Total	% RCL Op.	RCL Op.	Conv. Op.	Total	RCL Op.	Conv. Op.
Grand Total	137	403	540	25.4	21,097,583	49,513,963	70,611,546	6.49	8.14
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]	29	63	92	31.5	5,026,175	9,708,587	14,734,762	5.77	6.49
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	126	146	13.7	4,851,944	8,127,775	12,979,719	4.12	15.50
Elgin, Joliet & Eastern Rwy Co. [EJE]	-	7	7	0.0	44,936	233,372	278,308	-	30.00
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]	-	18	18	0.0	66,541	2,559,672	2,626,213	-	7.03
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]	-	29	29	0.0	339,451	934,253	1,273,704	-	31.04
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]	-	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	5	10	50.0	280,059	218,782	498,841	17.85	22.85
Nebraska Central RR [NCRC]	-	-	-	-	2,312	20,597	22,909	-	-
Norfolk Southern Corp. [NS]	-	45	45	0.0	866,592	13,070,316	13,936,908	-	3.44
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	66	135	51.1	8,040,837	8,875,851	16,916,688	8.58	7.44
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]	-	11	11	0.0	71,148	1,459,612	1,530,760	-	7.54
Wheeling & Lake Erie Rwy Co. [WE]	-	-	-	-	15,398	261,020	276,418	-	-
Willamette & Pacific RR, Inc. [WPRR]	-	-	-	-	25,040	62,835	87,875	-	-
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 3-2
Comparison of Employee on Duty RCL and Conventional Switching Related Injuries
by Month and Type of Injury
on Yard and Industry Tracks
For the Period December 2003 through December 2004 (Yard Switching Crafts Only)

	Nonfatal		Fatalities		Total Cases	
	RCL	Conventional	RCL	Conventional	RCL	Conventional
Total	135	401	2	2	137	403
--YEAR/MONTH---						
2003-12	12	25	1	.	13	25
2004-01	11	43	.	1	11	44
2004-02	15	31	.	.	15	31
2004-03	12	29	.	.	12	29
2004-04	7	26	.	.	7	26
2004-05	7	35	.	.	7	35
2004-06	15	37	.	.	15	37
2004-07	14	28	.	.	14	28
2004-08	9	37	.	.	9	37
2004-09	8	33	1	.	9	33
2004-10	10	18	.	1	10	19
2004-11	10	34	.	.	10	34
2004-12	5	25	.	.	5	25
--INJURIES---						
****Fatal	.	.	2	2	2	2
Bruise/contusion	20	56	.	.	20	56
Occupational Illness	1	.	.	.	1	.
Crushing injury	.	1	.	.	.	1
Sprain/Strain, arm/hand	6	23	.	.	6	23
Sprain/Strain, leg/foot	24	86	.	.	24	86
Sprain/Strain, head/face	4	15	.	.	4	15
Sprain/Strain, torso	36	99	.	.	36	99
Sprain/Strain, other	.	4	.	.	.	4
Cut/abrasion	12	31	.	.	12	31
Puncture wound	1	2	.	.	1	2
Other burn	.	1	.	.	.	1
Dislocation	3	3	.	.	3	3
Fracture, arm/hand	7	16	.	.	7	16
Fracture, leg/foot	3	13	.	.	3	13
Fracture, torso	3	4	.	.	3	4
Rupture/tear, tendon, etc.	2	7	.	.	2	7
Gunshot/knife wound	.	1	.	.	.	1
Animal/snake/insect bite	2	2	.	.	2	2
Dental related	2	1	.	.	2	1
Amputation, arm/hand	.	2	.	.	.	2
Amputation, leg/foot	3	1	.	.	3	1
Object in eye	2	8	.	.	2	8
Hernia	.	6	.	.	.	6
Concussion	.	2	.	.	.	2
Skin reaction	.	2	.	.	.	2
One-time exp. to noise	1	1	.	.	1	1
Unspecified injury	3	14	.	.	3	14

Table 3-3
Comparison of Employee on Duty RCL and Conventional Switching Related Injuries
by Craft Job Titles
on Yard and Industry Tracks
For the Period December 2003 through December 2004 (Yard Switching Crafts Only

	Nonfatal		Fatalities		Total Cases	
	RCL	Conventional	RCL	Conventional	RCL	Conventional
Total	135	401	2	2	137	403
--CRAFT---						
Road freight conductors (through freight)	3	.	.	.	3	.
Yard conductors and yard foremen	3	166	.	2	3	168
Yard brakemen and yard helpers	2	162	.	.	2	162
Road freight engineers (through freight)	2	.	.	.	2	.
Road freight engineers (local and way freight)	1	.	.	.	1	.
Yard engineers	1	73	.	.	1	73
Remote control locomotive operator-operating	51	.	1	.	52	.
Remote control locomotive operator-not operating	72	.	1	.	73	.

Table 3-4
Comparison of Employee on Duty RCL and Conventional Switching Related Injuries – By States
on Yard And Industry Tracks
For The Period December 2003 Through December 2004 (Yard Switching Crafts Only)

	Nonfatal		Fatalities		Total Cases	
	RCL	Conventional	RCL	Conventional	RCL	Conventional
Total	135	401	2	2	137	403
Alabama	1	8	.	.	1	8
Arizona	1	7	.	.	1	7
Arkansas	4	.	.	.	4	.
California	10	10	.	.	10	10
Colorado	7	3	.	.	7	3
Florida	2	16	.	.	2	16
Georgia	.	19	.	.	.	19
Idaho	.	3	.	.	.	3
Illinois	20	36	.	1	20	37
Indiana	2	10	.	.	2	10
Iowa	.	7	.	.	.	7
Kansas	4	5	.	.	4	5
Kentucky	2	10	.	.	2	10
Louisiana	1	31	.	.	1	31
Maryland	2	2	.	.	2	2
Massachusetts	.	1	.	.	.	1
Michigan	.	10	.	.	.	10
Minnesota	5	4	.	.	5	4
Mississippi	.	9	.	.	.	9
Missouri	4	9	.	.	4	9
Montana	5	5	.	.	5	5
Nebraska	9	3	.	.	9	3
New Jersey	.	6	.	.	.	6
New Mexico	1	2	1	.	2	2
New York	1	7	.	.	1	7
North Carolina	3	9	.	.	3	9
North Dakota	3	1	.	.	3	1
Ohio	7	41	.	.	7	41
Oklahoma	1	5	.	.	1	5
Oregon	8	4	.	.	8	4
Pennsylvania	.	20	.	1	.	21
South Carolina	.	9	.	.	.	9
Tennessee	3	24	.	.	3	24
Texas	18	26	1	.	19	26
Utah	5	4	.	.	5	4
Virginia	.	6	.	.	.	6
Washington	2	8	.	.	2	8
West Virginia	.	4	.	.	.	4
Wisconsin	2	14	.	.	2	14
Wyoming	2	3	.	.	2	3

Table 3-5
Comparison of Employee on Duty RCL and Conventional Switching Related Injuries
by Location of Injured Employee at Time of Accident
on Yard ad Industry Tracks
For the Period December 2003 Through December 2004 (Yard Switching Crafts Only)

	Nonfatal		Fatalities		Total Cases	
	RCL	Conventional	RCL	Conventional	RCL	Conventional
Total	135	401	2	2	137	403
--LOCATION---						
Alongside of on-track equipment on ground	28	85	.	2	28	87
Beside track	28	72	.	.	28	72
In cab or on walkways of locomotive	19	65	.	.	19	65
On side of car	21	53	.	.	21	53
On end of car	9	41	1	.	10	41
Between tracks	9	18	.	.	9	18
Between cars/locomotives	6	20	.	.	6	20
Other location on locomotive	5	13	.	.	5	13
On track	1	7	1	.	2	7
Other location	1	5	.	.	1	5
On highway-rail crossing	1	5	.	.	1	5
On platform	1	4	.	.	1	4
On ladder	3	2	.	.	3	2
In/operating vehicle	1	4	.	.	1	4
At work station	1	2	.	.	1	2
In car	.	2	.	.	.	2
In elevator	.	1	.	.	.	1
Under locomotive	.	1	.	.	.	1
Depot	.	1	.	.	.	1
On stairs	1	.	.	.	1	.
-- MOTORIZED EQUIPMENT---						
Freight car(s)-standing	24	113	.	.	24	113
Did not involve on-track/other equipment	25	81	.	.	25	81
Freight car(s)-moving	25	56	.	.	25	56
Freight train-standing	15	32	.	.	15	32
Freight train-moving	3	36	.	2	3	38
Locomotive(s)-standing	.	40	.	.	.	40
Locomotive(s)-moving	.	31	.	.	.	31
Locomotive(s), remote control-moving	24	.	2	.	26	.
Locomotive(s), remote control-standing	17	.	.	.	17	.
Van (passenger)	.	4	.	.	.	4
Taxi/commercial vehicle	1	1	.	.	1	1
Automobile	.	2	.	.	.	2
Passenger car(s)-standing	.	1	.	.	.	1
Other on-track equipment-standing	.	1	.	.	.	1
Truck	.	1	.	.	.	1
Van (utility)	.	1	.	.	.	1
Camp car-moving	.	1	.	.	.	1
Off road vehicle-industrial	1	.	.	.	1	.

Table 3-6
Comparison of Employee on Duty RCL and Convention Switching Related Injuries
by Physical Act Involved in at Time of Accident
on Yard and Industry Tracks
For The Period December 2003 Through December 2004 (Yard Switching Crafts Only)

Activity	Accidents				Accident Rate		
	RCL Op.	Conv. Op.	Total	% RCL Op.	RCL Op.	Conv. Op.	Combined
Grand Total	137	403	540	25.4	6.49	8.14	7.65
Walking	36	87	123	29.3	1.71	1.76	1.74
Riding	25	49	74	33.8	1.18	0.99	1.05
Getting off	12	30	42	28.6	0.57	0.61	0.59
Lining switches	7	30	37	18.9	0.33	0.61	0.52
Pulling pin lifter/operating uncoupling	11	16	27	40.7	0.52	0.32	0.38
Handbrakes, applying	3	22	25	12.0	0.14	0.44	0.35
Sitting	8	16	24	33.3	0.38	0.32	0.34
Standing	7	17	24	29.2	0.33	0.34	0.34
Operating	1	17	18	5.6	0.05	0.34	0.25
Handbrakes, releasing	3	12	15	20.0	0.14	0.24	0.21
Jumping from	2	8	10	20.0	0.09	0.16	0.14
Stepping down	1	9	10	10.0	0.05	0.18	0.14
Adjusting drawbar	2	6	8	25.0	0.09	0.12	0.11
Climbing over/on	3	5	8	37.5	0.14	0.10	0.11
Coupling air hose	1	7	8	12.5	0.05	0.14	0.11
Descending	2	6	8	25.0	0.09	0.12	0.11
Adjusting coupler	4	3	7	57.1	0.19	0.06	0.10
Getting on	-	7	7	-	-	0.14	0.10
Opening/closing angle cock	1	5	6	16.7	0.05	0.10	0.08
Getting out	-	5	5	-	-	0.10	0.07
Stepped on	1	4	5	20.0	0.05	0.08	0.07
Bending, stooping	-	4	4	-	-	0.08	0.06
Closing	-	4	4	-	-	0.08	0.06
Opening	-	3	3	-	-	0.06	0.04
Pulling	-	3	3	-	-	0.06	0.04
Running	-	3	3	-	-	0.06	0.04
Stepping up	-	3	3	-	-	0.06	0.04
Other (Narrative must be provided)	-	3	3	-	-	0.06	0.04
Ascending	-	3	3	-	-	0.06	0.04
Adjusting, other	-	2	2	-	-	0.04	0.03
Crossing over	-	2	2	-	-	0.04	0.03
Crossing between	2	-	2	100.0	0.09	0.00	0.03
Stepping over	-	2	2	-	-	0.04	0.03
Derail, applying	1	1	2	50.0	0.05	0.02	0.03
Driving (motor vehicle, forklift, etc.)	-	1	1	-	-	0.02	0.01
Handling car parts	1	-	1	100.0	0.05	0.00	0.01
Handling locomotive parts	-	1	1	-	-	0.02	0.01
Inspecting	-	1	1	-	-	0.02	0.01
Jumping onto	1	-	1	100.0	0.05	0.00	0.01
Lifting other material	-	1	1	-	-	0.02	0.01
Reaching	-	1	1	-	-	0.02	0.01
Uncoupling air hose	-	1	1	-	-	0.02	0.01
Using hand tool	1	-	1	100.0	0.05	0.00	0.01
Using, other	-	1	1	-	-	0.02	0.01
Derail, removing	1	-	1	100.0	0.05	0.00	0.01
Replacing	-	1	1	-	-	0.02	0.01
Moving	-	1	1	-	-	0.02	0.01

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

Table 3-7
Summary of Employee on Duty RCL Operators Injured when Riding on side or ends of cars
and while Operating the RCL
on Yard and Industry Tracks
For the Period December 2003 through December 2004

Job Remote control locomotive operator –operating

Location 1	Location 2	Event	Activity	Injury
On side of car	Freight car(s) - standing	Overexertion	Climbing over/on	1
			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 3-8
Summary of Employee on Duty RCL Operators Injured when Riding on side or ends of cars
but NOT Operating the RCL
on Yard And Industry Tracks
For the Period December 2003 through December 2004

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 3-9
Listing of Casualties to Employees on Duty Associated With RCL Operations
on Yard and Industry Tracks
For the Period December 2003 through December 2004

Nbr	Date	RR	County	State	Physical Condition	General activity	Job	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- ot 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
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

Table 3-9
Listing of Casualties to Employees on Duty Associated With RCL Operations
on Yard and Industry Tracks
For the Period December 2003 through December 2004

Nbr	Date	RR	County	State	Physical Condition	General activity	Job	Days Absent	Days Restricted	Age
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
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

Table 3-9
Listing of Casualties to Employees on Duty Associated With RCL Operations
on Yard and Industry Tracks
For the Period December 2003 through December 2004

Nbr	Date	RR	County	State	Physical Condition	General activity	Job	Days Absent	Days Restricted	Age
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
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

Table 3-9
Listing of Casualties to Employees on Duty Associated With RCL Operations
on Yard and Industry Tracks
For the Period December 2003 through December 2004

Nbr	Date	RR	County	State	Physical Condition	General activity	Job	Days Absent	Days Restricted	Age
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
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 3-9
Listing of Casualties to Employees on Duty Associated With RCL Operations
on Yard and Industry Tracks
For the Period December 2003 through December 2004

Nbr	Date	RR	County	State	Physical Condition	General activity	Job	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
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

Table 3-9
Listing of Casualties to Employees on Duty Associated With RCL Operations
on Yard and Industry Tracks
For the Period December 2003 through December 2004

Nbr	Date	RR	County	State	Physical Condition	General activity	Job	Days Absent	Days Restricted	Age
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, grab-iron, step, etc., Getting off	Remote control locomotive operator - not operating	0	0	56
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	203	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	180	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

Table 3-9
Listing of Casualties to Employees on Duty Associated With RCL Operations
on Yard and Industry Tracks
For the Period December 2003 through December 2004

Nbr	Date	RR	County	State	Physical Condition	General activity	Job	Days Absent	Days Restricted	Age
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	180	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	09/28/2004	CSX	VANDERBURGH	IN	Sprain/strain, knee	Slipped, fell, stumbled, other, Walking	Road freight engineers (local and way freight)	59	0	34
113	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
114	10/06/2004	BNSF	FRESNO	CA	Sprain/strain, wrist	Aggravated pre-existing condition, Getting off	Remote control locomotive operator - not operating	140	0	41
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	38	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	158	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	48	0	28

Table 3-9
Listing of Casualties to Employees on Duty Associated With RCL Operations
on Yard and Industry Tracks
For the Period December 2003 through December 2004

Nbr	Date	RR	County	State	Physical Condition	General activity	Job	Days Absent	Days Restricted	Age
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	141	0	31
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	99	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	0	107	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	89	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	23	0	43

Table 4-1
Comparison RCL and Convention Switching Related Highway-Rail Grade Crossing Accidents
Accident Rates for the Industry and Individual Railroads
on Yard and Industry Tracks
For the Period December 2003 through December 2004

Railroads	Accidents				Yard Switching Miles			Accident Rate	
	RCL Op.	Conv. Op.	Total	% RCL Op.	RCL Op.	Conv. Op.	Total	RCL Op.	Conv. Op.
Grand Total	14	183	197	7.1	21,097,583	49,513,963	70,611,546	0.66	3.70
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	33	39	15.4	5,026,175	9,708,587	14,734,762	1.19	3.40
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]	-	13	-	-	93,796	1,875,632	1,969,428	-	6.93
CSX Transportation [CSX]	-	18	-	-	4,851,944	8,127,775	12,979,719	-	2.21
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]	-	1	-	-	66,541	2,559,672	2,626,213	-	0.39
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]	-	10	-	-	339,451	934,253	1,273,704	-	10.70
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]	-	2	-	-	280,059	218,782	498,841	-	9.14
Nebraska Central RR [NCRC]	-	-	-	-	2,312	20,597	22,909	-	-
Norfolk Southern Corp. [NS]	-	41	-	-	866,592	13,070,316	13,936,908	-	3.14
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]	8	52	60	13.3	8,040,837	8,875,851	16,916,688	0.99	5.86
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]	-	2	-	-	71,148	1,459,612	1,530,760	-	1.37
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 I.D.	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	ALLIANCE	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	03/19/2004	UP	KS	KANSAS CITY	429475G	Train pushing-RCL	Yard/Switch	Industry	0	0
6	06/01/2004	BNSF	NM	CLOVIS	RRYARD	Train pulling-RCL	Yard/Switch	Yard	0	0
7	08/02/2004	UP	CA	MILPITAS	833901Y	Train pushing-RCL	Yard/Switch	Industry	0	0
8	08/21/2004	UP	NE	NORTH PLATTE	RRYARD	Train pushing-RCL	Yard/Switch	Yard	0	0
9	10/09/2004	BNSF	TN	MEMPHIS	663417C	Train pulling-RCL	Yard/Switch	Yard	0	1
10	11/21/2004	BNSF	MN	MINNEAPOLIS	061227K	Train pushing-RCL	Yard/Switch	Industry	0	0
11	11/28/2004	BNSF	WA	SEATTLE	101136S	Train pushing-RCL	Yard/Switch	Yard	0	0
12	11/30/2004	BNSF	WA	SEATTLE	096448L	Train pulling-RCL	Yard/Switch	Yard	0	0
13	12/21/2004	UP	CA	BENICIA	751516S	Train pushing-RCL	Yard/Switch	Yard	0	0
14	12/22/2004	UP	AR	PINE BLUFF	748338E	Train pushing-RCL	Yard/Switch	Industry	0	0

Appendix 2 - 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:

1) A comparative risk assessment of RCL and conventional yard switching operations.
2) Focus groups with RCOs to identify safety issues and best practices.
3) 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 beltpack 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), or 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 beltpack safety features can be bypassed inadvertently
The beltpack is designed to require the manipulation of two controls before initiating movement of the RCL. This feature prevents the locomotive from moving in the event one control is accidentally bumped. Some RCOs described a situation where it is possible to place the speed control dial to the stop position and, before the locomotive stops, place the speed control dial from stop to a desired speed and continue to move. In this situation, the safety feature is bypassed. 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.

3. 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 beltpack 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.

4. 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 factor-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 factor 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 factor* 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.

Appendix 3 - Description of RCL and Conventional Switching Operation Fatalities

RCL Operations

1. December 7, 2003-Sunday - Union Pacific (UP), San Antonio, Texas
A 36-year-old remote control locomotive switching foreman was struck and killed by his locomotive at the West end of UP's East yard. The employee had reversed one end of a crossover switch and was walking toward the other end of the crossover switch to line it when he was struck from behind by the RCL. The foreman had started the RCL moving as he was walking toward the other end of the crossover.

2. September 2, 2004-Thursday - Burlington Northern Santa Fe (BNSF), Clovis, New Mexico
A 26-year-old switchman died when he jumped from the leading end of a tank car as it derailed during a switching move. The switchman was riding the leading end of a tank car and was accompanied by the foreman who was controlling the movement. As the car began to traverse a switch, it derailed. As a result, the switchman jumped from the car and was run over by the derailed tank car before it stopped.

Conventional Operation

1. January 14, 2004 – Wednesday - Norfolk Southern (NS), Kankakee, Illinois
A 40-year-old conductor was struck and killed while switching cars during his yard assignment. The conductor was in the process of uncoupling one car from another while under movement when he was run over by the following car.

2. October 4, 2004 – Monday - Norfolk Southern (NS), Harrisburg, Pennsylvania
A 58-year-old conductor was struck and killed by a shoving movement of another assignment when he stepped in front of the shoved cars. He was engaged in directing his assignment's movement into another track and inadvertently stepped into the path of the shoved cars.

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