

Table A1.1: Relationship Between FRA Accident Causes and Cause Groups

Cause Code	Train Mile/Car Mile	Cause Group	Description
TRACK, ROADBED AND STRUCTURES			
Roadbed			
T001	TM	01T	T001 Roadbed settled or soft
T002	TM	02T	T002 Washout/rain/slide/flood/snow/ice damage to track
T099	TM	01T	T099 Other roadbed defects (Provide detailed description in narrative)
Track Geometry			
T101	TM	04T	T101 Cross level of track irregular (at joints)
T102	TM	04T	T102 Cross level of track irregular (not at joints)
T103	TM	04T	T103 Deviation from uniform top of rail profile
T104	TM	04T	T104 Disturbed ballast section
T105	TM	04T	T105 Insufficient ballast section
T106	TM	04T	T106 Superelevation improper, excessive, or insufficient
T107	TM	04T	T107 Superelevation runoff improper
T108	TM	04T	T108 Track alignment irregular (other than buckled/sunkink)
T109	CM	05T	T109 Track alignment irregular (buckled/sunkink)
T110	TM	03T	T110 Wide gage (due to defective or missing crossties)
T111	TM	03T	T111 Wide gage (due to defective or missing spikes or other rail fasteners)
T112	TM	03T	T112 Wide gage (due to loose, broken, or defective gage rods)
T113	TM	03T	T113 Wide gage (due to worn rails)
T199	TM	04T	T199 Other track geometry defects (Provide detailed description in narrative)
Rail, Joint Bar and Rail Anchoring			
T201	CM	06T	T201 Bolt hole crack or break
T202	CM	08T	T202 Broken base of rail
T203	CM	08T	T203 Broken weld (plant)
T204	CM	08T	T204 Broken weld (field)
T205	TM	12T	T205 Defective or missing crossties (use code T110 if results in wide gage)
T206	TM	12T	T206 Defective spikes or missing spikes or other rail fasteners (use code T111 if results in wide gage)
T207	CM	08T	T207 Detail fracture from shelling or head check
T208	CM	08T	T208 Engine burn fracture
T210	CM	08T	T210 Head and web separation (outside joint bar limits)
T211	CM	06T	T211 Head and web separation (within joint bar limits)
T212	CM	08T	T212 Horizontal split head
T213	CM	07T	T213 Joint bar broken (compromise)
T214	CM	07T	T214 Joint bar broken (insulated)
T215	CM	07T	T215 Joint bar broken (noninsulated)
T216	CM	07T	T216 Joint bolts, broken, or missing
T217	CM	12T	T217 Mismatched rail-head contour
T218	CM	08T	T218 Piped rail
T219	CM	08T	T219 Rail defect with joint bar repair
T220	CM	08T	T220 Transverse/compound fissure
T221	CM	08T	T221 Vertical split head
T222	TM	12T	T222 Worn rail
T223	TM	12T	T223 Rail condition - dry rail, fresh ground rail
T299	CM	09T	T299 Other rail and joint bar defects (Provide detailed description in narrative)
Frogs, Switches and Track Appliances			
T301	TM	12T	T301 Derail, defective
T302	TM	12T	T302 Expansion joint failed or malfunctioned
T303	TM	12T	T303 Guard rail loose/broken or mislocated
T304	CM	11T	T304 Railroad crossing frog, worn or broken
T305	TM	12T	T305 Retarder worn, broken, or malfunctioning
T306	TM	12T	T306 Retarder yard skate defective
T307	CM	10T	T307 Spring/power switch mechanism malfunction
T308	CM	10T	T308 Stock rail worn, broken or disconnected
T309	CM	10T	T309 Switch (hand operated) stand mechanism broken, loose, or worn
T310	CM	10T	T310 Switch connecting or operating rod is broken or defective
T311	CM	10T	T311 Switch damaged or out of adjustment
T312	CM	10T	T312 Switch lug/crank broken
T313	CM	10T	T313 Switch out of adjustment because of insufficient rail anchoring
T314	CM	10T	T314 Switch point worn or broken
T315	CM	10T	T315 Switch rod worn, bent, broken, or disconnected
T316	CM	11T	T316 Turnout frog (rigid) worn, or broken
T317	CM	11T	T317 Turnout frog (self guarded), worn or broken
T318	CM	11T	T318 Turnout frog (spring) worn, or broken
T319	CM	10T	T319 Switch point gapped (between switch point and stock rail)
T399	TM	12T	T399 Other frog, switch and track appliance defects (Provide detailed description in narrative)

Notes can be found at the end of the table

Table A1.1: Relationship Between FRA Accident Causes and Cause Groups

Cause Code	Train Mile/ Car Mile	Cause Group	Description

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Cause Code	Train Mile/Car Mile	Cause Group	Description
			Other Way and Structure
T401	TM	02T	T401 Bridge misalignment or failure
T402	TM	02T	T402 Flangeway clogged
T403	TM	02T	T403 Engineering design or construction
T499	TM	12T	T499 Other way and structure defect (Provide detailed description in narrative)
			SIGNAL AND COMMUNICATION
S001	CM	01S	S001 Automatic cab signal displayed false proceed
S002	CM	01S	S002 Automatic cab signal inoperative
S003	CM	01S	S003 Automatic train control system inoperative
S004	CM	01S	S004 Automatic train-stop device inoperative
S005	CM	01S	S005 Block signal displayed false proceed
S006	CM	01S	S006 Classification yard automatic control system switch failure
S007	CM	01S	S007 Classification yard automatic control system retarder failure
S008	CM	01S	S008 Fixed signal improperly displayed (defective)
S009	CM	01S	S009 Interlocking signal displayed false proceed
S010	CM	01S	S010 Power device interlocking failure
S011	CM	01S	S011 Power switch failure
S012	CM	01S	S012 Radio communication equipment failure
S013	CM	01S	S013 Other communication equipment failure
S014	CM	01S	S014 Computer system design error (vendor)
S015	CM	01S	S015 Computer system configuration/management error (vendor)
S016	CM	01S	S016 Classification yard automatic control system - inadequate or insufficient control.(e.g. automatic cycling/other software/programming deficiencies, etc.)
S099	CM	01S	S099 Other signal failures (Provide detailed description in narrative)
S101	CM	01S	Remote control transmitter defective
S102	CM	01S	Remote control transmitter, loss of communication
S103	CM	01S	Remote controlled switch/communications failure
S104	CM	01S	Remote controlled switch not locked effectively
			MECHANICAL AND ELECTRICAL FAILURES
			Brakes
E00C	CM	01E	E00C Air hose uncoupled or burst
E00L	TM	17E	E00L Air hose uncoupled or burst (LOCOMOTIVE)
E01C	CM	05E	E01C Hydraulic hose uncoupled or burst
E01L	TM	17E	E01L Hydraulic hose uncoupled or burst (LOCOMOTIVE)
E02C	CM	05E	E02C Broken brake pipe or connections
E02L	TM	17E	E02L Broken brake pipe or connections (LOCOMOTIVE)
E03C	CM	05E	E03C Obstructed brake pipe (closed angle cock, ice, etc.)
E03L	TM	17E	E03L Obstructed brake pipe (closed angle cock, ice, etc.) (LOCOMOTIVE)
E04C	CM	05E	E04C Other brake components damaged, worn, broken, or disconnected
E04L	TM	17E	E04L Other brake components damaged, worn, broken, or disconnected (LOCOMOTIVE)
E05C	CM	04E	E05C Brake valve malfunction (undesired emergency)
E05L	CM	04E	E05L Brake valve malfunction (undesired emergency) (LOCOMOTIVE)
E06C	CM	05E	E06C Brake valve malfunction (stuck brake, etc.)
E06L	TM	17E	E06L Brake valve malfunction (stuck brake, etc.) (LOCOMOTIVE)
E07C	CM	02E	E07C Rigging down or dragging
E07L	CM	15E	E07L Rigging down or dragging (LOCOMOTIVE)
E08C	CM	03E	E08C Hand brake (including gear) broken or defective
E08L	TM	17E	E08L Hand brake (including gear) broken or defective (LOCOMOTIVE)
E0HC	CM	03E	E0HC Hand brake linkage and/or connections broken or defective
E0HL	TM	17E	E0HL Hand brake linkage/Connections broken/defective (LOCOMOTIVE)
E09C	CM	05E	E09C Other brake defects, cars (Provide detailed description in narrative)
E09L	TM	17E	E09L Other brake defects, (Provide detailed description in narrative) (LOCOMOTIVE)
			Trailer Or Container On Flatcar
E11C	CM	14E	E11C Broken or defective tiedown equipment
E12C	CM	14E	E12C Broken or defective container
E13C	CM	14E	E13C Broken or defective trailer
E19C	CM	14E	E19C Other trailer or container on flat car defects (Provide detailed description in narrative)

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Cause Code	Train Mile/Car Mile	Cause Group	Description
			Body
E20C	CM	06E	E20C Body bolster broken or defective
E20L	TM	17E	E20L Body bolster broken or defective (LOCOMOTIVE)
E21C	CM	06E	E21C Center sill broken or bent
E21L	TM	17E	E21L Center sill broken or bent (LOCOMOTIVE)
E22C	CM	06E	E22C Draft sill broken or bent
E22L	TM	17E	E22L Draft sill broken or bent (LOCOMOTIVE)
E23C	CM	06E	E23C Center plate broken or defective
E23L	TM	17E	E23L Center plate broken or defective (LOCOMOTIVE)
E24C	CM	06E	E24C Center plate disengaged from truck (car off center)
E24L	TM	17E	E24L Center plate disengaged from truck unit/off center (LOCOMOTIVE)
E25C	CM	06E	E25C Center pin broken or missing
E25L	TM	17E	E25L Center pin broken or missing (LOCOMOTIVE)
E26C	CM	06E	E26C Center plate attachment defective
E26L	TM	17E	E26L Center plate attachment defective (LOCOMOTIVE)
E27C	CM	06E	E27C Side sill broken
E27L	TM	17E	E27L Side sill broken (LOCOMOTIVE)
E29C	CM	06E	E29C Other body defects, (CAR) (Provide detailed description in narrative)
E29L	TM	17E	E29L Other body defects, (LOCOMOTIVE) (Provide detailed description in narrative)
			Coupler and Draft System
E30C	CM	07E	E30C Knuckle broken or defective
E30L	TM	17E	E30L Knuckle broken or defective (LOCOMOTIVE)
E31C	CM	07E	E31C Coupler mismatch, high/low
E31L	TM	17E	E31L Coupler mismatch, high/low (LOCOMOTIVE)
E32C	CM	07E	E32C Coupler drawhead broken or defective
E32L	TM	17E	E32L Coupler drawhead broken or defective (LOCOMOTIVE)
E33C	CM	07E	E33C Coupler retainer pin/cross key missing
E33L	TM	17E	E33L Coupler retainer pin/cross key missing (LOCOMOTIVE)
E34C	CM	07E	E34C Draft gear/mechanism broken or defective (including yoke)
E34L	TM	17E	E34L Draft gear/mechanism broken/defective (including yoke) (LOCOMOTIVE)
E35C	CM	07E	E35C Coupler carrier broken or defective
E35L	TM	17E	E35L Coupler carrier broken or defective (LOCOMOTIVE)
E36C	CM	07E	E36C Coupler shank broken or defective (includes defective alignment control)
E36L	TM	17E	(LOCOMOTIVE)
E37C	CM	07E	E37C Failure of articulated connectors
E37L	TM	17E	E37L Failure of articulated connectors (LOCOMOTIVE)
E39C	CM	07E	E39C Other coupler and draft system defects, (CAR) (Provide detailed description in narrative)
E39L	TM	17E	E39L Other coupler and draft system defects, (LOCOMOTIVE) (Provide detailed description in narrative)
			Truck Components
E40C	CM	09E	E40C Side bearing clearance insufficient
E40L	CM	15E	E40L Side bearing clearance insufficient (LOCOMOTIVE)
E41C	CM	09E	E41C Side bearing clearance excessive
E41L	CM	15E	E41L Side bearing clearance excessive (LOCOMOTIVE)
E42C	CM	09E	E42C Side bearing(s) broken
E42L	CM	15E	E42L Side bearing(s) broken (LOCOMOTIVE)
E43C	CM	09E	E43C Side bearing(s) missing
E43L	CM	15E	E43L Side bearing(s) missing (LOCOMOTIVE)
E44C	CM	08E	E44C Truck bolster broken
E44L	CM	15E	E44L Truck bolster broken (LOCOMOTIVE)
E45C	CM	08E	E45C Side frame broken
E45L	CM	15E	E45L Side frame broken (LOCOMOTIVE)
E46C	CM	19E	E46C Truck bolster stiff, improper lateral or improper swiveling
E4AC	CM	09E	E4ACGib clearance (lateral motion excessive)
E4BC	TM	19E	E4BC Truck Bolster Stiff (failure to slew)
E46L	CM	15E	E46L Truck bolster stiff, improper lateral or improper swiveling(LOCOMOTIVE)
E47C	CM	09E	E47C Defective snubbing
E47L	CM	15E	E47L Defective snubbing (LOCOMOTIVE)
E48C	CM	09E	E48C Broken, missing, or otherwise defective springs
E48L	CM	15E	E48L Broken, missing, or otherwise defective springs (LOCOMOTIVE)
E4TC	CM	20E	E4TC Truck hunting
E4TL	CM	15E	E4TL Truck hunting (LOCOMOTIVE)
E49C	CM	18E	E49C Other truck component defects, (CAR) (Provide detailed description in narrative)
E49L	CM	15E	E49L Other truck component defects, (LOCOMOTIVE) (Provide detailed description in narrative)

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Cause Code	Train Mile/Car Mile	Cause Group	Description
Axles and Journal Bearings			
E51C	CM	11E	E51C Broken or bent axle between wheel seats
E51L	CM	15E	E51L Broken or bent axle between wheel seats (LOCOMOTIVE)
E52C	CM	10E	E52C Journal (plain) failure from overheating
E52L	CM	15E	E52L Journal (plain) failure from overheating (LOCOMOTIVE)
E53C	CM	10E	E53C Journal (roller bearing) failure from overheating
E53L	CM	15E	E53L Journal (roller bearing) failure from overheating- LOCOMOTIVE
E54C	CM	11E	E54C Journal fractured, new cold break
E54L	CM	15E	E54L Journal fractured, new cold break (LOCOMOTIVE)
E55C	CM	11E	E55C Journal fractured, cold break, previously overheated
E55L	CM	15E	E55L Journal fractured, cold break, previously overheated (LOCOMOTIVE)
E59C	CM	11E	E59C Other axle and journal bearing defects (CAR) (Provide detailed description in narrative)
E59L	CM	15E	E59L Other axle and journal bearing defects (LOCOMOTIVE) (Provide detailed description in narrative)
Wheels			
E60C	CM	12E	E60C Broken flange
E60L	CM	15E	E60L Broken flange (LOCOMOTIVE)
E61C	CM	12E	E61C Broken rim
E61L	CM	15E	E61L Broken rim (LOCOMOTIVE)
E62C	CM	12E	E62C Broken plate
E62L	CM	15E	E62L Broken plate (LOCOMOTIVE)
E63C	CM	12E	E63C Broken hub
E63L	CM	15E	E63L Broken hub (LOCOMOTIVE)
E64C	CM	13E	E64C Worn flange
E64L	CM	15E	E64L Worn flange (LOCOMOTIVE)
E65C	CM	13E	E65C Worn tread
E65L	CM	15E	E65L Worn tread (LOCOMOTIVE)
E66C	CM	13E	E66C Damaged flange or tread (flat)
E66L	CM	15E	E66L Damaged flange or tread (flat) (LOCOMOTIVE)
E67C	CM	13E	E67C Damaged flange or tread (build up)
E67L	CM	15E	E67L Damaged flange or tread (build up) (LOCOMOTIVE)
E68C	CM	13E	E68C Loose wheel
E68L	CM	15E	E68L Loose wheel (LOCOMOTIVE)
E6AC	CM	12E	E6AC Thermal crack, flange or tread
E6AL	CM	15E	E6AL Thermal crack, flange or tread (LOCOMOTIVE)
E69C	CM	13E	E69C Other wheel defects (CAR) (Provide detailed description in narrative)
E69L	CM	15E	E69L Other wheel defects (LOCOMOTIVE) (Provide detailed description in narrative)
Locomotives			
E70L	CM	15E	E70L Running gear failure (LOCOMOTIVE)
E71L	TM	16E	E71L Traction motor failure (LOCOMOTIVE)
E72L	TM	16E	E72L Crank case or air box explosion (LOCOMOTIVE)
E73L	TM	16E	E73L Oil or fuel fire (LOCOMOTIVE)
E74L	TM	16E	E74L Electrically caused fire (LOCOMOTIVE)
E75L	CM	21E	E75L Current collector system (LOCOMOTIVE)
E76L	TM	16E	E76L Remote control equipment inoperative (LOCOMOTIVE)
E77L	CM	15E	E77L Broken or defective swing hanger or spring plank (LOCOMOTIVE)
E79L	TM	17E	E79L Other locomotive defects (Provide detail description in narrative)
Doors			
E80C	CM	18E	E80C Box car plug door open
E81C	CM	18E	E81C Box car plug door, attachment defective
E82C	CM	18E	E82C Box car plug door, locking lever not in place
E83C	CM	18E	E83C Box car door, other than plug, open
E84C	CM	18E	E84C Box car door, other than plug, attachment defective
E85C	CM	18E	E85C Bottom outlet car door open
E86C	CM	18E	E86C Bottom outlet car door attachment defective
E89C	CM	18E	E89C Other car door defects (Provide detail description in narrative)
General Mechanical and Electrical Failures			
E99C	CM	18E	E99C Other mechanical and electrical failures, (CAR) (Provide detailed description in narrative)
E99L	CM	17E	E99L Other mechanical and electrical failures, (LOCOMOTIVE) (Provide detailed description in narrative)

Table A1.1: Relationship Between FRA Accident Causes and Cause Groups

Cause Code	Train Mile/Car Mile	Cause Group	Description
TRAIN OPERATION - HUMAN FACTORS			
Brakes, Use of			
H008	TM	03H	H008 Improper operation of train line air connections (bottling the air)
H017	TM	02H	H017 Failure to properly secure engine(s) (railroad employee)
H018	TM	02H	H018 Failure to properly secure hand brake on car(s) (railroad employee)
H019	TM	02H	H019 Failure to release hand brakes on car(s) (railroad employee)
H020	TM	02H	H020 Failure to apply sufficient number of hand brakes on car(s) (railroad employee)
H021	TM	02H	H021 Failure to apply hand brakes on car(s) (railroad employee)
H022	TM	02H	H022 Failure to properly secure engine(s) or car(s) (non railroad employee)
H025	TM	02H	H025 Failure to control speed of car using hand brake (railroad employee)
H099	TM	03H	H099 Use of brakes, other (Provide detailed description in narrative)
Employee Physical Condition			
H101	TM	04H	H101 Impairment of efficiency or judgment because of drugs or alcohol
H102	TM	04H	H102 Incapacitation due to injury or illness
H103	TM	04H	H103 Employee restricted in work or motion
H104	TM	04H	H104 Employee asleep
H199	TM	04H	H199 Employee physical condition, other (Provide detailed description in narrative)
Flagging, Fixed, Hand and Radio Signals			
H201	TM	05H	H201 Absence of fixed signal (Blue Signal)
H202	TM	05H	H202 Fixed signal improperly displayed (Blue Signal)
H203	TM	05H	H203 Fixed signal improperly displayed
H204	TM	05H	H204 Fixed signal, failure to comply
H205	TM	05H	H205 Flagging, improper or failure to flag
H206	TM	05H	H206 Flagging signal, failure to comply
H207	TM	05H	H207 Hand signal, failure to comply
H208	TM	05H	H208 Hand signal improper
H209	TM	05H	H209 Hand signal, failure to give/receive
H210	TM	06H	H210 Radio communication, failure to comply
H211	TM	06H	H211 Radio communication, improper
H212	TM	06H	H212 Radio communication, failure to give/receive
H215	TM	05H	H215 Block signal, failure to comply
H216	TM	05H	H216 Interlocking signal, failure to comply
H217	TM	05H	H217 Failure to observe hand signals given during a wayside inspection of moving train
H218	TM	12H	H218 Failure to comply with failed equipment detector warning or with applicable train inspection rules
H219	TM	05H	H219 fixed signal (other than automatic block or interlocking signal), improperly displayed
H220	TM	05H	H220 Fixed signal (other than automatic block or interlocking signal), failure to comply
H221	TM	05H	H221 Automatic block or interlocking signal displaying stop indication - failure to comply
H222	TM	05H	H222 Automatic block or interlocking signal displaying other than stop indication - failure to comply
H299	TM	05H	H299 Other signal causes (Provide detailed description in narrative)
General Switching Rules			
H301	TM	07H	H301 Car(s) shoved out and left out of clear
H302	TM	07H	H302 Cars left foul
H303	TM	07H	H303 Derail, failure to apply or remove
H304	TM	07H	H304 Hazardous materials regulations, failure to comply
H305	TM	07H	H305 Instruction to train/yard crew improper
H306	TM	07H	H306 Shoving movement, absence of man on or at leading end of movement
H307	TM	07H	H307 Shoving movement, man on or at leading end of movement, failure to control
H308	TM	07H	H308 Skate, failure to remove or place
H309	TM	07H	H309 Failure to stretch cars before shoving
H310	TM	07H	H310 Failure to couple
H311	TM	07H	H311 Moving cars while loading ramp/hose/chute/cables/bridge plate, etc., not in proper position
H312	TM	07H	H312 Passed couplers
H313	TM	07H	H313 Retarder, improper manual operation
H314	TM	07H	H314 Retarder yard skate improperly applied
H315	TM	07H	H315 Portable derail, improperly applied
H317	TM	07H	H 317 Humping or cutting off in motion equipment susceptible to damage, or to cause damage to other equipment
H318	TM	07H	Kicking or dropping cars, inadequate precautions
H399	TM	07H	H399 Other general switching rules (Provide detailed description in narrative)

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Cause Code	Train Mile/Car Mile	Cause Group	Description
			Main Track Authority
H401	TM	08H	H401 Failure to stop train in clear
H402	TM	08H	H402 Motor car or on-track equipment rules, failure to comply
H403	TM	08H	H403 Movement of engine(s) or car(s) without authority (railroad employee)
H404	TM	08H	H404 Train order, track warrant, track bulletin, or timetable authority, failure to comply
H405	TM	06H	H405 Train orders, track warrants, direct traffic control, track bulletins, radio, error in preparation, transmission or delivery
H406	TM	08H	H406 Train orders, track warrants, direct traffic control, track bulletins, written, error in preparation, transmission or delivery
H499	TM	08H	H499 Other main track authority causes (Provide detailed description in narrative)
			Train Handling/Train Make-Up
H501	CM	09H	H501 Improper train make-up at initial terminal
H502	CM	09H	H502 Improper placement of cars in train between terminals
H503	CM	09H	H503 Buffing or slack action excessive, train handling
H504	CM	09H	H504 Buffing or slack action excessive, train make-up
H505	CM	09H	H505 Lateral drawbar force on curve excessive, train handling
H506	CM	09H	H506 Lateral drawbar force on curve excessive, train make-up
H507	CM	09H	H507 Lateral drawbar force on curve excessive, car geometry (short car/long car combination)
H508	CM	09H	H508 Improper train make-up
H509	CM	09H	H509 Improper train inspection
H510	CM	01H	H510 Automatic brake, insufficient (H001) -- see note after cause H599
H511	CM	01H	H511 Automatic brake, excessive (H002)
H512	CM	01H	H512 Automatic brake, failure to use split reduction (H003)
H513	CM	01H	H513 Automatic brake, other improper use (H004)
H514	CM	01H	H514 Failure to allow air brakes to fully release before proceeding (H005)
H515	CM	01H	H515 Failure to properly cut-out brake valves on locomotives (H006)
H516	CM	01H	H516 Failure to properly cut-in brake valves on locomotives (H007)
H517	CM	01H	H517 Dynamic brake, insufficient (H009)
H518	CM	01H	H518 Dynamic brake, excessive (H010)
H519	CM	01H	H519 Dynamic brake, too rapid adjustment (H011)
H520	CM	01H	H520 Dynamic brake, excessive axles (H012)
H521	CM	01H	H521 Dynamic brake, other improper use (H013)
H522	CM	09H	H522 Throttle (power), improper use (H014)
H523	CM	09H	H523 Throttle (power), too rapid adjustment (H015)
H524	CM	09H	H524 Excessive horsepower (H016)
H525	CM	01H	H525 Independent (engine) brake, improper use (except actuation) (H023)
H526	CM	01H	H526 Failure to actuate off independent brake (H024)
H599	CM	09H	H599 Other causes relating to train handling or makeup (Provide detailed description in narrative)
			Note: The description of the causes for codes H510 through H526 were originally found in subgroup Brakes, Use of. It has been decided that these causes are more appropriate to the "Train Handling/Train Makeup" subgroup. Consequently, it was necessary to assign new codes in order to maintain the coding convention and to simplify grouping of causes by computer. The original code has been appended to the description to aid in data conversion.
			Speed
H601	TM	10H	H601 Coupling speed excessive
H602	TM	10H	H602 Switching movement, excessive speed
H603	TM	10H	H603 Train inside yard limits, excessive speed
H604	TM	10H	H604 Train outside yard limits under clear block, excessive speed
H605	TM	10H	H605 Failure to comply with restricted speed
H606	TM	10H	H606 Train outside yard limits in nonblock territory, excessive speed
H607		10H	signal
H699	TM	10H	H699 Speed, other (Provide detailed description in narrative)
			Switches, Use of
H701	TM	11H	H701 Spring Switch not cleared before reversing
H702	TM	11H	H702 Switch improperly lined
H703	TM	11H	H703 Switch not latched or locked
H704	TM	11H	H704 Switch previously run through
H705	TM	11H	H705 Moveable point switch frog improperly lined
H706		11H	H 706 Switch improperly lined, radio controlled
H799	TM	11H	H799 Use of switches, other (Provide detailed description in narrative)

Table A1.1: Relationship Between FRA Accident Causes and Cause Groups

Cause Code	Train Mile/Car Mile	Cause Group	Description
Cab Signals			
H821	TM	12H	H821 Automatic cab signal, failure to comply
H822	TM	12H	H822 Automatic cab signal cut out
H823	TM	12H	H823 Automatic train-stop device cut out
H824	TM	12H	H824 Automatic train control device cut out
H899	TM	12H	H899 Other causes relating to cab signals (provide detailed description in narrative)
Miscellaneous			
H991	TM	12H	H991 Tampering with safety/protective device(s)
H992	TM	12H	H992 Operation of locomotive by uncertified/unqualified person
H993	TM	12H	H993 Human Factor - track Example: Track is inspected and an FRA defect is found; however, the track supervisor decides to delay repairs and does not slow order that location. A derailment occurs which is attributable to the defective track condition.
H994	TM	12H	H994 Human Factor - signal Example: A signal maintainer was servicing the signal cabinet. It was later determined, during an investigation of a rear-end collision, that the repairs were improperly performed causing a clear signal to be incorrectly displayed
H995	TM	12H	H995 Human Factor - motive power and equipment Example: A car inspector observes an obvious thin flange wheel that normally requires the car to be removed from service. However, because the train is ready to leave, he elects to leave the car in service. The wheel splits the next switch point and the car derails.
H996	TM	12H	H996 Oversized loads or excess height/width cars misrouted or switched
H997	TM	12H	H997 Motor car or other on-track equipment rules (other than main track authority) - failure to comply
H99C	TM	12H	H99C Human factor -signal-train control - operator input on-board computer incorrect data provided
H99E	TM	12H	H99E computer system configuration/management error (non vendor)
H999	TM	12H	H999 Other train operation/human factors (Provide detailed description in narrative)
MISCELLANEOUS CAUSES NOT OTHERWISE LISTED			
Environmental Conditions			
M101	TM	01M	M101 Snow, ice, mud, gravel, coal, etc. on track
M102	TM	01M	M102 Extreme environmental condition - TORNADO
M103	TM	01M	M103 Extreme environmental condition - FLOOD
M104	TM	01M	M104 Extreme environmental condition - DENSE FOG
M105	TM	01M	M105 Extreme environmental condition - EXTREME WIND VELOCITY
M199	TM	01M	M199 Other extreme environmental conditions (Provide detailed description in narrative)
Loading Procedures			
M201	CM	03M	M201 Load shifted
M202	CM	03M	M202 Load fell from car
M203	CM	03M	M203 Overloaded car
M204	CM	03M	M204 Improperly loaded car
M205	CM	03M	M205 Oversized load, misrouted
M206	CM	03M	M206 Trailer or container tiedown equipment improperly applied
M207	CM	03M	M207 Overloaded/improperly loaded container/trailer on flat car
M208	CM	03M	M208 Improperly loaded container/trailer on flat car
M299	CM	03M	M299 Miscellaneous loading procedures (Provide detailed description in narrative)
Highway-Rail Grade Crossing Accidents			
M301	TM	02M	M301 Highway user impairment because of drug or alcohol usage (as determined by local authorities, e.g., police)
M302	TM	02M	M302 Highway user inattentiveness
M303	TM	02M	M303 Highway user misjudgment under normal weather and traffic conditions
M304	TM	02M	M304 Highway user cited for violation of highway-rail grade crossing traffic laws
M305	TM	02M	M305 Highway user unawareness due to environmental factors (angle of sun, etc.)
M306	TM	02M	M306 Highway user inability to stop due to extreme weather conditions (dense fog, ice or snow packed road, etc.)
M307	TM	02M	M307 Malfunction, improper operation of train activated warning devices
M308	TM	02M	M308 Highway user deliberately disregarded crossing warning devices
M399	TM	02M	M399 Other causes (Provide detailed description in narrative)

Table A1.1: Relationship Between FRA Accident Causes and Cause Groups

Cause Code	Train Mile/Car Mile	Cause Group	Description
Unusual Operational Situations			
M401	TM	05M	M401 Emergency brake application to avoid accident
M402	TM	01M	M402 Object or equipment on or fouling track (motor vehicle - other than highway-rail crossing)
M403	TM	01M	M403 Object or equipment on or fouling track (livestock)
M404	TM	01M	M404 Object or equipment on or fouling track - other than above (for vandalism, see code M503)
M405	CM	04M	M405 Interaction of lateral/vertical forces (includes harmonic rock off)
M406	TM	05M	M406 Fire, other than vandalism, involving on-track equipment
M407	TM	05M	humped
M408	TM	05M	M408 Yard skate slid and failed to stop cars
M409	CM	03M	M409 Objects such as lading chains or straps fouling switches
M410	CM	03M	M410 Objects such as lading chains or straps fouling wheels
Other Miscellaneous			
M501	TM	05M	M501 Interference (other than vandalism) with railroad operations by nonrailroad employee
M502	TM	05M	M502 Vandalism of on-track equipment, e.g., brakes released
M503	TM	05M	M503 Vandalism of track or track appliances, e.g., objects placed on track, switch thrown, etc.
M504	TM	02H	M504 Failure by nonrailroad employee, e.g., industry employee, to control speed of car using hand brake
M505	TM	05M	M505 Cause under investigation (Corrected report will be forwarded at later date)
M506	TM	12T	M506 Track damage caused by non-railroad interference with track structure
M507	TM	05M	M507 Investigation complete, cause could not be determined
M599	TM	05M	M599 Other miscellaneous causes (Provide detailed description in narrative)

Notes for Table A1.1

List of FRA cause codes is based on the FRA Guide for Preparing Accident/Incident Reports, effective May 2003. Note that a new edition of the guide was issued in 2011, after this analysis was complete.

Highlighted cells indicate changes from a cause code list and CM/TM cause groups used in previous analyses by ICF, Arthur D. Little, AAR and researchers at University of Illinois, Urbana-Champaign.

Car-mile and train-mile cause group allocations are based on the results of analysis reported in Shafer and Barkan 2008.

Table A1.2: Accident Cause Groups Used in Analysis

Cause Group	Description	Car Mile/Train Mile	Car Mile/Train Mile Changed From*
Track Defects			
01T	Roadbed Defects	TM	CM
02T	Non-Traffic, Weather Causes	TM	*
03T	Wide Gauge	TM	CM
04T	Track Geometry (excl. Wide Gauge)	TM	CM
05T	Buckled Track	CM	*
06T	Rail Defects at Bolted Joint	CM	*
07T	Joint Bar Defects	CM	*
08T	Broken Rails or Welds	CM	*
09T	Other Rail and Joint Defects	CM	*
10T	Turnout Defects - Switches	CM	*
11T	Turnout Defects - Frogs	CM	*
12T	Misc. Track and Structure Defects	TM	CM
Signal and Communications Defects			
01S	Signal failures	CM	TM
Equipment Defects			
01E	Air Hose Defect (Car)	CM	*
02E	Brake Rigging Defect (Car)	CM	*
03E	Handbrake Defects (Car)	CM	*
04E	UDE (Car or Loco)	CM	*
05E	Other Brake Defect (Car)	CM	*
06E	Centerplate/Carbody Defects (Car)	CM	*\
07E	Coupler Defects (Car)	CM	*
08E	Truck Structure Defects (Car)	CM	*
09E	Sidebearing, Suspension Defects (Car)	CM	*
10E	Bearing failure (Car)	CM	*
11E	Other Axle/Journal Defects (Car)	CM	*
12E	Broken Wheels (Car)	CM	*
13E	Other Wheel Defects (Car)	CM	*
14E	TOFC/COFC Defects	CM	*
15E	Loco Trucks/Bearings/Wheels	CM	*
16E	Loco Electrical and Fires	TM	CM
17E	All Other Locomotive Defects	TM	CM
18E	All Other Car Defects	TM	CM
19E	Stiff Truck (Car)	TM	CM
20E	Track/Train Interaction (Hunting)(Car)	CM	*
21E	Current Collection Equipment (Loco)	CM	*
Human Factors/Operations			
01H	Brake Operation (Main Line)	CM	TM
02H	Handbrake Operations	TM	*
03H	Brake Operations (Other)	TM	*
04H	Employee Physical Condition	TM	*
05H	Failure to Obey/Display Signals	TM	*
06H	Radio Communications Error	TM	*
07H	Switching Rules	TM	*
08H	Mainline Rules	TM	*
09H	Train Handling (excl Brakes)	CM	TM
10H	Train Speed	TM	*
11H	Use of Switches	TM	*
12H	Miscellaneous Human Factors	TM	*
Miscellaneous Causes			
01M	Obstructions	TM	*
02M	Grade Crossing Collisions	TM	*
03M	Lading Problems	CM	*
04M	Track-Train Interaction	CM	*
05M	Other Miscellaneous	TM	*

* Original CM/TM designation as listed in Table 1 of Schafer and Barkan 2008. Asterisk means no change.

Table A2.3: Trains in Accidents by Cause Group and Track Class - Class I and Non-Class I Railroads

Train Mile or Car Mile	Cause Group		Trains in Derailments by Track Class					
			X & 1	2	3	4	5 & 6	Total
		Track and Structure Defects (CM)						
TM	01T	Roadbed Defects	12	4	5	9	1	31
TM	02T	Non-Traffic, Weather Causes	4	3	5	6	0	18
TM	03T	Wide Gauge	38	18	10	9	1	76
TM	04T	Track Geometry (excl. Wide Gauge)	35	56	36	48	4	179
CM	05T	Buckled Track	4	9	14	25	1	53
CM	06T	Rail Defects at Bolted Joint	3	2	4	11	6	26
CM	07T	Joint Bar Defects	3	2	6	20	13	44
CM	08T	Broken Rails or Welds	68	67	59	100	24	318
CM	09T	Other Rail and Joint Defects	1	5	5	14	3	28
CM	10T	Turnout Defects - Switches	19	5	11	9	5	49
CM	11T	Turnout Defects - Frogs	1	1	3	4	0	9
TM	12T	Misc. Track and Structure Defects	18	8	6	5	4	41
		Total Track and Structure Defects	206	180	164	260	62	872
		Signal and Communications Defects (TM)						
CM	01S	Signal failures	4	0	5	1	1	11
		Equipment Defects						
CM	01E	Air Hose Defect (Car)	0	2	1	4	1	8
CM	02E	Brake Rigging Defect (Car)	0	4	2	7	2	15
CM	03E	Handbrake Defects (Car)	1	0	0	0	0	1
CM	04E	UDE (Car or Loco)	1	0	0	2	0	3
CM	05E	Other Brake Defect (Car)	0	4	8	9	1	22
CM	06E	Centerplate/Carbody Defects (Car)	2	7	14	20	6	49
CM	07E	Coupler Defects (Car)	4	4	16	42	6	72
CM	08E	Truck Structure Defects (Car)	0	0	2	8	7	17
CM	09E	Sidebearing, Suspension Defects (Car)	10	24	15	21	7	77
CM	10E	Bearing failure (Car)	0	5	22	74	18	119
CM	11E	Other Axle/Journal Defects (Car)	1	7	16	33	15	72
CM	12E	Broken Wheels (Car)	2	7	23	61	15	108
CM	13E	Other Wheel Defects (Car)	7	14	10	33	4	68
CM	14E	TOFC/COFC Defects	0	0	0	1	0	1
CM	15E	Loco Trucks/Bearings/Wheels	2	4	4	13	8	31
TM	16E	Loco Electrical and Fires	0	0	0	5	0	5
TM	17E	All Other Locomotive Defects	0	1	1	2	0	4
TM	18E	All Other Car Defects	4	2	5	8	3	22
TM	19E	Stiff Truck (Car)	3	7	1	4	0	15
CM	20E	Track/Train Interaction (Hunting)(Car)	0	0	2	10	5	17
		Total Equipment Defects	37	92	142	357	98	726
		Human Factors/Operations						
CM	01H	Brake Operation (Main Line)	7	6	10	20	4	47
TM	02H	Handbrake Operations	3	1	9	4	3	20
TM	03H	Brake Operations (Other)	0	0	0	0	0	0
TM	04H	Employee Physical Condition	0	2	0	0	0	2
TM	05H	Failure to Obey/Display Signals	1	1	4	13	4	23
TM	06H	Radio Communications Error	1	0	0	0	0	1
TM	07H	Switching Rules	4	3	3	3	2	15
TM	08H	Mainline Rules	1	2	3	1	0	7
CM	09H	Train Handling (excl Brakes)	23	19	17	30	4	93
TM	10H	Train Speed	17	8	5	8	2	40
TM	11H	Use of Switches	20	8	7	10	4	49
TM	12H	Miscellaneous Human Factors	4	1	7	8	2	22
		Total Human Factors/Operations	81	51	65	97	25	319
		Miscellaneous Causes (TM)						
TM	01M	Obstructions	9	8	11	34	19	81
TM	02M	Grade Crossing Collisions	0	0	0	0	0	0
CM	03M	Lading Problems	11	21	18	24	6	80
CM	04M	Track-Train Interaction	9	26	22	18	5	80
TM	05M	Other Miscellaneous	3	11	5	17	1	37
		Total Miscellaneous Causes	32	66	56	93	31	278
		Total Car-Mile Causes	183	245	309	614	167	1518
		Total Train Mile Causes	177	144	123	194	50	688
		Total all Causes	360	389	432	808	217	2206

Table A2.3: Trains in Accidents by Cause Group and Track Class - Class I and Non-Class I Railroads

Train Mile or Car Mile	Cause Group		Trains in Collisions by Track Class					
			X & 1	2	3	4	5 & 6	Total
		Track and Structure Defects (CM)						
TM	01T	Roadbed Defects	0	0	0	0	0	0
TM	02T	Non-Traffic, Weather Causes	0	0	0	0	0	0
TM	03T	Wide Gauge	0	0	0	0	0	0
TM	04T	Track Geometry (excl. Wide Gauge)	0	0	1	1	0	2
CM	05T	Buckled Track	0	0	0	0	0	0
CM	06T	Rail Defects at Bolted Joint	0	0	0	0	0	0
CM	07T	Joint Bar Defects	0	0	0	0	0	0
CM	08T	Broken Rails or Welds	1	0	0	0	0	1
CM	09T	Other Rail and Joint Defects	0	0	0	1	0	1
CM	10T	Turnout Defects - Switches	0	0	0	0	0	0
CM	11T	Turnout Defects - Frogs	0	0	0	0	0	0
TM	12T	Misc. Track and Structure Defects	0	0	0	0	0	0
		Total Track and Structure Defects	1	0	1	2	0	4
		Signal and Communications Defects (TM)						
CM	01S	Signal failures	0	0	0	0	3	3
		Equipment Defects						
CM	01E	Air Hose Defect (Car)	0	0	0	0	0	0
CM	02E	Brake Rigging Defect (Car)	0	0	0	0	1	1
CM	03E	Handbrake Defects (Car)	0	0	0	0	0	0
CM	04E	UDE (Car or Loco)	0	0	0	0	0	0
CM	05E	Other Brake Defect (Car)	0	0	0	0	0	0
CM	06E	Centerplate/Carbody Defects (Car)	0	0	1	1	0	2
CM	07E	Coupler Defects (Car)	1	0	1	2	0	4
CM	08E	Truck Structure Defects (Car)	0	0	0	0	0	0
CM	09E	Sidebearing, Suspension Defects (Car)	0	0	0	0	0	0
CM	10E	Bearing failure (Car)	0	0	0	0	1	1
CM	11E	Other Axle/Journal Defects (Car)	0	0	0	0	0	0
CM	12E	Broken Wheels (Car)	0	0	0	0	0	0
CM	13E	Other Wheel Defects (Car)	0	0	0	2	0	2
CM	14E	TOFC/COFC Defects	0	2	0	0	0	2
CM	15E	Loco Trucks/Bearings/Wheels	0	0	0	0	1	1
TM	16E	Loco Electrical and Fires	0	0	0	0	0	0
TM	17E	All Other Locomotive Defects	0	0	1	1	0	2
TM	18E	All Other Car Defects	0	0	0	0	1	1
TM	19E	Stiff Truck (Car)	0	0	0	0	0	0
CM	20E	Track/Train Interaction (Hunting)(Car)	0	0	0	0	0	0
		Total Equipment Defects	1	2	3	6	4	16
		Human Factors/Operations						
CM	01H	Brake Operation (Main Line)	0	2	1	2	0	5
TM	02H	Handbrake Operations	3	3	0	2	0	8
TM	03H	Brake Operations (Other)	0	0	0	1	0	1
TM	04H	Employee Physical Condition	0	0	1	0	2	3
TM	05H	Failure to Obey/Display Signals	3	5	15	45	15	83
TM	06H	Radio Communications Error	0	1	2	3	0	6
TM	07H	Switching Rules	5	4	3	2	0	14
TM	08H	Mainline Rules	4	5	4	18	3	34
CM	09H	Train Handling (excl Brakes)	0	1	0	0	0	1
TM	10H	Train Speed	8	8	13	19	9	57
TM	11H	Use of Switches	3	0	0	0	0	3
TM	12H	Miscellaneous Human Factors	0	1	4	7	0	12
		Total Human Factors/Operations	26	30	43	99	29	227
		Miscellaneous Causes (TM)						
TM	01M	Obstructions	0	0	0	0	0	0
TM	02M	Grade Crossing Collisions	0	0	0	0	0	0
CM	03M	Lading Problems	0	1	1	2	3	7
CM	04M	Track-Train Interaction	0	0	0	0	0	0
TM	05M	Other Miscellaneous	2	0	0	1	0	3
		Total Miscellaneous Causes	2	1	1	3	3	10
		Total Car-Mile Causes	2	6	4	10	9	31
		Total Train Mile Causes	28	27	44	100	30	229
		Total all Causes	30	33	48	110	39	260

Table A2.3: Trains in Accidents by Cause Group and Track Class - Class I and Non-Class I Railroads

Train Mile or Car Mile	Cause Group		Trains in Other Accidents by Track Class					All Accident Types and Track Classes Class I Railroads	
			X & 1	2	3	4	5 & 6		Total
		Track and Structure Defects (CM)							
TM	01T	Roadbed Defects	0	0	1	0	2	3	34
TM	02T	Non-Traffic, Weather Causes	0	1	1	0	0	2	20
TM	03T	Wide Gauge	0	0	0	0	0	0	76
TM	04T	Track Geometry (excl. Wide Gauge)	0	0	0	0	0	0	181
CM	05T	Buckled Track	0	0	0	0	0	0	53
CM	06T	Rail Defects at Bolted Joint	0	0	0	1	0	1	27
CM	07T	Joint Bar Defects	0	0	0	0	0	0	44
CM	08T	Broken Rails or Welds	0	0	0	0	0	0	319
CM	09T	Other Rail and Joint Defects	0	0	0	0	0	0	29
CM	10T	Turnout Defects - Switches	0	0	0	0	0	0	49
CM	11T	Turnout Defects - Frogs	0	0	0	0	0	0	9
TM	12T	Misc. Track and Structure Defects	0	0	0	0	0	0	41
		Total Track and Structure Defects	0	1	2	1	2	6	882
		Signal and Communications Defects (TM)							
CM	01S	Signal failures	0	0	1	0	1	2	16
		Equipment Defects							
CM	01E	Air Hose Defect (Car)	0	0	0	0	0	0	8
CM	02E	Brake Rigging Defect (Car)	0	0	0	1	0	1	17
CM	03E	Handbrake Defects (Car)	0	0	0	0	0	0	1
CM	04E	UDE (Car or Loco)	0	0	0	1	0	1	4
CM	05E	Other Brake Defect (Car)	0	0	1	1	0	2	24
CM	06E	Centerplate/Carbody Defects (Car)	3	1	4	10	2	20	71
CM	07E	Coupler Defects (Car)	0	0	0	7	5	12	88
CM	08E	Truck Structure Defects (Car)	0	0	1	0	0	1	18
CM	09E	Sidebearing, Suspension Defects (Car)	0	0	0	0	0	0	77
CM	10E	Bearing failure (Car)	0	0	1	5	3	9	129
CM	11E	Other Axle/Journal Defects (Car)	0	0	0	1	0	1	73
CM	12E	Broken Wheels (Car)	0	0	1	6	0	7	115
CM	13E	Other Wheel Defects (Car)	0	0	1	0	0	1	71
CM	14E	TOFC/COFC Defects	0	0	0	0	0	0	3
CM	15E	Loco Trucks/Bearings/Wheels	0	0	0	1	1	2	34
TM	16E	Loco Electrical and Fires	0	1	2	5	1	9	14
TM	17E	All Other Locomotive Defects	0	1	0	1	0	2	8
TM	18E	All Other Car Defects	0	0	1	0	0	1	24
TM	19E	Stiff Truck (Car)	0	0	0	0	0	0	15
CM	20E	Track/Train Interaction (Hunting)(Car)	0	0	0	0	0	0	17
		Total Equipment Defects	3	3	12	39	12	69	811
		Human Factors/Operations							
CM	01H	Brake Operation (Main Line)	0	0	0	0	0	0	52
TM	02H	Handbrake Operations	6	2	6	3	0	17	45
TM	03H	Brake Operations (Other)	0	0	1	0	0	1	2
TM	04H	Employee Physical Condition	0	0	0	0	1	1	6
TM	05H	Failure to Obey/Display Signals	2	1	1	5	0	9	115
TM	06H	Radio Communications Error	0	0	0	1	0	1	8
TM	07H	Switching Rules	6	1	4	5	0	16	45
TM	08H	Mainline Rules	2	0	3	10	2	17	58
CM	09H	Train Handling (excl Brakes)	0	0	0	1	2	3	97
TM	10H	Train Speed	0	1	5	5	2	13	110
TM	11H	Use of Switches	2	0	2	7	1	12	64
TM	12H	Miscellaneous Human Factors	0	1	5	0	0	6	40
		Total Human Factors/Operations	18	6	27	37	8	96	642
		Miscellaneous Causes (TM)							
TM	01M	Obstructions	1	12	16	32	17	78	159
TM	02M	Grade Crossing Collisions	3	25	103	435	137	703	703
CM	03M	Lading Problems	0	0	0	10	1	11	98
CM	04M	Track-Train Interaction	0	0	1	0	0	1	81
TM	05M	Other Miscellaneous	0	6	1	6	3	16	56
		Total Miscellaneous Causes	4	43	121	483	158	809	1097
		Total Car-Mile Causes	3	1	11	45	15	75	1624
		Total Train Mile Causes	22	52	152	515	166	907	1824
		Total all Causes	25	53	163	560	181	982	3448

Table A2.3: Trains in Accidents by Cause Group and Track Class - Class I and Non-Class I Railroads

Train Mile or Car Mile	Cause Group		Trains in Accidents on Non Class I Railroads				All Railroads, Accident Types and Track Classes
			Derailments	Collisions	Other	Total	
		Track and Structure Defects (CM)					
TM	01T	Roadbed Defects	20	0	0	20	54
TM	02T	Non-Traffic, Weather Causes	11	0	4	15	35
TM	03T	Wide Gauge	113	0	0	113	189
TM	04T	Track Geometry (excl. Wide Gauge)	103	1	1	105	286
CM	05T	Buckled Track	64	0	0	64	117
CM	06T	Rail Defects at Bolted Joint	12	0	0	12	39
CM	07T	Joint Bar Defects	7	0	0	7	51
CM	08T	Broken Rails or Welds	207	0	0	207	526
CM	09T	Other Rail and Joint Defects	16	0	0	16	45
CM	10T	Turnout Defects - Switches	35	0	0	35	84
CM	11T	Turnout Defects - Frogs	2	0	0	2	11
TM	12T	Misc. Track and Structure Defects	27	0	0	27	68
		Total Track and Structure Defects	617	1	5	623	1505
		Signal and Communications Defects (TM)					
CM	01S	Signal failures	0	0	0	0	16
		Equipment Defects					
CM	01E	Air Hose Defect (Car)	0	0	0	0	8
CM	02E	Brake Rigging Defect (Car)	3	0	0	3	20
CM	03E	Handbrake Defects (Car)	0	0	0	0	1
CM	04E	UDE (Car or Loco)	1	0	0	1	5
CM	05E	Other Brake Defect (Car)	4	0	0	4	28
CM	06E	Centerplate/Carbody Defects (Car)	10	2	3	15	86
CM	07E	Coupler Defects (Car)	7	0	0	7	95
CM	08E	Truck Structure Defects (Car)	3	0	1	4	22
CM	09E	Sidebearing, Suspension Defects (Car)	17	0	0	17	94
CM	10E	Bearing failure (Car)	30	0	3	33	162
CM	11E	Other Axle/Journal Defects (Car)	8	0	0	8	81
CM	12E	Broken Wheels (Car)	4	0	0	4	119
CM	13E	Other Wheel Defects (Car)	15	0	0	15	86
CM	14E	TOFC/COFC Defects	2	0	0	2	5
CM	15E	Loco Trucks/Bearings/Wheels	3	0	0	3	37
TM	16E	Loco Electrical and Fires	0	0	3	3	17
TM	17E	All Other Locomotive Defects	2	0	3	5	13
TM	18E	All Other Car Defects	4	0	2	6	30
TM	19E	Stiff Truck (Car)	8	0	0	8	23
CM	20E	Track/Train Interaction (Hunting)(Car)	2	0	0	2	19
		Total. Equipment Defects	123	2	15	140	951
		Human Factors/Operations					
CM	01H	Brake Operation (Main Line)	11	0	1	12	64
TM	02H	Handbrake Operations	5	5	6	16	61
TM	03H	Brake Operations (Other)	3	0	1	4	6
TM	04H	Employee Physical Condition	1	0	0	1	7
TM	05H	Failure to Obey/Display Signals	0	6	2	8	123
TM	06H	Radio Communications Error	0	2	0	2	10
TM	07H	Switching Rules	9	1	3	13	58
TM	08H	Mainline Rules	1	3	1	5	63
CM	09H	Train Handling (excl Brakes)	37	1	1	39	136
TM	10H	Train Speed	21	6	4	31	141
TM	11H	Use of Switches	18	1	2	21	85
TM	12H	Miscellaneous Human Factors	0	3	0	3	43
		Total Human Factors/Operations	106	28	21	155	797
		Miscellaneous Causes (TM)					
TM	01M	Obstructions	13	1	11	25	184
TM	02M	Grade Crossing Collisions	0	0	84	84	787
CM	03M	Lading Problems	27	1	2	30	128
CM	04M	Track-Train Interaction	20	0	0	20	101
TM	05M	Other Miscellaneous	17	4	5	26	82
		Total Miscellaneous Causes	77	6	102	185	1282
		Total Car-Mile Causes	547	4	11	562	2186
		Total Train Mile Causes	376	33	132	541	2365
		Total all Causes	923	37	143	1103	4551

Table A 2.4: Cars Derailed in Accidents by Cause Group, Track Class, Accident Type and Railroad Type

Train Mile or Car Mile	Cause Group		Cars Derailed in Derailments by Track Class					
			X & 1	2	3	4	5 & 6	Total
		Track and Structure Defects (CM)						
TM	01T	Roadbed Defects	71	31	64	158	19	343
TM	02T	Non-Traffic, Weather Causes	10	30	21	27	0	88
TM	03T	Wide Gauge	260	275	87	158	10	790
TM	04T	Track Geometry (excl. Wide Gauge)	152	284	265	323	55	1079
CM	05T	Buckled Track	23	97	263	356	9	748
CM	06T	Rail Defects at Bolted Joint	20	15	32	282	144	493
CM	07T	Joint Bar Defects	6	17	73	240	268	604
CM	08T	Broken Rails or Welds	386	606	879	1669	369	3909
CM	09T	Other Rail and Joint Defects	5	61	108	458	85	717
CM	10T	Turnout Defects - Switches	89	13	70	33	33	238
CM	11T	Turnout Defects - Frogs	8	1	3	22	0	34
TM	12T	Misc. Track and Structure Defects	116	43	55	36	68	318
		Total Track and Structure Defects	1146	1473	1920	3762	1060	9361
		Signal and Communications Defects (TM)						
CM	01S	Signal failures	12	0	28	23	21	84
		Equipment Defects						
CM	01E	Air Hose Defect (Car)	0	21	10	26	7	64
CM	02E	Brake Rigging Defect (Car)	0	37	2	65	4	108
CM	03E	Handbrake Defects (Car)	2	0	0	0	0	2
CM	04E	UDE (Car or Loco)	2	0	0	18	0	20
CM	05E	Other Brake Defect (Car)	0	22	44	31	1	98
CM	06E	Centerplate/Carbody Defects (Car)	5	34	81	114	8	242
CM	07E	Coupler Defects (Car)	4	53	78	241	40	416
CM	08E	Truck Structure Defects (Car)	0	0	6	61	8	75
CM	09E	Sidebearing, Suspension Defects (Car)	51	162	122	164	11	510
CM	10E	Bearing failure (Car)	0	23	96	455	75	649
CM	11E	Other Axle/Journal Defects (Car)	6	31	106	264	69	476
CM	12E	Broken Wheels (Car)	11	70	201	401	63	746
CM	13E	Other Wheel Defects (Car)	39	67	52	105	6	269
CM	14E	TOFC/COFC Defects	0	0	0	1	0	1
CM	15E	Loco Trucks/Bearings/Wheels	0	46	13	39	11	109
TM	16E	Loco Electrical and Fires	0	0	0	16	0	16
TM	17E	All Other Locomotive Defects	0	13	9	31	0	53
TM	18E	All Other Car Defects	14	21	44	29	15	123
TM	19E	Stiff Truck (Car)	9	44	3	40	0	96
CM	20E	Track/Train Interaction (Hunting)(Car)	0	0	18	68	59	145
		Total. Equipment Defects	143	623	875	2143	370	4218
		Human Factors/Operations						
CM	01H	Brake Operation (Main Line)	17	60	85	230	27	419
TM	02H	Handbrake Operations	14	2	42	8	18	84
TM	03H	Brake Operations (Other)	0	0	0	0	0	0
TM	04H	Employee Physical Condition	0	30	0	0	0	30
TM	05H	Failure to Obey/Display Signals	7	1	16	86	5	115
TM	06H	Radio Communications Error	1	0	0	0	0	1
TM	07H	Switching Rules	17	8	18	73	5	121
TM	08H	Mainline Rules	1	12	7	4	0	24
CM	09H	Train Handling (excl Brakes)	119	138	204	311	14	786
TM	10H	Train Speed	107	43	55	57	5	267
TM	11H	Use of Switches	67	28	36	53	9	193
TM	12H	Miscellaneous Human Factors	29	5	28	110	9	181
		Total Human Factors/Operations	379	327	491	932	92	2221
		Miscellaneous Causes (TM)						
TM	01M	Obstructions	34	66	149	328	325	902
TM	02M	Grade Crossing Collisions	0	0	0	0	0	0
CM	03M	Lading Problems	37	130	114	164	56	501
CM	04M	Track-Train Interaction	60	138	169	172	9	548
TM	05M	Other Miscellaneous	3	82	85	178	0	348
		Total Miscellaneous Causes	134	416	517	842	390	2299
		Total Car-Mile Causes	902	1842	2857	6013	1397	13011
		Total Train Mile Causes	912	1018	984	1715	543	5172
		Total all Causes	1814	2839	3831	7702	1933	18183

*Including unknown track class

Check Sum 1814 2860 3841 7728 1940 18183

Table A 2.4: Cars Derailed in Accidents by Cause Group, Track Class, Accident Type and Railroad Type

Train Mile or Car Mile	Cause Group		Cars Derailed in Collisions by Track Class					Total
			X & 1	2	3	4	5 & 6	
		Track and Structure Defects (CM)						
TM	01T	Roadbed Defects	0	0	0	0	0	0
TM	02T	Non-Traffic, Weather Causes	0	0	0	0	0	0
TM	03T	Wide Gauge	0	0	0	0	0	0
TM	04T	Track Geometry (excl. Wide Gauge)	0	0	0	0	0	0
CM	05T	Buckled Track	0	0	0	0	0	0
CM	06T	Rail Defects at Bolted Joint	0	0	0	0	0	0
CM	07T	Joint Bar Defects	0	0	0	0	0	0
CM	08T	Broken Rails or Welds	3	0	0	0	0	3
CM	09T	Other Rail and Joint Defects	0	0	0	24	0	24
CM	10T	Turnout Defects - Switches	0	0	0	0	0	0
CM	11T	Turnout Defects - Frogs	0	0	0	0	0	0
TM	12T	Misc. Track and Structure Defects	0	0	0	0	0	0
		Total Track and Structure Defects	3	0	0	24	0	27
		Signal and Communications Defects (TM)						
CM	01S	Signal failures	0	0	0	0	5	5
		Equipment Defects						
CM	01E	Air Hose Defect (Car)	0	0	0	0	0	0
CM	02E	Brake Rigging Defect (Car)	0	0	0	0	7	7
CM	03E	Handbrake Defects (Car)	0	0	0	0	0	0
CM	04E	UDE (Car or Loco)	0	0	0	0	0	0
CM	05E	Other Brake Defect (Car)	0	0	0	0	0	0
CM	06E	Centerplate/Carbody Defects (Car)	0	0	0	0	0	0
CM	07E	Coupler Defects (Car)	1	0	2	3	0	6
CM	08E	Truck Structure Defects (Car)	0	0	0	0	0	0
CM	09E	Sidebearing, Suspension Defects (Car)	0	0	0	0	0	0
CM	10E	Bearing failure (Car)	0	0	0	0	4	4
CM	11E	Other Axle/Journal Defects (Car)	0	0	0	0	0	0
CM	12E	Broken Wheels (Car)	0	0	0	0	0	0
CM	13E	Other Wheel Defects (Car)	0	0	0	24	0	24
CM	14E	TOFC/COFC Defects	0	0	0	0	0	0
CM	15E	Loco Trucks/Bearings/Wheels	0	0	0	0	0	0
TM	16E	Loco Electrical and Fires	0	0	0	0	0	0
TM	17E	All Other Locomotive Defects	0	0	0	0	0	0
TM	18E	All Other Car Defects	0	0	0	0	0	0
TM	19E	Stiff Truck (Car)	0	0	0	0	0	0
CM	20E	Track/Train Interaction (Hunting)(Car)	0	0	0	0	0	0
		Total. Equipment Defects	1	0	2	27	11	41
		Human Factors/Operations						
CM	01H	Brake Operation (Main Line)	0	0	11	3	0	14
TM	02H	Handbrake Operations	2	14	0	0	0	16
TM	03H	Brake Operations (Other)	0	0	0	1	0	1
TM	04H	Employee Physical Condition	0	0	1	0	22	23
TM	05H	Failure to Obey/Display Signals	4	8	27	206	75	320
TM	06H	Radio Communications Error	0	0	18	0	0	18
TM	07H	Switching Rules	3	14	9	4	0	30
TM	08H	Mainline Rules	0	5	1	72	0	78
CM	09H	Train Handling (excl Brakes)	0	0	0	0	0	0
TM	10H	Train Speed	26	33	14	30	14	117
TM	11H	Use of Switches	3	0	0	0	0	3
TM	12H	Miscellaneous Human Factors	0	1	0	8	0	9
		Total Human Factors/Operations	38	75	81	324	111	629
		Miscellaneous Causes (TM)						
TM	01M	Obstructions	0	0	0	0	0	0
TM	02M	Grade Crossing Collisions	0	0	0	0	0	0
CM	03M	Lading Problems	0	0	5	0	0	5
CM	04M	Track-Train Interaction	0	0	0	0	0	0
TM	05M	Other Miscellaneous	0	0	0	0	0	0
		Total Miscellaneous Causes	0	0	5	0	0	5
		Total Car-Mile Causes	4	0	18	54	16	92
		Total Train Mile Causes	38	75	70	321	111	615
		Total all Causes	42	75	88	375	127	707

*Including unknown track class

Check Sum 42 75 88 375 127 707

Table A 2.4: Cars Derailed in Accidents by Cause Group, Track Class, Accident Type and Railroad Type

Train Mile or Car Mile	Cause Group		Cars Derailed in Other Accidents by Track Class					All Accident Types and Track Classes Class I Railroads
			X & 1	2	3	4	5 & 6	
		Track and Structure Defects (CM)						
TM	01T	Roadbed Defects	0	0	0	0	0	343
TM	02T	Non-Traffic, Weather Causes	0	0	0	0	0	88
TM	03T	Wide Gauge	0	0	0	0	0	790
TM	04T	Track Geometry (excl. Wide Gauge)	0	0	0	0	0	1079
CM	05T	Buckled Track	0	0	0	0	0	748
CM	06T	Rail Defects at Bolted Joint	0	0	0	0	0	493
CM	07T	Joint Bar Defects	0	0	0	0	0	604
CM	08T	Broken Rails or Welds	0	0	0	0	0	3912
CM	09T	Other Rail and Joint Defects	0	0	0	0	0	741
CM	10T	Turnout Defects - Switches	0	0	0	0	0	238
CM	11T	Turnout Defects - Frogs	0	0	0	0	0	34
TM	12T	Misc. Track and Structure Defects	0	0	0	0	0	318
		Total Track and Structure Defects	0	0	0	0	0	9388
		Signal and Communications Defects (TM)						
CM	01S	Signal failures	0	0	0	0	0	89
		Equipment Defects						
CM	01E	Air Hose Defect (Car)	0	0	0	0	0	64
CM	02E	Brake Rigging Defect (Car)	0	0	0	0	0	115
CM	03E	Handbrake Defects (Car)	0	0	0	0	0	2
CM	04E	UDE (Car or Loco)	0	0	0	0	0	20
CM	05E	Other Brake Defect (Car)	0	0	0	0	0	98
CM	06E	Centerplate/Carbody Defects (Car)	1	0	0	40	0	283
CM	07E	Coupler Defects (Car)	0	0	0	3	5	430
CM	08E	Truck Structure Defects (Car)	0	0	0	0	0	75
CM	09E	Sidebearing, Suspension Defects (Car)	0	0	0	0	0	510
CM	10E	Bearing failure (Car)	0	0	0	1	1	655
CM	11E	Other Axle/Journal Defects (Car)	0	0	0	1	0	477
CM	12E	Broken Wheels (Car)	0	0	0	1	0	747
CM	13E	Other Wheel Defects (Car)	0	0	0	0	0	293
CM	14E	TOFC/COFC Defects	0	0	0	0	0	1
CM	15E	Loco Trucks/Bearings/Wheels	0	0	0	0	0	109
TM	16E	Loco Electrical and Fires	0	0	0	0	0	16
TM	17E	All Other Locomotive Defects	0	1	0	0	0	54
TM	18E	All Other Car Defects	0	0	0	0	0	123
TM	19E	Stiff Truck (Car)	0	0	0	0	0	96
CM	20E	Track/Train Interaction (Hunting)(Car)	0	0	0	0	0	145
		Total. Equipment Defects	1	1	0	46	6	4313
		Human Factors/Operations						
CM	01H	Brake Operation (Main Line)	0	0	0	0	0	433
TM	02H	Handbrake Operations	6	2	16	1	0	125
TM	03H	Brake Operations (Other)	0	0	0	0	0	1
TM	04H	Employee Physical Condition	0	0	0	0	0	53
TM	05H	Failure to Obey/Display Signals	0	0	1	0	0	436
TM	06H	Radio Communications Error	0	0	0	0	0	19
TM	07H	Switching Rules	6	1	1	4	0	163
TM	08H	Mainline Rules	0	0	0	0	0	102
CM	09H	Train Handling (excl Brakes)	0	0	0	0	0	786
TM	10H	Train Speed	0	6	0	5	0	395
TM	11H	Use of Switches	1	0	0	12	0	209
TM	12H	Miscellaneous Human Factors	0	0	0	0	0	190
		Total Human Factors/Operations	13	9	18	22	0	2912
		Miscellaneous Causes (TM)						
TM	01M	Obstructions	0	27	9	38	9	985
TM	02M	Grade Crossing Collisions	2	0	49	165	53	269
CM	03M	Lading Problems	0	0	0	0	0	506
CM	04M	Track-Train Interaction	0	0	0	0	0	548
TM	05M	Other Miscellaneous	0	1	11	0	0	360
		Total Miscellaneous Causes	2	28	69	203	62	2668
		Total Car-Mile Causes	1	0	0	46	6	13156
		Total Train Mile Causes	15	38	87	225	62	6214
		Total all Causes	16	38	87	271	68	19370

*Including unknown track class

Check Sum 16 38 87 271 68 480 19370

Table A 2.4: Cars Derailed in Accidents by Cause Group, Track Class, Accident Type and Railroad Type

Train Mile or Car Mile	Cause Group		Cars Derailed in Accidents on Non Class I Railroads				Tab Types and Track Classes
			Derailments	Collisions	Other	Total	
		Track and Structure Defects (CM)					
TM	01T	Roadbed Defects	102	0	0	102	445
TM	02T	Non-Traffic, Weather Causes	72	0	1	73	161
TM	03T	Wide Gauge	720	0	0	720	1510
TM	04T	Track Geometry (excl. Wide Gauge)	510	2	3	515	1594
CM	05T	Buckled Track	391	0	0	391	1139
CM	06T	Rail Defects at Bolted Joint	94	0	0	94	587
CM	07T	Joint Bar Defects	58	0	0	58	662
CM	08T	Broken Rails or Welds	1563	0	0	1563	5475
CM	09T	Other Rail and Joint Defects	138	0	0	138	879
CM	10T	Turnout Defects - Switches	134	0	0	134	372
CM	11T	Turnout Defects - Frogs	134	0	0	134	168
TM	12T	Misc. Track and Structure Defects	181	0	0	181	499
		Total Track and Structure Defects	4,097	2	4	4,103	13491
		Signal and Communications Defects (TM)					
CM	01S	Signal failures	0	0	0	0	89
		Equipment Defects					
CM	01E	Air Hose Defect (Car)	0	0	0	0	64
CM	02E	Brake Rigging Defect (Car)	26	0	0	26	141
CM	03E	Handbrake Defects (Car)	0	0	0	0	2
CM	04E	UDE (Car or Loco)	7	0	0	7	27
CM	05E	Other Brake Defect (Car)	24	0	0	24	122
CM	06E	Centerplate/Carbody Defects (Car)	35	0	0	35	318
CM	07E	Coupler Defects (Car)	100	0	0	100	530
CM	08E	Truck Structure Defects (Car)	48	0	0	48	123
CM	09E	Sidebearing, Suspension Defects (Car)	111	0	0	111	621
CM	10E	Bearing failure (Car)	125	0	6	131	786
CM	11E	Other Axle/Journal Defects (Car)	58	0	0	58	535
CM	12E	Broken Wheels (Car)	27	0	0	27	774
CM	13E	Other Wheel Defects (Car)	91	0	0	91	384
CM	14E	TOFC/COFC Defects	6	0	0	6	7
CM	15E	Loco Trucks/Bearings/Wheels	0	0	0	0	109
TM	16E	Loco Electrical and Fires	0	0	0	0	16
TM	17E	All Other Locomotive Defects	6	0	0	6	60
TM	18E	All Other Car Defects	15	0	12	27	150
TM	19E	Stiff Truck (Car)	31	0	0	31	127
CM	20E	Track/Train Interaction (Hunting)(Car)	6	0	0	6	151
		Total. Equipment Defects	716	0	18	734	5047
		Human Factors/Operations					
CM	01H	Brake Operation (Main Line)	86	0	2	88	521
TM	02H	Handbrake Operations	22	12	10	44	169
TM	03H	Brake Operations (Other)	26	0	0	26	27
TM	04H	Employee Physical Condition	5	0	0	5	58
TM	05H	Failure to Obey/Display Signals	0	27	1	28	464
TM	06H	Radio Communications Error	0	6	0	6	25
TM	07H	Switching Rules	27	0	1	28	191
TM	08H	Mainline Rules	5	4	0	9	111
CM	09H	Train Handling (excl Brakes)	228	0	0	228	1014
TM	10H	Train Speed	139	11	0	150	545
TM	11H	Use of Switches	77	2	5	84	293
TM	12H	Miscellaneous Human Factors	0	0	0	0	190
		Total Human Factors/Operations	615	62	19	696	3608
		Miscellaneous Causes (TM)					
TM	01M	Obstructions	70	0	0	70	1055
TM	02M	Grade Crossing Collisions	0	0	39	39	308
CM	03M	Lading Problems	141	0	0	141	647
CM	04M	Track-Train Interaction	106	0	0	106	654
TM	05M	Other Miscellaneous	112	18	0	130	490
		Total Miscellaneous Causes	429	18	39	486	3154
		Total Car-Mile Causes	3737	0	8	3745	16901
		Total Train Mile Causes	2120	82	72	2274	8488
		Total all Causes	5857	82	80	6019	25389

*Including unknown track class

Check Sum 5857 82 80 6019 25389

Table A2.5. Accident frequencies and Car Derailment Metrics

RR Type	CM/TM	Traffic, Accident Type Percent Traffic	Track Class					Total
			X/1	2	3	4	5 and 6	
		Car-miles	0.30%	3.20%	11.60%	63.10%	21.90%	100.10%
		Train-miles	0.30%	3.30%	12.10%	61.80%	22.60%	100.10%
Class I	Car-Mile Accident Frequencies	Traffic (millions CM)	567	6053	21941	119354	41424	189150
		Derailments	183	245	309	614	167	1518
		Derailment Frequency/Billion CM	**	45.00	14.08	5.14	4.03	8.03
		Collisions	2	6	4	10	9	31
		Collision Frequency/Billion CM	**	0.99	0.18	0.08	0.22	0.16
		Other Accidents	3	1	11	45	15	75
		Other Accident Frequency/ Billion CM	**	0.17	0.50	0.38	0.36	0.40
		All "Car-Mile" Accidents	188	252	324	669	191	1624
		All "Car-Mile" Accident Frequencies	**	41.63	14.77	5.61	4.61	8.59
Class I	Train-Mile Accident Frequencies	Traffic (millions TM)	8.1	89.6	328.4	1677.3	613.4	2714
		Derailments	177	144	123	194	50	688
		Derailment Frequency/Million TM	**	1.608	0.375	0.116	0.082	0.254
		Collisions	28	27	44	100	30	229
		Collision Frequency/Million TM	**	0.301	0.134	0.060	0.049	0.084
		Other Accidents	22	52	152	515	166	907
		Other Accident Frequency/ Billion TM	**	0.581	0.463	0.307	0.271	0.334
		All "Train-Mile" Accidents	227	223	319	809	246	1824
		All "Train-Mile" Accident Frequencies	**	2.490	0.971	0.482	0.401	0.672
Class I	Overall Accident Frequencies	Derailment Frequency/Million TM	**	4.343	1.315	0.482	0.354	0.813
		Collision Frequency/ Million TM	**	0.368	0.146	0.066	0.064	0.096
		Other Accident Frequency/Million TM	**	0.592	0.496	0.334	0.295	0.362
		Frequency of All Class I Accidents	**	5.304	1.958	0.881	0.712	1.270
	Car Derailment Metrics	Cars Derailed in Train Derailments	1814	2839	3831	7702	1933	18183
		Cars Derailed in Train Derailments/Billion Car-Miles	**	469.0	174.6	64.5	46.7	96.1
		Average Cars Derailed per Derailment Accident	**	7.3	8.9	9.5	8.9	8.2
		Cars Derailed in Train Collisions	42	75	88	375	127	707
		Cars Derailed in Train Collisions/Billion Car-Miles	**	12.391	4.011	3.142	3.066	3.738
		Average Cars Derailed per Collision Accident	**	2.273	1.833	3.409	3.256	2.719
		Cars Derailed in Other Accidents	16	38	87	271	68	480
		Cars Derailed in Other Accidents/Billion Car-miles	**	6.278	3.965	2.271	1.642	2.538
		Average Cars Derailed per Other Accident	**	0.717	0.534	0.484	0.376	0.489
		Cars Derailed in all Accident Types	1872	2952	4006	8348	2128	19370
Cars Derailed in all Accident Types/Billion Car-Miles	**	487.7	182.6	69.9	51.4	102.4		
Cars Derailed per Accident	**	6.0	6.0	5.2	4.4	5.3		
Non Class I	Car-Mile Accident Frequencies	Traffic (millions CM)						11009
		Derailments						547
		Derailment Frequency/Billion CM	Not calculated: no car- and train-mile data by track class					49.69
		Collisions						4
		Collision Frequency/Billion CM	Not calculated: no car- and train-mile data by track class					0.36
		Other Accidents						11
		Other Accident Frequency/ Billion CM	Not calculated: no car- and train-mile data by track class					1.00
		All "Car-Mile" Accidents						562
All "Car-Mile" Accident Frequencies						51.05		
Non Class I	Train-Mile Accident Frequencies	Traffic (millions TM)						220
		Derailments						376
		Derailment Frequency/Million TM	Not calculated: no car- and train-mile data by track class					1.71
		Collisions						33
		Collision Frequency/Billion TM	Not calculated: no car- and train-mile data by track class					0.15
		Other Accidents						132
		Other Accident Frequency/ Million TM	Not calculated: no car- and train-mile data by track class					0.60
		All "Train-Mile" Accidents						541
All "Train-Mile" Accident Frequencies						2.55		

Table A2.5. Accident frequencies and Car Derailment Metrics

RR Type	CM/TM	Traffic, Accident Type Percent Traffic	Track Class					Total
			X/1	2	3	4	5 and 6	
Non-Class I	Overall Accident Frequencies	Derailment Frequency/Million TM						4.20
		Collision Frequency/ Million TM						0.17
		Other Accident Frequency/Million TM						0.65
		Frequency of All Class I Accidents/Million TM						5.01
	Car Derailment Metrics	Cars Derailed in Train Derailments						5857
		Cars Derailed in Train Derailments/Billion Car-Miles						532
		Average Cars Derailed per Derailment Accident						6.35
		Cars Derailed in Train Collisions						82
		Cars Derailed in Train Collisions/Billion Car-Miles						7.45
		Average Cars Derailed per Collision Accident						2.22
		Cars Derailed in Other Accidents						80
		Cars Derailed in Other Accidents/Billion Car-miles						7.45
		Average Cars Derailed per Other Accident						1.82
		Cars Derailed in all Accident Types						6019
Cars Derailed in all Accident Types/Billion Car-Miles						547		
Cars Derailed per Accident						5.46		
All Railroads	Overall Accident Frequencies	Derailment Frequency/Million TM						1.066
		Collision Frequency/ Million TM						0.101
		Other Accident Frequency/Million TM						0.383
		Frequency of All Class I Accidents/Million TM						1.551
	Car Derailment Metrics	Cars Derailed in Train Derailments						24040
		Cars Derailed in Train Derailments/Billion Car-Miles						120.1
		Average Cars Derailed per Derailment Accident						7.68
		Cars Derailed in Train Collisions						789
		Cars Derailed in Train Collisions/Billion Car-Miles						3.94
		Average Cars Derailed per Collision Accident						2.66
		Cars Derailed in Other Accidents						560
		Cars Derailed in Other Accidents/Billion Car-miles						2.80
		Average Cars Derailed per Other Accident						0.123
		Cars Derailed in all Accident Types						25389
Cars Derailed in all Accident Types/Billion Car-Miles						126.8		
Cars Derailed per Accident						5.58		

**Table A3.1: Hazmat Trains in Accidents
by Cause Group, Track Class and Railroad Type**

Train Mile or Car Mile	Cause Group		Hazmat trains in Derailments by Track Class					Total Class I
			X & 1	2	3	4	5 & 6	
		Track and Structure Defects (CM)						
TM	01T	Roadbed Defects	3	2	4	2	0	11
TM	02T	Non-Traffic, Weather Causes	1	0	1	3	0	5
TM	03T	Wide Gauge	9	5	3	5	0	22
TM	04T	Track Geometry (excl. Wide Gauge)	15	25	16	22	2	80
CM	05T	Buckled Track	1	5	4	5	0	15
CM	06T	Rail Defects at Bolted Joint	1	1	1	5	3	11
CM	07T	Joint Bar Defects	0	1	1	5	6	13
CM	08T	Broken Rails or Welds	13	21	19	38	7	98
CM	09T	Other Rail and Joint Defects	0	1	1	3	0	5
CM	10T	Turnout Defects - Switches	4	1	7	4	1	17
CM	11T	Turnout Defects - Frogs	0	0	0	1	0	1
TM	12T	Misc. Track and Structure Defects	4	4	1	1	0	10
		Total Track and Structure Defects	51	66	58	94	19	288
		Signal and Communications Defects (TM)						
CM	01S	Signal failures	1	0	1	0	1	3
		Equipment Defects						
CM	01E	Air Hose Defect (Car)	0	1	1	2	0	4
CM	02E	Brake Rigging Defect (Car)	0	1	1	2	0	4
CM	03E	Handbrake Defects (Car)	1	0	0	0	0	1
CM	04E	UDE (Car or Loco)	1	0	0	1	0	2
CM	05E	Other Brake Defect (Car)	0	1	4	3	1	9
CM	06E	Centerplate/Carbody Defects (Car)	1	1	6	13	2	23
CM	07E	Coupler Defects (Car)	1	2	5	19	2	29
CM	08E	Truck Structure Defects (Car)	0	0	0	1	2	3
CM	09E	Sidebearing, Suspension Defects (Car)	4	12	6	9	2	33
CM	10E	Bearing failure (Car)	0	0	8	24	8	40
CM	11E	Other Axle/Journal Defects (Car)	0	2	2	4	1	9
CM	12E	Broken Wheels (Car)	1	1	5	14	2	23
CM	13E	Other Wheel Defects (Car)	0	4	6	9	0	19
CM	14E	TOFC/COFC Defects	0	0	0	1	0	1
CM	15E	Loco Trucks/Bearings/Wheels	0	2	3	1	3	9
TM	16E	Loco Electrical and Fires	0	0	0	3	0	3
TM	17E	All Other Locomotive Defects	0	1	0	1	0	2
TM	18E	All Other Car Defects	0	0	1	2	2	5
TM	19E	Stiff Truck (Car)	1	5	1	1	0	8
CM	20E	Track/Train Interaction (Hunting)(Car)	0	0	1	2	3	6
		Total. Equipment Defects	10	33	50	112	28	233
		Human Factors/Operations						
CM	01H	Brake Operation (Main Line)	2	4	3	11	1	21
TM	02H	Handbrake Operations	0	1	1	0	1	3
TM	03H	Brake Operations (Other)	0	0	0	0	0	0
TM	04H	Employee Physical Condition	0	1	0	0	0	1
TM	05H	Failure to Obey/Display Signals	0	0	0	6	0	6
TM	06H	Radio Communications Error	0	0	0	0	0	0
TM	07H	Switching Rules	2	0	2	2	1	7
TM	08H	Mainline Rules	0	1	2	0	0	3
CM	09H	Train Handling (excl Brakes)	10	8	10	16	0	44
TM	10H	Train Speed	3	3	2	3	1	12
TM	11H	Use of Switches	4	4	2	6	2	18
TM	12H	Miscellaneous Human Factors	2	0	4	5	2	13
		Total Human Factors/Operations	23	22	26	49	8	128
		Miscellaneous Causes (TM)						
TM	01M	Obstructions	1	0	5	8	8	22
TM	02M	Grade Crossing Collisions	0	0	0	0	0	0
CM	03M	Lading Problems	4	9	8	8	5	34
CM	04M	Track-Train Interaction	1	7	8	8	1	25
TM	05M	Other Miscellaneous	0	1	2	7	0	10
		Total Miscellaneous Causes	6	17	23	31	14	91
		Total Car-Mile Causes	46	85	111	209	51	502
		Total Train Mile Causes	45	53	47	77	19	241
		Total all Causes	91	138	158	286	70	743

**Table A3.1: Hazmat Trains in Accidents
by Cause Group, Track Class and Railroad Type**

Train Mile or Car Mile	Cause Group		Hazmat trains in Collisions by Track Class					Total Class I
			X & 1	2	3	4	5 & 6	
		Track and Structure Defects (CM)						
TM	01T	Roadbed Defects	0	0	0	0	0	0
TM	02T	Non-Traffic, Weather Causes	0	0	0	0	0	0
TM	03T	Wide Gauge	0	0	0	0	0	0
TM	04T	Track Geometry (excl. Wide Gauge)	0	0	0	0	0	0
CM	05T	Buckled Track	0	0	0	0	0	0
CM	06T	Rail Defects at Bolted Joint	0	0	0	0	0	0
CM	07T	Joint Bar Defects	0	0	0	0	0	0
CM	08T	Broken Rails or Welds	0	0	0	0	0	0
CM	09T	Other Rail and Joint Defects	0	0	0	1	0	1
CM	10T	Turnout Defects - Switches	0	0	0	0	0	0
CM	11T	Turnout Defects - Frogs	0	0	0	0	0	0
TM	12T	Misc. Track and Structure Defects	0	0	0	0	0	0
		Total Track and Structure Defects	0	0	0	1	0	1
		Signal and Communications Defects (TM)						
CM	01S	Signal failures	0	0	0	0	1	1
		Equipment Defects						
CM	01E	Air Hose Defect (Car)	0	0	0	0	0	0
CM	02E	Brake Rigging Defect (Car)	0	0	0	0	0	0
CM	03E	Handbrake Defects (Car)	0	0	0	0	0	0
CM	04E	UDE (Car or Loco)	0	0	0	0	0	0
CM	05E	Other Brake Defect (Car)	0	0	0	0	0	0
CM	06E	Centerplate/Carbody Defects (Car)	0	0	0	0	0	0
CM	07E	Coupler Defects (Car)	0	0	0	1	0	1
CM	08E	Truck Structure Defects (Car)	0	0	0	0	0	0
CM	09E	Sidebearing, Suspension Defects (Car)	0	0	0	0	0	0
CM	10E	Bearing failure (Car)	0	0	0	0	1	1
CM	11E	Other Axle/Journal Defects (Car)	0	0	0	0	0	0
CM	12E	Broken Wheels (Car)	0	0	0	0	0	0
CM	13E	Other Wheel Defects (Car)	0	0	0	2	0	2
CM	14E	TOFC/COFC Defects	0	0	0	0	0	0
CM	15E	Loco Trucks/Bearings/Wheels	0	0	0	0	0	0
TM	16E	Loco Electrical and Fires	0	0	0	0	0	0
TM	17E	All Other Locomotive Defects	0	0	0	1	0	1
TM	18E	All Other Car Defects	0	0	0	0	1	1
TM	19E	Stiff Truck (Car)	0	0	0	0	0	0
CM	20E	Track/Train Interaction (Hunting)(Car)	0	0	0	0	0	0
		Total. Equipment Defects	0	0	0	4	2	6
		Human Factors/Operations						
CM	01H	Brake Operation (Main Line)	0	0	0	1	0	1
TM	02H	Handbrake Operations	1	0	0	1	0	2
TM	03H	Brake Operations (Other)	0	0	0	0	0	0
TM	04H	Employee Physical Condition	0	0	0	0	0	0
TM	05H	Failure to Obey/Display Signals	1	2	6	16	3	28
TM	06H	Radio Communications Error	0	0	0	1	0	1
TM	07H	Switching Rules	1	2	3	2	0	8
TM	08H	Mainline Rules	0	2	2	6	2	12
CM	09H	Train Handling (excl Brakes)	0	1	0	0	0	1
TM	10H	Train Speed	4	5	5	4	5	23
TM	11H	Use of Switches	1	0	0	0	0	1
TM	12H	Miscellaneous Human Factors	0	0	2	1	0	3
		Total Human Factors/Operations	8	12	18	32	10	80
		Miscellaneous Causes (TM)						
TM	01M	Obstructions	0	0	0	0	0	0
TM	02M	Grade Crossing Collisions	0	0	0	0	0	0
CM	03M	Lading Problems	0	0	0	2	1	3
CM	04M	Track-Train Interaction	0	0	0	0	0	0
TM	05M	Other Miscellaneous	0	0	0	1	0	1
		Total Miscellaneous Causes	0	0	0	3	1	4
		Total Car-Mile Causes	0	1	0	7	3	11
		Total Train Mile Causes	8	11	18	33	11	81
		Total all Causes	8	12	18	40	14	92

Table A3.1: Hazmat Trains in Accidents
by Cause Group, Track Class and Railroad Type

Train Mile or Car Mile	Cause Group		Hazmat trains in Other Accidents by Track Class					Total Class I	All Accident Types and Track Classes Class I Railroads
			X & 1	2	3	4	5 & 6		
		Track and Structure Defects (CM)							
TM	01T	Roadbed Defects	0	0	1	0	1	2	13
TM	02T	Non-Traffic, Weather Causes	0	0	0	0	0	0	5
TM	03T	Wide Gauge	0	0	0	0	0	0	22
TM	04T	Track Geometry (excl. Wide Gauge)	0	0	0	0	0	0	80
CM	05T	Buckled Track	0	0	0	0	0	0	15
CM	06T	Rail Defects at Bolted Joint	0	0	0	0	0	0	11
CM	07T	Joint Bar Defects	0	0	0	0	0	0	13
CM	08T	Broken Rails or Welds	0	0	0	0	0	0	98
CM	09T	Other Rail and Joint Defects	0	0	0	0	0	0	6
CM	10T	Turnout Defects - Switches	0	0	0	0	0	0	17
CM	11T	Turnout Defects - Frogs	0	0	0	0	0	0	1
TM	12T	Misc. Track and Structure Defects	0	0	0	0	0	0	10
		Total Track and Structure Defects	0	0	1	0	1	2	291
		Signal and Communications Defects (TM)							
CM	01S	Signal failures	0	0	0	0	0	0	4
		Equipment Defects							
CM	01E	Air Hose Defect (Car)	0	0	0	0	0	0	4
CM	02E	Brake Rigging Defect (Car)	0	0	0	0	0	0	4
CM	03E	Handbrake Defects (Car)	0	0	0	0	0	0	1
CM	04E	UDE (Car or Loco)	0	0	0	1	0	1	3
CM	05E	Other Brake Defect (Car)	0	0	1	0	0	1	10
CM	06E	Centerplate/Carbody Defects (Car)	2	0	2	2	0	6	29
CM	07E	Coupler Defects (Car)	0	0	0	3	3	6	36
CM	08E	Truck Structure Defects (Car)	0	0	0	0	0	0	3
CM	09E	Sidebearing, Suspension Defects (Car)	0	0	0	0	0	0	33
CM	10E	Bearing failure (Car)	0	0	0	0	1	1	42
CM	11E	Other Axle/Journal Defects (Car)	0	0	0	0	0	0	9
CM	12E	Broken Wheels (Car)	0	0	0	3	0	3	26
CM	13E	Other Wheel Defects (Car)	0	0	0	0	0	0	21
CM	14E	TOFC/COFC Defects	0	0	0	0	0	0	1
CM	15E	Loco Trucks/Bearings/Wheels	0	0	0	1	0	1	10
TM	16E	Loco Electrical and Fires	0	0	2	1	0	3	6
TM	17E	All Other Locomotive Defects	0	1	0	0	0	1	4
TM	18E	All Other Car Defects	0	0	0	0	0	0	6
TM	19E	Stiff Truck (Car)	0	0	0	0	0	0	8
CM	20E	Track/Train Interaction (Hunting)(Car)	0	0	0	0	0	0	6
		Total. Equipment Defects	2	1	5	11	4	23	262
		Human Factors/Operations							
CM	01H	Brake Operation (Main Line)	0	0	0	0	0	0	22
TM	02H	Handbrake Operations	1	0	2	1	0	4	9
TM	03H	Brake Operations (Other)	0	0	0	0	0	0	0
TM	04H	Employee Physical Condition	0	0	0	0	0	0	1
TM	05H	Failure to Obey/Display Signals	1	0	1	2	0	4	38
TM	06H	Radio Communications Error	0	0	0	0	0	0	1
TM	07H	Switching Rules	1	0	2	0	0	3	18
TM	08H	Mainline Rules	1	0	1	4	1	7	22
CM	09H	Train Handling (excl Brakes)	0	0	0	0	0	0	45
TM	10H	Train Speed	0	0	2	2	0	4	39
TM	11H	Use of Switches	1	0	1	2	0	4	23
TM	12H	Miscellaneous Human Factors	0	0	3	0	0	3	19
		Total Human Factors/Operations	5	0	12	11	1	29	237
		Miscellaneous Causes (TM)							
TM	01M	Obstructions	0	2	6	11	3	22	44
TM	02M	Grade Crossing Collisions	1	9	35	146	49	240	240
CM	03M	Lading Problems	0	0	0	4	1	5	42
CM	04M	Track-Train Interaction	0	0	0	0	0	0	25
TM	05M	Other Miscellaneous	0	1	1	0	1	3	14
		Total Miscellaneous Causes	1	12	42	161	54	270	365
		Total Car-Mile Causes	2	0	3	14	5	24	537
		Total Train Mile Causes	6	13	57	169	55	300	622
		Total all Causes	8	13	60	183	60	324	1159

Table A3.1: Hazmat Trains in Accidents
by Cause Group, Track Class and Railroad Type

Train Mile or Car Mile	Cause Group		Hazmat Trains in Accidents on Non Class I Railroads				All Railroads, Accident Types and Track Classes
			Derailments	Collisions	Other	Total	
		Track and Structure Defects (CM)					
TM	01T	Roadbed Defects	3	0	0	3	16
TM	02T	Non-Traffic, Weather Causes	3	0	1	4	9
TM	03T	Wide Gauge	21	0	0	21	43
TM	04T	Track Geometry (excl. Wide Gauge)	21	0	0	21	101
CM	05T	Buckled Track	19	0	0	19	34
CM	06T	Rail Defects at Bolted Joint	3	0	0	3	14
CM	07T	Joint Bar Defects	1	0	0	1	14
CM	08T	Broken Rails or Welds	50	0	0	50	148
CM	09T	Other Rail and Joint Defects	1	0	0	1	7
CM	10T	Turnout Defects - Switches	8	0	0	8	25
CM	11T	Turnout Defects - Frogs	1	0	0	1	2
TM	12T	Misc. Track and Structure Defects	2	0	0	2	12
		Total Track and Structure Defects	133	0	1	134	425
		Signal and Communications Defects (TM)					
CM	01S	Signal failures	0	0	0	0	4
		Equipment Defects					
CM	01E	Air Hose Defect (Car)	0	0	0	0	4
CM	02E	Brake Rigging Defect (Car)	2	0	0	2	6
CM	03E	Handbrake Defects (Car)	0	0	0	0	1
CM	04E	UDE (Car or Loco)	1	0	0	1	4
CM	05E	Other Brake Defect (Car)	1	0	0	1	11
CM	06E	Centerplate/Carbody Defects (Car)	2	2	1	5	34
CM	07E	Coupler Defects (Car)	3	0	0	3	39
CM	08E	Truck Structure Defects (Car)	0	0	0	0	3
CM	09E	Sidebearing, Suspension Defects (Car)	7	0	0	7	40
CM	10E	Bearing failure (Car)	10	0	0	10	52
CM	11E	Other Axle/Journal Defects (Car)	4	0	0	4	13
CM	12E	Broken Wheels (Car)	2	0	0	2	28
CM	13E	Other Wheel Defects (Car)	1	0	0	1	22
CM	14E	TOFC/COFC Defects	1	0	0	1	2
CM	15E	Loco Trucks/Bearings/Wheels	1	0	0	1	11
TM	16E	Loco Electrical and Fires	0	0	1	1	7
TM	17E	All Other Locomotive Defects	1	0	2	3	7
TM	18E	All Other Car Defects	0	0	1	1	7
TM	19E	Stiff Truck (Car)	3	0	0	3	11
CM	20E	Track/Train Interaction (Hunting)(Car)	0	0	0	0	6
		Total. Equipment Defects	39	2	5	46	308
		Human Factors/Operations					
CM	01H	Brake Operation (Main Line)	5	0	0	5	27
TM	02H	Handbrake Operations	2	1	2	5	14
TM	03H	Brake Operations (Other)	0	0	0	0	0
TM	04H	Employee Physical Condition	0	0	0	0	1
TM	05H	Failure to Obey/Display Signals	0	4	2	6	44
TM	06H	Radio Communications Error	0	1	0	1	2
TM	07H	Switching Rules	1	0	0	1	19
TM	08H	Mainline Rules	0	0	0	0	22
CM	09H	Train Handling (excl Brakes)	12	1	0	13	58
TM	10H	Train Speed	5	3	0	8	47
TM	11H	Use of Switches	7	1	0	8	31
TM	12H	Miscellaneous Human Factors	0	1	0	1	20
		Total Human Factors/Operations	32	12	4	48	285
		Miscellaneous Causes (TM)					
TM	01M	Obstructions	4	0	6	10	54
TM	02M	Grade Crossing Collisions	0	0	31	31	271
CM	03M	Lading Problems	5	0	0	5	47
CM	04M	Track-Train Interaction	5	0	0	5	30
TM	05M	Other Miscellaneous	3	1	0	4	18
		Total Miscellaneous Causes	17	1	37	55	420
		Total Car-Mile Causes	145	3	1	149	686
		Total Train Mile Causes	76	12	46	134	756
		Total all Causes	221	15	47	283	1442

Table A3.2. Cars Derailed in Hazmat Trains in Accidents

Train Mile or Car Mile	Cause Group		Cars Derailed in Hazmat Train Derailments by Track Class					Total Class I
			X & 1	2	3	4	5 & 6	
		Track and Structure Defects (CM)						
TM	01T	Roadbed Defects	7	18	25	24	0	74
TM	02T	Non-Traffic, Weather Causes	2	0	0	10	0	12
TM	03T	Wide Gauge	73	80	23	62	0	238
TM	04T	Track Geometry (excl. Wide Gauge)	69	105	115	150	1	440
CM	05T	Buckled Track	6	41	57	61	0	165
CM	06T	Rail Defects at Bolted Joint	6	3	4	139	51	203
CM	07T	Joint Bar Defects	0	8	8	38	122	176
CM	08T	Broken Rails or Welds	81	174	273	633	95	1256
CM	09T	Other Rail and Joint Defects	0	10	10	74	0	94
CM	10T	Turnout Defects - Switches	19	1	53	19	7	99
CM	11T	Turnout Defects - Frogs	0	0	0	2	0	2
TM	12T	Misc. Track and Structure Defects	15	24	14	8	0	61
		Total Track and Structure Defects	278	464	582	1220	276	2820
		Signal and Communications Defects (TM)						
CM	01S	Signal failures	4	0	4	0	21	29
		Equipment Defects						
CM	01E	Air Hose Defect (Car)	0	16	10	9	0	35
CM	02E	Brake Rigging Defect (Car)	0	20	1	2	0	23
CM	03E	Handbrake Defects (Car)	2	0	0	0	0	2
CM	04E	UDE (Car or Loco)	2	0	0	12	0	14
CM	05E	Other Brake Defect (Car)	0	1	16	9	1	27
CM	06E	Centerplate/Carbody Defects (Car)	4	1	70	94	4	173
CM	07E	Coupler Defects (Car)	1	44	16	101	4	166
CM	08E	Truck Structure Defects (Car)	0	0	0	1	2	3
CM	09E	Sidebearing, Suspension Defects (Car)	10	69	87	129	5	300
CM	10E	Bearing failure (Car)	0	0	30	145	60	235
CM	11E	Other Axle/Journal Defects (Car)	0	12	4	16	1	33
CM	12E	Broken Wheels (Car)	1	7	6	107	2	123
CM	13E	Other Wheel Defects (Car)	0	32	36	44	0	112
CM	14E	TOFC/COFC Defects	0	0	0	1	0	1
CM	15E	Loco Trucks/Bearings/Wheels	0	41	9	21	0	71
TM	16E	Loco Electrical and Fires	0	0	0	16	0	16
TM	17E	All Other Locomotive Defects	0	13	0	1	0	14
TM	18E	All Other Car Defects	0	0	15	3	14	32
TM	19E	Stiff Truck (Car)	2	20	3	24	0	49
CM	20E	Track/Train Interaction (Hunting)(Car)	0	0	17	19	54	90
		Total. Equipment Defects	22	260	310	745	147	1519
		Human Factors/Operations						
CM	01H	Brake Operation (Main Line)	4	55	23	146	3	231
TM	02H	Handbrake Operations	0	2	1	0	16	19
TM	03H	Brake Operations (Other)	0	0	0	0	0	0
TM	04H	Employee Physical Condition	0	29	0	0	0	29
TM	05H	Failure to Obey/Display Signals	0	0	0	9	0	9
TM	06H	Radio Communications Error	0	0	0	0	0	0
TM	07H	Switching Rules	9	0	18	13	5	45
TM	08H	Mainline Rules	0	0	7	0	0	7
CM	09H	Train Handling (excl Brakes)	62	60	156	166	0	444
TM	10H	Train Speed	25	15	35	7	3	85
TM	11H	Use of Switches	12	13	25	46	4	100
TM	12H	Miscellaneous Human Factors	7	0	17	89	9	122
		Total Human Factors/Operations	119	174	282	476	40	1091
		Miscellaneous Causes (TM)						
TM	01M	Obstructions	2	0	52	63	88	205
TM	02M	Grade Crossing Collisions	0	0	0	0	0	0
CM	03M	Lading Problems	8	50	68	62	54	242
CM	04M	Track-Train Interaction	7	45	65	102	1	220
TM	05M	Other Miscellaneous	0	8	29	58	0	95
		Total Miscellaneous Causes	17	103	214	285	143	762
		Total Car-Mile Causes	217	690	1023	2152	487	4569
		Total Train Mile Causes	223	327	379	583	140	1652
		Total all Causes	440	1001	1392	2726	627	6221

Table A3.2. Cars Derailed in Hazmat Trains in Accidents

Train Mile or Car Mile	Cause Group		Cars Derailed in Hazmat Train Collisions by Track Class					Total Class I
			X & 1	2	3	4	5 & 6	
		Track and Structure Defects (CM)						
TM	01T	Roadbed Defects	0	0	0	0	0	0
TM	02T	Non-Traffic, Weather Causes	0	0	0	0	0	0
TM	03T	Wide Gauge	0	0	0	0	0	0
TM	04T	Track Geometry (excl. Wide Gauge)	0	0	0	0	0	0
CM	05T	Buckled Track	0	0	0	0	0	0
CM	06T	Rail Defects at Bolted Joint	0	0	0	0	0	0
CM	07T	Joint Bar Defects	0	0	0	0	0	0
CM	08T	Broken Rails or Welds	0	0	0	0	0	0
CM	09T	Other Rail and Joint Defects	0	0	0	24	0	24
CM	10T	Turnout Defects - Switches	0	0	0	0	0	0
CM	11T	Turnout Defects - Frogs	0	0	0	0	0	0
TM	12T	Misc. Track and Structure Defects	0	0	0	0	0	0
		Total Track and Structure Defects	0	0	0	24	0	24
		Signal and Communications Defects (TM)						
CM	01S	Signal failures	0	0	0	0	0	0
		Equipment Defects						
CM	01E	Air Hose Defect (Car)	0	0	0	0	0	0
CM	02E	Brake Rigging Defect (Car)	0	0	0	0	0	0
CM	03E	Handbrake Defects (Car)	0	0	0	0	0	0
CM	04E	UDE (Car or Loco)	0	0	0	0	0	0
CM	05E	Other Brake Defect (Car)	0	0	0	0	0	0
CM	06E	Centerplate/Carbody Defects (Car)	0	0	0	0	0	0
CM	07E	Coupler Defects (Car)	0	0	0	0	0	0
CM	08E	Truck Structure Defects (Car)	0	0	0	0	0	0
CM	09E	Sidebearing, Suspension Defects (Car)	0	0	0	0	0	0
CM	10E	Bearing failure (Car)	0	0	0	0	4	4
CM	11E	Other Axle/Journal Defects (Car)	0	0	0	0	0	0
CM	12E	Broken Wheels (Car)	0	0	0	0	0	0
CM	13E	Other Wheel Defects (Car)	0	0	0	24	0	24
CM	14E	TOFC/COFC Defects	0	0	0	0	0	0
CM	15E	Loco Trucks/Bearings/Wheels	0	0	0	0	0	0
TM	16E	Loco Electrical and Fires	0	0	0	0	0	0
TM	17E	All Other Locomotive Defects	0	0	0	0	0	0
TM	18E	All Other Car Defects	0	0	0	0	0	0
TM	19E	Stiff Truck (Car)	0	0	0	0	0	0
CM	20E	Track/Train Interaction (Hunting)(Car)	0	0	0	0	0	0
		Total. Equipment Defects	0	0	0	24	4	28
		Human Factors/Operations						
CM	01H	Brake Operation (Main Line)	0	0	0	0	0	0
TM	02H	Handbrake Operations	0	0	0	0	0	0
TM	03H	Brake Operations (Other)	0	0	0	0	0	0
TM	04H	Employee Physical Condition	0	0	0	0	0	0
TM	05H	Failure to Obey/Display Signals	4	6	23	97	5	135
TM	06H	Radio Communications Error	0	0	0	0	0	0
TM	07H	Switching Rules	0	5	9	4	0	18
TM	08H	Mainline Rules	0	5	1	28	0	34
CM	09H	Train Handling (excl Brakes)	0	0	0	0	0	0
TM	10H	Train Speed	7	19	9	9	10	54
TM	11H	Use of Switches	1	0	0	0	0	1
TM	12H	Miscellaneous Human Factors		0	0	0	0	0
		Total Human Factors/Operations	12	35	42	138	15	242
		Miscellaneous Causes (TM)						
TM	01M	Obstructions	0	0	0	0	0	0
TM	02M	Grade Crossing Collisions	0	0	0	0	0	0
CM	03M	Lading Problems	0	0	0	0	0	0
CM	04M	Track-Train Interaction	0	0	0	0	0	0
TM	05M	Other Miscellaneous	0	0	0	0	0	0
		Total Miscellaneous Causes	0	0	0	0	0	0
		Total Car-Mile Causes	0	0	0	48	4	52
		Total Train Mile Causes	12	35	42	138	15	242
		Total all Causes	12	35	42	186	19	294

Table A3.2. Cars Derailed in Hazmat Trains in Accidents

Train Mile or Car Mile	Cause Group		Cars Derailed in Hazmat Train Other Accidents by Track Class					Total Class I	All Accident Types and Track Classes Class I Railroads
			X & 1	2	3	4	5 & 6		
		Track and Structure Defects (CM)							
TM	01T	Roadbed Defects	0	0	0	0	0	0	74
TM	02T	Non-Traffic, Weather Causes	0	0	0	0	0	0	12
TM	03T	Wide Gauge	0	0	0	0	0	0	238
TM	04T	Track Geometry (excl. Wide Gauge)	0	0	0	0	0	0	440
CM	05T	Buckled Track	0	0	0	0	0	0	165
CM	06T	Rail Defects at Bolted Joint	0	0	0	0	0	0	203
CM	07T	Joint Bar Defects	0	0	0	0	0	0	176
CM	08T	Broken Rails or Welds	0	0	0	0	0	0	1256
CM	09T	Other Rail and Joint Defects	0	0	0	0	0	0	118
CM	10T	Turnout Defects - Switches	0	0	0	0	0	0	99
CM	11T	Turnout Defects - Frogs	0	0	0	0	0	0	2
TM	12T	Misc. Track and Structure Defects	0	0	0	0	0	0	61
		Total Track and Structure Defects	0	0	0	0	0	0	2844
		Signal and Communications Defects (TM)							
CM	01S	Signal failures	0	0	0	0	0	0	29
		Equipment Defects							
CM	01E	Air Hose Defect (Car)	0	0	0	0	0	0	35
CM	02E	Brake Rigging Defect (Car)	0	0	0	0	0	0	23
CM	03E	Handbrake Defects (Car)	0	0	0	0	0	0	2
CM	04E	UDE (Car or Loco)	0	0	0	0	0	0	14
CM	05E	Other Brake Defect (Car)	0	0	0	0	0	0	27
CM	06E	Centerplate/Carbody Defects (Car)	1	0	0	1	0	2	175
CM	07E	Coupler Defects (Car)	0	0	0	3	5	8	174
CM	08E	Truck Structure Defects (Car)	0	0	0	0	0	0	3
CM	09E	Sidebearing, Suspension Defects (Car)	0	0	0	0	0	0	300
CM	10E	Bearing failure (Car)	0	0	0	0	1	1	240
CM	11E	Other Axle/Journal Defects (Car)	0	0	0	0	0	0	33
CM	12E	Broken Wheels (Car)	0	0	0	1	0	1	124
CM	13E	Other Wheel Defects (Car)	0	0	0	0	0	0	136
CM	14E	TOFC/COFC Defects	0	0	0	0	0	0	1
CM	15E	Loco Trucks/Bearings/Wheels	0	0	0	0	0	0	71
TM	16E	Loco Electrical and Fires	0	0	0	0	0	0	16
TM	17E	All Other Locomotive Defects	0	1	0	0	0	1	15
TM	18E	All Other Car Defects	0	0	0	0	0	0	32
TM	19E	Stiff Truck (Car)	0	0	0	0	0	0	49
CM	20E	Track/Train Interaction (Hunting)(Car)	0	0	0	0	0	0	90
		Total. Equipment Defects	1	1	0	5	6	13	1560
		Human Factors/Operations							
CM	01H	Brake Operation (Main Line)	0	0	0	0	0	0	231
TM	02H	Handbrake Operations	0	0	15	0	0	15	34
TM	03H	Brake Operations (Other)	0	0	0	0	0	0	0
TM	04H	Employee Physical Condition	0	0	0	0	0	0	29
TM	05H	Failure to Obey/Display Signals	0	0	1	0	0	1	145
TM	06H	Radio Communications Error	0	0	0	0	0	0	0
TM	07H	Switching Rules	1	0	0	0	0	1	64
TM	08H	Mainline Rules	0	0	0	0	0	0	41
CM	09H	Train Handling (excl Brakes)	0	0	0	0	0	0	444
TM	10H	Train Speed	0	0	0	1	0	1	140
TM	11H	Use of Switches	1	0	0	12	0	13	114
TM	12H	Miscellaneous Human Factors	0	0	0	0	0	0	122
		Total Human Factors/Operations	2	0	16	13	0	31	1364
		Miscellaneous Causes (TM)							
TM	01M	Obstructions	0	22	8	6	0	36	241
TM	02M	Grade Crossing Collisions	0	0	3	20	13	36	36
CM	03M	Lading Problems	0	0	0	0	0	0	242
CM	04M	Track-Train Interaction	0	0	0	0	0	0	220
TM	05M	Other Miscellaneous	0	0	11	0	0	11	106
		Total Miscellaneous Causes	0	22	22	26	13	83	845
		Total Car-Mile Causes	1	0	0	5	6	12	4633
		Total Train Mile Causes	2	23	38	39	13	115	2009
		Total all Causes	3	23	38	44	19	127	6642

Table A3.2. Cars Derailed in Hazmat Trains in Accidents

Train Mile or Car Mile	Cause Group		Cars Derailed in Hazmat Train Accidents on Non Class I Railroads				All Railroads, Accident Types and Track Classes
			Derailments	Collisions	Other	Total	
		Track and Structure Defects (CM)					
TM	01T	Roadbed Defects	20	0	0	20	94
TM	02T	Non-Traffic, Weather Causes	22	0	0	22	34
TM	03T	Wide Gauge	141	0	0	141	379
TM	04T	Track Geometry (excl. Wide Gauge)	125	0	0	125	565
CM	05T	Buckled Track	123	0	0	123	288
CM	06T	Rail Defects at Bolted Joint	48	0	0	48	251
CM	07T	Joint Bar Defects	9	0	0	9	185
CM	08T	Broken Rails or Welds	444	0	0	444	1700
CM	09T	Other Rail and Joint Defects	7	0	0	7	125
CM	10T	Turnout Defects - Switches	39	0	0	39	138
CM	11T	Turnout Defects - Frogs	122	0	0	122	124
TM	12T	Misc. Track and Structure Defects	13	0	0	13	74
		Total Track and Structure Defects	1,113	0	0	1,113	3957
		Signal and Communications Defects (TM)					
CM	01S	Signal failures	0	0	0	0	29
		Equipment Defects					
CM	01E	Air Hose Defect (Car)	0	0	0	0	35
CM	02E	Brake Rigging Defect (Car)	25	0	0	25	48
CM	03E	Handbrake Defects (Car)	0	0	0	0	2
CM	04E	UDE (Car or Loco)	7	0	0	7	21
CM	05E	Other Brake Defect (Car)	4	0	0	4	31
CM	06E	Centerplate/Carbody Defects (Car)	10	0	0	10	185
CM	07E	Coupler Defects (Car)	59	0	0	59	233
CM	08E	Truck Structure Defects (Car)	0	0	0	0	3
CM	09E	Sidebearing, Suspension Defects (Car)	53	0	0	53	353
CM	10E	Bearing failure (Car)	59	0	0	59	299
CM	11E	Other Axle/Journal Defects (Car)	7	0	0	7	40
CM	12E	Broken Wheels (Car)	13	0	0	13	137
CM	13E	Other Wheel Defects (Car)	18	0	0	18	154
CM	14E	TOFC/COFC Defects	1	0	0	1	2
CM	15E	Loco Trucks/Bearings/Wheels	0	0	0	0	71
TM	16E	Loco Electrical and Fires	0	0	0	0	16
TM	17E	All Other Locomotive Defects	1	0	0	1	16
TM	18E	All Other Car Defects	0	0	7	7	39
TM	19E	Stiff Truck (Car)	18	0	0	18	67
CM	20E	Track/Train Interaction (Hunting)(Car)	0	0	0	0	90
		Total. Equipment Defects	275	0	7	282	1842
		Human Factors/Operations					
CM	01H	Brake Operation (Main Line)	23	0	0	23	254
TM	02H	Handbrake Operations	5	3	6	14	48
TM	03H	Brake Operations (Other)	0	0	0	0	0
TM	04H	Employee Physical Condition	0	0	0	0	29
TM	05H	Failure to Obey/Display Signals	0	22	1	23	168
TM	06H	Radio Communications Error	0	5	0	5	5
TM	07H	Switching Rules	1	0	0	1	65
TM	08H	Mainline Rules	0	0	0	0	41
CM	09H	Train Handling (excl Brakes)	72	0	0	72	516
TM	10H	Train Speed	51	7	0	58	198
TM	11H	Use of Switches	23	2	0	25	139
TM	12H	Miscellaneous Human Factors		0	0	0	122
		Total Human Factors/Operations	175	39	7	221	1585
		Miscellaneous Causes (TM)					
TM	01M	Obstructions	36	0	0	36	277
TM	02M	Grade Crossing Collisions	0	0	13	13	49
CM	03M	Lading Problems	28	0	0	28	270
CM	04M	Track-Train Interaction	21	0	0	21	241
TM	05M	Other Miscellaneous	27	6	0	33	139
		Total Miscellaneous Causes	112	6	13	131	976
		Total Car-Mile Causes	1192	0	0	1192	5825
		Total Train Mile Causes	483	45	27	555	2564
		Total all Causes	1675	45	27	1747	8389

**Table A3.3. Accidents and Car Derailment Metrics
Hazmat Trains in Accidents**

RR Type	CM/TM	Traffic, Accident Type Percent Traffic	Track Class					Total
			X/1	2	3	4	5 and 6	
		Car-miles	0.30%	3.20%	11.60%	63.10%	21.90%	100.10%
		Train-miles	0.30%	3.30%	12.10%	61.80%	22.60%	100.10%
Class I	Car-Mile Accidents	Derailments	46	85	111	209	51	502
		Collisions	0	1	0	7	3	11
		Other Accidents	2	0	3	14	5	24
		All "Car-Mile" Accidents	48	86	114	230	59	537
	Train-Mile Accidents	Derailments	45	53	47	77	19	241
		Collisions	8	11	18	33	11	81
		Other Accidents	6	13	57	169	55	300
		All "Train-Mile" Accidents	59	77	122	279	85	622
Class I	Car Derailment Metrics	Cars Derailed in Train Derailments	440	1001	1392	2726	627	6221
		Average Cars Derailed per Derailment Accident	**	7.3	8.8	9.5	9.0	8.4
		Cars Derailed in Train Collisions	12	35	42	186	19	294
		Average Cars Derailed per Collision Accident	**	2.917	2.333	4.650	1.357	3.196
		Cars Derailed in Other Accidents	3	23	38	44	19	127
		Average Cars Derailed per Other Accident	**	1.769	0.633	0.240	0.317	0.392
		Cars Derailed in all Accident Types	455	1059	1472	2956	665	6642
		Cars Derailed per Accident	**	6.1	5.9	5.4	4.4	5.4
Non- Class I	Car-Mile Accidents	Derailments						145
		Collisions						3
		Other Accidents						1
		All "Car-Mile" Accidents						149
	Train-Mile Accidents	Derailments						76
		Collisions						12
		Other Accidents						46
		All "Train-Mile" Accidents						134
Non- Class I	Car Derailment Metrics	Cars Derailed in Train Derailments						1675
		Average Cars Derailed per Derailment Accident						7.58
		Cars Derailed in Train Collisions						45
		Average Cars Derailed per Collision Accident						3.00
		Cars Derailed in Other Accidents						27
		Average Cars Derailed per Other Accident						2.08
		Cars Derailed in all Accident Types						1675
		Cars Derailed per Accident						5.92 1747
All Railroads	Car Derailment Metrics	Cars Derailed in Train Derailments						7896
		Average Cars Derailed per Derailment Accident						8.19
		Cars Derailed in Train Collisions						339
		Average Cars Derailed per Collision Accident						3.17
		Cars Derailed in Other Accidents						154
		Average Cars Derailed per Other Accident						0.107
		Cars Derailed in all Accident Types						8317
		Cars Derailed per Accident						5.77

Table A5.1A: Trains in Accidents by Cause Group and Track Class - Broad Implementation of PTC

Train Mile or Car Mile	Cause Group		Non Class I Railroads				Total	All Railroads, Accident Types and Track Classes
			After	Base	Other Adjust't	After		
		Track and Structure Defects (CM)						
TM	01T	Roadbed Defects	0.00	0.00	1.00	0.00	20.00	54.00
TM	02T	Non-Traffic, Weather Causes	0.00	4.00	1.00	4.00	15.00	35.00
TM	03T	Wide Gauge	0.00	0.00	1.00	0.00	113.00	189.00
TM	04T	Track Geometry (excl. Wide Gauge)	1.00	1.00	1.00	1.00	105.00	286.00
CM	05T	Buckled Track	0.00	0.00	1.00	0.00	64.00	117.00
CM	06T	Rail Defects at Bolted Joint	0.00	0.00	1.00	0.00	12.00	39.00
CM	07T	Joint Bar Defects	0.00	0.00	1.00	0.00	7.00	51.00
CM	08T	Broken Rails or Welds	0.00	0.00	0.93	0.00	191.48	487.45
CM	09T	Other Rail and Joint Defects	0.00	0.00	1.00	0.00	16.00	45.00
CM	10T	Turnout Defects - Switches	0.00	0.00	1.00	0.00	35.00	84.00
CM	11T	Turnout Defects - Frogs	0.00	0.00	1.00	0.00	2.00	11.00
TM	12T	Misc. Track and Structure Defects	0.00	0.00	1.00	0.00	27.00	68.00
		Total Track and Structure Defects	1.00	5.00		5.00	607.48	1466.45
		Signal and Communications Defects (TM)						
CM	01S	Signal failures		0.00	1.00		0.00	16.00
		Equipment Defects						
CM	01E	Air Hose Defect (Car)	0.00	0.00	1.00	0.00	0.00	8.00
CM	02E	Brake Rigging Defect (Car)	0.00	0.00	1.00	0.00	3.00	20.00
CM	03E	Handbrake Defects (Car)	0.00	0.00	1.00	0.00	0.00	1.00
CM	04E	UDE (Car or Loco)	0.00	0.00	1.00	0.00	1.00	5.00
CM	05E	Other Brake Defect (Car)	0.00	0.00	1.00	0.00	4.00	28.00
CM	06E	Centerplate/Carbody Defects (Car)	2.00	3.00	1.00	3.00	15.00	86.00
CM	07E	Coupler Defects (Car)	0.00	0.00	1.00	0.00	7.00	95.00
CM	08E	Truck Structure Defects (Car)	0.00	1.00	1.00	1.00	4.00	22.00
CM	09E	Sidebearing, Suspension Defects (Car)	0.00	0.00	1.00	0.00	17.00	94.00
CM	10E	Bearing failure (Car)	0.00	3.00	1.00	3.00	33.00	162.00
CM	11E	Other Axle/Journal Defects (Car)	0.00	0.00	1.00	0.00	8.00	81.00
CM	12E	Broken Wheels (Car)	0.00	0.00	1.00	0.00	4.00	119.00
CM	13E	Other Wheel Defects (Car)	0.00	0.00	1.00	0.00	15.00	86.00
CM	14E	TOFC/COFC Defects	0.00	0.00	1.00	0.00	2.00	5.00
CM	15E	Loco Trucks/Bearings/Wheels	0.00	0.00	1.00	0.00	3.00	37.00
TM	16E	Loco Electrical and Fires	0.00	3.00	1.00	3.00	3.00	17.00
TM	17E	All Other Locomotive Defects	0.00	3.00	1.00	3.00	5.00	13.00
TM	18E	All Other Car Defects	0.00	2.00	1.00	2.00	6.00	30.00
TM	19E	Stiff Truck (Car)	0.00	0.00	1.00	0.00	8.00	23.00
CM	20E	Track/Train Interaction (Hunting)(Car)	0.00	0.00	1.00	0.00	2.00	19.00
		Total. Equipment Defects	2.00	15.00		15.00	140.00	951.00
		Human Factors/Operations						
CM	01H	Brake Operation (Main Line)	0.00	1.00	0.88	0.88	10.50	54.13
TM	02H	Handbrake Operations	5.00	6.00	1.00	6.00	16.00	61.00
TM	03H	Brake Operations (Other)	0.00	1.00	1.00	1.00	4.00	6.00
TM	04H	Employee Physical Condition	0.00	0.00	0.60	0.00	0.60	3.80
TM	05H	Failure to Obey/Display Signals	3.60	2.00	0.60	1.20	4.80	46.20
TM	06H	Radio Communications Error	1.50	0.00	0.75	0.00	1.50	7.00
TM	07H	Switching Rules	0.93	3.00	0.93	2.79	12.09	55.44
TM	08H	Mainline Rules	1.80	1.00	0.60	0.60	3.00	29.80
CM	09H	Train Handling (excl Brakes)	1.00	1.00	1.00	1.00	39.00	136.00
TM	10H	Train Speed	3.78	4.00	0.63	2.52	19.53	87.27
TM	11H	Use of Switches	1.00	2.00	1.00	2.00	21.00	83.80
TM	12H	Miscellaneous Human Factors	3.00	0.00	1.00	0.00	3.00	40.65
		Total Human Factors/Operations	21.61	21.00		17.99	135.02	611.09
		Miscellaneous Causes (TM)						
TM	01M	Obstructions	0.95	11.00	0.95	10.45	23.75	171.20
TM	02M	Grade Crossing Collisions	0.00	84.00	0.95	79.80	79.80	720.45
CM	03M	Lading Problems	1.00	2.00	1.00	2.00	30.00	128.00
CM	04M	Track-Train Interaction	0.00	0.00	1.00	0.00	20.00	101.00
TM	05M	Other Miscellaneous	4.00	5.00	1.00	5.00	26.00	82.00
		Total Miscellaneous Causes	5.95	102.00		97.25	179.55	1202.65
		Total Car-Mile Causes		11.00			544.98	2137.58
		Total Train Mile Causes		132.00			517.07	2109.61
		Total all Causes		143.00			1062.05	4247.19

Table 5.1B. PTC Broad Implementation – Cars Derailed in Accidents

Train Mile or Car Mile	Cause Group	Cars Derailed in Derailments by Track Class														Cars Derailed in Collisions by Track Class													
		X & 1	2			3			4			5 & 6			Total	X & 1	2			3			4						
			Base	Adjust't	After	Base	Adjust't	After	Base	Adjust't	After	Base	Adjust't	After			Base	Adjust't	After	Base	Adjust't	After	Base	Adjust't	After				
		Track and Structure Defects (CM)																											
TM	01T	Roadbed Defects	71	31	1.00	31	64	1.00	64	158	1.00	158	19	1.00	19	343	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	02T	Non-Traffic, Weather Causes	10	30	1.00	30	21	1.00	21	27	1.00	27	0	1.00	0	88	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	03T	Wide Gauge	260	275	1.00	275	87	1.00	87	158	1.00	158	10	1.00	10	790	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	04T	Track Geometry (excl. Wide Gauge)	152	284	1.00	284	265	1.00	265	323	1.00	323	55	1.00	55	1079	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	05T	Buckled Track	23	97	1.00	97	263	1.00	263	356	1.00	356	9	1.00	9	748	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	06T	Rail Defects at Bolted Joint	20	15	1.00	15	32	1.00	32	282	1.00	282	144	1.00	144	493	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	07T	Joint Bar Defects	6	17	1.00	17	73	1.00	73	240	1.00	240	268	1.00	268	604	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	08T	Broken Rails or Welds	386	606	1.00	606	879	0.93	817	1669	0.85	1419	369	0.85	314	3542	3	0	1.00	0	0	0.93	0	0	0.93	0	0	0.85	0
CM	09T	Other Rail and Joint Defects	5	61	1.00	61	108	1.00	108	458	1.00	458	85	1.00	85	717	0	0	1.00	0	0	1.00	0	0	1.00	0	24	1.00	24
CM	10T	Turnout Defects - Switches	89	13	1.00	13	70	1.00	70	33	1.00	33	33	1.00	33	238	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	11T	Turnout Defects - Frogs	8	1	1.00	1	3	1.00	3	22	1.00	22	0	1.00	0	34	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	12T	Misc. Track and Structure Defects	116	43	1.00	43	55	1.00	55	36	1.00	36	68	1.00	68	318	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
		Total Track and Structure Defects	1146	1473		1473	1920		1858	3762		3512	1060		1005	8994	3	0		0	0		0	24		24		24	
		Signal and Communications Defects (TM)																											
CM	01S	Signal failures	12	0	1.00	0	28	1.00	28	23	1.00	23	21	1.00	21	84	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
		Equipment Defects																											
CM	01E	Air Hose Defect (Car)	0	21	1.00	21	10	1.00	10	26	1.00	26	7	1.00	7	64	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	02E	Brake Rigging Defect (Car)	0	37	1.00	37	2	1.00	2	65	1.00	65	4	1.00	4	108	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	03E	Handbrake Defects (Car)	2	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	2	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	04E	UDE (Car or Loco)	2	0	1.00	0	0	1.00	0	18	1.00	18	0	1.00	0	20	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	05E	Other Brake Defect (Car)	0	22	1.00	22	44	1.00	44	31	1.00	31	1	1.00	1	98	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	06E	Centerplate/Carbody Defects (Car)	5	34	1.00	34	81	1.00	81	114	1.00	114	8	1.00	8	242	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	07E	Coupler Defects (Car)	4	53	1.00	53	78	1.00	78	241	1.00	241	40	1.00	40	416	1	0	1.00	0	2	1.00	2	3	1.00	3	1.00	3	
CM	08E	Truck Structure Defects (Car)	0	0	1.00	0	6	1.00	6	61	1.00	61	8	1.00	8	75	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	09E	Sidebearing, Suspension Defects (Car)	51	162	1.00	162	122	1.00	122	164	1.00	164	11	1.00	11	510	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	10E	Bearing failure (Car)	0	23	1.00	23	96	1.00	96	455	1.00	455	75	1.00	75	649	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	11E	Other Axle/Journal Defects (Car)	6	31	1.00	31	106	1.00	106	264	1.00	264	69	1.00	69	476	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	12E	Broken Wheels (Car)	11	70	1.00	70	201	1.00	201	401	1.00	401	63	1.00	63	746	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	13E	Other Wheel Defects (Car)	39	67	1.00	67	52	1.00	52	105	1.00	105	6	1.00	6	269	0	0	1.00	0	0	1.00	0	0	1.00	0	24	1.00	24
CM	14E	TOFC/COFC Defects	0	0	1.00	0	0	1.00	0	1	1.00	1	0	1.00	0	1	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	15E	Loco Trucks/Bearings/Wheels	0	46	1.00	46	13	1.00	13	39	1.00	39	11	1.00	11	109	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	16E	Loco Electrical and Fires	0	0	1.00	0	0	1.00	0	16	1.00	16	0	1.00	0	16	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	17E	All Other Locomotive Defects	0	13	1.00	13	9	1.00	9	31	1.00	31	0	1.00	0	53	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	18E	All Other Car Defects	14	21	1.00	21	44	1.00	44	29	1.00	29	15	1.00	15	123	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	19E	Stiff Truck (Car)	9	44	1.00	44	3	1.00	3	40	1.00	40	0	1.00	0	96	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	20E	Track/Train Interaction (Hunting)(Car)	0	0	1.00	0	18	1.00	18	68	1.00	68	59	1.00	59	145	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
		Total Equipment Defects	143	644		644	885		885	2169		2169	377		377	4218	1	0		0	2		2	27		27		27	
		Human Factors/Operations																											
CM	01H	Brake Operation (Main Line)	17	60	1.00	60	85	0.88	74	230	0.75	173	27	0.75	20	344	0	0	1.00	0	11	0.88	10	3	0.75	2	0.75	2	
TM	02H	Handbrake Operations	14	2	1.00	2	42	1.00	42	8	1.00	8	18	1.00	18	84	2	14	1.00	14	0	1.00	0	0	1.00	0	0	1.00	0
TM	03H	Brake Operations (Other)	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	1.00	0	0	1.00	0	1	1.00	1	1.00	1	
TM	04H	Employee Physical Condition	0	30	1.00	30	0	0.60	0	0	0.20	0	0	0.20	0	30	0	0	1.00	0	1	0.60	1	0	0.20	0	0	0.20	0
TM	05H	Failure to Obey/Display Signals	7	1	1.00	1	16	0.60	10	86	0.20	17	5	0.20	1	36	4	8	1.00	8	27	0.60	16	206	0.20	41	0.20	41	
TM	06H	Radio Communications Error	1	0	1.00	0	0	0.75	0	0	0.50	0	0	0.50	0	1	0	0	1.00	0	18	0.75	14	0	0.50	0	0.50	0	
TM	07H	Switching Rules	17	8	1.00	8	18	0.93	17	73	0.85	62	5	0.85	4	108	3	14	1.00	14	9	0.93	8	4	0.85	3	0.85	3	
TM	08H	Mainline Rules	1	12	1.00	12	7	0.60	4	4	0.20	1	0	0.20	0	18	0	5	1.00	5	1	0.60	1	72	0.20	14	0.20	14	
CM	09H	Train Handling (excl Brakes)	119	138	1.00	138	204	1.00	204	311	1.00	311	14	1.00	14	786	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	10H	Train Speed	107	43	1.00	43	55	0.63	35	57	0.25	14	5	0.25	1	200	26	33	1.00	33	14	0.63	9	30	0.25	8	0.25	8	
TM	11H	Use of Switches	67	28	1.00	28	36	1.00	36	53	1.00	53	9	1.00	9	193	3	0	1.00	0									

Table 5.1B. PTC Broad Implementation – Cars Derailed in Accidents

Train Mile or Car Mile	Cause Group		Cars Derailed in Other Accidents by Track Class																	All Accident Types and Track Classes Class I Railroads	
			5 & 6			Total	X & 1	2			3			4			5 & 6				Total
			Base	Adjust't	After			Base	Adjust't	After	Base	Adjust't	After	Base	Adjust't	After	Base	Adjust't	After		
Track and Structure Defects (CM)																					
TM	01T	Roadbed Defects	0	1.00	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	343
TM	02T	Non-Traffic, Weather Causes	0	1.00	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	88
TM	03T	Wide Gauge	0	1.00	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	790
TM	04T	Track Geometry (excl. Wide Gauge)	0	1.00	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1079
CM	05T	Buckled Track	0	1.00	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	748
CM	06T	Rail Defects at Bolted Joint	0	1.00	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	493
CM	07T	Joint Bar Defects	0	1.00	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	604
CM	08T	Broken Rails or Welds	0	0.85	0	3	0	0	1.00	0	0	0.93	0	0	0.85	0	0	0.85	0	0	3545
CM	09T	Other Rail and Joint Defects	0	1.00	0	24	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	741
CM	10T	Turnout Defects - Switches	0	1.00	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	238
CM	11T	Turnout Defects - Frogs	0	1.00	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	34
TM	12T	Misc. Track and Structure Defects	0	1.00	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	318
Total Track and Structure Defects			0	1.00	0	27	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	9021
Signal and Communications Defects (TM)																					
CM	01S	Signal failures	5	1.00	5	5	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	89
Equipment Defects																					
CM	01E	Air Hose Defect (Car)	0	1.00	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	64
CM	02E	Brake Rigging Defect (Car)	7	1.00	7	7	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	115
CM	03E	Handbrake Defects (Car)	0	1.00	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	2
CM	04E	UDE (Car or Loco)	0	1.00	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	20
CM	05E	Other Brake Defect (Car)	0	1.00	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	98
CM	06E	Centerplate/Carbody Defects (Car)	0	1.00	0	0	1	0	1.00	0	0	1.00	0	40	1.00	40	0	1.00	0	41	283
CM	07E	Coupler Defects (Car)	0	1.00	0	6	0	0	1.00	0	0	1.00	0	3	1.00	3	5	1.00	5	8	430
CM	08E	Truck Structure Defects (Car)	0	1.00	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	75
CM	09E	Sidebearing, Suspension Defects (Car)	0	1.00	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	510
CM	10E	Bearing failure (Car)	4	1.00	4	4	0	0	1.00	0	0	1.00	0	1	1.00	1	1	1.00	1	2	655
CM	11E	Other Axle/Journal Defects (Car)	0	1.00	0	0	0	0	1.00	0	0	1.00	0	1	1.00	1	0	1.00	0	1	477
CM	12E	Broken Wheels (Car)	0	1.00	0	0	0	0	1.00	0	0	1.00	0	1	1.00	1	0	1.00	0	1	747
CM	13E	Other Wheel Defects (Car)	0	1.00	0	24	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	293
CM	14E	TOFC/COFC Defects	0	1.00	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1
CM	15E	Loco Trucks/Bearings/Wheels	0	1.00	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	109
TM	16E	Loco Electrical and Fires	0	1.00	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	16
TM	17E	All Other Locomotive Defects	0	1.00	0	0	0	1	1.00	1	0	1.00	0	0	1.00	0	0	1.00	0	1	54
TM	18E	All Other Car Defects	0	1.00	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	123
TM	19E	Stiff Truck (Car)	0	1.00	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	96
CM	20E	Track/Train Interaction (Hunting)(Car)	0	1.00	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	145
Total Equipment Defects			11	1.00	11	41	1	1	1.00	1	0	1.00	0	46	1.00	46	6	1.00	6	54	4313
Human Factors/Operations																					
CM	01H	Brake Operation (Main Line)	0	0.75	0	12	0	0	1.00	0	0	0.88	0	0	0.75	0	0	0.75	0	0	356
TM	02H	Handbrake Operations	0	1.00	0	16	6	2	1.00	2	16	1.00	16	1	1.00	1	0	1.00	0	25	125
TM	03H	Brake Operations (Other)	0	1.00	0	1	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1
TM	04H	Employee Physical Condition	22	0.20	4	5	0	0	1.00	0	0	0.60	0	0	0.20	0	0	0.20	0	0	35
TM	05H	Failure to Obey/Display Signals	75	0.20	15	84	0	0	1.00	0	1	0.60	1	0	0.20	0	0	0.20	0	1	121
TM	06H	Radio Communications Error	0	0.50	0	14	0	0	1.00	0	0	0.75	0	0	0.50	0	0	0.50	0	0	15
TM	07H	Switching Rules	0	0.85	0	29	6	1	1.00	1	1	0.93	1	4	0.85	3	0	0.85	0	11	148
TM	08H	Mainline Rules	0	0.20	0	20	0	0	1.00	0	0	0.60	0	0	0.20	0	0	0.20	0	0	38
CM	09H	Train Handling (excl Brakes)	0	1.00	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	786
TM	10H	Train Speed	14	0.25	4	79	0	6	1.00	6	0	0.63	0	5	0.25	1	0	0.25	0	7	286
TM	11H	Use of Switches	0	1.00	0	3	1	0	1.00	0	0	1.00	0	12	1.00	12	0	1.00	0	13	209
TM	12H	Miscellaneous Human Factors	0	1.00	0	9	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	190
Total Human Factors/Operations			111	0.75	23	271	13	9	1.00	9	18	1.00	18	22	0.75	18	0	0.75	0	57	2310
Miscellaneous Causes (TM)																					
TM	01M	Obstructions	0	0.90	0	0	0	27	1.00	27	9	0.95	9	38	0.90	34	9	0.90	8	78	907
TM	02M	Grade Crossing Collisions	0	0.90	0	0	2	0	1.00	0	49	0.95	47	165	0.90	149	53	0.90	48	245	245
CM	03M	Lading Problems	0	1.00	0	5	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	506
CM	04M	Track-Train Interaction	0	1.00	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	548
TM	05M	Other Miscellaneous	0	1.00	0	0	0	1	1.00	1	11	1.00	11	0	1.00	0	0	1.00	0	12	360
Total Miscellaneous Causes			0	0.90	0	5	2	28	1.00	28	69	1.00	66	203	0.90	183	62	0.90	56	335	2566
Total Car-Mile Causes			16			90	1	0			0		46			6			53	12712	
Total Train Mile Causes			111			259	15	38			87		225			62			393	5587	
Total all Causes			127			349	16	38			87		271			68			446	18298	

Table 5.1B. PTC Broad Implementation – Cars Derailed in Accidents

Train Mile or Car Mile	Cause Group		Cars Derailed in Accidents on Non Class I Railroads									All Railroads, Accident Types and Track Classes	
			Derailments			Collisions			Other				Total
			Base	Adjust't	After	Base	Adjust't	After	Base	Adjust't	After		
		Track and Structure Defects (CM)											
TM	01T	Roadbed Defects	102	1.00	102	0	1.00	0	0	1.00	0	102	445
TM	02T	Non-Traffic, Weather Causes	72	1.00	72	0	1.00	0	1	1.00	1	73	161
TM	03T	Wide Gauge	720	1.00	720	0	1.00	0	0	1.00	0	720	1510
TM	04T	Track Geometry (excl. Wide Gauge)	510	1.00	510	2	1.00	2	3	1.00	3	515	1594
CM	05T	Buckled Track	391	1.00	391	0	1.00	0	0	1.00	0	391	1139
CM	06T	Rail Defects at Bolted Joint	94	1.00	94	0	1.00	0	0	1.00	0	94	587
CM	07T	Joint Bar Defects	58	1.00	58	0	1.00	0	0	1.00	0	58	662
CM	08T	Broken Rails or Welds	1563	0.93	1454	0	0.93	1	0	0.93	0	1455	4999
CM	09T	Other Rail and Joint Defects	138	1.00	138	0	1.00	0	0	1.00	0	138	879
CM	10T	Turnout Defects - Switches	134	1.00	134	0	1.00	0	0	1.00	0	134	372
CM	11T	Turnout Defects - Frogs	134	1.00	134	0	1.00	0	0	1.00	0	134	168
TM	12T	Misc. Track and Structure Defects	181	1.00	181	0	1.00	0	0	1.00	0	181	499
		Total Track and Structure Defects	4097		3988	2		3	4		4	3995	13015
		Signal and Communications Defects (TM)											
CM	01S	Signal failures	0	1.00	0	0	1.00	0	0	1.00	0	0	89
		Equipment Defects											
CM	01E	Air Hose Defect (Car)	0	1.00	0	0	1.00	0	0	1.00	0	0	64
CM	02E	Brake Rigging Defect (Car)	26	1.00	26	0	1.00	0	0	1.00	0	26	141
CM	03E	Handbrake Defects (Car)	0	1.00	0	0	1.00	0	0	1.00	0	0	2
CM	04E	UDE (Car or Loco)	7	1.00	7	0	1.00	0	0	1.00	0	7	27
CM	05E	Other Brake Defect (Car)	24	1.00	24	0	1.00	0	0	1.00	0	24	122
CM	06E	Centerplate/Carbody Defects (Car)	35	1.00	35	0	1.00	0	0	1.00	0	35	318
CM	07E	Coupler Defects (Car)	100	1.00	100	0	1.00	0	0	1.00	0	100	530
CM	08E	Truck Structure Defects (Car)	48	1.00	48	0	1.00	0	0	1.00	0	48	123
CM	09E	Sidebearing, Suspension Defects (Car)	111	1.00	111	0	1.00	0	0	1.00	0	111	621
CM	10E	Bearing failure (Car)	125	1.00	125	0	1.00	0	6	1.00	6	131	786
CM	11E	Other Axle/Journal Defects (Car)	58	1.00	58	0	1.00	0	0	1.00	0	58	535
CM	12E	Broken Wheels (Car)	27	1.00	27	0	1.00	0	0	1.00	0	27	774
CM	13E	Other Wheel Defects (Car)	91	1.00	91	0	1.00	0	0	1.00	0	91	384
CM	14E	TOFC/COFC Defects	6	1.00	6	0	1.00	0	0	1.00	0	6	7
CM	15E	Loco Trucks/Bearings/Wheels	0	1.00	0	0	1.00	0	0	1.00	0	0	109
TM	16E	Loco Electrical and Fires	0	1.00	0	0	1.00	0	0	1.00	0	0	16
TM	17E	All Other Locomotive Defects	6	1.00	6	0	1.00	0	0	1.00	0	6	60
TM	18E	All Other Car Defects	15	1.00	15	0	1.00	0	12	1.00	12	27	150
TM	19E	Stiff Truck (Car)	31	1.00	31	0	1.00	0	0	1.00	0	31	127
CM	20E	Track/Train Interaction (Hunting)(Car)	6	1.00	6	0	1.00	0	0	1.00	0	6	151
		Total Equipment Defects	716		716	0		0	18		18	734	5047
		Human Factors/Operations											
CM	01H	Brake Operation (Main Line)	86	0.88	75	0	0.88	0	2	0.88	2	77	433
TM	02H	Handbrake Operations	22	1.00	22	12	1.00	12	10	1.00	10	44	169
TM	03H	Brake Operations (Other)	26	1.00	26	0	1.00	0	0	1.00	0	26	27
TM	04H	Employee Physical Condition	5	0.60	3	0	0.60	0	0	0.60	0	3	38
TM	05H	Failure to Obey/Display Signals	0	0.60	0	27	0.60	16	1	0.60	1	17	138
TM	06H	Radio Communications Error	0	0.75	0	6	0.75	5	0	0.75	0	5	19
TM	07H	Switching Rules	27	0.93	25	0	0.93	0	1	0.93	1	26	174
TM	08H	Mainline Rules	5	0.60	3	4	0.60	2	0	0.60	0	5	43
CM	09H	Train Handling (excl Brakes)	228	1.00	228	0	1.00	0	0	1.00	0	228	1014
TM	10H	Train Speed	139	0.63	88	11	0.63	7	0	0.63	0	95	381
TM	11H	Use of Switches	77	1.00	77	2	1.00	2	5	1.00	5	84	293
TM	12H	Miscellaneous Human Factors	0	1.00	0	0	1.00	0	0	1.00	0	0	190
		Total Human Factors/Operations	615		547	62		44	19		18	609	2919
		Miscellaneous Causes (TM)											
TM	01M	Obstructions	70	0.95	67	0	0.95	0	0	0.95	0	67	974
TM	02M	Grade Crossing Collisions	0	0.95	0	0	0.95	0	39	0.95	37	37	282
CM	03M	Lading Problems	141	1.00	141	0	1.00	0	0	1.00	0	141	647
CM	04M	Track-Train Interaction	106	1.00	106	0	1.00	0	0	1.00	0	106	654
TM	05M	Other Miscellaneous	112	1.00	112	18	1.00	18	0	1.00	0	130	490
		Total Miscellaneous Causes	429		426	18		18	39		37	481	3046
		Total Car-Mile Causes	3737			0			8			3626	16337
		Total Train Mile Causes	2120			82			72			2193	7779
		Total all Causes	5857			82			80			5818	24117

Table 5.2 A. PTC Narrow Implementation – Trains in Accidents

Train Mile or Car Mile	Cause Group	Trains in Accidents on Non Class I Railroads								All Railroads, Accident Types and Track Classes	
		Collisions			Other			Total			
		After	Base	Adjust't	After	Base	Adjust't		After		
		Track and Structure Defects (CM)									
TM	01T	Roadbed Defects	20	0	1.00	0	0	1.00	0	20	54
TM	02T	Non-Traffic, Weather Causes	11	0	1.00	0	4	1.00	4	15	35
TM	03T	Wide Gauge	113	0	1.00	0	0	1.00	0	113	189
TM	04T	Track Geometry (excl. Wide Gauge)	103	1	1.00	1	1	1.00	1	105	286
CM	05T	Buckled Track	64	0	1.00	0	0	1.00	0	64	117
CM	06T	Rail Defects at Bolted Joint	12	0	1.00	0	0	1.00	0	12	39
CM	07T	Joint Bar Defects	7	0	1.00	0	0	1.00	0	7	51
CM	08T	Broken Rails or Welds	207	0	1.00	0	0	1.00	0	207	507.4
CM	09T	Other Rail and Joint Defects	16	0	1.00	0	0	1.00	0	16	45
CM	10T	Turnout Defects - Switches	35	0	1.00	0	0	1.00	0	35	84
CM	11T	Turnout Defects - Frogs	2	0	1.00	0	0	1.00	0	2	11
TM	12T	Misc. Track and Structure Defects	27	0	1.00	0	0	1.00	0	27	68
		Total Track and Structure Defects	617	1		1	5		5	623	1486.4
		Signal and Communications Defects (TM)									
CM	01S	Signal failures		0	1.00		0	1.00		0	16
		Equipment Defects									
CM	01E	Air Hose Defect (Car)	0	0	1.00	0	0	1.00	0	0	8
CM	02E	Brake Rigging Defect (Car)	3	0	1.00	0	0	1.00	0	3	20
CM	03E	Handbrake Defects (Car)	0	0	1.00	0	0	1.00	0	0	1
CM	04E	UDE (Car or Loco)	1	0	1.00	0	0	1.00	0	1	5
CM	05E	Other Brake Defect (Car)	4	0	1.00	0	0	1.00	0	4	28
CM	06E	Centerplate/Carbody Defects (Car)	10	2	1.00	2	3	1.00	3	15	86
CM	07E	Coupler Defects (Car)	7	0	1.00	0	0	1.00	0	7	95
CM	08E	Truck Structure Defects (Car)	3	0	1.00	0	1	1.00	1	4	22
CM	09E	Sidebearing, Suspension Defects (Car)	17	0	1.00	0	0	1.00	0	17	94
CM	10E	Bearing failure (Car)	30	0	1.00	0	3	1.00	3	33	162
CM	11E	Other Axle/Journal Defects (Car)	8	0	1.00	0	0	1.00	0	8	81
CM	12E	Broken Wheels (Car)	4	0	1.00	0	0	1.00	0	4	119
CM	13E	Other Wheel Defects (Car)	15	0	1.00	0	0	1.00	0	15	86
CM	14E	TOFC/COFC Defects	2	0	1.00	0	0	1.00	0	2	5
CM	15E	Loco Trucks/Bearings/Wheels	3	0	1.00	0	0	1.00	0	3	37
TM	16E	Loco Electrical and Fires	0	0	1.00	0	3	1.00	3	3	17
TM	17E	All Other Locomotive Defects	2	0	1.00	0	3	1.00	3	5	13
TM	18E	All Other Car Defects	4	0	1.00	0	2	1.00	2	6	30
TM	19E	Stiff Truck (Car)	8	0	1.00	0	0	1.00	0	8	23
CM	20E	Track/Train Interaction (Hunting)(Car)	2	0	1.00	0	0	1.00	0	2	19
		Total Equipment Defects	123	2		2	15		15	140	951
		Human Factors/Operations									
CM	01H	Brake Operation (Main Line)	11	0	1.00	0	1	1.00	1	12	57
TM	02H	Handbrake Operations	5	5	1.00	5	6	1.00	6	16	61
TM	03H	Brake Operations (Other)	3	0	1.00	0	1	1.00	1	4	6
TM	04H	Employee Physical Condition	1	0	1.00	0	0	1.00	0	1	4.6
TM	05H	Failure to Obey/Display Signals	0	6	1.00	6	2	1.00	2	8	57.4
TM	06H	Radio Communications Error	0	2	1.00	2	0	1.00	0	2	8
TM	07H	Switching Rules	9	1	1.00	1	3	1.00	3	13	57.05
TM	08H	Mainline Rules	1	3	1.00	3	1	1.00	1	5	35.8
CM	09H	Train Handling (excl Brakes)	37	1	1.00	1	1	1.00	1	39	136
TM	10H	Train Speed	21	6	1.00	6	4	1.00	4	31	107.25
TM	11H	Use of Switches	18	1	1.00	1	2	1.00	2	21	83.8
TM	12H	Miscellaneous Human Factors	0	3	1.00	3	0	1.00	0	3	40.65
		Total Human Factors/Operations	106	28		28	21		21	155	654.55
		Miscellaneous Causes (TM)									
TM	01M	Obstructions	13	1	1.00	1	11	1.00	11	25	173.8
TM	02M	Grade Crossing Collisions	0	0	1.00	0	84	1.00	84	84	729.8
CM	03M	Lading Problems	27	1	1.00	1	2	1.00	2	30	128
CM	04M	Track-Train Interaction	20	0	1.00	0	0	1.00	0	20	101
TM	05M	Other Miscellaneous	17	4	1.00	4	5	1.00	5	26	82
		Total Miscellaneous Causes	77	6		6	102		102	185	1214.6
		Total Car-Mile Causes		4			11			562	2160.4
		Total Train Mile Causes		33			132			541	2162.15
		Total all Causes		37			143			1103	4322.55

Table 5.2B. PTC Narrow Implementation – Cars Derailed in Accidents

Train Mile or Car Mile	Cause Group		Cars Derailed in Derailments by Track Class													Cars Derailed in Collisions by Track Class										
			X & 1	Base	2	3	4	5 & 6	Total	X & 1	Base	2	3	4	5	6	7	8	9	10						
				Adjust't	After	Base	Adjust't	After	Base	Adjust't	After	Base	Adjust't	After			Adjust't	After	Base	Adjust't	After	Base	Adjust't	After		
		Track and Structure Defects (CM)																								
TM	01T	Roadbed Defects	71	31	1.00	31	64	1.00	64	158	1.00	158	19	1.00	19	343	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	02T	Non-Traffic, Weather Causes	10	30	1.00	30	21	1.00	21	27	1.00	27	0	1.00	0	88	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	03T	Wide Gauge	260	275	1.00	275	87	1.00	87	158	1.00	158	10	1.00	10	790	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	04T	Track Geometry (excl. Wide Gauge)	152	284	1.00	284	265	1.00	265	323	1.00	323	55	1.00	55	1079	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	05T	Buckled Track	23	97	1.00	97	263	1.00	263	356	1.00	356	9	1.00	9	748	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	06T	Rail Defects at Bolted Joint	20	15	1.00	15	32	1.00	32	282	1.00	282	144	1.00	144	493	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	07T	Joint Bar Defects	6	17	1.00	17	73	1.00	73	240	1.00	240	268	1.00	268	604	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	08T	Broken Rails or Welds	386	606	1.00	606	879	1.00	879	1669	0.85	1418.65	369	0.85	313.65	3603.3	3	0	1.00	0	0	1.00	0	0	0.85	0
CM	09T	Other Rail and Joint Defects	5	61	1.00	61	108	1.00	108	458	1.00	458	85	1.00	85	717	0	0	1.00	0	0	1.00	0	24	1.00	24
CM	10T	Turnout Defects - Switches	89	13	1.00	13	70	1.00	70	33	1.00	33	33	1.00	33	238	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	11T	Turnout Defects - Frogs	8	1	1.00	1	3	1.00	3	22	1.00	22	0	1.00	0	34	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	12T	Misc. Track and Structure Defects	116	43	1.00	43	55	1.00	55	36	1.00	36	68	1.00	68	318	0	0	1.00	0	0	1.00	0	0	1.00	0
		Total Track and Structure Defects	1146	1473		1473	1920		1920	3762		3512	1060		1005	9055	3	0		0	0		0	24		24
		Signal and Communications Defects (TM)																								
CM	01S	Signal failures	12	0	1.00	0	28	1.00	28	23	1.00	23	21	1.00	21	84	0	0	1.00	0	0	1.00	0	0	1.00	0
		Equipment Defects																								
CM	01E	Air Hose Defect (Car)	0	21	1.00	21	10	1.00	10	26	1.00	26	7	1.00	7	64	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	02E	Brake Rigging Defect (Car)	0	37	1.00	37	2	1.00	2	65	1.00	65	4	1.00	4	108	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	03E	Handbrake Defects (Car)	2	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	2	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	04E	UDE (Car or Loco)	2	0	1.00	0	0	1.00	0	18	1.00	18	0	1.00	0	20	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	05E	Other Brake Defect (Car)	0	22	1.00	22	44	1.00	44	31	1.00	31	1	1.00	1	98	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	06E	Centerplate/Carbody Defects (Car)	5	34	1.00	34	81	1.00	81	114	1.00	114	8	1.00	8	242	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	07E	Coupler Defects (Car)	4	53	1.00	53	78	1.00	78	241	1.00	241	40	1.00	40	416	1	0	1.00	0	2	1.00	2	3	1.00	3
CM	08E	Truck Structure Defects (Car)	0	0	1.00	0	6	1.00	6	61	1.00	61	8	1.00	8	75	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	09E	Sidebearing, Suspension Defects (Car)	51	162	1.00	162	122	1.00	122	164	1.00	164	11	1.00	11	510	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	10E	Bearing failure (Car)	0	23	1.00	23	96	1.00	96	455	1.00	455	75	1.00	75	649	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	11E	Other Axle/Journal Defects (Car)	6	31	1.00	31	106	1.00	106	264	1.00	264	69	1.00	69	476	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	12E	Broken Wheels (Car)	11	70	1.00	70	201	1.00	201	401	1.00	401	63	1.00	63	746	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	13E	Other Wheel Defects (Car)	39	67	1.00	67	52	1.00	52	105	1.00	105	6	1.00	6	269	0	0	1.00	0	0	1.00	0	24	1.00	24
CM	14E	TOFC/COFC Defects	0	0	1.00	0	0	1.00	0	1	1.00	1	0	1.00	0	1	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	15E	Loco Trucks/Bearings/Wheels	0	46	1.00	46	13	1.00	13	39	1.00	39	11	1.00	11	109	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	16E	Loco Electrical and Fires	0	0	1.00	0	0	1.00	0	16	1.00	16	0	1.00	0	16	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	17E	All Other Locomotive Defects	0	13	1.00	13	9	1.00	9	31	1.00	31	0	1.00	0	53	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	18E	All Other Car Defects	14	21	1.00	21	44	1.00	44	29	1.00	29	15	1.00	15	123	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	19E	Stiff Truck (Car)	9	44	1.00	44	3	1.00	3	40	1.00	40	0	1.00	0	96	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	20E	Track/Train Interaction (Hunting)(Car)	0	0	1.00	0	18	1.00	18	68	1.00	68	59	1.00	59	145	0	0	1.00	0	0	1.00	0	0	1.00	0
		Total Equipment Defects	143	644		644	885		885	2169		2169	377		377	4218	1	0		0	2		2	27		27
		Human Factors/Operations																								
CM	01H	Brake Operation (Main Line)	17	60	1.00	60	85	1.00	85	230	0.75	172.5	27	0.75	20.25	354.75	0	0	1.00	0	11	1.00	11	3	0.75	2.25
TM	02H	Handbrake Operations	14	2	1.00	2	42	1.00	42	8	1.00	8	18	1.00	18	84	2	14	1.00	14	0	1.00	0	0	1.00	0
TM	03H	Brake Operations (Other)	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	1.00	0	0	1.00	0	1	1.00	1
TM	04H	Employee Physical Condition	0	30	1.00	30	0	1.00	0	0	0.20	0	0	0.20	0	30	0	0	1.00	0	1	1.00	1	0	0.20	0
TM	05H	Failure to Obey/Display Signals	7	1	1.00	1	16	1.00	16	86	0.20	17.2	5	0.20	1	42.2	4	8	1.00	8	27	1.00	27	206	0.20	41.2
TM	06H	Radio Communications Error	1	0	1.00	0	0	1.00	0	0	0.50	0	0	0.50	0	1	0	0	1.00	0	18	1.00	18	0	0.50	0
TM	07H	Switching Rules	17	8	1.00	8	18	1.00	18	73	0.85	62.05	5	0.85	4.25	109.3	3	14	1.00	14	9	1.00	9	4	0.85	3.4
TM	08H	Mainline Rules	1	12	1.00	12	7	1.00	7	4	0.20	0.8	0	0.20	0	20.8	0	5	1.00	5	1	1.00	1	72	0.20	14.4
CM	09H	Train Handling (excl Brakes)	119	138	1.00	138	204	1.00	204	311	1.00	311	14	1.00	14	786	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	10H	Train Speed	107	43	1.00	43	55	1.00	55	57	0.25	14.25	5	0.25	1.25	220.5	26	33	1.00	33	14	1.00	14	30	0.25	7.5
TM	11H	Use of Switches	67	28	1.00	28	36	1.00	36	53	1.00	53	9	1.00	9	193	3	0	1.00	0	0	1.00	0	0	1.00	0
TM	12H	Miscellaneous Human Factors	29	5	1.00	5	28	1.00	28	110	1.00	110	9	1.00	9	181	0	1	1.00	1	0	1.00	0	8	1.00	8
		Total Human Factors/Operations	379	327		327	491		491	932		749	92		77	2023	38	75		7						

Table 5.2B. PTC Narrow Implementation – Cars Derailed in Accidents

Train Mile or Car Mile	Cause Group				Cars Derailed in Other Accidents by Track Class															All Accident Types and Track Classes Class I Railroads						
					5 & 6			Total	X & 1	2			3			4			5 & 6			Total				
					Base	Adjust't	After	Total		Base	Adjust't	After	Base	Adjust't	After	Base	Adjust't	After	Base	Adjust't	After	Total		Base		
		Track and Structure Defects (CM)																								
TM	01T	Roadbed Defects	0	1.00	0	0	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	343	102
TM	02T	Non-Traffic, Weather Causes	0	1.00	0	0	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	88	72
TM	03T	Wide Gauge	0	1.00	0	0	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	790	720
TM	04T	Track Geometry (excl. Wide Gauge)	0	1.00	0	0	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	1079	510
CM	05T	Buckled Track	0	1.00	0	0	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	748	391
CM	06T	Rail Defects at Bolted Joint	0	1.00	0	0	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	493	94
CM	07T	Joint Bar Defects	0	1.00	0	0	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	604	58
CM	08T	Broken Rails or Welds	0	0.85	0	3	0	0	0	0	1.00	0	0	1.00	0	0	0.85	0	0	0.85	0	0	0	0	3606.3	1563
CM	09T	Other Rail and Joint Defects	0	1.00	0	24	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	741	138
CM	10T	Turnout Defects - Switches	0	1.00	0	0	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	238	134
CM	11T	Turnout Defects - Frogs	0	1.00	0	0	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	34	134
TM	12T	Misc. Track and Structure Defects	0	1.00	0	0	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	318	181
		Total Track and Structure Defects	0		0	27	0	0		0		0	0		0	0		0	0		0	0	0	9082	4097	
		Signal and Communications Defects (TM)																								
CM	01S	Signal failures	5	1.00	5	5	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	89	0
		Equipment Defects																								
CM	01E	Air Hose Defect (Car)	0	1.00	0	0	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	64	0
CM	02E	Brake Rigging Defect (Car)	7	1.00	7	7	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	115	26
CM	03E	Handbrake Defects (Car)	0	1.00	0	0	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	2	0
CM	04E	UDE (Car or Loco)	0	1.00	0	0	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	20	7
CM	05E	Other Brake Defect (Car)	0	1.00	0	0	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	98	24
CM	06E	Centerplate/Carbody Defects (Car)	0	1.00	0	0	1	0	0	0	1.00	0	0	1.00	0	40	1.00	40	0	1.00	0	41	0	0	283	35
CM	07E	Coupler Defects (Car)	0	1.00	0	6	0	0	0	0	1.00	0	0	1.00	0	3	1.00	3	5	1.00	5	8	0	0	430	100
CM	08E	Truck Structure Defects (Car)	0	1.00	0	0	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	75	48
CM	09E	Sidebearing, Suspension Defects (Car)	0	1.00	0	0	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	510	111
CM	10E	Bearing failure (Car)	4	1.00	4	4	0	0	0	0	1.00	0	0	1.00	0	1	1.00	1	1	1.00	1	2	0	0	655	125
CM	11E	Other Axle/Journal Defects (Car)	0	1.00	0	0	0	0	0	0	1.00	0	0	1.00	0	1	1.00	1	0	1.00	0	1	0	0	477	58
CM	12E	Broken Wheels (Car)	0	1.00	0	0	0	0	0	0	1.00	0	0	1.00	0	1	1.00	1	0	1.00	0	1	0	0	747	27
CM	13E	Other Wheel Defects (Car)	0	1.00	0	24	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	293	91
CM	14E	TOFC/COFC Defects	0	1.00	0	0	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	1	6
CM	15E	Loco Trucks/Bearings/Wheels	0	1.00	0	0	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	109	0
TM	16E	Loco Electrical and Fires	0	1.00	0	0	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	16	0
TM	17E	All Other Locomotive Defects	0	1.00	0	0	0	1	0	0	1.00	1	0	1.00	0	0	1.00	0	0	1.00	0	1	0	0	54	6
TM	18E	All Other Car Defects	0	1.00	0	0	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	123	15
TM	19E	Stiff Truck (Car)	0	1.00	0	0	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	96	31
CM	20E	Track/Train Interaction (Hunting)(Car)	0	1.00	0	0	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	145	6
		Total Equipment Defects	11		11	41	1	1		1	0		0	46		46	6		6		6	54		4313	716	
		Human Factors/Operations																								
CM	01H	Brake Operation (Main Line)	0	0.75	0	13.25	0	0	0	0	1.00	0	0	1.00	0	0	0.75	0	0	0.75	0	0	0	0	368	86
TM	02H	Handbrake Operations	0	1.00	0	16	6	2	0	0	1.00	2	16	1.00	16	1	1.00	1	0	1.00	0	25	0	0	125	22
TM	03H	Brake Operations (Other)	0	1.00	0	1	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	1	26
TM	04H	Employee Physical Condition	22	0.20	4.4	5.4	0	0	0	0	1.00	0	0	1.00	0	0	0.20	0	0	0.20	0	0	0	0	35.4	5
TM	05H	Failure to Obey/Display Signals	75	0.20	15	95.2	0	0	0	0	1.00	0	1	1.00	1	0	0.20	0	0	0.20	0	1	0	0	138.4	0
TM	06H	Radio Communications Error	0	0.50	0	18	0	0	0	0	1.00	0	0	1.00	0	0	0.50	0	0	0.50	0	0	0	0	19	0
TM	07H	Switching Rules	0	0.85	0	29.4	6	1	0	0	1.00	1	1	1.00	1	4	0.85	3.4	0	0.85	0	11.4	0	0	150.1	27
TM	08H	Mainline Rules	0	0.20	0	20.4	0	0	0	0	1.00	0	0	1.00	0	0	0.20	0	0	0.20	0	0	0	0	41.2	5
CM	09H	Train Handling (excl Brakes)	0	1.00	0	0	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	786	228
TM	10H	Train Speed	14	0.25	3.5	84	0	6	0	0	1.00	6	0	1.00	0	5	0.25	1.25	0	0.25	0	7.25	0	0	311.75	139
TM	11H	Use of Switches	0	1.00	0	3	1	0	0	0	1.00	0	0	1.00	0	12	1.00	12	0	1.00	0	13	0	0	209	77
TM	12H	Miscellaneous Human Factors	0	1.00	0	9	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	190	0
		Total Human Factors/Operations	111		23	295	13	9		9	18		18	22		18	0		0		58		2375	615		
		Miscellaneous Causes (TM)																								
TM	01M	Obstructions	0	0.90	0	0	0	27	0	0	1.00	27	9	1.00	9	38	0.90	34.2	9	0.90	8.1	78.3	0	0	915	70
TM	02M	Grade Crossing Collisions	0	0.90	0	0	2	0	0	0	1.00	0	49	1.00	49	165	0.90	148.5	53	0.90	47.7	247.2	0	0	247.2	0
CM	03M	Lading Problems	0	1.00	0	5	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0	0							

Table 5.2B. PTC Narrow Implementation – Cars Derailed in Accidents

Train Mile or Car Mile	Cause Group		Cars Derailed in Accidents on Non Class I Railroads								All Railroads, Accident Types and Track Classes	
			Derailments		Collisions			Other		Total		
			Adjust't	After	Base	Adjust't	After	Base	Adjust't		After	
		Track and Structure Defects (CM)										
TM	01T	Roadbed Defects	1.00	102	0	1.00	0	0	1.00	0	102	445
TM	02T	Non-Traffic, Weather Causes	1.00	72	0	1.00	0	1	1.00	1	73	161
TM	03T	Wide Gauge	1.00	720	0	1.00	0	0	1.00	0	720	1510
TM	04T	Track Geometry (excl. Wide Gauge)	1.00	510	2	1.00	2	3	1.00	3	515	1594
CM	05T	Buckled Track	1.00	391	0	1.00	0	0	1.00	0	391	1139
CM	06T	Rail Defects at Bolted Joint	1.00	94	0	1.00	0	0	1.00	0	94	587
CM	07T	Joint Bar Defects	1.00	58	0	1.00	0	0	1.00	0	58	662
CM	08T	Broken Rails or Welds	1.00	1563	0	1.00	0	0	1.00	0	1563	5169.3
CM	09T	Other Rail and Joint Defects	1.00	138	0	1.00	0	0	1.00	0	138	879
CM	10T	Turnout Defects - Switches	1.00	134	0	1.00	0	0	1.00	0	134	372
CM	11T	Turnout Defects - Frogs	1.00	134	0	1.00	0	0	1.00	0	134	168
TM	12T	Misc. Track and Structure Defects	1.00	181	0	1.00	0	0	1.00	0	181	499
		Total Track and Structure Defects		4097	2		2	4		4	4103	13185
		Signal and Communications Defects (TM)										
CM	01S	Signal failures	1.00	0	0	1.00	0	0	1.00	0	0	89
		Equipment Defects										
CM	01E	Air Hose Defect (Car)	1.00	0	0	1.00	0	0	1.00	0	0	64
CM	02E	Brake Rigging Defect (Car)	1.00	26	0	1.00	0	0	1.00	0	26	141
CM	03E	Handbrake Defects (Car)	1.00	0	0	1.00	0	0	1.00	0	0	2
CM	04E	UDE (Car or Loco)	1.00	7	0	1.00	0	0	1.00	0	7	27
CM	05E	Other Brake Defect (Car)	1.00	24	0	1.00	0	0	1.00	0	24	122
CM	06E	Centerplate/Carbody Defects (Car)	1.00	35	0	1.00	0	0	1.00	0	35	318
CM	07E	Coupler Defects (Car)	1.00	100	0	1.00	0	0	1.00	0	100	530
CM	08E	Truck Structure Defects (Car)	1.00	48	0	1.00	0	0	1.00	0	48	123
CM	09E	Sidebearing, Suspension Defects (Car)	1.00	111	0	1.00	0	0	1.00	0	111	621
CM	10E	Bearing failure (Car)	1.00	125	0	1.00	0	6	1.00	6	131	786
CM	11E	Other Axle/Journal Defects (Car)	1.00	58	0	1.00	0	0	1.00	0	58	535
CM	12E	Broken Wheels (Car)	1.00	27	0	1.00	0	0	1.00	0	27	774
CM	13E	Other Wheel Defects (Car)	1.00	91	0	1.00	0	0	1.00	0	91	384
CM	14E	TOFC/COFC Defects	1.00	6	0	1.00	0	0	1.00	0	6	7
CM	15E	Loco Trucks/Bearings/Wheels	1.00	0	0	1.00	0	0	1.00	0	0	109
TM	16E	Loco Electrical and Fires	1.00	0	0	1.00	0	0	1.00	0	0	16
TM	17E	All Other Locomotive Defects	1.00	6	0	1.00	0	0	1.00	0	6	60
TM	18E	All Other Car Defects	1.00	15	0	1.00	0	12	1.00	12	27	150
TM	19E	Stiff Truck (Car)	1.00	31	0	1.00	0	0	1.00	0	31	127
CM	20E	Track/Train Interaction (Hunting)(Car)	1.00	6	0	1.00	0	0	1.00	0	6	151
		Total. Equipment Defects		716	0		0	18		18	734	5047
		Human Factors/Operations										
CM	01H	Brake Operation (Main Line)	1.00	86	0	1.00	0	2	1.00	2	88	456
TM	02H	Handbrake Operations	1.00	22	12	1.00	12	10	1.00	10	44	169
TM	03H	Brake Operations (Other)	1.00	26	0	1.00	0	0	1.00	0	26	27
TM	04H	Employee Physical Condition	1.00	5	0	1.00	0	0	1.00	0	5	40.4
TM	05H	Failure to Obey/Display Signals	1.00	0	27	1.00	27	1	1.00	1	28	166.4
TM	06H	Radio Communications Error	1.00	0	6	1.00	6	0	1.00	0	6	25
TM	07H	Switching Rules	1.00	27	0	1.00	0	1	1.00	1	28	178.1
TM	08H	Mainline Rules	1.00	5	4	1.00	4	0	1.00	0	9	50.2
CM	09H	Train Handling (excl Brakes)	1.00	228	0	1.00	0	0	1.00	0	228	1014
TM	10H	Train Speed	1.00	139	11	1.00	11	0	1.00	0	150	461.75
TM	11H	Use of Switches	1.00	77	2	1.00	2	5	1.00	5	84	293
TM	12H	Miscellaneous Human Factors	1.00	0	0	1.00	0	0	1.00	0	0	190
		Total Human Factors/Operations		615	62		62	19		19	696	3071
		Miscellaneous Causes (TM)										
TM	01M	Obstructions	1.00	70	0	1.00	0	0	1.00	0	70	985
TM	02M	Grade Crossing Collisions	1.00	0	0	1.00	0	39	1.00	39	39	286.2
CM	03M	Lading Problems	1.00	141	0	1.00	0	0	1.00	0	141	647
CM	04M	Track-Train Interaction	1.00	106	0	1.00	0	0	1.00	0	106	654
TM	05M	Other Miscellaneous	1.00	112	18	1.00	18	0	1.00	0	130	490
		Total Miscellaneous Causes		429	18		18	39		39	486	3062
		Total Car-Mile Causes			0			8			3745	16530.3
		Total Train Mile Causes			82			72			2274	7924.05
		Total all Causes			82			80			6019	24454.35

Table 5.3 A. 30% Reduction in Rail Defects – Trains in Accidents

Train Mile or Car Mile	Cause Group	Trains in Derailments by Track Class														Trains in Collisions by Track Class										
		X & 1		Track Class 2		Track Class 3			Track Class 4			Track Class 5 & 6			Total	X & 1		Track Class 2		Track Class 3			Track Class 4			
		Base	Adjust't	Base	After	Base	Adjust't	After	Base	Adjust't	After	Base	Adjust't	After		Base	Adjust't	After	Base	Adjust't	After	Base	Adjust't	After		
		Track and Structure Defects (CM)																								
TM	01T	Roadbed Defects	12	4	1.00	4	5	1.00	5	9	1.00	9	1	1.00	1	31	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	02T	Non-Traffic, Weather Causes	4	3	1.00	3	5	1.00	5	6	1.00	6	0	1.00	0	18	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	03T	Wide Gauge	38	18	1.00	18	10	1.00	10	9	1.00	9	1	1.00	1	76	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	04T	Track Geometry (excl. Wide Gauge)	35	56	1.00	56	36	1.00	36	48	1.00	48	4	1.00	4	179	0	0	1.00	0	1	1.00	1	1	1.00	1
CM	05T	Buckled Track	4	9	1.00	9	14	1.00	14	25	1.00	25	1	1.00	1	53	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	06T	Rail Defects at Bolted Joint	3	2	0.85	1.7	4	0.70	2.8	11	0.70	7.7	6	0.70	4.2	19.4	0	0	0.85	0	0	0.70	0	0	0.70	0
CM	07T	Joint Bar Defects	3	2	0.85	1.7	6	0.70	4.2	20	0.70	14	13	0.70	9.1	32	0	0	0.85	0	0	0.70	0	0	0.70	0
CM	08T	Broken Rails or Welds	68	67	0.85	56.95	59	0.70	41.3	100	0.70	70	24	0.70	16.8	253.05	1	0	0.85	0	0	0.70	0	0	0.70	0
CM	09T	Other Rail and Joint Defects	1	5	0.85	4.25	5	0.70	3.5	14	0.70	9.8	3	0.70	2.1	20.65	0	0	0.85	0	0	0.70	0	1	0.70	0.7
CM	10T	Turnout Defects - Switches	19	5	1.00	5	11	1.00	11	9	1.00	9	5	1.00	5	49	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	11T	Turnout Defects - Frogs	1	1	1.00	1	3	1.00	3	4	1.00	4	0	1.00	0	9	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	12T	Misc. Track and Structure Defects	18	8	1.00	8	6	1.00	6	5	1.00	5	4	1.00	4	41	0	0	1.00	0	0	1.00	0	0	1.00	0
		Total Track and Structure Defects	206	180		168.6	164		141.8	260		216.5	62		48.2	781.1	1	0		0	1		1	2		1.7
		Signal and Communications Defects (TM)																								
CM	01S	Signal failures	4	0	1.00	0	5	1.00	5	1	1.00	1	1	1.00	1	11	0	0	1.00	0	0	1.00	0	0	1.00	0
		Equipment Defects																								
CM	01E	Air Hose Defect (Car)	0	2	1.00	2	1	1.00	1	4	1.00	4	1	1.00	1	8	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	02E	Brake Rigging Defect (Car)	0	4	1.00	4	2	1.00	2	7	1.00	7	2	1.00	2	15	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	03E	Handbrake Defects (Car)	1	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	1	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	04E	UDE (Car or Loco)	1	0	1.00	0	0	1.00	0	2	1.00	2	0	1.00	0	3	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	05E	Other Brake Defect (Car)	0	4	1.00	4	8	1.00	8	9	1.00	9	1	1.00	1	22	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	06E	Centerplate/Carbody Defects (Car)	2	7	1.00	7	14	1.00	14	20	1.00	20	6	1.00	6	49	0	0	1.00	0	1	1.00	1	1	1.00	1
CM	07E	Coupler Defects (Car)	4	4	1.00	4	16	1.00	16	42	1.00	42	6	1.00	6	72	1	0	1.00	0	1	1.00	1	2	1.00	2
CM	08E	Truck Structure Defects (Car)	0	0	1.00	0	2	1.00	2	8	1.00	8	7	1.00	7	17	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	09E	Sidebearing, Suspension Defects (Car)	10	24	1.00	24	15	1.00	15	21	1.00	21	7	1.00	7	77	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	10E	Bearing failure (Car)	0	5	1.00	5	22	1.00	22	74	1.00	74	18	1.00	18	119	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	11E	Other Axle/Journal Defects (Car)	1	7	1.00	7	16	1.00	16	33	1.00	33	15	1.00	15	72	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	12E	Broken Wheels (Car)	2	7	1.00	7	23	1.00	23	61	1.00	61	15	1.00	15	108	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	13E	Other Wheel Defects (Car)	7	14	1.00	14	10	1.00	10	33	1.00	33	4	1.00	4	68	0	0	1.00	0	0	1.00	0	2	1.00	2
CM	14E	TOFC/COFC Defects	0	0	1.00	0	0	1.00	0	1	1.00	1	0	1.00	0	1	0	2	1.00	2	0	1.00	0	0	1.00	0
CM	15E	Loco Trucks/Bearings/Wheels	2	4	1.00	4	4	1.00	4	13	1.00	13	8	1.00	8	31	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	16E	Loco Electrical and Fires	0	0	1.00	0	0	1.00	0	5	1.00	5	0	1.00	0	5	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	17E	All Other Locomotive Defects	0	1	1.00	1	1	1.00	1	2	1.00	2	0	1.00	0	4	0	0	1.00	0	1	1.00	1	1	1.00	1
TM	18E	All Other Car Defects	4	2	1.00	2	5	1.00	5	8	1.00	8	3	1.00	3	22	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	19E	Stiff Truck (Car)	3	7	1.00	7	1	1.00	1	4	1.00	4	0	1.00	0	15	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	20E	Track/Train Interaction (Hunting)(Car)	0	0	1.00	0	2	1.00	2	10	1.00	10	5	1.00	5	17	0	0	1.00	0	0	1.00	0	0	1.00	0
		Total Equipment Defects	37	92		92	142		142	357		357	98		98	726	1	2		2	3		3	6		6
		Human Factors/Operations																								
CM	01H	Brake Operation (Main Line)	7	6	1.00	6	10	1.00	10	20	1.00	20	4	1.00	4	47	0	2	1.00	2	1	1.00	1	2	1.00	2
TM	02H	Handbrake Operations	3	1	1.00	1	9	1.00	9	4	1.00	4	3	1.00	3	20	3	3	1.00	3	0	1.00	0	2	1.00	2
TM	03H	Brake Operations (Other)	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	1.00	0	0	1.00	0	1	1.00	1
TM	04H	Employee Physical Condition	0	2	1.00	2	0	1.00	0	0	1.00	0	0	1.00	0	2	0	0	1.00	0	1	1.00	1	0	1.00	0
TM	05H	Failure to Obey/Display Signals	1	1	1.00	1	4	1.00	4	13	1.00	13	4	1.00	4	23	3	5	1.00	5	15	1.00	15	45	1.00	45
TM	06H	Radio Communications Error	1	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	1	0	1	1.00	1	2	1.00	2	3	1.00	3
TM	07H	Switching Rules	4	3	1.00	3	3	1.00	3	3	1.00	3	2	1.00	2	15	5	4	1.00	4	3	1.00	3	2	1.00	2
TM	08H	Mainline Rules	1	2	1.00	2	3	1.00	3	1	1.00	1	0	1.00	0	7	4	5	1.00	5	4	1.00	4	18	1.00	18
CM	09H	Train Handling (excl Brakes)	23	19	1.00	19	17	1.00	17	30	1.00	30	4	1.00	4	93	0	1	1.00	1	0	1.00	0	0	1.00	0
TM	10H	Train Speed	17	8	1.00	8	5	1.00	5	8	1.00	8	2	1.00	2	40	8	8	1.00	8	13	1.00	13	19	1.00	19
TM	11H	Use of Switches	20	8	1.00	8	7	1.00	7	10	1.00	10	4	1.00	4	49	3	0	1.00	0	0	1.00	0	0	1.00	0
TM	12H	Miscellaneous Human Factors	4	1	1.00	1	7	1.00	7	8	1.00	8	2	1.00	2	22	0	1	1.00	1	4	1.00	4	7	1.00	7
		Total Human Factors/Operations	81	51		51	65		65	97		97	25		25	319	26	30		30	43		43	99		99
		Miscellaneous Causes (TM)																								
TM	01M	Obstructions	9	8	1.00	8	11	1.00	11	34	1.00	34	19	1.00	19	81	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	02M	Grade Crossing Collisions	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	03M	Lading Problems	11	21	1.00	21	18	1.00	18	24	1.00	24	6	1.00	6	80	0	1	1.00	1	1	1.00	1	2		

Table 5.3 A. 30% Reduction in Rail Defects – Trains in Accidents

Train Mile or Car Mile	Cause Group	Trains in Accidents on Non Class I Railroads								All Railroads, Accident Types and Track Classes	
		Collisions			Other			Total			
		After	Base	Adjust't	After	Base	Adjust't		After		
		Track and Structure Defects (CM)									
TM	01T	Roadbed Defects	20	0	1.00	0	0	1.00	0	20	54
TM	02T	Non-Traffic, Weather Causes	11	0	1.00	0	4	1.00	4	15	35
TM	03T	Wide Gauge	113	0	1.00	0	0	1.00	0	113	189
TM	04T	Track Geometry (excl. Wide Gauge)	103	1	1.00	1	1	1.00	1	105	286
CM	05T	Buckled Track	64	0	1.00	0	0	1.00	0	64	117
CM	06T	Rail Defects at Bolted Joint	10.2	0	0.85	0	0	0.85	0	10.2	30.3
CM	07T	Joint Bar Defects	5.95	0	0.85	0	0	0.85	0	5.95	37.95
CM	08T	Broken Rails or Welds	175.95	0	0.85	0	0	0.85	0	175.95	430
CM	09T	Other Rail and Joint Defects	13.6	0	0.85	0	0	1.00	0	13.6	34.95
CM	10T	Turnout Defects - Switches	35	0	1.00	0	0	1.00	0	35	84
CM	11T	Turnout Defects - Frogs	2	0	1.00	0	0	1.00	0	2	11
TM	12T	Misc. Track and Structure Defects	27	0	1.00	0	0	1.00	0	27	68
		Total Track and Structure Defects	580.7	1		1	5		5	586.7	1377.2
		Signal and Communications Defects (TM)									
CM	01S	Signal failures		0	1.00		0	1.00		0	16
		Equipment Defects									
CM	01E	Air Hose Defect (Car)	0	0	1.00	0	0	1.00	0	0	8
CM	02E	Brake Rigging Defect (Car)	3	0	1.00	0	0	1.00	0	3	20
CM	03E	Handbrake Defects (Car)	0	0	1.00	0	0	1.00	0	0	1
CM	04E	UDE (Car or Loco)	1	0	1.00	0	0	1.00	0	1	5
CM	05E	Other Brake Defect (Car)	4	0	1.00	0	0	1.00	0	4	28
CM	06E	Centerplate/Carbody Defects (Car)	10	2	1.00	2	3	1.00	3	15	86
CM	07E	Coupler Defects (Car)	7	0	1.00	0	0	1.00	0	7	95
CM	08E	Truck Structure Defects (Car)	3	0	1.00	0	1	1.00	1	4	22
CM	09E	Sidebearing, Suspension Defects (Car)	17	0	1.00	0	0	1.00	0	17	94
CM	10E	Bearing failure (Car)	30	0	1.00	0	3	1.00	3	33	162
CM	11E	Other Axle/Journal Defects (Car)	8	0	1.00	0	0	1.00	0	8	81
CM	12E	Broken Wheels (Car)	4	0	1.00	0	0	1.00	0	4	119
CM	13E	Other Wheel Defects (Car)	15	0	1.00	0	0	1.00	0	15	86
CM	14E	TOFC/COFC Defects	2	0	1.00	0	0	1.00	0	2	5
CM	15E	Loco Trucks/Bearings/Wheels	3	0	1.00	0	0	1.00	0	3	37
TM	16E	Loco Electrical and Fires	0	0	1.00	0	3	1.00	3	3	17
TM	17E	All Other Locomotive Defects	2	0	1.00	0	3	1.00	3	5	13
TM	18E	All Other Car Defects	4	0	1.00	0	2	1.00	2	6	30
TM	19E	Stiff Truck (Car)	8	0	1.00	0	0	1.00	0	8	23
CM	20E	Track/Train Interaction (Hunting)(Car)	2	0	1.00	0	0	1.00	0	2	19
		Total Equipment Defects	123	2		2	15		15	140	951
		Human Factors/Operations									
CM	01H	Brake Operation (Main Line)	11	0	1.00	0	1	1.00	1	12	64
TM	02H	Handbrake Operations	5	5	1.00	5	6	1.00	6	16	61
TM	03H	Brake Operations (Other)	3	0	1.00	0	1	1.00	1	4	6
TM	04H	Employee Physical Condition	1	0	1.00	0	0	1.00	0	1	7
TM	05H	Failure to Obey/Display Signals	0	6	1.00	6	2	1.00	2	8	123
TM	06H	Radio Communications Error	0	2	1.00	2	0	1.00	0	2	10
TM	07H	Switching Rules	9	1	1.00	1	3	1.00	3	13	58
TM	08H	Mainline Rules	1	3	1.00	3	1	1.00	1	5	63
CM	09H	Train Handling (excl Brakes)	37	1	1.00	1	1	1.00	1	39	136
TM	10H	Train Speed	21	6	1.00	6	4	1.00	4	31	141
TM	11H	Use of Switches	18	1	1.00	1	2	1.00	2	21	85
TM	12H	Miscellaneous Human Factors	0	3	1.00	3	0	1.00	0	3	43
		Total Human Factors/Operations	106	28		28	21		21	155	797
		Miscellaneous Causes (TM)									
TM	01M	Obstructions	13	1	1.00	1	11	1.00	11	25	184
TM	02M	Grade Crossing Collisions	0	0	1.00	0	84	1.00	84	84	787
CM	03M	Lading Problems	27	1	1.00	1	2	1.00	2	30	128
CM	04M	Track-Train Interaction	20	0	1.00	0	0	1.00	0	20	101
TM	05M	Other Miscellaneous	17	4	1.00	4	5	1.00	5	26	82
		Total Miscellaneous Causes	77	6		6	102		102	185	1282
		Total Car-Mile Causes		4			11			525.7	2058.2
		Total Train Mile Causes		33			132			541	2365
		Total all Causes		37			143			1066.7	4423.2

Table 5.3 B. 30% reduction in Rail Defects – Cars Derailed in Accidents

Train Mile or Car Mile	Cause Group		Cars Derailed in Derailments by Track Class													Cars Derailed in Collisions by Track Class										
			X & 1	2		3			4			5 & 6			Total	X & 1	2		3			4				
			Base	Adjust't	After	Base	Adjust't	After	Base	Adjust't	After	Base	Adjust't	After		Base	Adjust't	After	Base	Adjust't	After	Base	Adjust't	After		
		Track and Structure Defects (CM)																								
TM	01T	Roadbed Defects	71	31	1.00	31	64	1.00	64	158	1.00	158	19	1.00	19	343	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	02T	Non-Traffic, Weather Causes	10	30	1.00	30	21	1.00	21	27	1.00	27	0	1.00	0	88	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	03T	Wide Gauge	260	275	1.00	275	87	1.00	87	158	1.00	158	10	1.00	10	790	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	04T	Track Geometry (excl. Wide Gauge)	152	284	1.00	284	265	1.00	265	323	1.00	323	55	1.00	55	1079	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	05T	Buckled Track	23	97	1.00	97	263	1.00	263	356	1.00	356	9	1.00	9	748	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	06T	Rail Defects at Bolted Joint	20	15	0.85	12.75	32	0.70	22.4	282	0.70	197.4	144	0.70	100.8	353.35	0	0	0.85	0	0	0.70	0	0	0.70	0
CM	07T	Joint Bar Defects	6	17	0.85	14.45	73	0.70	51.1	240	0.70	168	268	0.70	187.6	427.15	0	0	0.85	0	0	0.70	0	0	0.70	0
CM	08T	Broken Rails or Welds	386	606	0.85	515.1	879	0.70	615.3	1669	0.70	1168.3	369	0.70	258.3	2943	3	0	0.85	0	0	0.70	0	0	0.70	0
CM	09T	Other Rail and Joint Defects	5	61	0.85	51.85	108	0.70	75.6	458	0.70	320.6	85	0.70	59.5	512.55	0	0	0.85	0	0	0.70	0	24	0.70	16.8
CM	10T	Turnout Defects - Switches	89	13	1.00	13	70	1.00	70	33	1.00	33	33	1.00	33	238	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	11T	Turnout Defects - Frogs	8	1	1.00	1	3	1.00	3	22	1.00	22	0	1.00	0	34	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	12T	Misc. Track and Structure Defects	116	43	1.00	43	55	1.00	55	36	1.00	36	68	1.00	68	318	0	0	1.00	0	0	1.00	0	0	1.00	0
		Total Track and Structure Defects	1146	1473		1368.15	1920		1592.4	3762		2967.3	1060		800.2	7874.05	3	0		0	0		24		16.8	
		Signal and Communications Defects (TM)																								
CM	01S	Signal failures	12	0	1.00	0	28	1.00	28	23	1.00	23	21	1.00	21	84	0	0	1.00	0	0	1.00	0	0	1.00	0
		Equipment Defects																								
CM	01E	Air Hose Defect (Car)	0	21	1.00	21	10	1.00	10	26	1.00	26	7	1.00	7	64	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	02E	Brake Rigging Defect (Car)	0	37	1.00	37	2	1.00	2	65	1.00	65	4	1.00	4	108	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	03E	Handbrake Defects (Car)	2	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	2	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	04E	UDE (Car or Loco)	2	0	1.00	0	0	1.00	0	18	1.00	18	0	1.00	0	20	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	05E	Other Brake Defect (Car)	0	22	1.00	22	44	1.00	44	31	1.00	31	1	1.00	1	98	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	06E	Centerplate/Carbody Defects (Car)	5	34	1.00	34	81	1.00	81	114	1.00	114	8	1.00	8	242	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	07E	Coupler Defects (Car)	4	53	1.00	53	78	1.00	78	241	1.00	241	40	1.00	40	416	1	0	1.00	0	2	1.00	2	3	1.00	3
CM	08E	Truck Structure Defects (Car)	0	0	1.00	0	6	1.00	6	61	1.00	61	8	1.00	8	75	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	09E	Sidebearing, Suspension Defects (Car)	51	162	1.00	162	122	1.00	122	164	1.00	164	11	1.00	11	510	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	10E	Bearing failure (Car)	0	23	1.00	23	96	1.00	96	455	1.00	455	75	1.00	75	649	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	11E	Other Axle/Journal Defects (Car)	6	31	1.00	31	106	1.00	106	264	1.00	264	69	1.00	69	476	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	12E	Broken Wheels (Car)	11	70	1.00	70	201	1.00	201	401	1.00	401	63	1.00	63	746	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	13E	Other Wheel Defects (Car)	39	67	1.00	67	52	1.00	52	105	1.00	105	6	1.00	6	269	0	0	1.00	0	0	1.00	0	24	1.00	24
CM	14E	TOFC/COFC Defects	0	0	1.00	0	0	1.00	0	1	1.00	1	0	1.00	0	1	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	15E	Loco Trucks/Bearings/Wheels	0	46	1.00	46	13	1.00	13	39	1.00	39	11	1.00	11	109	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	16E	Loco Electrical and Fires	0	0	1.00	0	0	1.00	0	16	1.00	16	0	1.00	0	16	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	17E	All Other Locomotive Defects	0	13	1.00	13	9	1.00	9	31	1.00	31	0	1.00	0	53	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	18E	All Other Car Defects	14	21	1.00	21	44	1.00	44	29	1.00	29	15	1.00	15	123	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	19E	Stiff Truck (Car)	9	44	1.00	44	3	1.00	3	40	1.00	40	0	1.00	0	96	0	0	1.00	0	0	1.00	0	0	1.00	0
CM	20E	Track/Train Interaction (Hunting)(Car)	0	0	1.00	0	18	1.00	18	68	1.00	68	59	1.00	59	145	0	0	1.00	0	0	1.00	0	0	1.00	0
		Total Equipment Defects	143	644		644	885		885	2169		2169	377		377	4218	1	0		0	2		2	27		27
		Human Factors/Operations																								
CM	01H	Brake Operation (Main Line)	17	60	1.00	60	85	1.00	85	230	1.00	230	27	1.00	27	419	0	0	1.00	0	11	1.00	11	3	1.00	3
TM	02H	Handbrake Operations	14	2	1.00	2	42	1.00	42	8	1.00	8	18	1.00	18	84	2	14	1.00	14	0	1.00	0	0	1.00	0
TM	03H	Brake Operations (Other)	0	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	0	0	0	1.00	0	0	1.00	0	1	1.00	1
TM	04H	Employee Physical Condition	0	30	1.00	30	0	1.00	0	0	1.00	0	0	1.00	0	30	0	0	1.00	0	1	1.00	1	0	1.00	0
TM	05H	Failure to Obey/Display Signals	7	1	1.00	1	16	1.00	16	86	1.00	86	5	1.00	5	115	4	8	1.00	8	27	1.00	27	206	1.00	206
TM	06H	Radio Communications Error	1	0	1.00	0	0	1.00	0	0	1.00	0	0	1.00	0	1	0	0	1.00	0	18	1.00	18	0	1.00	0
TM	07H	Switching Rules	17	8	1.00	8	18	1.00	18	73	1.00	73	5	1.00	5	121	3	14	1.00	14	9	1.00	9	4	1.00	4
TM	08H	Mainline Rules	1	12	1.00	12	7	1.00	7	4	1.00	4	0	1.00	0	24	0	5	1.00	5	1	1.00	1	72	1.00	72
CM	09H	Train Handling (excl Brakes)	119	138	1.00	138	204	1.00	204	311	1.00	311	14	1.00	14	786	0	0	1.00	0	0	1.00	0	0	1.00	0
TM	10H	Train Speed	107	43	1.00	43	55	1.00	55	57	1.00	57	5	1.00	5	267	26	33	1.00	33	14	1.00	14	30	1.00	30
TM	11H	Use of Switches	67	28	1.00	28	36	1.00	36	53	1.00	53	9	1.00	9	193	3	0	1.00	0	0	1.00	0	0	1.00	0
TM	12H	Miscellaneous Human Factors	29	5	1.00	5	28	1.00	28	110	1.00	110	9	1.00	9	181	0	1	1.00	1	0	1.00	0	8	1.00	8
		Total Human Factors/Operations	379	327		327	491		491	932		932	92		92	2221	38	75		75	81		81	324		324
		Miscellaneous Causes (TM)																								

Table 5.3 B. 30% reduction in Rail Defects – Cars Derailed in Accidents

Train Mile or Car Mile	Cause Group		Cars Derailed in Accidents on Non Class I Railroads								All Railroads, Accident Types and Track Classes	
			Derailments		Collisions			Other		Total		
			Adjust't	After	Base	Adjust't	After	Base	Adjust't			After
Track and Structure Defects (CM)												
TM	01T	Roadbed Defects	1.00	102	0	1.00	0	0	1.00	0	102	445
TM	02T	Non-Traffic, Weather Causes	1.00	72	0	1.00	0	1	1.00	1	73	161
TM	03T	Wide Gauge	1.00	720	0	1.00	0	0	1.00	0	720	1510
TM	04T	Track Geometry (excl. Wide Gauge)	1.00	510	2	1.00	2	3	1.00	3	515	1594
CM	05T	Buckled Track	1.00	391	0	1.00	0	0	1.00	0	391	1139
CM	06T	Rail Defects at Bolted Joint	0.85	79.9	0	0.85	0	0	0.85	0	79.9	433.25
CM	07T	Joint Bar Defects	0.85	49.3	0	0.85	0	0	0.85	0	49.3	476.45
CM	08T	Broken Rails or Welds	0.85	1328.55	0	0.85	0	0	0.85	0	1328.55	4274.55
CM	09T	Other Rail and Joint Defects	0.85	117.3	0	0.85	0	0	0.85	0	117.3	646.65
CM	10T	Turnout Defects - Switches	1.00	134	0	1.00	0	0	1.00	0	134	372
CM	11T	Turnout Defects - Frogs	1.00	134	0	1.00	0	0	1.00	0	134	168
TM	12T	Misc. Track and Structure Defects	1.00	181	0	1.00	0	0	1.00	0	181	499
		Total Track and Structure Defects		3819.05	2		2	4		4	3825.05	11718.9
Signal and Communications Defects (TM)												
CM	01S	Signal failures	1.00	0	0	1.00	0	0	1.00	0	0	89
Equipment Defects												
CM	01E	Air Hose Defect (Car)	1.00	0	0	1.00	0	0	1.00	0	0	64
CM	02E	Brake Rigging Defect (Car)	1.00	26	0	1.00	0	0	1.00	0	26	141
CM	03E	Handbrake Defects (Car)	1.00	0	0	1.00	0	0	1.00	0	0	2
CM	04E	UDE (Car or Loco)	1.00	7	0	1.00	0	0	1.00	0	7	27
CM	05E	Other Brake Defect (Car)	1.00	24	0	1.00	0	0	1.00	0	24	122
CM	06E	Centerplate/Carbody Defects (Car)	1.00	35	0	1.00	0	0	1.00	0	35	318
CM	07E	Coupler Defects (Car)	1.00	100	0	1.00	0	0	1.00	0	100	530
CM	08E	Truck Structure Defects (Car)	1.00	48	0	1.00	0	0	1.00	0	48	123
CM	09E	Sidebearing, Suspension Defects (Car)	1.00	111	0	1.00	0	0	1.00	0	111	621
CM	10E	Bearing failure (Car)	1.00	125	0	1.00	0	6	1.00	6	131	786
CM	11E	Other Axle/Journal Defects (Car)	1.00	58	0	1.00	0	0	1.00	0	58	535
CM	12E	Broken Wheels (Car)	1.00	27	0	1.00	0	0	1.00	0	27	774
CM	13E	Other Wheel Defects (Car)	1.00	91	0	1.00	0	0	1.00	0	91	384
CM	14E	TOFC/COFC Defects	1.00	6	0	1.00	0	0	1.00	0	6	7
CM	15E	Loco Trucks/Bearings/Wheels	1.00	0	0	1.00	0	0	1.00	0	0	109
TM	16E	Loco Electrical and Fires	1.00	0	0	1.00	0	0	1.00	0	0	16
TM	17E	All Other Locomotive Defects	1.00	6	0	1.00	0	0	1.00	0	6	60
TM	18E	All Other Car Defects	1.00	15	0	1.00	0	12	1.00	12	27	150
TM	19E	Stiff Truck (Car)	1.00	31	0	1.00	0	0	1.00	0	31	127
CM	20E	Track/Train Interaction (Hunting)(Car)	1.00	6	0	1.00	0	0	1.00	0	6	151
		Total. Equipment Defects		716	0		0	18		18	734	5047
Human Factors/Operations												
CM	01H	Brake Operation (Main Line)	1.00	86	0	1.00	0	2	1.00	2	88	521
TM	02H	Handbrake Operations	1.00	22	12	1.00	12	10	1.00	10	44	169
TM	03H	Brake Operations (Other)	1.00	26	0	1.00	0	0	1.00	0	26	27
TM	04H	Employee Physical Condition	1.00	5	0	1.00	0	0	1.00	0	5	58
TM	05H	Failure to Obey/Display Signals	1.00	0	27	1.00	27	1	1.00	1	28	464
TM	06H	Radio Communications Error	1.00	0	6	1.00	6	0	1.00	0	6	25
TM	07H	Switching Rules	1.00	27	0	1.00	0	1	1.00	1	28	191
TM	08H	Mainline Rules	1.00	5	4	1.00	4	0	1.00	0	9	111
CM	09H	Train Handling (excl Brakes)	1.00	228	0	1.00	0	0	1.00	0	228	1014
TM	10H	Train Speed	1.00	139	11	1.00	11	0	1.00	0	150	545
TM	11H	Use of Switches	1.00	77	2	1.00	2	5	1.00	5	84	293
TM	12H	Miscellaneous Human Factors	1.00	0	0	1.00	0	0	1.00	0	0	190
		Total Human Factors/Operations		615	62		62	19		19	696	3608
Miscellaneous Causes (TM)												
TM	01M	Obstructions	1.00	70	0	1.00	0	0	1.00	0	70	1055
TM	02M	Grade Crossing Collisions	1.00	0	0	1.00	0	39	1.00	39	39	308
CM	03M	Lading Problems	1.00	141	0	1.00	0	0	1.00	0	141	647
CM	04M	Track-Train Interaction	1.00	106	0	1.00	0	0	1.00	0	106	654
TM	05M	Other Miscellaneous	1.00	112	18	1.00	18	0	1.00	0	130	490
		Total Miscellaneous Causes		429	18		18	39		39	486	3154
		Total Car-Mile Causes			0			8			3467.05	15128.9
		Total Train Mile Causes			82			72			2274	8488
		Total all Causes			82			80			5741.05	23616.9