

(2) The PTCDP and PTCSP shall address and describe the training required with provisions for the maintenance of skills proficiency. As a minimum, the training program must:

(i) As described in §236.1043(a)(2), develop failure scenarios which incorporate the safety hazards identified in the PTCDP and PTCSP including the return of train operations to a fully manual mode;

(ii) Provide training, consistent with §236.1047(a), for safe train operations under all failure scenarios and identified safety hazards that affect train operations;

(iii) Provide training, consistent with §236.1047(a), for safe train operations under manual control; and

(iv) Consistent with §236.1047(a), ensure maintenance of manual train operating skills by requiring manual starting and stopping of the train for an appropriate number of trips and by one or more of the following methods:

(A) Manual operation of a train for a 4-hour work period;

(B) Simulated manual operation of a train for a minimum of 4 hours in a Type I simulator as required; or

(C) Other means as determined following consultation between the railroad and designated representatives of the affected employees and approved by FRA. The PTCDP and PTCSP shall designate the appropriate frequency when manual operation, starting, and stopping must be conducted, and the appropriate frequency of simulated manual operation.

(d) *Conductor training.* Training required under this subpart for a conductor, together with required records,

shall be integrated into the program of training required under this chapter.

§236.1049 Training specific to roadway workers.

(a) *Roadway worker training.* Training required under this subpart for a roadway worker shall be integrated into the program of instruction required under part 214, subpart C of this chapter (“Roadway Worker Protection”), consistent with task analysis requirements of §236.1043. This training shall provide instruction for roadway workers who provide protection for themselves or roadway work groups.

(b) *Training subject areas.* (1) Instruction for roadway workers shall ensure an understanding of the role of processor-based signal and train control equipment in establishing protection for roadway workers and their equipment.

(2) Instruction for all roadway workers working in territories where PTC is required under this subpart shall ensure recognition of processor-based signal and train control equipment on the wayside and an understanding of how to avoid interference with its proper functioning.

(3) Instructions concerning the recognition of system failures and the provision of alternative methods of on-track safety in case the train control system fails, including periodic practical exercises or simulations and operational testing under part 217 of this chapter to ensure the continued capability of roadway workers to be free from the danger of being struck by a moving train or other on-track equipment.

APPENDIX A TO PART 236—CIVIL PENALTIES¹

Section	Violation	Willful violation
Subpart A—Rules and Instructions—All Systems		
<i>General:</i>		
236.0 Applicability, minimum requirements	\$2,500	\$5,000
236.1 Plans, where kept	1,000	2,000
236.2 Grounds	1,000	2,000
236.3 Locking of signal apparatus housings:		
(a) Power interlocking machine cabinet not secured against unauthorized entry	2,500	5,000
(b) other violations	1,000	2,000
236.4 Interference with normal functioning of device	5,000	7,500
236.5 Design of control circuits on closed circuit principle	1,000	2,000
236.6 Hand-operated switch equipped with switch circuit controller	1,000	2,000
236.7 Circuit controller operated by switch-and-lock movement	1,000	2,000

Section	Violation	Willful violation
236.8 Operating characteristics of electro-magnetic, electronic, or electrical apparatus	1,000	2,000
236.9 Selection of circuits through indicating or annunciating instruments	1,000	2,000
236.10 Electric locks, force drop type; where required	1,000	2,000
236.11 Adjustment, repair, or replacement of component	2,500	5,000
236.12 Spring switch signal protection; where required	1,000	2,000
236.13 Spring switch; selection of signal control circuits through circuit controller	1,000	2,000
236.14 Spring switch signal protection; requirements	1,000	2,000
236.15 Timetable instructions	1,000	2,000
236.16 Electric lock, main track releasing circuit: (a) Electric lock releasing circuit on main track extends into fouling circuit where turnout not equipped with derail at clearance point either pipe-connected to switch or independently locked, electrically	2,500	5,000
(b) other violations	1,000	2,000
236.17 Pipe for operating connections, requirements	1,000	2,000
236.18 Software management control plan: Failure to develop and adopt a plan	\$5,000	\$10,000
Failure to fully implement plan	5,000	10,000
Inadequate plan	2,500	10,000
<i>Roadway Signals and Cab Signals—</i>		
236.21 Location of roadway signals	1,000	2,000
236.22 Semaphore signal arm; clearance to other objects	1,000	2,000
236.23 Aspects and indications	1,000	2,000
236.24 Spacing of roadway signals	2,500	5,000
236.26 Buffering device, maintenance	1,000	2,000
<i>Track Circuits—</i>		
236.51 Track circuit requirements: (a) Shunt fouling circuit used where permissible speed through turnout greater than 45 m.p.h.	2,500	5,000
(b) Track relay not in de-energized position or device that functions as track relay not in its most restrictive state when train, locomotive, or car occupies any part of track circuit, except fouling section of turnout of hand-operated main-track crossover	2,500	5,000
(c) other violations	1,000	2,000
236.52 Relayed cut-section	1,000	2,000
236.53 Track circuit feed at grade crossing	1,000	2,000
236.54 Minimum length of track circuit	1,000	2,000
236.55 Dead section; maximum length	1,000	2,000
236.56 Shunting sensitivity	2,500	5,000
236.57 Shunt and fouling wires: (a) Shunt or fouling wires do not consist of at least two discrete conductors	2,500	5,000
(b) other violations	1,000	2,000
236.58 Turnout, fouling section: (a) Rail joint in shunt fouling section not bonded	2,500	5,000
(b) other violations	1,000	2,000
236.59 Insulated rail joints	1,000	2,000
236.60 Switch shunting circuit; use restricted	2,500	5,000
<i>Wires and Cables—</i>		
236.71 Signal wires on pole line and aerial cable	1,000	2,000
236.73 Open-wire transmission line; clearance to other circuits	1,000	2,000
236.74 Protection of insulated wire; splice in underground wire	1,000	2,000
236.76 Tagging of wires and interference of wires or tags with signal apparatus	1,000	2,000
<i>Inspections and Tests; All Systems—</i>		
236.101 Purpose of inspection and tests; removal from service or relay or device failing to meet test requirements	2,500	5,000
236.102 Semaphore or search-light signal mechanism	1,000	2,000
236.103 Switch circuit controller or point detector	1,000	2,000
236.104 Shunt fouling circuit	1,000	2,000
236.105 Electric lock	1,000	2,000
236.106 Relays	1,000	2,000
236.107 Ground tests	1,000	2,000
236.108 Insulation resistance tests, wires in trunking and cables: (a) Circuit permitted to function on a conductor having insulation resistance value less than 200,000 ohms	2,500	5,000
(b) other violations	1,000	2,000
236.109 Time releases, timing relays and timing devices	1,000	2,000
236.110 Results of tests	1,000	2,000
Subpart B—Automatic Block Signal Systems		
236.201 Track circuit control of signals	1,000	2,000
236.202 Signal governing movements over hand-operated switch	1,000	2,000
236.203 Hand-operated crossover between main tracks; protection	1,000	2,000

Section	Violation	Willful violation
236.204 Track signaled for movements in both directions, requirements	1,000	2,000
236.205 Signal control circuits; requirements	1,000	2,000
236.206 Battery or power supply with respect to relay; location	1,000	2,000

Subpart C—Interlocking

236.207 Electric lock on hand-operated switch; control:		
(a) Approach or time locking of electric lock on hand-operated switch can be defeated by unauthorized use of emergency device which is not kept sealed in the non-release position	2,500	5,000
(b) other violations	1,000	2,000
236.301 Where signals shall be provided	1,000	2,000
236.302 Track circuits and route locking	1,000	2,000
236.303 Control circuits for signals, selection through circuit controller operated by switch points or by switch locking mechanism	1,000	2,000
236.304 Mechanical locking or same protection effected by circuits	1,000	2,000
236.305 Approach or time locking	1,000	2,000
236.306 Facing point lock or switch-and-lock movement	1,000	2,000
236.307 Indication locking:		
236.308 Mechanical or electric locking or electric circuits; requisites	1,000	2,000
236.309 Loss of shunt protection; where required:		
(a) Loss of shunt of five seconds or less permits release of route locking of power-operated switch, movable point frog, or derail	2,500	5,000
(b) Other violations	1,000	2,000
236.310 Signal governing approach to home signal	1,000	2,000
236.311 Signal control circuits, selection through track relays or devices functioning as track relays and through signal mechanism contacts and time releases at automatic interlocking	1,000	2,000
236.312 Movable bridge, interlocking of signal appliances with bridge devices:		
(a) Emergency bypass switch or device not locked or sealed	2,500	5,000
(b) other violations	1,000	2,000
236.314 Electric lock for hand-operated switch or derail:		
(a) Approach or time locking of electric lock at hand-operated switch or derail can be defeated by unauthorized use of emergency device which is not kept sealed in non-release position	2,500	5,000
(b) other violations	1,000	2,000
<i>Rules and Instructions—</i>		
236.326 Mechanical locking removed or disarranged; requirement for permitting train movements through interlocking	1,000	2,000
236.327 Switch, movable-point frog or split-point derail	1,000	2,000
236.328 Plunger of facing-point	1,000	2,000
236.329 Bolt lock	1,000	2,000
236.330 Locking dog of switch and lock movement	1,000	2,000
236.334 Point detector	1,000	2,000
236.335 Dogs, stops and trunnions of mechanical locking	1,000	2,000
236.336 Locking bed	1,000	2,000
236.337 Locking faces of mechanical locking; fit	1,000	2,000
236.338 Mechanical locking required in accordance with locking sheet and dog chart	1,000	2,000
236.339 Mechanical locking; maintenance requirements	1,000	2,000
236.340 Electromechanical interlocking machine; locking between electrical and mechanical levers	1,000	2,000
236.341 Latch shoes, rocker links, and quadrants	1,000	2,000
236.342 Switch circuit controller	1,000	2,000
<i>Inspection and Tests—</i>		
236.376 Mechanical locking	1,000	2,000
236.377 Approach locking	1,000	2,000
236.378 Time locking	1,000	2,000
236.379 Route locking	1,000	2,000
236.380 Indication locking	1,000	2,000
236.381 Traffic locking	1,000	2,000
236.382 Switch obstruction test	1,000	2,000
236.383 Valve locks, valves, and valve magnets	1,000	2,000
236.384 Cross protection		
236.386 Restoring feature on power switches		
236.387 Movable bridge locking	1,000	2,000

Subpart D—Traffic Control Systems Standards

236.401 Automatic block signal system and interlocking standards applicable to traffic control systems:		
236.402 Signals controlled by track circuits and control operator	1,000	2,000
236.403 Signals at controlled point	1,000	2,000
236.404 Signals at adjacent control points	1,000	2,000

Section	Violation	Willful violation
236.405 Track signaled for movements in both directions, change of direction of traffic	1,000	2,000
236.407 Approach or time locking; where required	1,000	2,000
236.408 Route locking	1,000	2,000
236.410 Locking, hand-operated switch; requirements:		
(a) Hand-operated switch on main track not electrically or mechanically locked in normal position where signal not provided to govern movement to main track, movements made at speeds in excess of 20 m.p.h., and train or engine movements may clear main track	2,500	5,000
(b) Hand-operated switch on signaled siding not electrically or mechanically locked in normal position where signal not provided to govern movements to signaled siding, train movements made at speeds in excess of 30 m.p.h., and train or engine movements may clear signaled siding	2,500	5,000
(c) Approach or time locking of electric lock at hand-operated switch can be defeated by use of emergency release device of electric lock which is not kept sealed in non-release position	2,500	5,000
(d) other violations	1,000	2,000
<i>Rules and Instructions—</i>		
236.426 Interlocking rules and instructions applicable to traffic control systems	1,000	2,000
236.476 Interlocking inspections and tests applicable to traffic control systems	1,000	2,000

Subpart E—Automatic Train Stop, Train Control and Cab Signal Systems Standards

236.501 Forestalling device and speed control	1,000	2,000
236.502 Automatic brake application, initiation by restrictive block conditions stopping distance in advance	1,000	2,000
236.503 Automatic brake application; initiation when predetermined rate of speed exceeded	1,000	2,000
236.504 Operations interconnected with automatic block-signal system	1,000	2,000
236.505 Proper operative relation between parts along roadway and parts on locomotive	1,000	2,000
236.506 Release of brakes after automatic application	1,000	2,000
236.507 Brake application; full service	1,000	2,000
236.508 Interference with application of brakes by means of brake valve	1,000	2,000
236.509 Two or more locomotives coupled	1,000	2,000
236.511 Cab signals controlled in accordance with block conditions stopping distance in advance	1,000	2,000
236.512 Cab signal indication when locomotive enters blocks	1,000	2,000
236.513 Audible indicator	1,000	2,000
236.514 Interconnection of cab signal system with roadway signal system	1,000	2,000
236.515 Visibility of cab signals	1,000	2,000
236.516 Power supply	1,000	2,000
<i>Rules and Instructions; Roadway—</i>		
236.526 Roadway element not functioning properly	2,500	5,000
236.527 Roadway element insulation resistance	1,000	2,000
236.528 Restrictive condition resulting from open hand-operated switch; requirement	1,000	2,000
236.529 Roadway element inductor; height and distance from rail	1,000	2,000
236.531 Trip arm; height and distance from rail	1,000	2,000
236.532 Strap iron inductor; use restricted	1,000	2,000
236.534 Rate of pressure reduction; equalizing reservoir or brake pipe	1,000	2,000
236.551 Power supply voltage	1,000	2,000
236.552 Insulation resistance	1,000	2,000
236.553 Seal, where required	2,500	5,000
236.554 Rate of pressure reduction; equalizing reservoir or brake pipe	1,000	2,000
236.555 Repaired or rewound receiver coil	1,000	2,000
236.556 Adjustment of relay	1,000	2,000
236.557 Receiver; location with respect to rail	1,000	2,000
236.560 Contact element, mechanical trip type; location with respect to rail	1,000	2,000
236.562 Minimum rail current required	1,000	2,000
236.563 Delay time	1,000	2,000
236.564 Acknowledging time	1,000	2,000
236.565 Provision made for preventing operation of pneumatic brake-applying apparatus by double-heading clock; requirement	1,000	2,000
236.566 Locomotive of each train operating in train stop, train control or cab signal territory; equipped	5,000	7,500
236.567 Restrictions imposed when device fails and/or is cut out en route:		
(a) Report not made to designated officer at next available point of communication after automatic train stop, train control, or cab signal device fails and/or is cut en route	5,000	7,500
(b) Train permitted to proceed at speed exceeding 79 m.p.h. where automatic train stop, train control, or cab signal device fails and/or is cut out en route when absolute block established in advance of train on which device is inoperative	5,000	7,500
(c) other violations	1,000	2,000
236.568 Difference between speeds authorized by roadway signal and cab signal; action	1,000	2,000
<i>Inspection and Tests; Roadway—</i>		
236.576 Roadway element	1,000	2,000

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Section	Violation	Willful violation
236.577 Test, acknowledgement, and cut-in circuits	1,000	2,000
<i>Inspection and Tests; Locomotive—</i>		
236.586 Daily or after trip test	2,500	5,000
236.587 Departure test:		
(a) Test of automatic train stop, train control, or cab signal apparatus on locomotive not made on departure of locomotive from initial terminal if equipment on locomotive not cut out between initial terminal and equipped territory	5,000	7,500
(b) Test of automatic train stop, train control, or cab signal apparatus on locomotive not made immediately on entering equipped territory, if equipment on locomotive cut out between initial terminal and equipped territory	5,000	7,500
(c) Automatic train stop, train control, or cab signal apparatus on locomotive making more than one trip within 24-hour period not given departure test within corresponding 24-hour period	5,000	7,500
(d) other violations	2,500	5,000
236.588 Periodic test	2,500	5,000
236.589 Relays	2,500	5,000
236.590 Pneumatic apparatus:		
(a) Automatic train stop, train control, or cab signal apparatus not inspected and cleaned at least once every 736 days	2,500	5,000
(b) other violations	1,000	2,000
Subpart F—Dragging Equipment and Slide Detectors and Other Similar Protective Devices; Standards		
236.601 Signals controlled by devices; location	1,000	2,000
Subpart H—Standards for Processor-Based Signal and Train Control Systems		
236.905 Railroad Safety Program Plan (RSPP):		
Failure to develop and submit RSPP when required	5,000	7,500
Failure to obtain FRA approval for a modification to RSPP	5,000	7,500
236.907 Product Safety Plan (PSP):		
Failure to develop a PSP	5,000	7,500
Failure to submit a PSP when required	5,000	7,500
236.909 Minimum Performance Standard:		
Failure to make analyses or documentation available	2,500	5,000
Failure to determine that the standard has been met	5,000	7,500
236.913 Notification to FRA of PSPs:		
Failure to prepare a PSP or PSP amendment as required	2,500	5,000
Failure to submit a PSP or PSP amendment as required	5,000	7,500
Field testing without authorization or approval	10,000	20,000
236.915 Implementation and operation:		
(a) Operation of product without authorization or approval	10,000	20,000
(b) Failure to comply with PSP	2,500	5,000
(c) Interference with normal functioning safety-critical product	7,500	15,000
(d) Failure to determine cause and adjust, repair or replace without undue delay or take appropriate action pending repair	5,000	7,500
236.917 Retention of records:		
Failure to maintain records as required	7,500	15,000
Failure to report inconsistency	10,000	20,000
Failure to take prompt countermeasures	10,000	20,000
Failure to provide final report	2,500	5,000
236.919 Operations and Maintenance Manual	3,000	6,000
236.921 Training and qualification program, general	3,000	6,000
236.923 Task analysis and basic requirements:		
Failure to develop an acceptable training program	2,500	5,000
Failure to train persons as required	2,500	5,000
Failure to conduct evaluation of training program as required	2,500	5,000
Failure to maintain records as required	1,500	3,000
236.925 Training specific to control office personnel	2,500	5,000
236.927 Training specific to locomotive engineers and other operating personnel	2,500	5,000
236.929 Training specific to roadway workers	2,500	5,000
Subpart I—Positive Train Control Systems		
236.1005 Positive Train Control System Requirements:		
Failure to complete PTC system installation on track segment where PTC is required prior to 12/31/2015	16,000	25,000
Commencement of revenue service prior to obtaining PTC System Certification	16,000	25,000
Failure of the PTC system to perform a safety-critical function required by this section	5,000	7,500
Failure to provide notice, obtain approval, or follow a condition for temporary rerouting when required	5,000	7,500
Exceeding the allowed percentage of controlling locomotives operating out of an initial terminal after receiving a failed initialization	5,000	7,500
236.1006 Equipping locomotives operating in PTC territory:		

Section	Violation	Willful violation
Operating in PTC territory a controlling locomotive without a required and operative PTC onboard apparatus	15,000	25,000
Failure to report as prescribed by this section	5,000	7,500
Non-compliant operation of unequipped trains in PTC territory	15,000	25,000
236.1007 Additional requirements for high-speed service:		
Operation of passenger trains at speed equal to or greater than 60 mph on non-PTC-equipped territory where required	15,000	25,000
Operation of freight trains at speed equal to or greater than 50 mph on non-PTC-equipped territory where required	15,000	25,000
Failure to fully implement incursion protection where required	5,000	7,500
236.1009 Procedural requirements:		
Failure to file PTCIP when required	5,000	7,500
Failure to amend PTCIP when required	5,000	7,500
Failure to obtain Type Approval when required	5,000	7,500
Failure to update NPI	5,000	7,500
Operation of PTC system prior to system certification	16,000	25,000
236.1011 PTCIP content requirements:		
Failure to install a PTC system in accordance with subpart I when so required	11,000	16,000
236.1013 PTCDP content requirements and Type Approval:		
Failure to maintain quality control system	5,000	7,500
Inappropriate use of Type Approval	5,000	7,500
236.1015 PTCSP content requirements and PTC System Certification:		
Failure to implement PTC system in accordance with the associated PTCSP and resultant system certification	16,000	25,000
Failure to maintain PTC system in accordance with the associated PTCSP and resultant system certification	16,000	25,000
Failure to maintain required supporting documentation	2,500	5,000
236.1017 Independent third party Verification and Validation:		
Failure to conduct independent third party Verification and Validation when ordered	11,000	16,000
236.1019 Main line track exceptions:		
Revenue operations conducted in non-compliance with the passenger terminal exception	16,000	25,000
Revenue operations conducted in non-compliance with the limited operations exception	16,000	25,000
Failure to request modification of the PTCIP or PTCSP when required	11,000	16,000
Revenue operations conducted in violation of (c)(2)	16,000	25,000
Revenue operations conducted in violation of (c)(3)	25,000	25,000
236.1021 Discontinuances, material modifications, and amendments:		
Failure to update PTCDP when required	5,000	7,500
Failure to update PTCSP when required	5,000	7,500
Failure to immediately adopt and comply with approved RFA	5,000	7,500
Discontinuance or modification of a PTC system without approval when required	11,000	16,000
236.1023 Errors and malfunctions:		
Railroad failure to provide proper notification of PTC system error or malfunction	5,000	7,500
Failure to maintain PTCIPVL	2,500	5,000
Supplier failure to provide proper notification of previously identified PTC system error or malfunction	5,000	7,500
Failure to provide timely notification	5,000	7,500
Failure to provide appropriate protective measures in the event of PTC system failure	15,000	25,000
236.1027 Exclusions:		
Integration of primary train control system with locomotive electronic system without approval	5,000	7,500
236.1029 PTC system use and en route failures:		
Failure to determine cause of PTC system component failure without undue delay	5,000	7,500
Failure to adjust, repair, or replace faulty PTC system component without undue delay	5,000	7,500
Failure to take appropriate action pending adjustment, repair, or replacement of faulty PTC system component	15,000	25,000
Non-compliant train operation within PTC-equipped territory with inoperative PTC onboard apparatus	5,000	7,500
Interference with the normal functioning of safety-critical PTC system	15,000	25,000
Improper arrangement of the PTC system onboard apparatus	2,500	5,000
236.1033 Communications and security requirements:		
Failure to provide cryptographic message integrity and authentication	5,000	7,500
Improper use of revoked cryptographic key	5,000	15,000
Failure to protect cryptographic keys from unauthorized disclosure, modification, or substitution	5,000	15,000
Failure to establish prioritized service restoration and mitigation plan for communication services	5,000	7,500
236.1035 Field testing requirements:		
Field testing without authorization or approval	10,000	20,000
236.1037 Records retention:		
Failure to maintain records and databases as required	7,500	15,000
Failure to report inconsistency	10,000	20,000
Failure to take prompt countermeasures	10,000	20,000
Failure to provide final report	2,500	5,000

Section	Violation	Willful violation
236.1039 Operations and Maintenance Manual: Failure to implement and maintain Operations and Maintenance Manual as required	3,000	6,000
236.1043 Task analysis and basic requirements: Failure to develop and maintain an acceptable training program	10,000	20,000
Failure to train persons as required	2,500	5,000
Failure to conduct evaluation of training program as required	2,500	5,000
Failure to maintain records as required	1,500	3,000
236.1045 Training specific to office control personnel: Failure to conduct training unique to office control personnel	2,500	5,000
236.1047 Training specific to locomotive engineers and other operating personnel: Failure to conduct training unique to locomotive engineers and other operating personnel	2,500	5,000
236.1049 Training specific to roadway workers: Failure to conduct training unique to roadway workers	2,500	5,000

¹ A penalty may be assessed against an individual only for a willful violation. The Administrator reserves the right to assess a penalty of up to \$100,000 for any violation where circumstances warrant. See 49 CFR part 209, appendix A.

[53 FR 52936, Dec. 29, 1988, as amended at 63 FR 11624, Mar. 10, 1998; 69 FR 30595, May 28, 2004; 70 FR 11104, Mar. 7, 2005; 73 FR 79704, Dec. 30, 2008; 75 FR 2715, Jan. 15, 2010]

APPENDIX B TO PART 236—RISK ASSESSMENT CRITERIA

The safety-critical performance of each product for which risk assessment is required under this part must be assessed in accordance with the following minimum criteria or other criteria if demonstrated to the Associate Administrator for Safety to be equally suitable:

(a) *How are risk metrics to be expressed?* The risk metric for the proposed product must describe with a high degree of confidence the accumulated risk of a train control system that operates over the designated life-cycle of the product. Each risk metric for the proposed product must be expressed with an upper bound, as estimated with a sensitivity analysis, and the risk value selected must be demonstrated to have a high degree of confidence.

(b) *How does the risk assessment handle interaction risks for interconnected subsystems/components?* The risk assessment of each safety-critical system (product) must account not only for the risks associated with each subsystem or component, but also for the risks associated with interactions (interfaces) between such subsystems.

(c) *What is the main principle in computing risk for the previous and current conditions?* The risk for the previous condition must be computed using the same metrics as for the new system being proposed. A full risk assessment must consider the entire railroad environment where the product is being applied, and show all aspects of the previous condition that are affected by the installation of the product, considering all faults, operating errors, exposure scenarios, and consequences that are related as described in this part. For the full risk assessment, the total societal cost of the potential numbers of accidents assessed for both previous and new system conditions must be computed for

comparison. An abbreviated risk assessment must, as a minimum, clearly compute the MTTHE for all of the hazardous events identified for both previous and current conditions. The comparison between MTTHE for both conditions is to determine whether the product implementation meets the safety criteria as required by subpart H or subpart I of this part as applicable.

(d) *What major system characteristics must be included when relevant to risk assessment?* Each risk calculation must consider the total signaling and train control system and method of operation, as subjected to a list of hazards to be mitigated by the signaling and train control system. The methodology requirements must include the following major characteristics, when they are relevant to the product being considered:

- (1) Track plan infrastructure, switches, rail crossings at grade and highway-rail grade crossings as applicable;
- (2) Train movement density for freight, work, and passenger trains where applicable and computed over a time span of not less than 12 months;
- (3) Train movement operational rules, as enforced by the dispatcher, roadway worker/Employee in Charge, and train crew behaviors;
- (4) Wayside subsystems and components;
- (5) Onboard subsystems and components;
- (6) Consist contents such as hazardous material, oversize loads; and
- (7) Operating speeds if the provisions of part 236 cite additional requirements for certain type of train control systems to be used at such speeds for freight and passenger trains.

(e) *What other relevant parameters must be determined for the subsystems and components?* In order to derive the frequency of hazardous events (or MTTHE) applicable for a product, subsystem or component included in the risk assessment, the railroad may use various