DEPARTMENT OF TRANSPORTATION

Federal Railroad Administration

49 CFR Part 243

[FRA Docket No. HST–1]

RIN 2130–AB14

FOX High Speed Rail Safety Standards

AGENCY: Federal Railroad Administration (FRA), Department of Transportation (DOT).

ACTION: Notice of proposed rulemaking for rule of particular applicability (NPRM).

SUMMARY: FRA is proposing a rule of particular applicability that establishes safety standards for the Florida Overland eXpress (FOX) high speed rail system. The proposed standards are not intended for general application in the railroad industry, but would apply only to the FOX system that is planned for development in the State of Florida. The FOX system will operate from Miami to Tampa, via Orlando on dedicated track, with no grade crossings, at a maximum speed of 200 mph. The FOX equipment and track are patterned after the French TGV high speed rail system, and will be used exclusively for passenger service.

The proposed rule of particular applicability takes a systems approach, and so includes standards that address all aspects of the FOX high speed system, including system description, system safety, signal, track, rolling stock, operating practices, system qualification tests, personnel qualifications, and power distribution. In addition, the proposed rule adopts and incorporates by reference many existing standards that apply to all railroads, which are appropriate for application to FOX, such as alcohol and drug standards, hours of service requirements, and locomotive engineer qualifications.

DATES: (1) *Written comments:* Written comments must be received on or before February 10, 1998. Comments received after that date will be considered only to the extent possible without incurring substantial expense or delay.

(2) *Public hearing:* A public hearing will be held if one is requested by January 2, 1998. Anyone requesting a hearing must notify FRA's Docket Clerk, Renee Bridgers, in writing and provide her with the requesting party's name, telephone number, and address. If a hearing is requested, FRA will notify the public of the date, time, and location of the hearing, and provide instructions for those who wish to make an oral statement at the hearing.

ADDRESSES: Written comments must identify the docket number and be submitted in triplicate to the Docket Clerk, Office of Chief Counsel, Federal Railroad Administration, Stop 10, 400 Seventh Street, S.W., Washington, D.C. 20590. Persons desiring to be notified that their comments have been received by FRA should submit a stamped, self-addressed postcard with their comments. The Docket Clerk will indicate on the postcard the date on which the comments were received and will return the card to the addressee. Written comments will be available for examination, both before and after the closing date for written comments, during regular business hours on the seventh floor of 1120 Vermont Avenue, NW, in Washington, D.C.

FOR FURTHER INFORMATION, CONTACT: Bill Goodman or Mark Jones, Signal Division, Office of Safety Assurance and Compliance, FRA, 400 Seventh St., S.W., Stop 25, Washington, D.C. 20590, (telephone: 202–632–3353); Bill O'Sullivan or Dave Jamieson, Track Division, at the same address, (telephone: 202–632–3341); Ed Pritchard, Motive Power and Equipment Division, at the same address, (telephone: 202–632–3348); Doug Taylor or Laura Mizner, Operating Practices Division, at the same address, (telephone: 202–632–3346); Bob Dorer, Volpe National Transportation Systems Center, Kendall Square, Cambridge, MA 02142, (telephone: 617–494–3481); or Christine Beyer, Trial Attorney, Office of Chief Counsel, FRA, 400 Seventh St., S.W., Stop 10, Washington, D.C. 20590 (telephone: 202–632–3177).

SUPPLEMENTARY INFORMATION:

Background and Regulatory Structure

The State of Florida plans to develop a high speed rail system that will run from Miami to Tampa, via Orlando. The system's trains will travel on dedicated rail, with no public grade crossings, in exclusive passenger service, at speeds not to exceed 200 mph. These operational characteristics and the equipment that the State plans to use mark a dramatic step forward for the development of regional high speed passenger rail service in the United States. FRA announces in this notice proposed safety standards for the system that will be developed in Florida.

Through a public bid process, Florida has selected the Florida Overland eXpress (FOX) to build and operate the high speed rail system. FOX is a consortium of engineering and rail design and construction entities. The system FOX proposes to build in Florida utilizes the high speed technology and equipment currently in use in France, Holland, Spain, and Belgium, which was developed in France and is known as the French TGV (train a grande vitesse, or very high speed train). The French TGV has been in service in Europe since 1981 and has safely carried 450 million passengers. This is a traditional rail system, in the sense that steel wheels operate over steel rails, powered by electrical power that is carried and transferred to the equipment through an overhead catenary system. However, the TGV equipment is generally lighter than conventional rail vehicles, and utilizes advanced computer and aerodynamic technology that facilitates travel at very high speeds with minimal track and equipment degradation. (The trainsets travel at maximum speeds of 186 mph in France.) In addition, the TGV high speed trainsets are articulated into one long unit that resists buckling or rolling in the event of an accident, which greatly reduces the likelihood of serious injury for passengers. The lightweight design of the equipment permits high speed travel, but also lends itself to grave damage if involved in a train-to-train collision, particularly where heavy freight vehicles are present. To counter this aspect of the design, the TGV is operated with a focus on collision-avoidance, in addition to collision-mitigation, a systems approach to safety that has proven to be quite successful. (It is also important to note here that the Florida system will not include any freight traffic.) Newer generations of the TGV system include in-cab signal systems and passenger stations that are customized to service high speed trainsets only. The French TGV system has an exceedingly safe record, which is discussed in greater detail below.

The federal railroad statutes apply to all railroads, as defined in 49 U.S.C. 20102, including the FOX system proposed to be built in Florida. The only railroads excluded from FRA's jurisdiction are urban rapid transit railroads that are not connected to the general railroad system. The contemplated FOX system will clearly be intercity passenger rail, not urban rapid transit. Accordingly, the Florida system will be subject to FRA jurisdiction whether or not it is connected to the general railroad system. Moreover, FRA would consider a stand-alone intercity railroad line to be part of the general system, even though not physically connected to other railroads (as FRA has previously stated with respect to the Alaska Railroad; see 49 CFR part 209, Appendix A).

FRA has a regulatory program in place, pursuant to its statutory authority, to address equipment, track, operating practices, and human factors in the existing, conventional railroad environment. However, significant operational and equipment differences exist between the system proposed for Florida and existing passenger operations in the United States. In many of the railroad safety disciplines, FRA's existing standards of general applicability do not address the safety concerns and operational peculiarities of the proposed FOX system. Therefore, in order to assure the public that this new system will operate safely, minimum federal standards must be in place when FOX commences operations.

FOX and FDOT discussed their plans for the system in a series of meetings with FRA held throughout 1996. The purpose of the discussions was to explain to FRA the system that they plan to build in Florida, and for FOX and FDOT to understand more fully the applicable regulatory framework that would govern their operations. On February 18, 1997, FOX filed a petition for rulemaking (Petition) with FRA, which proposes standards that would apply to their system safety program, track, rolling stock, signal, operating practices, personnel qualifications, and power distribution. Since February, FOX has supplemented the Petition with additional information that is pertinent to the existing French operation or the one planned for Florida. (A copy of the Petition and supplemental submissions are available for public review in the docket of this matter, which is docket number HST–1, previously identified as docket number RM Pet. 97–1.) The FOX Petition attempts to incorporate the French practice in each safety discipline listed in the Petition, but also contains proposed standards that differ from practices in France. FRA understands these differences to reflect operational and environmental deviations between the system proposed for Florida and the TGV lines in operation in France.

FRA analyzed the Petition and supporting documentation, gathered background data that describe the French system, and now publishes this Notice of Proposed Rulemaking (NPRM), based on consideration of the available information and the expertise of the Agency's safety specialists. This NPRM constitutes FRA's initial response to the Petition and includes standards that are similar, but not identical, to those in the FOX Petition.

It is important to note at this juncture that any new standards which FRA adopts to address safety on the FOX high speed rail system would apply only to that system, and therefore will be issued in the form of a rule of particular applicability, rather than one of general applicability. Such a rule of particular applicability would not displace existing safety standards that apply to all other entities in the railroad industry, and would be enforced only against the FOX system. Also, it should be noted that FRA plans at this time to publish any final standards that pertain to the FOX system in the Code of Federal Regulations (CFR). For that reason, these proposed standards have been assigned Part number 243, and are organized into Subparts for each safety discipline.

Safety Characteristics of the French TGV System

As part of the process for determining appropriate rules for those aspects of the FOX system that will duplicate the French TGV system, it is logical to consider the safety record of the French high speed rail system.

In preparation for filing the Petition, FOX and the Florida Department of Transportation (FDOT) commissioned DLSF Systems, Inc. to complete a risk assessment to evaluate the relative safety of the FOX system vis-a-vis the French TGV system, and that predicted for the Amtrak 150-mph trainsets in the northeast corridor (NEC). (A copy of the Florida Overland eXpress Risk Assessment is available for public review in the docket of this matter, docket number HST–1.) The analysis set forth in the risk assessment provides a fairly extensive discussion of the safety of TGV high speed rail in France, and the numbers indicate an admirable safety record.

The risk assessment divides the analysis of the TGV system into two categories: those that are exclusive high speed lines, which include in-cab signaling, and passenger stations designed to service only high speed trains; and those that consist of a mixed high speed/conventional system in which high speed trains service conventional passenger stations, and use conventional trackside signaling. For the most part, the risk assessment deals with incidents that occurred between January 1, 1990 and June 30, 1996. The numbers are limited to post-1989 data because the Societe Nationale des Chemins de Fer Francais (SNCF), the quasi-governmental agency in France that oversees and operates TGV, does not have computerized records concerning events prior to 1990.

It is important to note that the accident figures discussed below occurred in a system that maintains high traffic density and passenger service: train-miles for this period totaled 204 million for all TGV service and 111 million for the exclusive high speed lines; passenger-miles on the high speed lines totaled 43,316,000; and the number of passengers served on TGV trains totaled 249,696. The TGV system operates at a maximum speed of 186 mph and runs approximately 184 trains per day.

On the exclusive high speed lines, only thirteen incidents have been recorded from January 1, 1990 through June 30, 1996. There have been no fatalities and no collisions between trains during this period. Of the thirteen recorded incidents, only three resulted in passenger injury. The first incident that caused injury did not involve casualties on board a TGV trainset. This incident, which caused 27 of the 30 total injuries, occurred when passengers waiting on a loading platform were sprayed with ballast that was kicked up by a derailed truck. The truck in this incident derailed due to a wheel slide failure that resulted in a flat wheel. The second incident that resulted in casualty involved two passengers who were slightly injured when a trainset derailed. The derailment occurred while traveling at 150 mph, due to track subsidence that was caused by heavy rains and a previously unknown World War I trench. The third event, in which one passenger was injured, was caused by human error. Fasteners were incorrectly tightened after a maintenance procedure, which caused a fairing to fall and break a window in a passenger coach.

The remaining ten incidents on the exclusive high speed lines did not involve passenger injuries. Five of the incidents recorded involved trainsets that struck an animal in the right-of-way. Two of the incidents consisted of fire on moving equipment: In one event the fire was located in the baggage compartment, cause unknown; and in the other it was located in the rear locomotive, due to rolling stock failure. Two of the thirteen incidents involved the operation of the passenger compartment doors. In one of these events, a trainset door opened and was pulled away by the force of the wind while the conductor was checking an air leak, and in the second event a passenger compartment door opened while the train was moving, due to rolling stock failure. Finally, in the last incident a trainset hit concrete covers of electrical cable conduits, which was attributed to vandalism.

In the second category, which includes all mixed high speed/

conventional lines, eight incidents have been recorded from January 1, 1990 to June 30, 1996. In this group of accidents, two fatalities occurred. The first involved a passenger who boarded the trainset, and then subsequently disembarked after departure was underway, and fell under the train. The second fatality occurred when a conductor attempted to board after train departure and fell between the train and platform. In another incident reported in this group, ten injuries occurred when a high speed trainset passed an absolute stop signal during a switching movement and hit a local train. The injuries occurred on the local, conventional train. In the final incident which involved injuries, a passenger standing on a platform was injured when a shock absorber between two passenger cars broke and kicked up ballast.

The remaining four incidents on the mixed lines occurred due to human error. In two instances, the locomotive engineer forgot to apply an immobilization brake after a switching movement, and in each case the trainset slowly hit another rail car. In one case, an engineer was distracted by another individual in the cab and released the brakes. The trainset slowly hit a bumper. In the last incident, a trainset rolled from a rolling stock repair facility unattended and hit a loading ramp.

Prior to 1990, one significant accident involving TGV equipment is noted, in which two fatalities and forty-four injuries occurred. A highway vehicle at a public grade crossing entered the railroad right-of-way and was struck by a TGV trainset. The TGV engineer and a passenger were killed and forty-four people were injured. (It is important to note here that the FOX high speed rail system will not contain any public grade crossings.) A second event is noted in the risk assessment concerning a terrorist attack in 1983 in which fatalities occurred, but no description of the incident is provided.

In summary, four fatalities have occurred on the TGV system from 1981 through June 1996, and none of these occurred on the exclusive high speed lines. FRA and, undoubtedly, the SNCF believe that any loss of life is one too many. However, given the traffic density, speed of travel, and passenger load that the TGV system supports, these figures are exceptional. The risk assessment calculates a TGV passenger risk of less than 0.99 per billion passenger-miles traveled.

It is difficult to make many meaningful comparisons between the French TGV system and existing passenger service in the United States because the operating environment, technology, data collection, and equipment differ in a variety of ways. However, the risk assessment computes fatality rates based on available information for the TGV system in France and the NEC, and those rates provide some context to the accident data. According to the risk assessment, the normalized passenger risk calculated in per billion passenger-miles for the TGV system in France is 5.9% of that for the 1994 NEC.

FRA understands that differences of opinion may exist concerning methodology or conclusions reached in the FOX/FDOT risk assessment. Moreover, as explained below, FRA's safety determinations about the FOX system are based on its own careful analysis of the proposed system and the existing French system. However, the Agency believes the document presents useful data concerning the general safety of the French TGV system.

FRA, in conjunction with the Volpe National Transportation Systems Center (Volpe), has studied the French TGV system extensively. FRA and Volpe technical staff visited France and Belgium in order to examine the TGV system in operation, to review the signal system testing as it is conducted, and to pose questions to representatives of the SNCF concerning details of the system.

FRA and Volpe staff visited a manufacturing plant in eastern France where the equipment is constructed, and met with the plant's staff to discuss equipment design, crashworthiness, operating characteristics, and construction. FRA and Volpe staff visited a central train dispatching center, and studied the practices and required procedures that train dispatchers follow to prevent train collisions. FRA and Volpe staff spent several days at the signal system test track in Belgium to review the test procedures and test results with SNCF personnel. In addition, FRA has maintained communications with personnel at the test site to follow the progress of the signal testing as it proceeds.

FRA and Volpe staff visited a TGV repair facility in order to analyze the existing facility design, and employee practices at repair facilities generally. At the repair site, Agency staff received training from SNCF personnel on the operation of the major components of the TGV rolling stock, and the inspection and maintenance frequencies that have been established over time by the SNCF.

Agency and Volpe staff met with representatives of the French government and the SNCF in a series of meetings, and discussed a variety of questions concerning governmental oversight of the TGV operation, annual safety reviews, the process by which the SNCF revises the TGV system safety plan, personnel qualifications, operating rules, track maintenance and repair, and the development of new equipment.

Personnel from Volpe have studied and prepared reports on the French TGV, which not only provide a broad overview of the system, but also examine individual components and operating practices of the system. This, in combination with Volpe's broad expertise in the area of high speed rail systems generally, aided the FRA team to make effective and rapid comparisons and assessments of the relative safety of all aspects of the French TGV as the comprehensive review proceeded. Based on its own review of all of the information received, FRA possesses a high level of confidence in the safety of many of the major elements of the French system that will be duplicated in Florida.

Safety Characteristics of the FOX System

The FOX system planned for development in Florida contains safety features that do not exist on the TGV system in France, and so presumably, FOX has the potential to surpass the level of safety that exists on the TGV high speed lines. The primary improvements include lower traffic density, no opportunity for mixed traffic, an expanded intrusion protection system, fewer underpasses and overpasses, an advanced technology signal system, and the addition of protective station platform doors. In addition, the FOX system includes several attributes that do not exist on passenger lines in the U.S., which are discussed below, that should also enhance the overall safety of the program.

The traffic density will be lower in Florida than that of the TGV system in France. FOX anticipates operating a maximum of eighteen trains per day in the first two years of operation, at a rate of approximately one train every thirty minutes. FOX plans to increase the number to twenty-six per day afterward. In France, approximately 184 TGV trains run per day. Traffic density has generally been associated with train accidents and incidents, and can impact the likelihood and severity of train accidents. The expanded train departure intervals on FOX are expected to reduce the risk of one train overtaking another or train-to-train collisions.

FOX will operate over a dedicated right-of-way that will not include freight

traffic or other types of passenger equipment. The high speed track in France is connected directly to conventional lines and so the risk of freight penetrating the high speed tracks exists. In Florida, the track will not be connected to rail lines that carry freight traffic. The only freight equipment that will be permitted on the FOX system is that involved in FOX maintenance or rescue operations. This is a significant factor that will eliminate or reduce a variety of risks. First, the likelihood of a freight-to-passenger trainset collision, and the high casualty rates that would accompany such a collision, will be nearly eliminated. Second, the absence of freight traffic will minimize track degradation that occurs with the transport of heavy loads, which in turn will reduce the risk of track defects that cause train derailments. Finally, train dispatchers will not manage districts that carry mixed passenger and freight loads, and so the stress and confusion that may result from freight and passenger route scheduling will be eliminated.

There will no public at-grade crossings on the FOX system, and so the risk of a highway-rail grade crossing accident will be eliminated. There are no public at-grade crossings on the TGV high speed lines in France, but highway-rail grade crossings are prevalent on the U.S. rail system, and account for many human injuries and fatalities. This aspect of the FOX system greatly reduces the risk of casualties to railroad employees, passengers, and road travelers along the FOX right-of-way.

FOX will install fencing that runs the length of the right-of-way to restrict unauthorized entry, which should minimize the risk of accidents involving trespassers and animals. In addition, the FOX system will include detection systems for intrusion, high wind, flood conditions, and rolling stock that contains dragging equipment. These detection systems will be connected to the signal system, and will notify the main dispatching center when hazardous events occur. Some of these features do not exist on the French TGV, and most do not currently exist on American railroads. It is expected that they will enhance safety for the FOX system.

The French TGV operates over a system that includes 490 overpasses and 676 underpasses. Current plans for FOX indicate that there will be approximately 100 overpasses and 60 underpasses. In addition, there will be no moveable bridges on the Florida system, structures that, like overpasses and underpasses, tend to increase the need for maintenance and the risk of incident.

FOX will utilize a new signal and train control system that is not currently in revenue service anywhere in the world. Trainsets in Belgium are testing the system, which is a form of Positive Train Control (PTC), and it is anticipated that before FOX commences revenue operations, the system will be certified and in use in Europe. Although FRA and others familiar with the system generally believe that this new variety of signaling will increase railroad safety, there may be some risk associated with the introduction of this new component to an operative railroad system. The risk assessment prepared for FOX and FDOT does not address this factor. However, FRA believes that this item deserves significant attention, given the ramifications of a signal system failure on high speed passenger lines. This issue deserves particular concern in Florida because of the significant risk that exists there of extreme weather conditions, *i.e.*, lightning strikes, hurricanes, and flooding which could require relatively frequent exercise of the safety-critical features of this signal system. As the risk assessment notes, these are conditions that do not exist in France. FRA must be very cautious in establishing standards for a system that has not been used in revenue service, and that will be expected to function without fail in a location where catastrophic weather conditions are not rare. Therefore, FRA proposes as a requirement in this NPRM, a process in which an independent entity with proven technical expertise will conduct a review of the safety of the safety-critical hardware and software microprocessor-based elements of the signal system, which will be submitted to FRA. The proposed standards include a brief acceptance procedure that would follow this submission and precede implementation of the signal system as finally configured. FRA anticipates that this sort of process will accompany certification of the system in Europe, which will likely predate FOX operations. Given the risks presented by a signaling failure on a passenger line traveling at speeds of 200 mph, the Agency believes it is necessary to implement standards that formalize such a peer review process for FOX in this country. This is very similar to procedures that FRA has required other entities to follow concerning signal systems. However, FRA invites comment on this and all other proposals set forth in the NPRM from interested and expert parties, particularly as to the criteria that should be addressed in the peer review, or other avenues of achieving the same end.

Although FRA does not currently enforce safety standards concerning passenger stations, it is important to note that the FOX system will include protective doors on the station platforms to prevent the risk of injury from loose equipment or flying debris. As the TGV safety record discussed above points out, passengers waiting to board face the risk of injury unless shielded by the sort of protection that will be included in the FOX system.

There are certain advantages to building this new railroad system, particularly relating to roadbed and infrastructure, that accrue simply because construction will be designed to suit all components of the system. For instance, the right-of-way may be selected to suit the needs of the track and signaling system. Track curves will be minimized during track layout and designed to accommodate speeds in excess of the maximum revenue service speed of 200 mph. However, it is important to acknowledge, as the risk assessment does, that unique system aspects such as sink holes are an ever-present, potential problem in Florida, and decrease the safety of the FOX system unless mitigated. FOX plans to use geotechnical analysis to look for indicators of sinkhole activity prior to installing the track infrastructure. FRA's proposal includes a proviso that any abnormalities which arise in the construction phase of development must be recorded, and that all actions taken in response to the abnormality must be documented. Also, this hazard must be accounted for in the FOX system safety plan, which will be developed prior to commencing construction. FRA seeks comment from interested parties and experts on this subject to determine other methods for managing this risk effectively.

There are two other potential areas of risk that warrant particular attention. Neither is fully addressed in the FOX/FDOT risk assessment. The first involves the increase in TGV speed from a maximum of 186 mph, which is currently used in French operations, to 200 mph, which is proposed for Florida operations. The risk assessment states that French TGV plans to increase the operating speed to 200 mph, and a safety record will have developed in France prior to FOX operations in Florida. Unfortunately, FRA finds itself in the position of writing safety standards for the system at this juncture, when the appropriate safety record concerning these enhanced speeds is unformed. As is also noted in the risk assessment, higher train speed tends to

increase the severity of accidents. The FOX system safety plan must address this issue, but we also seek comment from interested parties and experts as to the enhanced risk involved, if any, and other viable methods of addressing it.

Second, FRA believes that there is a risk, however intangible, that arises from moving this European system to a new culture where the pertinent institutional knowledge is not abundant and the role of the government in supporting operations is quite different. For instance, rolling stock maintenance personnel on FOX will be expected to inspect and maintain equipment using unfamiliar tools, in dramatically different repair facilities, on equipment that utilizes computers to achieve what is traditionally done in the U.S. by visual and manual means. No amount of training can achieve the level of professional insight that fifteen years of experience on the equipment would produce. The risk assessment alludes to this factor in passing, and seems to indicate that so long as the TGV equipment, inspection frequencies, and procedures are implemented on FOX, nothing is lost and no risk ensues.

FRA agrees that it is very difficult to quantify the value of institutional knowledge in a system as large as the French TGV or FOX. However, this is not a factor that the Agency can or desires to overlook. In discussions with FRA, FOX and FDOT have indicated that they plan to bring TGV professionals into the training, maintenance, and operation of the system. However, it is impossible to know at this point whether or to what extent that participation will occur, as revenue operations are not planned to commence until 2004. A variety of events may occur between now and then to make those plans difficult or impossible to achieve.

Also factored into this issue of risk, is the knowledge that the TGV has a different cost accounting structure, in which the daily safety of the operation is not compromised by short-term operating costs and long-term capitol costs. The SNCF may be able to make purchases and decisions that a private entity would be unable to accomplish. FRA is certain that all reputable transportation companies have as their first priority the safety of passengers and employees. However, the need to be profitable in a privately financial context undeniably plays a role in decision making that on occasion impacts safety. FRA believes that there may be a connection between the TGV's superb safety record and the degree to which the system is financially supported that will not exist on the FOX system. There is no way of knowing with certainty whether TGV safety is due in some measure to its financial structure. Similarly, there is no way of ascertaining at this point whether the loss of comprehensive institutional knowledge that is bound to occur in Florida will impact the safety of the operation. However, FRA believes that the potential for these safety risks is sufficient to make preventative measures sensible.

In this proposal, FRA seeks to address these concerns with standards that provide a very high level of safety in areas where FRA believes French TGV safety cannot or will not be met in Florida. FRA anticipates that the petitioner may object to the imposition of certain of the proposed standards that require more than is currently the practice in France. However, given the risk factors outlined above, the grave potential for human loss in the event of an accident, and the flexibility that is incorporated into the proposal, FRA believes at this time that any perceived burdens are justified.

System Safety

System safety is the cornerstone of the French TGV, and as proposed in these standards, the heart of the FOX high speed rail system. The systems approach to safety is used pervasively in a variety of industries to reduce the likelihood and occurrence of accidents and injuries. FRA has discussed the need for this approach to safety in two recent rulemakings, Passenger Train Emergency Standards, 62 FR 8330 (February 24, 1996), and Passenger Equipment Safety Standards, 62 FR 49728 (September 23, 1997). This concept requires an organization to identify, evaluate, and reduce or eliminate safety hazards that exist in any portion of the organization's ''system,'' or may be caused by interrelationships between various components of that system, and create a system safety plan to reflect those evaluations. Where possible, the development of a system safety plan precedes the design, construction, and operation of the system, so that potential risks are eliminated at the earliest possible opportunity. Once in place, system safety plans are viewed as living documents, which should be updated as circumstances change, new information becomes available, or goals shift. Therefore, incremental changes may be made on a daily basis, if appropriate, to reflect the safety needs of the organization. Typically, system safety plans should be formally updated on an annual basis, in order to maintain their utility in advancing safety with the best information available.

The French TGV utilizes a system safety approach whose primary goal or philosophy is to avoid collisions. This varies from an accident-mitigation philosophy, which seeks to maximize protection for employees and others at risk in the event of an accident. The FOX system, as planned, will operate under the theory of collision-avoidance. Examples of this philosophy at work in the design of the system are: the grade separated right-of-way that excludes public at-grade crossings; double track that will facilitate train movements side-by-side rather than end-to-end; and the PTC-style signal system that will prevent trains from being routed on collision courses, whether meeting or overtaking.

Subpart B of the NPRM requires FOX to prepare a system safety plan. For the most part, these proposed standards parallel the FOX Petition, and address every phase and component of the FOX system. However, FRA's proposal also includes the proviso that FOX submit the system safety plan to FRA for approval one year after the effective date of the final rule in this matter, and that the plan be updated at least annually. Based on the philosophy of systems planning, FRA believes that initiating this process prior to design and construction is critical to the development of a complete system safety plan and a safe high speed rail system. FRA understands, however, that this rulemaking proceeding predates much of the work involved in the Florida project, and so filing a complete system safety plan within one year of the final rule may be difficult. FRA seeks comment on this proposal, including suggestions for other methods of addressing this issue. For instance, perhaps the standard should impose a tiered completion date for portions of the system safety plan. On the other hand, a tiered system may undermine the purpose and philosophy of the system safety approach. FRA would find it helpful to know exactly when FDOT and FOX plan to initiate the final design, based on the specific right-of-way chosen, and the construction of the system. This information would likely inform the Agency's decision on the appropriate timing for submission of the system safety plan. It is important to note, however, that while FRA has not predetermined the specific outcome of this issue, the Agency believes in general terms that a fairly comprehensive system safety plan should precede the design and construction phases of the FOX system.

FRA's Proposal

FRA has made every attempt in this NPRM to facilitate the transfer of the excellence of the French equipment and operation, by proposing standards that would permit the TGV equipment and procedures to operate in the U.S. in the same fashion as is done in France. However, in several areas, FRA has gone beyond or varied from the French standards and practices where the Agency believed it necessary to do so in order to ensure the highest level of safety. FRA's proposal includes requirements, organized in chapters by subject matter, to address general legal principles, system safety, signaling, track, rolling stock, operating practices, system qualification testing, personnel qualifications, and power distribution. In addition, the proposal adopts and incorporates by reference several existing regulations that apply generally to all railroads operating in the U.S. These are listed specifically in Subpart A of the NPRM, and constitute areas in which FOX needs no special treatment. In other words, for these safety disciplines, FOX is so similar to the general railroad industry that no new standards are necessary. For instance, FRA's alcohol and drug regulations impose no burdens that are inherently impossible for FOX to meet or that are inconsistent with the FOX operation, and so these standards and any future amendments to them would apply to FOX.

FRA's proposal is similar in many ways to the Petition FOX filed. The FOX consortium includes entities that have been involved with the design, construction, and operation of the TGV equipment, and so FRA has made every effort to study their submission and replicate it in proposed standards where appropriate. Their assistance in this rulemaking proceeding is, and will continue to be, quite informative and helpful. However, it is important to note that railroads in the U.S. operate under a different legal framework than exists in France, and the differences are relevant in understanding why FRA changed some standards in the NPRM that were not in the Petition.

The French government has issued laws which broadly call for a safe railroad system, but which delegate that responsibility, in large measure, to the SNCF. Therefore, the SNCF, or TGV operator, establishes its own safety parameters and implements them. Each year, the SNCF files a report with the government that outlines the safety record of the previous year, emerging trends, and proposed changes to the operation. However, there are no government-issued regulations that mandate TGV activities or authorize enforcement of rules. There is no relationship equivalent to this in the U.S. regulatory or transportation system. There are political, legal, cultural, and financial differences at work here, and the result is that the FOX Petition omitted some internal SNCF guidelines that FRA believes would or should be regulations in the U.S. system. For instance, some of the FOX supplemental materials include a list of rolling stock components that are inspected at specified intervals in France. These intervals and items developed internally at SNCF over years of operational experience. Although FOX has expressed the intention to follow the SNCF internal guidelines in Florida, FRA believes that these guidelines should be part of the minimum Federal standards for the FOX system. Similarly, FRA has included a proviso in the Operating Practices Subpart that requires FRA approval of the FOX safety-critical operating rules prior to commencing operations. This was not part of the Petition, but FRA proposes it in the interest of ensuring that the internal, and at this time, undisclosed, SNCF–TGV operating rules will be followed on FOX. FRA values the internal guidelines that have developed in France over many areas, believes that they may be equivalent to U.S. Federal safety standards, and desires to incorporate them into the minimum Federal standards.

In addition to the reasons discussed above, the NPRM takes a different approach on some issues from that found in the Petition, based on the regulatory program that exists in this country, which has governed railroad operations for decades. FRA has a mandate to devise standards that protect the public, have a rational basis, and do not impose needless cost. FRA's existing regulatory program achieves these goals, and therefore, it would be unwise to vary from it greatly unless the subject matter requires a substantially different treatment given the nature of the FOX system. If FRA were to stray significantly from the existing U.S. safety standards in this proceeding, despite the fact that it will only apply to FOX, serious questions might be raised concerning the appropriateness of this proposal.

It is important to note that this proposal and many individual standards in it would be inappropriate for any other U.S. passenger or freight operation. The safety features of the FOX system, taken as a whole, do not exist in combination on any other railroad in this country. This uniqueness is the basis on which the proposal is made, and the treatment of any specific issue here should not be viewed as a regulatory trend for passenger operations generally. In this proposal, FRA has relied to a great extent on the operating environment in which FOX will exist, and unless that environment is duplicated in identical fashion elsewhere, these standards would not be suitable.

FRA believes that this proposal includes a reasonable and effective blend of proven practices and procedures from both the French TGV system and American railroading. However, with publication of this NPRM, FRA invites comment from all interested parties on each standard proposed. FRA requests comments on whether less or more permissive standards should be adopted, with supporting rationale; whether inspection frequencies should be increased or decreased, or are sufficient as written, with supporting rationale; whether FRA should widen or narrow the scope of subject matters covered by standards for the FOX system, and the reasons for such a change; whether FRA has assessed accurately the safety of French TGV and the risks that may arise on the FOX system in Florida; and any other areas that commenters deem necessary in order to produce final safety standards that are effective.

* * * * *

Section-by-Section Analysis

Subpart A—General Requirements

Section 243.1 Purpose and Scope

Paragraph (a) states that the purpose of this proposal is to prevent accidents, injuries, and property damage that could result from operation of FOX, or ''Railroad,'' as the system is called throughout the rule text. Also, this section explains that the scope of the Part is to provide minimum Federal safety standards for the Railroad. The Railroad may adopt more stringent requirements so long as they are not inconsistent with this rule.

Section 243.3 Applicability

Paragraph (a) of this section explains that this Part would apply only to the FOX system in Florida, and not to any other railroad operating in the U.S. Also, this paragraph restricts the FOX operation to the specific boundaries that are described in the system description, § 243.13 of the rule, unless FOX obtains prior approval from FRA. Therefore, if FOX desires to build a new line in the future, the Railroad would have to receive FRA approval prior to commencing operations on that line.

(The term ''approval'' is used loosely here. Conceivably, FOX could file a Petition for Rulemaking amending the system description to include the new line, and FRA's issuance of the new section would achieve the desired result.) FRA believes that such approval would be necessary to ensure that the new line meets all of the appropriate standards that exist in this Part. For instance, there could be no grade crossings or mixed traffic on the line. The TGV equipment is structurally different than passenger equipment currently in use in this country, and would not respond to a collision with a freight train in the same manner. The standards in this proposal permit 200 mph travel with this equipment because of the other operating conditions that exist on FOX, and FRA must ensure that those conditions also exist on any new lines that develop. Paragraph (a) reflects the fact that the standards in this proposed rule of particular applicability are appropriate for the FOX system only when all of the system elements are present; the systems approach demands this result. If an integral portion of the system disappears, all of the standards would have to be reevaluated.

Paragraph (b) of this section states that Part 243, rather than the general safety standards currently found in Title 49 of the Code of Federal Regulations (CFR), would govern the FOX system. However, in recognition of the fact that the FOX system is similar or identical to conventional railroad operations in certain areas, this paragraph also states that some of the general standards, which are adopted and incorporated in paragraph (c), shall apply to FOX. Paragraphs (b) and (c) work in conjunction with one another, so that the two taken as a whole constitute all of the railroad safety regulations that would apply to FOX at this time. Therefore, any regulations found in Title 49 of the CFR that have not been adopted and incorporated in paragraph (c) do not apply to FOX.

Paragraph (c) of this section lists the general railroad safety standards found in Title 49 of the CFR that apply to the FOX system. The subject areas are: Part 209, Safety Enforcement Procedures; Part 210, Railroad Noise Emission Compliance Regulations; Part 211, Rules of Practice; Part 212, State Safety Participation Regulations; Part 214, Railroad Workplace Safety; Part 216, Special Notice and Emergency Order Procedures; Part 218, Railroad Operating Practices; Part 219, Control of Alcohol and Drug Use; Part 220, Radio Standards and Procedures; Part 225, Railroad Accidents/Incidents: Reports, Classification, and Investigations; Part 228, Hours of Service of Railroad Employees; § 135 of Part 229, Event Recorders; Part 235, except § 235.7, Instructions Governing Applications for Approval of a Discontinuance or Material Modification of a Signal System or Relief from the Requirements of Part 236; Part 240, except §§ 240.227 and 240.229, Qualification and Certification of Locomotive Engineers; Part 215, Railroad Freight Car Standards, Part 229, Railroad Locomotive Safety Standards, Part 232, Locomotive Inspection, Part 231, Railroad Safety Appliance Standards, and Part 232, Railroad Power Brakes and Drawbars shall all apply to the FOX conventional equipment; and FRA's proposed Passenger Train Emergency Standards, which will be codified when finalized in 49 CFR Part 239. Because these standards are suitable to apply to the FOX system as they are currently written, FRA is adopting and incorporating them to avoid massive reprinting. As has been stated earlier in this proposal, each of these standards address safety issues in a manner that is consistent with the FOX operation.

While the relevance to FOX of most of the incorporated rules is clear, the relevance of some CFR parts and the reasons that some sections are specifically not adopted requires some discussion. First, 49 CFR 235.7 of the signal modification standards permits a railroad to forego filing an application for approval concerning certain signal modifications. FRA believes that the more prudent approach would be to require FOX to apply for any modifications of its signal system for several reasons. The system FOX plans to utilize does not possess a long revenue service safety history for which future events are predictable. As planned, the system will carry thousands of passengers each year, and the cost in human lives for a signal failure could be catastrophic. FRA believes that these factors point to the need for Federal oversight concerning any modification of the FOX signal system. Accordingly, 49 CFR 235.7 will not apply to FOX. Instead, any modification of the Railroad's signal system must be accounted for in the system safety plan and be done cautiously in order to enhance the integrity of the system safety approach.

Second, the Petition did not include Part 240 in the list of regulations to be incorporated by reference in this rule. As FRA understands it, FOX plans to identify the personnel who will operate the power cars on the system as ''enginemen'' and so they object to Part 240 and its pervasive use of the term ''locomotive engineer.'' FRA chose this term in Part 240 for a variety of reasons, none of which relate to the gender, union status, or other extraneous background details of the in-cab personnel who direct locomotive movements. The term is a functional distinction that applies to the performance of a locomotive engineer, power car driver, or engineman. Therefore, FRA finds no merit in reissuing Part 240 in this proceeding in order to change the title of a cadre of employees. FRA has no interest in mandating the use of any occupational title on any railroad. However, the Agency does have an interest in and obligation to use language that is gender-neutral and consistent with existing terminology, to the fullest extent possible.

It is also important to note that FRA's proposal does not incorporate 49 CFR 240.227 and 49 CFR 240.229 for application to FOX. These sections relate to joint operations with Canadian railroads, and with other railroads in the U.S. Neither of these scenarios can occur on the FOX system for reasons of geography and more importantly, safety, and therefore, it is important to exclude these sections explicitly from application to FOX.

Third, FRA's proposal includes the adoption of several existing standards that govern the maintenance, inspection, and operation of conventional freight equipment (Parts 215, 229, 230, 231, and 232). FRA believes that these requirements must be included here in order to protect employees and the public in instances where conventional equipment must be used on the FOX operation. As FRA understands it, FOX will likely have in its fleet conventional railroad equipment to facilitate maintenance and rescue operations in yards and along the right-of-way. FRA believes that where these limited operations arise, the existing safety standards should apply. There is nothing in the Petition or background information concerning FOX that would make application of these standards inappropriate or deleterious to safety. Moreover, the employees involved with the movement of conventional equipment must possess all of the protections that accompany conventional operations on other properties.

Fourth, FRA has adopted safety standards relating to emergency preparedness for application on the FOX network. FRA does not understand FOX to object to imposition of these standards, but because they were in proposed, rather than final, form at the time of Petition filing, FOX did not list them among the standards incorporated.

In this proposal, FRA adopts the emergency preparedness standards as proposed at this time, and ultimately as they appear in final form. FRA anticipates that these standards will be finalized in the very near future and codified at 49 CFR part 239.

Finally, FOX expressed the desire to adopt and incorporate by reference the existing general safety standards without also adopting future amendments to these standards. FRA does not agree with this approach to the general safety standards. By their very nature, these standards address subject matters that present no need for special treatment on FOX. Following this logic to its natural conclusion, FRA presumes that amendments to these same subject matters will not present the need for special proceedings or considerations for FOX. If proposed amendments give rise to safety concerns on the FOX system, FOX will have every opportunity, as a vital and responsible member of the U.S. railroad system, to provide comments in the normal course of regulatory process in those areas.

Paragraph (d) states that FOX is a railroad, pursuant to the definition set forth by statute, which includes, in pertinent part ''high speed ground transportation systems that connect metropolitan areas, without regard to whether those systems use new technologies not associated with traditional railroads * * *'' Therefore, all of the railroad safety statutes (including those pertaining to hours of service) apply to FOX, except portions of the former Safety Appliance Acts, from which FRA proposes that FOX be exempted due to the advanced technology in use that makes those requirements unnecessary. (The issue of new technology and safety appliances is discussed in detail in the analysis of § 243.15 below.)

Paragraph (e) states that the measurement values provided in the rule are in metric form, which is due to the fact that the TGV equipment was designed abroad according to metric standards. The NPRM includes the U.S. equivalent to provide an adequate frame of reference for interested parties. FRA has some concern that the American workforce, which maintains and inspects conventional railroad equipment using tools and measurements in U.S. standard values, may experience a period of adjustment in converting to the metric system. The FOX personnel qualification program, set forth in Subpart H, must address this potential safety factor.

Section 243.5 Definitions

As a general rule of regulatory construction, definitions provide clarity and understanding to the reader. Definitions should not include legal requirements, and should not somehow hide the true meaning of a standard. FRA's proposal makes changes to many definitions that were provided in the Petition where those definitions were unclear, contained legal requirements, or limited the scope of a standard's application. In addition, FRA has added to the list of definitions included in the Petition where necessary, and deleted those that involved terms not used in the proposed standards.

Most of the definitions included in this section have been published in other rulemaking proceedings, or have straightforward meaning, and so additional discussion on them is unnecessary. However, a few terms should be explained.

FRA would like to emphasize that the term ''employee'' used throughout the proposed rule includes Railroad employees, as well as the employees of contractors engaged by the Railroad. Therefore, contractors must comply with the requirements of the rule, and FOX may not avoid the Railroad's compliance with the standards through the use of contracting entities.

The terms ''in passenger service'' and ''in revenue service'' have identical meaning, and include all trains, trainsets, and passenger equipment that are carrying or are available to carry passengers. The determination as to whether a fare has been paid is not relevant to establishing the status of the equipment. The term ''in service'' includes equipment that is in revenue or passenger service, as well as other passenger equipment, unless the equipment falls into one of three categories: it is being handled as defective under § 243.15 of the proposal; or it is in a repair shop or repair track; or it is on a storage track without passengers. Generally, the Railroad will be subject to civil penalty for any equipment that is ''in service'' in noncomplying condition.

The term ''power car'' refers to a type of locomotive used on the TGV system that is typically positioned at the beginning and end of a passenger trainset. Power cars contain a cab in which the locomotive engineer controls the train's movement. As proposed for FOX, every passenger trainset will contain a power car at each end with eight trailer cars between them. FOX proposed a definition that would have set power cars apart from locomotives, but FRA finds no reason to define the term in that way. Also, it is important to note that the power cars and trailer cars are articulated and connected in such a way as to resist buckling in the event of a derailment. The term ''semi-permanent connectors'' describes the connections that exist among and between the trailer and power cars of a TGV trainset. These connections are significantly different from couplers that exist on conventional equipment. These connections are designed so that they may be disconnected only by use of special tools, and only in repair facilities. Because of this design, employees will not be involved in coupling or uncoupling at locations where they would face the risk of injury that arises from working between rail equipment. Conventional couplers will only be present on the leading or trailing ends of each trainset, and will be used primarily for attachment during rescue operations. Section 243.431 of the proposal sets forth the requirements that govern the use of conventional couplers and semi-permanent connectors.

FRA has revised the speed definitions that the Petition contained. Many of the definitions appeared to be circular in their use of terminology and so would not provide sufficient clarity and notice to the public. As FRA understands it, some of the speed definitions would be pertinent to a matrix that will be developed for use in the system safety plan, concerning train speed and braking capacity. Until such chart exists, the definitions serve no purpose and may ultimately be erroneous or inconsistent with the signal system. Therefore, FRA proposes a simplified approach. ''Maximum authorized speed'' is defined as the maximum speed at which trains may operate safely, taking into account all right-of-way, rolling stock, weather, and other operating conditions. ''Maximum revenue service speed'' is 200 mph, which cannot be exceeded under any circumstance. ''Maximum safe operating speed'' is the maximum speed at which braking can occur without damage to the discs or wheels. ''Slow speed'' is any speed less than 20 mph, and ''restricted speed'' is a speed that is less than 20 mph that will facilitate stopping within half the range of vision of the locomotive engineer.

FRA requests comments on these changes to the FOX proposed definitions, as well as all definitions proposed in this NPRM. FRA also requests comment on whether additional definitions should be provided in the rule text that FRA may have overlooked in preparing this proposal.

Section 243.7 Responsibility for Compliance

This section sets forth the compliance and liability requirements that will govern FOX operations. Paragraph (a) proposes that the Railroad will be strictly liable for all violations of the standards set forth in this rule, except where equipment is not ''in use'' or with respect to violations of the track standards. To establish a violation of the equipment standards, FRA must demonstrate that the equipment was in use, but need not demonstrate any level of knowledge on the part of the Railroad or other violator. To establish a violation of the track standards, FRA must show a failure to exercise reasonable care.

Paragraph (b) states that passenger equipment will be considered ''in use'' before a train has departed, but after the equipment has received or should have received the appropriate inspection. This proposal mirrors the approach taken in FRA's proposed rule on Passenger Equipment Safety Standards. 62 FR 49728, 49756. The result of this language is that FRA need not wait for a train to depart a terminal before issuing a citation for a defective condition. FRA believes that this authority is consistent with the purpose of our safety program—to reduce railroad accidents and injuries, and is prudent in its application to FOX.

Paragraph (c) states that this rule is applicable to the Railroad and to any person performing functions required by the rule. Although the proposal expresses the duties imposed by the rule in terms of the Railroad, FRA wishes to make clear that any person who performs on behalf of the Railroad an action that is covered by the proposed rule is required to perform that action in the same manner as required of the Railroad.

Paragraph (d) relates to track and states that the Railroad operator is responsible for compliance with all track safety provisions set forth in Subpart D of the proposal. FRA proposes this language to avoid any questions of track ownership, which are particularly important here because FRA does not know at this juncture which entity will purchase and own the right-of-way to be used for the FOX system. This language is different from the approach taken in 49 CFR part 213, FRA's existing track standards, which permit an owner to assign responsibility for operation of the track system to another entity. FRA obviates the need for the assignment process set forth in 49 CFR 213.5 by proposing that the Railroad operator, rather than the right-of-way owner, shall be responsible for track safety requirements.

When the Railroad operator has knowledge, or a reasonable person exercising reasonable care would have knowledge, that the track does not comply with the regulations, the Railroad operator has four options: it may bring the track into compliance; it may halt operations over the track; it may continue operations over the noncomplying track at 10 mph, for 30 days, under the authority of qualified personnel; or it may operate under the operational limits established for track classes 1–5, as set forth in 49 CFR part 213.

The Petition did not provide this level of flexibility for operations when track noncompliance occurs, and on occasion was silent or unclear concerning ameliorative action. For instance, the Petition called for ''immediate remedial action'' for some defects, but failed to specify the required actions. Also, the Petition established time periods for certain defects, in which conditions could go uncorrected. FRA believes that the options established in this section greatly enhance safety, provide clarity, and increase flexibility for the Railroad. There must be some provision in the standards for moving equipment that carries passengers to their final destination when a noncomplying event occurs on the Railroad track. FRA prefers to include these options rather than dictate one response, in order to allow the Railroad to choose the best alternative, given the existing operating conditions. This proposed section grants the Railroad broader and more comprehensive alternatives than were included in the Petition. FOX has stated that the French TGV track rarely reaches the condition that would warrant any of the measures discussed here. FRA is hopeful that will also be the case in Florida, but the Agency must provide a rational and safe response in the event of noncomplying track conditions.

Section 243.9 Enforcement

This section describes the civil penalties that FRA may impose on any person, including the Railroad or an independent contractor providing goods or services to the Railroad, that violates any requirement of this rule. These penalty provisions parallel the civil penalty provisions in numerous other railroad safety regulations, and are authorized by 49 U.S.C. 21301, 21302, 21303, and 21304. Any person who violates a requirement of this rule may be subject to a penalty of $500 to $10,000 per violation. Individuals may be subject to penalties for willful violations only. Where a pattern of repeated violations, or a grossly negligent violation creates an imminent hazard of death or injury, or causes death or injury, penalties of up to $20,000 may be assessed. In addition, each day a violation continues constitutes a separate offense. Finally, a person may be subject to criminal penalties under 49 U.S.C. 21311 for knowingly and willfully falsifying reports required by these regulations. FRA believes that inclusion of the penalty provisions is important in ensuring that compliance is achieved.

The final rule will include a schedule of civil penalties as Appendix A. Penalty schedules are considered statements of agency policy, and so notice and comment are not required prior to their issuance. See 5 U.S.C. 553(b)(3)(A). Nevertheless, FRA invites comment on proposed penalty amounts.

Section 243.11 Preemptive Effect

This section informs the public as to FRA's views regarding what will be the preemptive effect of the final rule in this proceeding. The presence or absence of this does not, in itself, affect the preemptive effect of a final rule, but it does inform the public concerning the statutory provision which governs the preemptive effect of a rule. Section 20106 of title 49 of the United States Code provides that all regulations prescribed by the Secretary relating to railroad safety preempt any State law, regulation, or order covering the same subject matter, except a provision necessary to eliminate or reduce an essentially local safety hazard that is not incompatible with a Federal law, regulation, or order and that does not unreasonably burden interstate commerce. With the exception of a provision directed at an essentially local safety hazard, 49 U.S.C. 20106 will preempt any State regulatory agency rule covering the same subject matter as the regulations proposed today when issued as final rules.

Section 243.13 System Description

This section describes the FOX system components. In addition, and more importantly, this provision requires FOX to include all of the elements and practices listed in this section when revenue operations begin. FRA has determined that the items discussed in this section are so integral to the overall safety of the FOX program, that all standards contained in this NPRM would have to be reevaluated if FOX failed to include, construct, or meet any of these system elements.

FRA's existing regulatory program does not include this sort of requirement in any other safety

discipline or context. However, due to the nature of the system safety, accident-avoidance philosophy that FOX has adopted in the design of the system, which FRA reflects in the proposed standards, FRA believes that it is necessary to include these requirements. It is important to note here that many of the standards proposed for FOX, if adopted separately, might lead to unsafe conditions in other operating environments. In fact, many of these standards would be wholly inappropriate on other railroads in this country where the full panoply of accident-avoidant measures are not also present. Therefore, FRA must ensure that the key system elements of this operating environment, on which all of the standards are ultimately based, remain in the system as finally configured. FRA's enforcement authority extends to this section as it does to all others in the rule, and the Railroad's failure to meet any condition specified in this section will be subject to civil penalty or other appropriate remedy. The FOX Petition contained a system description section, and it included most of the components enumerated here in FRA's proposal. However, FRA has deleted some unnecessary detail, and added a few proposals that were not contemplated by the Petition.

Paragraph (a) sets forth the general parameters of the FOX system. Paragraph (a)(1) establishes the geographic limits of the system, which are Miami to Tampa via Orlando. Operations beyond these limits are prohibited without prior FRA approval. FRA believes that it is extremely important to restrict the high speed operations to the right-of-way that is known at this time. For instance, if the Railroad chooses to expand its operation to cover track that includes freight traffic or grade crossings, many of the safety standards in this proposal would not adequately protect passengers. If FOX decides to increase the boundaries of the system, that should be accomplished through a thoughtful, methodical process that includes FRA oversight and public comment. FOX may accomplish this by filing a petition for rulemaking to develop new standards, or a petition to amend this section of the rule, if adopted in this form in the final standard in this proceeding.

Paragraph (a)(2) states that trains may not under any circumstance exceed a speed of 200 mph, and that the Railroad must operate at all times in accordance with the requirements of the rule. This language is meant to cover those situations in which conditions warrant certain speeds that may not be at or near 200 mph. For instance, if severe weather causes flooding or high wind, the FOX operating rules would require significant speed restrictions. This language makes clear that FOX must adhere to the speed restrictions, regardless of the maximum system capability of 200 mph.

Paragraph (a)(3) prohibits the transport of any hazardous material on the FOX high speed rail system. Although the Petition did not contain this restriction, FRA believes that safety demands it. An accident involving passengers at high speed would be catastrophic alone; adding hazardous materials to the mix would greatly reduce safety for the passengers, the surrounding environment, and local residents.

Paragraph (a)(4) prohibits smoking on trains while they are used in passenger service. FRA believes that fire safety is a key component for any passenger operation, and by prohibiting smoking, the potential for fire in passenger compartments is greatly reduced. In other sections of this proposal, FRA requires passenger equipment to include flame-retardant materials and fire detection systems, and FRA believes that all requirements are necessary to protect the public from fire hazards on passenger trains. Flame-retardent materials and detection systems greatly minimize the risk of injury due to fire and smoke inhalation. A ban on smoking further increases the level of passenger safety by eliminating a prime causal factor from the equipment altogether. The U.S. airline industry has adopted this approach with little or no passenger complaint, and FRA believes that nonsmoking high speed rail service will experience a similar outcome. Nonsmokers and employees would be protected from the hazards and discomfort of second-hand smoke, and smokers would have a relatively short trip—approximately 150 minutes from Miami to Tampa, without the opportunity to smoke. This item was not included in the Petition, but FRA believes that its safety interest in protecting employees and the traveling public makes this proposal a valid and important one.

Paragraph (b) describes the proposed requirements for the FOX right-of-way. This section requires FOX to operate over dedicated track, and prohibits any joint operations with freight or other passenger service. The Railroad would be permitted to operate conventional vehicles of its own to facilitate maintenance and rescue operations, but no other mixed freight or passenger service could occur. Paragraph (b)(2) prohibits public at-grade crossings throughout the right-of-way, and states that animal and equipment crossings not controlled by the Railroad must be accomplished by an underpass or overpass. As previously discussed, this characteristic of the FOX system greatly enhances railroad safety, and must be a part of the system as finally configured, if all other safety standards are to remain in place. The right-of-way may include private grade crossings that are for the exclusive use of the Railroad. FRA believes that this is necessary for the Railroad to complete repairs, inspections, construction, rescue movements, or other normal internal operations.

Paragraphs (b)(3), (4), and (5) require a permanent fence along the entire right-of-way; require intrusion, flood, high wind, hot box, and dragging equipment detectors along the right-of-way where deemed necessary by the system safety plan and Chapter 3 of this proposal; and limit access for Railroad employees to certain intervals along the right-of-way. FRA expects that these aspects of the FOX plan will enhance safety by reducing or eliminating the incidence of animals, trespassers, highway vehicles, and undesirable or unexpected events that could interrupt or impact safe train operation. However, FRA requests additional information from FOX as to the type of fencing that will be utilized along the right-of-way. Certain fences are designed to eliminate entirely the risk of unathorized entry and would enhance railroad safety greatly. However, these fences may be unnecessary along portions of the right-of-way where the system safety plan determines that the risk of entry from individuals, vehicles, or animals is negligible. Fences used along highways are generally designed to prevent cars from leaving the highway right-of way, rather than to restrict intrusion from individuals or animals. Therefore, typical highway fencing may not be effective in populated areas along the FOX right-of-way. In short, there are a variety of factors that must be considered in determining the appropriate design and strength for fencing along the FOX right-of-way. As FRA understands the situation, FOX has not yet finalized the location of the right-of-way, and so it may be premature to dictate strict guidelines concerning fencing. However, FRA will consider the risk factors presented and whether establishing specific fencing requirements would be appropriate in this proceeding. FRA requests a description from FOX as to what is planned in the way of fencing, and

invites comment from interested parties on appropriate fencing standards.

Paragraph (b)(6) provides that the Railroad will build walkways along the right-of-way, which will be used primarily for inspection activities or rescue operations. In order to ensure the safety of workers and rescue personnel, the walkways must be built at a safe distance from the track, which the proposed standard sets at a minimum of 7.87 feet from the outside rail. This means that the Railroad's walkways must be built at least 7.87 feet from the field side of the rail, or in other words, the rail that is farthest from the Railroad's double track. Due to the track centerlines that have been proposed in paragraph (d) of this section and the requirement that any walkway be at least 7.87 feet from the outside rail, the Railroad cannot build walkways between the double track. Such a scenario could lead to hazardous conditions for employees or rescue personnel forced to work between the Railroad's two tracks, in close proximity to moving, high speed equipment.

Paragraph (b)(7) requires the Railroad to design the right-of-way so that it will accommodate high speed travel, meaning curves should be avoided or large, so that the risk of derailment and excessive braking is reduced. Paragraphs (b)(8) and (9) require the Railroad to record all difficulties or abnormalities discovered during the construction phase of this project, and make available to FRA the track layout drawings that must include specified information. FRA believes that this section is critical to the safety of the FOX infrastructure and high speed operations. As discussed earlier, sink holes and other potentially dangerous sub-grade formations and conditions are prevalent in Florida, and create serious risks for FOX unless mitigated. One of the most serious high speed accidents in France occurred because an unknown, underground World War I trench collapsed under the weight of a TGV trainset. FRA proposes in this section to eliminate the risk that such an accident could occur in Florida. This section was also included in the FOX Petition.

Paragraph (b)(10) proposes that all highway bridges that cross the right-of-way be constructed so that drivers of motor vehicles will have a clear view of the right-of-way, and so that the potential for vehicles falling into the right-of-way are minimized to the fullest extent possible. It is also important to note that this proposal is bolstered by the fall intrusion detection systems that are required by Subpart C. The detection systems will alert the Railroad to any vehicles that enter the right-of-way, but this section requires an additional level of safety by mandating highway overpass design that will minimize the risk of a vehicle entering the right-of-way in the first place. Similarly, paragraph (b)(11) requires the Railroad to protect railroad bridges, if they are necessary, from impact. Railroad operations are vulnerable to accident when railroad bridges are struck by road or water transport. The track or signal systems on the bridge may be disturbed to such an extent that a derailment or signal malfunction occurs. This proposal seeks to avoid that by requiring FOX to erect a barrier or other device that will protect the bridge structure from a sudden strike or movement. If tunnels become necessary on the FOX right-of-way, paragraph (b)(12) requires the Railroad to design and construct them to minimize the safety hazards connected with excessive air pressure in the tunnel created by the operation of trains.

Paragraph(b)(13) restricts track crossings in areas where operating speeds reach 100 mph to locations where designated track crossing devices are installed. The track crossing devices must be installed where frequent crossing by employees is anticipated, such as turnouts and substations. Paragraph (b)(14) requires the Railroad to install emergency traffic stop or slow devices at certain intervals along the right-of-way, and at special locations such as turnouts, substations, block section limits, or autotransformers. These devices will be connected to the signaling system and create a communication link with the Railroad's central traffic control. All of the proposals in paragraph (b) were included in the Petition. However, FRA omitted one of the Petition's paragraphs which related to roadway worker protection. FRA has adopted and incorporated the existing roadway worker protection standards, 49 CFR part 214, and so additional language concerning this topic is unnecessary and potentially conflicting. The FOX Petition also adopted 49 CFR part 214 for incorporation on the FOX system.

In considering the appropriate standards for FOX to adhere to vis-a-vis the system description and the Railroad's right-of-way, it is important to determine whether the FOX high speed trainsets will travel on lines that are parallel to freight or conventional passenger operations, and if so, how close those lines will be to the FOX track. The presence of heavy, conventional rail equipment on parallel track, in close proximity to the FOX trainsets, would introduce risk factors that greatly detract from the system's overall safety, and might require a reevaluation of some of the standards in this proposal. A derailment on the conventional line could result in an accident between FOX trainsets and conventional equipment, which could bring about the sort of grave damage that the system, as planned, is designed to prevent. Therefore, FRA requests additional information from FOX concerning the clearance distances that are required to maintain the accident-avoidant systems approach that FOX has adopted, if the Railroad ultimately utilizes a right-of-way that runs parallel to conventional operations. FRA does not intend in this inquiry to preclude altogether a FOX right-of-way that runs parrallel to traditional rail operations. However, such a scenario may undermine the safety of the system, as it has been described to FRA and as is reflected in this proposal, and so, additional safety measures might be warranted. Similarly, the proximity of a highway right-of-way and traffic to the FOX lines is a matter that deserves attention. There is a ''startle'' factor associated with the sudden appearance of high speed trains next to highway traffic that should be minimized, to the extent possible, in the design and location of the FOX right-of-way. The Agency invites comment on all of the issues raised by this topic from interested parties. Also, FRA asks FOX to provide additional information that describes the proximity of conventional rail lines and highway traffic to the FOX track, and any additional measures needed to ensure the safety of the FOX right-of-way. Based on this information, FRA will consider whether further appropriate measures are necessary in order to ensure the integrity of the dedicated track system that FOX has planned for Florida.

Paragraph (c) contains proposed requirements for all of the Railroad's system components: system safety program; inspection, testing and maintenance procedures and criteria; operating practices; emergency preparedness plan; personnel qualification requirements; and system qualification tests. These items are proposed in the system description section of the proposal in order to underscore their importance in the overall FOX system. Although the primary requirements of these substantive areas are set forth in later Subparts of the proposal, their presence in the FOX system is mandated by the requirements of paragraph (c) of this section.

Paragraph (d) of this section sets forth the required primary elements of the Railroad's track and infrastructure. This

paragraph works in conjunction with Subpart D of the proposal, which contains the specific performance standards and inspection procedures that the Railroad must adhere to concerning track and infrastructure. This paragraph requires the Railroad to install and operate over standard gage track (56.5 in.). Paragraph (d)(3) requires the Railroad to install and operate over double track throughout its entire right-of-way. FOX plans to use each track for a single direction, except during certain maintenance operations, which will dramatically reduce the risk of head-on collisions between trains. As planned, trains will depart in 30-minute intervals, and so the risk of one train overtaking another is also minimized. Crossover connections are to be installed at each station, to facilitate change of direction for trains or the removal of disabled trains. In addition, crossovers will be located throughout the right-of-way in order to provide flexibility and emergency rescue.

Paragraphs (d)(4) and (5) require the Railroad to install continuous, shop-welded rail, and concrete ties. These items enhance the stability of the track and add to the system's safety. Paragraph (d)(6) requires the Railroad to use ballast that will support the track structure, but that will not degrade in combination with concrete ties. Some forms of ballast in use in the railroad industry are known to deteriorate when used with concrete ties. FOX may not use any of these forms of ballast. Paragraphs (d)(7)–(10) set forth standards for the substructure layer. Paragraph (d)(11) states that FOX must utilize moveable frog turnouts that are identical to those used along the TGV lines in France. FRA proposes this to ensure that alternate devices, which may decrease safety, are not substituted in Florida. Paragraph (d)(12) proposes that the Railroad may reduce the thickness of ballast in yards and maintenance facility operations, where speeds are generally low. The proposed requirements of paragraph (d) were included in the FOX Petition.

Paragraph (e) sets forth requirements for the integral portions of the Railroad's signal system. This paragraph works in conjunction with Chapter 3 of the rule, which sets standards for the specific performance of the signal system components and procedures. Paragraph (e)(1) explains that the Railroad's signal system shall include automatic train control (ATC), interlocking equipment, wayside detectors, and central traffic control. Paragraphs (e)(2)–(6) describe the basic function and design that must exist with respect to the ATC system. The system must interface with the interlocking system and train braking systems. The on-board equipment must include multiple processors, software for braking distance-to-go determinations, and decoders that receive messages from track beacons and short cable loops that provide notification of upcoming curves, gradients, speed restrictions, and track occupancy. The on-board equipment will also calculate braking curves, continuously monitor speed, and initiate braking in the event the locomotive engineer exceeds maximum authorized speed. The on-board computers are constructed on a two-out-of-three voting architecture, which fails safe in the event of an equipment failure. Paragraph (e)(7) requires the Railroad's braking profiles to comply with speed restrictions and maximum authorized speed. Paragraph (e)(9) sets basic requirements for the track circuits: those on main line must provide jointless audio frequency, which reduces the chance of intermittent of broken connections; those in crossovers may be combined with sequential release logic in the interlocking controllers to ensure protection against poor wheel-rail contact on the seldom-used rail; those in yards and maintenance facilities may be jointed high-voltage impulse.

Paragraph (e)(10) describes the function and design of the Railroad's interlocking system. The interlocking must: Interface with the wayside signal equipment, track circuits, switch machines, and wayside signals; monitor all track circuits; interface with the ATC; exchange supervisory control and status information with central traffic control; provide back-up control at each interlocking; and control switch machines and monitoring devices used to verify switch positions. Paragraphs (e)(11) and (12) require that the interlocking's vital logic processor shall utilize two processors that operate simultaneously in a redundant fashion, and that all wayside detectors interface with the train control system. Finally, paragraph (e)(13) requires that the Railroad's central traffic control shall monitor and regulate all train routes and movements. As FRA understands the current, proposed configuration for the FOX central traffic control system, there is no built-in redundancy for the CTC processors. The wayside processors are built with a two-out-of-three architecture, but it is presumed that the signal system will shut down and trains will come to a safe stop if the CTC processors fail. FRA requests clarification from FOX as to whether this is an accurate assessment of the system's operation. If this is not the case, FRA may consider further appropriate standards to ensure the safety of the system in the event that the central traffic control system fails.

Paragraph (f) describes the key communication systems and components for the Railroad. The Railroad must install a dedicated, fiber-optic system along the right-of-way to transmit data, and telephone and radio communications. In addition, the system must have back-up systems in place in the event of failures. For train operations, the system must include a dedicated telephone system with fixed telephones and field sockets along the track, yards, and platforms; a portable radio system; and a train radio to facilitate communication among trainsets and central traffic control.

Paragraph (g) addresses the primary elements of the Railroad's power distribution system. This paragraph works in conjunction with Chapter 9 of the rule, which sets forth minimum standards for the operation of the power distribution system. The system will include a 25 kV overhead catenary electrification system, which the Railroad must protect from the potentially unsafe consequences of lightning strikes. FRA anticipates that the Railroad's system safety plan will address this potentially serious risk to the overall safety of the system, and that the Railroad will devise protective measures in the design, construction, and equipment used for the catenary system and power distribution center. All power stations along the right-of-way will include remote control operating features that facilitate operation from a central control center. In addition, supervisory control equipment at remote locations and power substations must have battery-powered back-up capability in the event of a power system failure.

Paragraph (h) describes the primary elements of the Railroad's rolling stock. This section works in conjunction with Subpart E of the proposal, which sets forth equipment design, operation, and maintenance standards. Much of this paragraph is self-explanatory, but it is important to note that the FOX trainsets will mimic the basic elements of French TGV design, and so will consist of articulated, fixed-consist trains. This formation resists buckling and twisting, and tends to stay in an upright position in the event of a derailment, which greatly enhances passenger safety. The FOX trainsets will be capable of traveling in either direction because a power car will be positioned at either end of each trainset. The passenger cars and power cars will be connected with

semi-permanent connections that can be disconnected only with special tools and procedures. These semi-permanent connectors between each trailer car, and between the power cars and trailer cars, are not couplers. Therefore, the FOX trainsets will not and cannot be coupled or uncoupled in yards or along the right-of-way, a process which presents many safety risks for employees who work with conventional equipment. As an additional safety feature, couplers will be present and are required at the leading and trailing end of each trainset, in case a rescue operation requires attaching disabled high speed trainsets to operative equipment.

Paragraph (h)(3) requires each truck of the trainset to be continuously monitored by the on-board computer system, which will alert the locomotive engineer to any malfunction, including hunting oscillations, brake defects and wheelslide. This feature will greatly enhance the engineer's ability to prevent an accident or incident by bringing the train into proper operating condition, if possible, or slowing the train, as soon as possible. This may also restrict potential brake system degradation, because the corrective action can occur before the equipment deteriorates altogether. However, FRA is uncertain about the redundant capabilities of the on-board computer monitoring system. The system description section of the Petition states that the main cab microprocessor is ''backed up by a separate standby unit.'' It is unclear from the language provided as to whether this unit is designed to work redundantly and will fail safe in operation. Therefore, FRA requests additional information from FOX that describes in detail how the power car microprocessor, which continuously monitors the equipment, is supported by the other ''standby unit.'' For instance, FRA would like to know whether all circuits are redundant, if two-out-of-three voting architecture is employed, and all other pertinent information concerning the computer's resistance to failure in operation. Section 243.425 of Subpart E, Rolling Stock describes the requirements of the automated monitoring system further. However, because FRA is unsure as to whether this monitoring is redundant and will fail safe, FRA proposes in § 243.425 that the Railroad address a complete failure of the automated monitoring system in the system safety plan, and through appropriate operating rules. Based on the information that FRA receives from FOX concerning this issue, FRA may determine that an alternative method of addressing this risk would be preferable, or that the risk is adequately covered by the design of the equipment.

Paragraph (h)(4) requires each trainset to possess operative wheelslide control, independent trucks, and fault-tolerant braking. These devices enhance the overall system safety by permitting trainsets to stop within shorter distances, to slow or stop with certainty, and to continue operating safely with defective conditions. The wheelslide control system is designed to adjust the braking force on each wheel to prevent sliding during braking, and prevents flat wheel conditions to arise, which can occur when wheels lock during braking.

This proposal deals with fire safety in a variety of ways. Paragraph (h)(5) requires all FOX trainsets to possess operative smoke and fire detection systems, which will increase the likelihood that passengers will know of the existence of fire and smoke in sufficient time to exit the equipment. As stated earlier, FRA also proposes to prohibit smoking on FOX trainsets, which further enhances passenger safety. In addition, FRA proposes to adopt FRA's emergency preparedness regulations, which address fire safety and fire protection for railroad passengers. Finally, the system safety plan that FOX develops must address the likelihood of fire, the risks presented, and effective methods of eliminating or reducing those risks.

Paragraph (h)(6) permits FOX to operate vehicles other than the high speed equipment on the right-of-way. However, these vehicles are limited to maintenance and rescue equipment, such as a grinding train, a tamping machine, a track stabilizing machine, track inspection vehicles (Mauzin car and Melusine car), an ultrasonic test car to measure the integrity of the rails, a ballast-plowing railway car, and electric and diesel locomotives for shunting and rescue purposes. All other rail vehicles are prohibited by the rule. If FOX believes that other vehicles are necessary for the safe operation of the system, those should be listed, with rationale, in any comments that FOX may have to this proposal. FRA seeks to minimize the number and type of vehicles that operate over the right-of-way, for a variety of reasons that have been discussed previously. Unless required to advance safety or move passengers to their final destination, FRA believes that the operating environment would not support additional or mixed equipment on the FOX lines.

Paragraph (h)(7) requires the Railroad to equip fully each repair facility and employee with the appropriate tools needed to maintain the equipment. Paragraph (h)(8) requires the power cars to incorporate crash energy management that will protect the locomotive engineer to the maximum extent possible. The TGV equipment that FOX will use embodies this requirement. Additional, more specific structural standards are set forth in Subpart E of the proposal.

Paragraph (h)(10) requires the locomotive engineer cab to facilitate ease of movement, vision and access to all sensors, controls, and indicators, and to control climate and noise. FRA believes that these issues have an impact on employee performance and railroad safety, and so proposes that the cab be designed to maximize employee performance. The TGV equipment that FOX plans to use incorporates this principle.

Paragraph (h)(11) describes the critical components of the passenger equipment brake system. Each trainset must be equipped with an electro-pneumatic brake system that maintains the independence of each truck's response to a brake demand. The locomotive engineer's automatic brake valve in the leading cab controls the brake pipe pressure. Each of the following devices must be capable of initiating an emergency brake application: the ATC, the deadman control, two emergency brake valves located in the cab, and emergency brake valves located in two trailer cars of each trainset. Each powered truck shall be independently controlled by the brake pipe, and will have electric braking that is battery-operated in the case of a main power failure. The brake system will be arranged so that the electric brake has priority over others. During emergency braking, relays will check the level of electric braking, and will apply the friction brake if a failure is detected. The locomotive engineer will have control of the powered truck electric brake through the traction-braking master controller to slow the trainset or maintain low speed. The braking functions on each powered truck will be controlled by separate microprocessors. Also, microprocessors will continuously monitor all of the power brake systems. The microprocessors will store all brake failures and notify the locomotive engineer of failures in any of the following areas: reception of cab and train control signals, truck hunting, electric brake, friction brake, fire detection system, head end power system, alerter, horn, and wheel slide. The braking system must be designed and operated in a failsafe manner, and include fault tolerant redundancy and notification of failures as they occur.

Also, paragraph (h)(11) requires the Railroad to prepare, in conjunction with its system safety plan, a matrix of authorized train speed and braking reductions that correspond to potential brake failures that may occur en route. This matrix is required by Subparts B and E, and this section, and is an extremely important safety feature of the FOX system. This document, and the planning it reflects, will guide the movement of equipment in passenger service when brake failures occur en route, after the daily inspection. Without this plan in place, the Railroad may be forced to return to the more draconian and less effective option of moving the defective equipment to the next repair facility. (See full discussion below in § 243.15 concerning the movement of defective equipment for additional information on this topic.) The French TGV operates under a braking matrix plan that is devised specially for each route taken throughout their system. FOX plans to replicate this process in Florida. FRA requires development of and adherence to the matrix in this NPRM, but believes that it would be unwise to dictate the specific speed reductions and corresponding brake failures in this proposal. The right-of-way has not yet been chosen and many subtle operating conditions are unknown at this time. FRA believes that the most appropriate course is to require FOX to prepare and test the braking matrix as part of the overall system safety planning and development called for by the proposal. However, FRA seeks comment from FOX and other interested parties on whether these safety standards should require the Railroad to automate the enforcement of the braking matrix. Given the technological capacity of the equipment and the importance of the correct train speed in the event of brake failure, FRA is considering imposing such a requirement.

Finally, paragraph (h)(12) states that the Railroad must install and maintain hot box detectors throughout the right-of-way, which sense journal bearing temperature and alert central traffic control of any potentially defective equipment.

All of these provisions relating to the braking system were included in the FOX Petition, and reflect the state of modern braking systems for passenger equipment.

Section 243.15 Movement of Defective Equipment

This section requires the Railroad to meet certain conditions prior to moving defective equipment or continuing with it in revenue service. Paragraph (a) provides that any equipment containing a condition that does not comply with § 243.433(f)(1) of the proposal may be moved only after the Railroad has completed a series of actions to ensure the safety of the movement. In order for the movement to proceed, a qualified person must determine that the equipment can be moved safely; the qualified person must inform the locomotive engineer and crew of the non-complying condition, the maximum authorized speed and other appropriate restrictions; and the qualified person must affix a tag to the control cab of the trainset that contains specified information concerning the defect. Section 243.433(f)(1) is a daily inspection requirement contained in the rolling stock chapter of this proposal, which includes a list of several items that must be operating as intended when the inspection is done in order for the equipment to depart. Therefore, paragraph (a) covers any defect that occurs after the daily inspection has been completed, and the trainset was determined to be in compliance and released for revenue service.

Paragraph (b) provides that a trainset which develops a non-complying condition en route, or in other words, after the daily inspection required by § 243.433(f)(1), may continue in revenue service until the next inspection required by the rule, only if the Railroad has accomplished the tasks required by paragraph (a). Paragraph (b) also states that, if brake defects arise en route, the requirements of § 243.409 of the proposal apply. The pertinent portions of § 243.409 state that the Railroad must develop and adhere to speed restrictions that correspond to varying levels of brake defects or failure, and that the locomotive engineer must notify the central traffic control of any brake failure that occurs within one trip.

Paragraph (c) permits the movement of defective equipment in a yard, so long as there are no passengers in the equipment, the movement does not exceed a speed of 10 mph, and the movement is made solely for the purpose of moving to a repair facility.

The movement of defective equipment is a topic that deserves considerable discussion as it relates to power brakes and other safety appliances, given the safety risks involved and the statutory background implicated. FRA's proposed Passenger Equipment Safety Standards, published on September 23, 1997 (62 FR 49728) provide a thorough explanation of the factors and conclusions involved, which is summarized here.

FRA's existing regulations do not contain requirements pertaining to the movement of equipment with defective power brakes. The movement of equipment with these defects is currently controlled by a statutory provision (originally enacted in 1910 as part of the laws formerly known as the Safety Appliance Acts), which states:

> (a) GENERAL—A vehicle that is equipped in compliance with this chapter whose equipment becomes defective or insecure nevertheless may be moved when necessary to make repairs, without a penalty being imposed under section 21302 of this title, from the place at which the defect or insecurity was first discovered to the *nearest available place at which the repairs can be made*—
>
> (1) on the railroad line on which the defect or insecurity was discovered;
> or
>
> (2) at the option of a connecting railroad carrier, on the railroad line of the connecting carrier, if not further than the place of repair described in clause (1) of this subsection.

49 U.S.C. 20303(a) (emphasis added).

Although there is no limit contained in 49 U.S.C. 20303 as to the number of cars with defective equipment that may be hauled in a train, FRA has a longstanding interpretation which requires that, at a minimum, 85 percent of the cars in a train have operative brakes. FRA bases this interpretation on another statutory requirement that permits a railroad to use a train only if ''at least 50 percent of the vehicles in the train are equipped with power or train brakes and the engineer is using the power or train brakes on those vehicles and on all other vehicles equipped with them that are associated with those vehicles in a train.'' 49 U.S.C. 20302(a)(5)(B). As originally enacted in 1903, section 20302 also granted the Interstate Commerce Commission (ICC) the authority to increase this percentage, and in 1910 the ICC issued an order increasing the minimum percentage to 85 percent. See 49 CFR 232.1, which codified the ICC order.

As virtually all freight cars are presently equipped with power brakes and are operated on an associated trainline, the statutory requirement is in essence a requirement that 100 percent of the cars in a train have operative power brakes, unless being hauled for repairs pursuant to 49 U.S.C. 20303. Consequently, FRA currently requires that equipment with defective or inoperative air brakes constitute no more than 15 percent of the train and that, if it is necessary to move the equipment from where the railroad first discovered it to be defective, the defective equipment be moved no further than the nearest place on the

railroad's line where the necessary repairs can be made.

The requirements regarding the movement of equipment with defective or insecure brakes noted above can create safety hazards and operational difficulties in passenger operations. As the provisions regarding the movement of defective brake equipment were written almost a century ago, they do not address contemporary realities of these operations. Strict application of the requirements has the potential of causing major disruptions of service, which could create serious safety and security problems. For example, requiring repairs to be made at the nearest location where the necessary repairs can be made could result in discharging passengers between stations where adequate facilities for their safety are not available, or onto overcrowded station platforms. In addition, strict application of the statutory requirements could result in trains with defective brake equipment moving against the current of traffic during high traffic hours. Irregular movements of this type increase the risk of collisions. Furthermore, like many passenger operations, FOX may operate trains that include eight or fewer cars. Consequently, the necessity to cut out the brakes on one or more cars can easily result in noncompliance with the 85-percent requirement for hauling the car for repairs, thus prohibiting train movement and resulting in the same sort of safety problems noted above.

FRA has attempted to recognize the nature of passenger operations, and the importance of passenger safety, and to avoid disrupting service when applying the requirements regarding the movement of equipment with defective brakes. FRA believes that speed restrictions can readily be used to compensate for the loss of brakes on a minority of cars. FRA believes that affirmatively recognizing appropriate movement restrictions would actually enhance safety, because compliance with the existing restrictions is potentially unsafe.

FRA recognizes that some of the proposed standards in § 243.15 are not in accord with the requirement contained in 49 U.S.C. 20303(a) that cars with defective or insecure brakes be moved to the ''nearest'' location where the necessary repairs can be made. However, FRA does have authority under 49 U.S.C. 20306, entitled ''Exemption for technological improvements,'' to establish the restrictions proposed in § 243.15. Section 20306 provides:

> [T]he Secretary of Transportation may exempt from the requirements of this chapter railroad equipment or equipment that will be operated on rails, when those requirements preclude the development or implementation of more efficient railroad transportation equipment or other transportation innovations under existing law.

This provision was originally enacted as a part of the Rock Island Railroad Transition and Employee Assistance Act to authorize the use of certain trailers as freight cars. See Public Law 96–254 (May 30, 1980). FRA believes that the use of the provision as contemplated in this proposal is consistent with the authority granted the Secretary of Transportation in 49 U.S.C. 20306. As noted previously, the statutory requirements regarding the movement of equipment with defective brakes were written nearly a century ago, were focused largely on the operation of freight equipment, and did not contemplate passenger train operations currently prevalent throughout the nation and that will exist on FOX. Since the original enactment in 1910 of the provisions now codified at 49 U.S.C. 20303(a), there have been substantial changes in the nature of the operations of passenger trains, and the technology used in those operations.

Contemporary passenger equipment incorporates many types of advanced braking systems; in some cases these include electrical activation of brakes on each car (with pneumatic application through the train line available as a backup). Dynamic brakes are also typically employed to limit thermal stresses on friction surfaces and to limit the wear and tear on the brake equipment. Furthermore, the brake valves and brake components used today are far more reliable than was the case several decades ago. In addition to these technological advances, the brake equipment used in passenger train operations incorporates advanced technologies not found with any regularity in freight operations. These include:

- The use of brake cylinder pressure indicators which provide a reliable indication of the application and release of the brakes;
- The use of disc brakes which provide shorter stopping distances and decrease the risk of thermal damage to wheels;
- The ability to effectuate a graduated release of the brakes due to a design feature of the brake equipment which permits more flexibility and more forgiving train control;
- The ability to cut out brakes on a per-axle or per-truck basis rather than a per car basis, thus permitting greater use of those brakes that are operable;
- The use of a pressure-maintaining feature on each car which continuously maintains the air pressure in the brake system, thereby compensating for any leakage in the trainline and preventing a total loss of air in the brake system;
- The use of a separate trainline from the locomotive main reservoir to continuously charge supply reservoirs independent of the brake pipe train line; and
- Brake ratios that are 2½ times greater than the brake ratios of loaded freight cars.

Although some of the technologies noted above have existed for several decades, most of the technologies did not become prevalent until 1980. Furthermore, most of the noted technological advances have been integrated into one efficient and reliable braking system only within the last decade. Consequently, the technology incorporated into the brake equipment used in contemporary passenger train operations, including FOX equipment, increases the reliability of the braking system and permits the safe operation of the equipment for extended distances, even where a portion of the braking system may be inoperative or defective.

In the face of these technological advances, FRA believes it is appropriate to utilize the authority granted by 49 U.S.C. 20306 and exempt certain passenger train operations from the specific restriction contained in 49 U.S.C. 20303(a) requiring the movement of equipment with defective or insecure brakes to the nearest location where necessary repairs can be made. FRA proposes restrictions on the movement of this type of equipment that are more conducive to safe operations. Under this proposal, the Railroad could move such cars only at reduced speeds and only until the next required inspection of the equipment.

In utilizing the authority granted pursuant to 49 U.S.C. 20306, the Secretary is required to make ''findings based on evidence developed at a hearing,'' unless there is ''an agreement between national railroad labor representatives and the developer of the new equipment or technology.'' FRA is confident that, after notice and opportunity for oral and written public comment, the record will support a finding that the proposed provisions are ''in the public interest and consistent with railroad safety,'' the test required in order to waive safety requirements issued under other, general provisions of the code. *See* 49 U.S.C. 20103(d). It should be noted that the exemption granted to the movement of equipment

on FOX with defective brakes would not include an exemption from 49 U.S.C. 20303(c), which contains the liability provisions attendant with the movement of equipment with defective or insecure safety appliances, including power brakes. Consequently, the liability provisions contained in 49 U.S.C. 20303(c) will be applicable to the Railroad when hauling equipment with defective or insecure power brakes pursuant to the requirements proposed by FRA in this notice.

FRA also proposes to exempt FOX passenger train operations from its longstanding interpretation, based on 49 U.S.C. 20302(a)(5)(B) and 49 CFR 232.1 noted above, prohibiting the movement of a train if more than 15 percent of the cars in the train have defective, insecure, or inoperative brakes. As discussed above, such a limitation is overly burdensome and has the potential of creating safety hazards, due to the short length of the trains commonly operated in FOX passenger service.

Based on the preceding discussion, FRA proposes in this NPRM to permit FOX trainsets to move under speed restrictions if brake defects occur en route. This proposal incorporates procedures used in France on the TGV that will guide the establishment of those speed restrictions. As is discussed above, the Railroad shall devise a matrix, in which speed levels are established to correspond to certain brake defects that will facilitate the safe movement of the equipment. The development of this matrix must be accomplished in conjunction with the development of the Railroad's system safety plan, which requires FRA approval. FRA believes that this approach will ensure a high level of safety by taking into account advanced technology, the proven TGV procedure, and the system safety concept of planning to minimize or eliminate hazards.

Subpart B—System Safety Program and Plan

Section 243.101 General System Safety Requirements

This Subpart proposes system safety program requirements that FOX must develop and follow. System safety is the concept that forms the foundation for the proposed rule, as it does for TGV operation in France. As discussed earlier in this document, system safety means the application of design, operating, technical, and management techniques and principles throughout the life cycle of a system to reduce hazards and unsafe conditions to the lowest level possible, through the most effective use of available resources. In this process, FRA proposes that the Railroad implement a system safety program to identify and manage safety risks, and generate data for use in making safety decisions.

The proposed requirements for the Fox system safety program are very similar to the requirements proposed for high speed (Tier II) passenger equipment, which were published on September 23, 1997 in the **Federal Register** (62 FR 40728). However, the Tier II system safety standards were developed to cover only the trainset, and not the remaining railroad system elements. The system safety program proposed for FOX covers the design, development, testing and operation of the entire railroad system, which includes track, signal, rolling stock, operating practices, power distribution, personnel qualification requirements, and system qualification tests.

Paragraph (a) of § 243.101 requires the Railroad to adopt a system safety program using MIL–STD–882(C) as a guide. MIL–STD–882(C) is a standard issued by the Department of Defense that describes system safety planning and system safety programs used by the U.S. military for procuring and operating weapon systems. This standard is often used as a form or reference for system safety planning. FRA does not intend in this proposal to dictate how the Railroad should apply this guidance, but FRA believes that the Railroad should tailor application of the guidance to FOX's unique safety needs and operating scenarios. FRA envisions that the system safety plan will be a living document that evolves as new information and knowledge become available. Therefore, this section requires FOX to update the system accordingly in the course of operations, and to change practices that prove to be unsafe.

Due to the critical role that the system safety plan plays in this rule, FRA proposes that FOX submit the initial plan for FRA approval, and brief FRA annually on any changes made to it. The Petition contained language that provided for FRA ''audits'' of the system safety plan, rather than a clear approval process. However, given the fact that so many safety features in the FOX system are controlled by development of the system safety plan, FRA believes that anything short of approval would be an abdication of the Agency's responsibility to promulgate clear, enforceable, and effective safety standards. For instance, one of the safety features relied upon in the FOX risk assessment and Petition involve a series of wayside detection systems, which will greatly enhance the safety of the system and have led to standards in this proposal that permit 200 mph speeds and lighter equipment. However, these detection systems, as proposed, will not be placed at regular intervals throughout the right-of-way; rather, they will be placed, for the most part, where the system safety plan indicates safety risks exist. If FRA has no approval authority over the placement of the detection systems and the thought process that determined the placement, the detection system could conceivably be used ineffectively, and ultimately have no impact on improving safety. A similar analysis can be made concerning the braking system matrix that will define operating procedures for passenger equipment with defective brakes. Clearly, the Railroad braking system is key to the safety of the high speed trainsets, and a matrix that establishes rational speed restrictions is mandatory, for safety and statutory reasons. FRA believes that the Agency must have an approval mechanism in place to ensure that such a matrix is in place. FRA understands that FOX has the desire and capacity to operate the system safely, and FRA does not intend to interfere unnecessarily in the system safety process that will be undertaken in Florida. However, FRA believes that the basis of this rulemaking would be undermined if Federal oversight of the FOX system safety plan does not take place.

This paragraph also requires FOX to submit the initial system safety plan to FRA for approval no later than one year after the rule takes effect. The Petition contained a less certain time frame, related to the design and construction phases of the project. However, FRA believes that the system safety plan must be used as a guide in the earliest conceptual stages of the project. Thus, it should be available earlier in the program than initially proposed by FOX. As discussed previously in this document, FRA seeks comment from FOX and other interested parties concerning alternatives to this proposal. Commenters are asked to consider the relative merits of a tiered system safety plan submission schedule, that would permit FOX to produce the system safety plan in stages, rather than as one complete package. However, commenters should also address the risk that such a tiered schedule would lead to a system safety plan that is incomplete or inaccurate because it does not address all potential hazards at the earliest possible opportunity.

FRA also requires FOX to brief the FRA annually on the status of the

system safety program and on any proposed changes to the system safety plan. FRA believes this process will permit FRA to assess how effectively the system safety plan works, and how FOX identifies and resolves safety risks.

Paragraph (b) of § 243.101 makes clear that the system safety plan must address the design, construction, maintenance, operation, and overhaul of the system as a unit. The plan must address how individual components of the system operate, as well as how those components operate once integrated into the system. For instance, a particular appurtenance may perform well in tests or other operations, but that same component may not perform suitably when integrated into the FOX system. The plan must evaluate components in this light in order to ensure the ultimate safety of the system. Also, this paragraph requires FOX to consider safety at least as important as cost and performance in assessing design, construction, operation, maintenance, and overhaul of the Railroad system.

Paragraph (c) describes the various elements that must be included in the plan. FRA proposes, at a minimum, that the system safety plan specifically address fire protection; software safety; inspection, testing, and maintenance; training and qualifications; emergency preparedness; pre-revenue service qualification testing; hazard identification and reduction; operating procedures for defective equipment in passenger service; identification of safety-critical subsystems; and relationships between safety-critical subsystems. FRA places emphasis on these elements of the Fox system because they tend to be overlooked when a less formal, non-systems approach to safety analysis is taken. Each of these elements of the system safety program is discussed in greater detail below.

Paragraph (d) sets forth the approach and process FOX must take in order to develop the system safety program. FRA intends the program to be a formal step-by-step process that includes: identification of all safety requirements that govern the operation of the system; evaluation of the total system to identify known or potential safety hazards that may arise over the life cycle of the Railroad; identification of all safety issues during the design phase of the process; elimination or reduction of the risk posed by the hazards identified; resolution of safety issues presented; development of a process to track progress; and development of a program of testing and analysis to demonstrate that safety requirements are met.

Paragraph (e) requires the Railroad to document how the system design meets safety requirements, and to monitor how safety issues are raised and resolved. This is very important in system safety philosophy; if risks are not identified, eliminated or mitigated, the system is inherently unsafe.

Paragraph (f) requires the system safety plan to describe how operational limitations would be imposed if the FOX system design cannot meet certain safety requirements. FRA anticipates that this section would include an initial determination from FOX that operational limits can effectively address the hazard, and if not, a design change will be put in place to accommodate the risk. Operational limits are considered the least desirable option in system safety planning, and thus, the last means utilized to reduce a safety risk.

Paragraph (g) requires the Railroad to facilitate FRA inspection of the system safety plan and documentation required by paragraph (e). FRA must have access to this information in order to determine the Railroad's compliance with the requirements of this Chapter.

Section 243.103 Fire Protection Program

As part of the system safety program, paragraph (a) requires the Railroad to address fire safety considerations in the design stage of the project, and to reduce the risk of harm caused by fire on the equipment to a level established in MIL–STD–882(C) as acceptable. Paragraph (b) requires the Railroad to make a written analysis of the fire protection problem, and lists a series of factors that the Railroad must complete and consider concerning fire protection. These paragraphs require the Railroad to ensure that good fire protection practice is used during the design and operation of the equipment. FRA's primary concern is to protect passengers from the risk of fire and smoke inhalation, and to ensure that they can evacuate quickly and safely if a fire erupts.

Elements of this analysis correspond to required action under § 243.413 of the rolling stock provisions in the rule: Overheat detectors; a fire or smoke detection system; a fixed, automatic, fire-suppression system where the Railroad's written analysis determines they are required; and compliance with the Railroad's written procedures for the inspection, testing, and maintenance of fire safety systems and equipment that the procedures designate as mandatory. [See § 243.413(c)–(f)].

Paragraph (c) requires the Railroad to exercise reasonable care to assure that the design criteria are followed and that the tests required by this program are performed. To fulfill this obligation in part, the Railroad must include fire safety requirements in all contracts for new equipment purchases.

Section 243.105 Software Safety Program

This section proposes requirements for the software portion of the system safety program. Paragraph (a) requires the Railroad to develop and implement a software safety program to guide the design, development, testing, integration and verification of FOX system software. Software plays a key role in the overall performance of the FOX system, and safety demands that the Railroad place a strong emphasis on the system's software safety.

Paragraph (b) sets out the proposed required elements of the software safety program. The program must treat software that controls or monitors safety functions as safety-critical, unless a completely redundant, failsafe, non-software means to provide the same function is provided as part of the design. Paragraph (b) also specifies the steps required to develop a comprehensive software safety program, which must culminate in a demonstration of overall software safety as part of the pre-revenue service system qualification tests of the FOX system.

Paragraph (b) also requires the Railroad to include a hazard analysis in its software design and implementation that will, to the fullest extent possible, prevent unauthorized penetration on all computerized systems in use. As the railroad industry embraces new technology and increases reliance on electronic information systems, there must also be development and adherence to effective methods of preventing intrusion from unauthorized railroad personnel and other individuals or entities. The FOX system relies on many computerized systems and sub-systems, the largest being the Railroad's signal system. Clearly, any opportunity for infiltration of the signal system by outsiders would expose the passengers, employees, and those along the right-of-way to grave risk. Therefore, FOX must develop and implement in its system safety program a method to prevent cyber threats and alleviate these risks.

Paragraph (c) requires the Railroad to adhere to the requirements of the software safety program. To fulfill this obligation the Railroad must include software safety requirements in procurement contracts that involve design or purchase of software components.

Paragraph (d) requires the Railroad to follow the process and procedures of the software safety program.

Section 243.107 Inspection, Testing, and Maintenance Program

This section contains the requirements for the Railroad's program for inspecting, testing, and maintaining the FOX system. FRA's goal is a set of standards that will ensure that the Fox system remains safe as it wears and ages, and will protect workers who perform the inspection, testing, and maintenance tasks. These proposed requirements are based on FRA's knowledge of inspection, testing and maintenance programs generally, and the French TGV practices.

Paragraph (a) requires the Railroad to provide to FRA particulars concerning the inspection, testing, and maintenance program for the system, including: Safety inspection procedures, intervals and criteria; testing procedures and intervals; scheduled preventive maintenance intervals; maintenance procedures; and employee training.

In this proposal, FRA does not dictate specific program contents, and so the Railroad retains much flexibility to tailor the program to its needs and experience. However, FRA believes this provision is an important element of the overall Railroad system, and should be designed to maximize safe operations and protect safety-related components of the system from deterioration over time.

Paragraph (b) defines broadly the conditions that can endanger the safety of the crew, passengers, or equipment, which the inspection, testing, and maintenance program should prevent, or detect and correct. Paragraph (c) establishes a link between scheduled maintenance intervals and the system safety program. Scheduled maintenance intervals should be set so that worn parts are replaced before they fail. Initial intervals should be based on manufacturer's recommendations or operating experience. As more operating experience is gained, FRA believes that accumulated reliability data should be used as the basis for changing preventive maintenance intervals on safety-critical components. This standard should encourage the Railroad to keep reliability records on safety-critical components, which will provide confidence that any safety or economic trade-offs have a firm basis.

Paragraph (d) requires the Railroad to adopt standard operating procedures, in writing, that explain how all safety-critical inspection, testing, and maintenance tasks will be performed. This provision is intended to provide protection to the workers who perform maintenance and inspection duties, many of which are inherently dangerous. FRA does not intend to prescribe how these tasks should be performed. Rather, this proposal requires the Railroad to devise a program that will ensure employee safety in each individual setting that may arise in the maintenance of all of the Railroad's equipment. FRA believes that standard operating procedures are often a key component in a successful program to train employees to perform their employment duties safely.

Section 243.109 Training, Qualification, and Designation Program

This section requires the Railroad to develop and implement a training, qualification, and designation program for workers who perform inspection, testing, and maintenance tasks. FRA believes that employee training, qualification, and designation are central to maintain safe railroad equipment and a safe workforce. Paragraph (a) requires the Railroad to establish and comply with a training, qualification, and designation program for employees and contractors who perform safety-related inspection, testing, or maintenance tasks in this rule.

Paragraph (b) lists the steps that must be followed in developing the Railroad's training, qualification, and designation program. This paragraph lists the general requirements that the Railroad's training, qualification, and designation program must do to ensure that employees know how to keep the system operating safely. The SNCF has a training program in place for operation of TGV equipment in France that is similar to these proposed requirements. The list of actions that FRA proposes also compel the Railroad to evaluate its operation and focus its training resources where the need is greatest.

The proposed rule grants the Railroad flexibility to focus and provide training that is needed in order to complete a specific job category. For instance, the proposal does not require ''checkers'' to receive the same intensive training needed for ''maintainers.'' FRA anticipates that this proposal will not require extensive changes to the manner in which TGV employees in France are trained. However, the proposal will prevent the Railroad from using minimally trained and unqualified people to perform crucial safety tasks.

FRA believes that many benefits will be gained from the Railroad's investment in a comprehensive training program. The quality of inspections will improve, which will result in fewer instances of defective equipment in revenue service and increased operational safety. Equipment conditions that require maintenance attention are more likely to be discovered while the equipment is in a maintenance or yard site, where repairs can be completed safely and efficiently. Trouble-shooting will take less time, and maintenance will be completed correctly the first time, resulting in increased safety and decreased costs.

Section 243.111 Emergency Preparedness Program

This section requires the Railroad to develop and adopt an emergency preparedness program that meets the requirements set forth in FRA's proposed Passenger Train Emergency Standards, 62 FR 8330, (February 24, 1996) which will be codified at 49 CFR part 239 after consideration of all comments received and adopted as final. FRA believes that the FOX system should meet the same emergency preparedness requirements imposed on every other passenger railroad operating in the U.S.

Section 243.113 Pre-revenue Service System Qualification Plan

This section sets forth general requirements for pre-revenue service testing of the FOX system, and works in conjunction with the specific provisions set forth in Chapter 7 of this rule. Pre-revenue qualification tests are extremely important because they represent the culmination of all safety analysis and component tests conducted as part of the system safety program, and will serve as a basis for all passenger operations. The pre-revenue service system qualification tests are intended to demonstrate the effectiveness of the system safety program and to prove that the FOX system can operate safely in its intended environment. FRA believes that these procedures and the documentation required by the pre-revenue system qualification test plan are necessary to ensure that all safety risks have been reduced to a level that will facilitate safe operation in revenue service.

Section 243.115 Hazard Identification and Reduction

This section requires the Railroad to identify all hazards that may arise in the course of operations and analyze methods available to reduce or eliminate the hazards. The Railroad may consider remedies that are based in design, construction, equipment, or operations. However, operation-based solutions are not favored, and should be used only when no other alternative

exists. Design and construction are the preferred methods to eliminate risk in system safety philosophy, because they completely remove the opportunity for simple human mistakes or errors in judgment that can occur in the normal course of operations. This section is important because operational hazards cannot be minimized or prevented until they are first recognized as risks. This thought process is basic to system safety, and so this proposal is an integral component to the Railroad's system safety plan.

Section 243.117 Operating Procedures in the Event of Component Failure

This section requires the Railroad to consider and develop operating rules that will protect passengers, employees, and the public when portions of the system become defective. This section works in conjunction with Subpart F of the rule, which requires the Railroad to develop a comprehensive set of operating rules that must be approved by FRA. It is extremely important to the overall safety of the system that the Railroad deliberate over appropriate procedures that will compensate for the loss of safety that malfunctioning equipment causes. Aside from developing general operating rules, pursuant to the requirements of Subpart F, this section obligates the Railroad to engage in a slightly different thought process—to focus on defective equipment and to mitigate the dangers that arise when equipment malfunctions. FRA believes that this section is necessary to ensure passenger and system safety, particularly as it relates to power brake defects. Also, this section requires the Railroad to analyze and describe the fault tolerant limits of each system that possesses fault tolerant components, and develop a process by which the Railroad and the engineer operating a trainset will be made aware that the system is approaching its fault tolerant limits. This proposal requires the Railroad to acknowledge the pre-determined limits of the system equipment, and to prepare appropriately for instances when those limits are exceeded, which is consistent with and critical to comprehensive system safety planning.

Section 243.119 Safety-Critical Subsystems

This proposed section requires the Railroad to identify the safety-critical subsystems that exist in the FOX system, and to prepare an explanation of the relationship they have with one another throughout the life cycle of the system. FRA anticipates that this requirement reflects the thought that would occur in the normal course of system safety analysis, and believes it is important enough, in terms of the ultimate safety of the system, to incorporate in this Subpart.

Section 243.121 Approval Procedure

This section sets forth the system safety plan approval procedures that the Railroad and FRA must follow. Paragraph (b) requires the Railroad to file a petition for approval with FRA, and the petition must include the Railroad's system safety plan, pertinent supporting documentation, and the primary person to contact if questions arise. This section also requires the Railroad to prepare a petition for approval for safety-critical changes to the Railroad's existing safety plan. FRA believes that such changes have the potential to alter the overall safety of the FOX network, and therefore, Federal oversight should be present. Also, pursuant to principles of administrative law, FRA would notify the public of such changes. Paragraph (c) requires the Railroad to submit the petition for approval with FRA's Associate Administrator for Safety, and paragraph (d) describes the actions FRA must take upon receipt of the petition.

FRA must review the petition, detemine if it complies with all procedural requirements, and evaluate the substantive validity of the petition or proposed changes to the petition. Under this proposal, FRA may approve, approve with special conditions, or disapprove the petition within ninety days. If FRA is unable to arrive at a determination within ninety days, the petition remains pending until FRA acts. Once a petition has been approved, FRA may reopen consideration of the petition for good cause, which might include the discovery of new information or new safety evaluations. FRA must provide the Railroad with written notice of the disposition of the petition. If FRA determines that changes to safety-critical standards, criteria, or inspection frequencies are appropriate in the interest of safety, FRA will publish a notice in the **Federal Register** announcing those changes. Sixty days after the notice is published, the changes become effective.

The FOX system safety program is the most important portion of the Florida high speed rail project. Every safety discipline will be governed by the design, construction, and equipment determinations made in the process of developing the Railroad's system safety program. FRA has no desire to meddle unnecessarily in the internal, nonsafety matters of the Railroad's operation. However, due to the role that the system safety plan plays in the FOX system, and the potential for human casualty that exists on the system, FRA believes that the agency must have approval authority over the final system safety plan that is adopted by the Railroad, in order to ensure the safety of the public. As stated earlier, FRA invites comment on alternatives to the timing proposed for submission of the Railroad's system safety plan. In addition, FRA invites commentary on the approval process that is proposed in this NPRM, and any alternatives that may be more effective.

Subpart C—Signal System

Subpart C sets forth the safety standards for the Railroad's signal system. This Subpart is similar to FRA's existing signal safety standards, 49 CFR part 236, that apply generally to railroad operations in this country. However, changes have been made to account for the differences in the signal system that will be utilized in Florida and the high speed train operations associated with the FOX system.

Section 243.201 Plans, Where Kept

This section requires the Railroad to keep plans that are necessary for the proper maintenance and testing of the signal and train control system at each interlocking and intermediate track circuit case. Plans must be legible and accurate, in order to protect against errors in circuitry connections. This is consistent with the Petition and current U.S. practices.

Section 243.202 Grounds

This proposed section requires the Railroad to keep each circuit that affects the safety of train operations, free from any ground or combination of grounds that will permit a flow of current equal to or in excess of 75 percent of the release value of any relay or other electromagnetic device in the circuit. However, the following circuits are not included in this requirement: circuits that include any track rail; the common return wires of single-wire, single-break, signal control circuits using a grounded common; and alternating current power distribution circuits that are grounded in the interest of safety. This is consistent with the Petition and current U.S. practice.

Section 243.203 Locking of Signal Apparatus Housings

This section requires the Railroad to protect signal apparatus housings from unauthorized entry. The proposal requires the Railroad to lock, seal, or secure all external housings of signal and track-side automatic train control system apparatus. The purpose of this

section is to prevent vital components of the signal system from being vandalized or tampered with, which could cause the system to malfunction. The proposed rule is consistent with the Petition and current U.S. practice.

Section 243.204 Design of Control Circuits on Failsafe Principle

This section requires that the failure of a safety-critical control circuit will not cause a condition more permissive than intended. Safety-critical circuits shall be designed on a failsafe principle. This section includes all vital circuits and track circuits through which signal control circuits are selected, including any failure of the data link radio transmission system. Circuits should be designed so that failure of any part or component of the circuit will cause the most restrictive aspects to be displayed. The proposed rule is intended to address the design of the FOX signal system, including electronic and processor-based equipment.

Section 243.205 Power-operated Switch Use

This section requires all switch movements to be completed by power-operated electric switch machines. Hand-operated switches are prohibited in territory controlled by ATC. Each power-operated switch will be controlled from the Railroad's central traffic control center. This is consistent with the FOX petition and current U.S. practice.

Section 243.206 Yard Operations

This section requires the Railroad to control yard operations through the traffic control center for the yard, and to complete all movements in the yard at restricted speed. This section also states that relevant portions of 49 CFR 236.1 through 236.109 apply to signals that are used in FOX yard operations. There are some requirements presently in other sections of this proposed rule that would apply to yard operations. However, since signals and switches used in yard limits will be similar or identical to conventional signal systems currently in use in the U.S., FRA believes that the applicable portions of 49 CFR 236.1 through 236.109 would be more appropriate. These address such items as design of control circuits, operating characteristics, location of roadway signals, and shunting sensitivity.

Section 243.207 Timetable Instructions

The section requires the Railroad to designate all interlockings, automatic train control territory, and yard limits in timetable instructions. The designation may be published in timetable instructions in any manner that the Railroad chooses. This is consistent with the Petition and U.S. practice.

Wayside and Cab Signals

Section 243.208 Location of Wayside Signals

This section requires FOX to position and align each wayside signal so that its aspects can be visually associated with the track it governs. The proposal grants the Railroad discretion to determine where the wayside signals will be positioned. FRA's safety experts will determine whether the location and alignment of each signal complies with the intent of this section and that the signal aspect is associated with the track governed. This section is consistent with the Petition and current U.S. practice.

Section 243.209 Aspects and Indications

Paragraph (a) of this section requires that aspects of wayside signals must be shown by the color of lights, position of lights, flashing of lights, or any combination thereof. They may be qualified by marker plate, number plate, letter plate, marker light, or any combination thereof. Paragraph (b) states that the fundamental indications of wayside signal aspects must conform to the following: a red light or a series of horizontal lights will indicate stop; a yellow light or a lunar light will indicate that speed is to be restricted and stop may be required; and a green light or a series of vertical lights will indicate proceed at maximum authorized speed. Paragraph (c) requires that the names, indications, and aspects of wayside and cab signals must be defined in the Railroad's operating rules or special instructions, and all modifications must be filed with the FRA within thirty days after the modifications take effect. Paragraph (d) states that absence of a qualifying appurtenance or the failure of a lamp in a light signal may not cause the display of a less restrictive aspect than intended.

Paragraph (e) of this section relates to cab display and requires all cab displays to include the maximum authorized speed, shown by a bar graph or a needle in the periphery of the dial used for the indication of train speed; the target speed, shown by numbers; and the target distance corresponding to the indicated target speed, shown by a continuously refreshed bar graph and numbers in case of overflow of the bar graph. Paragraph (f) states that all bar graphs and numbers must be illuminated so that they can be read easily in all lighting conditions in which the equipment will be used. This proposed section is consistent with the Petition and current U.S. practice.

Section 243.210 Markers

This section requires the Railroad to equip all high speed lines with block section markers and route origin markers, and requires all block section limits to be indicated by marker plates installed along the right-of-way. These markers must be located at adjoining block sections and must be illuminated during night operations and when visibility along the line is limited. Paragraph (c) requires that route origin markers must be positioned at the beginning of each route and must be equipped with a proceed light. Paragraph (d) requires the Railroad to provide special shunting markers at locations that are not equipped with route origin markers and where turn-back operations may be required. This marker must be equipped with a shunting light.

This section, as proposed by FRA, is very similar to portions of the Petition, except that FRA requires the block section limits to be illuminated and FOX proposed that the block section limits would be indicated by retroreflective marker plates. FRA believes that, given the speed trains will travel and the frequent storms that occur in Florida, lighted markers enhance the safety of the system, and impose little financial burden. This addition should ensure that locomotive engineers recognize block sections, which is particularly important for occasions when an engineer must rely on the block sections during any interruption of the ATC system.

Section 243.211 Spacing of Beacons

This proposed section requires the Railroad to design the ATC system and beacon spacing so that the locomotive engineer can comply with any imposed speed restriction by initiating a service brake application, and if the locomotive engineer fails to react, an automatic brake application will occur. In ATC territory, the braking distances must be designed in order to compensate for delay time, which will ensure the trainset complies with the target speed and distance through the brake application initiated by the system. An aspect that mandates a stop at the next signal requires sufficient spacing so that a stop can be achieved before reaching the next signal, without an emergency brake application. These proposed sections apply to all systems, including

the Railroad's high wind, flood, intrusion, and dragging equipment protective devices. The section is consistent with the FOX petition and U.S. practice.

Track Circuits

Section 243.212 Track Circuit Requirements

This proposed section sets forth a variety of track circuit requirements. Generally, track relay controlling home signals or beacons must be in the de-energized position, or a device that functions as a track relay controlling home signals or beacons must be in its most restrictive state. In addition, the track circuit must be de-energized when a rail is broken or a rail or switch-frog is removed or when a trainset occupies any part of the track circuit. It will not be a violation if a track circuit is energized because a break occurs between the end of rail and track circuit connector; within the limits of rail-joint bond, appliance or other protective device, which provides a bypath for the electric current; or, as a result of leakage current or foreign current in the rear of a point where a break occurs.

This proposed section is consistent with the Petition and U.S. practice.

Section 243.213 Track Circuit Shunting Sensitivity

This proposed section requires the Railroad to maintain each track circuit controlling a home signal so that the track relay is in a de-energized position, or a device that functions as a track relay will be in its most restrictive state if, when the track circuit is dry, a shunt is connected across the track rails of the circuit, including fouling sections of turnouts. The electric resistance of the shunt must be: 0.15 Ohm on open track and 0.25 Ohm in interlocking areas. These values are given for use with a ballast of 8 Ohm per kilometer (0.62 mi) resistance and is consistent with the FOX petition.

The proposed signal system will utilize jointless audio frequency track circuits on the main line. Typical track circuits on the FOX main line will be center fed, using one transmitter at the center and a receiver at each end of the circuit. In crossover areas, circuits will be combined with sequential release logic in the interlocking controllers to ensure protection against poor wheel-rail contact on seldom-used rail. Jointed high-voltage impulse track circuits must be used in the yards and maintenance facilities.

Section 243.214 Insulated Rail Joints

This section requires the Railroad to maintain insulated rail joints so that the failure of any track circuit, caused by track circuit current that flows between insulated rails, will be prevented. This is consistent with the Petition and U.S. practice.

Section 243.215 Fouling Wires

This section requires that fouling wires consist of at least two discrete conductors, and that each be of sufficient conductivity and maintained in such condition that the track relay will be in de-energized position, or the device that functions as a track relay will be in its most restrictive state, when the circuit is shunted. This is consistent with the Petition and U.S. practice.

Section 243.216 Turnout, Fouling Section

This section requires rail joints within the fouling section to be bonded, and the fouling section to extend at least to a point where sufficient track centers and allowance for maximum car overhang will prevent interference with trainset movement on the adjacent track. It is important that all rail joints are bonded to ensure continuity of track circuits. The proposed rule is consistent with the FOX petition and U.S. practice.

Wires and Cables

Section 243.217 Protection of Insulated Wire; Splice in Underground Wire; Aerial Cable

This section requires insulated wire to be protected from mechanical injury, any splice in underground wire to have insulation resistance at least equal to the wire spliced, and all aerial cable to be supported by messenger. This is consistent with the Petition and U.S. practice. Insulated wire must be positioned in such a manner that it cannot be damaged by the operation of apparatus, vehicles, tools, workers, or by closing doors. Temporary installation of cable or wires on top of the ground is prohibited by this section.

Section 243.218 Tagging of Wires and Interference of Wires or Tags With Signal Apparatus

This section requires the Railroad to tag or otherwise mark each wire so that it can be identified at each terminal. Tags and other identifiers must be made of insulating material, arranged so that they do not interfere with the moving parts of equipment, and correspond with the circuit plans. The proposed rule is consistent with the FOX petition and U.S. practice.

Standards

Section 243.219 Control Circuits; Requirements

This section of the proposal requires the Railroad to install each signal or beacon that governs train movements into a block section so that it will convey its most restrictive state as long as any of the following conditions exist within the block: a trainset occupies the block, points of a switch are not closed in proper position; a track relay is in de-energized position or a device which functions as a track relay is in its most restrictive state; or, when a signal control circuit is de-energized. This section reflects the unique characteristics of the FOX beacon and loop transmission signal system (TBL) and is consistent with the Petition.

Section 243.220 Control Circuits for Signals, Selection Through Point Detector Operated by Switch Movement

This section requires that control circuit(s) for each signal aspect or beacon, which conveys an indication more favorable than ''proceed at restricted speed'' for signal governing movements over switches, be selected through a point detector operated directly by switch points for each switch, movable-point frog, and derail in the routes governed by such signal or beacon. Circuits must be arranged so that the signal or beacon can convey an indication more favorable than ''proceed at restricted speed'' only when each switch, movable-point frog, and derail in the route is in proper position. This section reflects the FOX TBL system and is consistent with the Petition.

Section 243.221 Time Locking; Where Required

This section of the proposal requires the Railroad to provide time locking in conjunction with signal aspects or beacons that convey indications more favorable than ''proceed at restricted speed.'' FRA will expect that any signal that displays an aspect more favorable than ''proceed at restricted speed'' will have time locking. This requirement would apply regardless of any speed restrictions that may be placed on a stretch of track at any given time. The time locking must be effective for the maximum authorized speed that is permitted on each route. Also, this section requires the Railroad to provide locking for all interlocking signals where route or direction of traffic can be changed. FRA's proposal differs from the Petition by using the term ''interlocking signals'' rather than'controlled signals' because the

FOX system will consist of interlockings.

Section 243.222 Indication Locking

This proposed section requires the Railroad to provide indication locking for switches, movable-point frogs, and derails. Indication locking should prevent the clearing of signals governing movements over switches, movable-point frogs, and derails until each operative unit has completed its required movement. This is consistent with the Petition and U.S. practice.

Section 243.223 Electric Locking Circuits

This proposed section requires the Railroad to provide vital design methods to prevent the system from displaying aspects that will result in conflicting or unsafe movements. The operation of controlling devices, logic, or apparatus are required to succeed each other in proper sequence before a proceed aspect can be displayed. Vital design methods in interlocking circuitry shall prevent ''proceed'' aspects from being displayed for conflicting movements.

Section 243.224 Loss of Shunt Protection; Where Required

This section requires that loss of shunt protection not permit the release of the route locking circuit of each power-operated switch. The loss of shunt protection must be based on a sequential release logic. Sequential release logic requires that when any track circuit becomes occupied in logical sequence from a previous track circuit, in combination with an established train route, its status will not be allowed to return to unoccupied, even though the detected shunt may be lost, until a specified safe time interval after the next track circuit in the route becomes occupied. This section is consistent with the Petition and U.S. practice.

Section 243.225 Signal Control Circuits, Selection Through Track Relays or Devices Functioning as Track Relays

This section requires control circuits for signal aspects or beacons, which convey indications more favorable than ''proceed at restricted speed,'' to be selected through track relays, or through devices that function as track relays, for all track circuits in the route governed. This section would not apply to control circuits of signals displaying aspects with indications of ''proceed at restricted speed.'' This is consistent with the Petition and U.S. practice.

Section 243.226 Switch, Movable-Point Frog or Split-point Derail

This section requires the Railroad to equip switches, movable-point frogs, or split-point derails with clamp locks on each switch or movable point frog and to maintain it so that it cannot be locked when the point is open 6 mm (.25 in) or more. Each high speed turnout on the main line must be equipped with a pair of switch machines (one for the points and one for the movable frog), clamp locks, and position detectors.

Section 243.227 Point Detector

This proposed section requires the Railroad to maintain point detectors so that when switch mechanisms are locked in normal or reverse position, contacts cannot be opened by manually applying force at the closed switch point. Point detector circuit controllers must be maintained so that the contacts will not assume the position corresponding to switch point closure if the switch point is prevented by an obstruction, from closing to within 6 mm (0.25 in). This is consistent with the Petition.

Section 243.228 Signals Controlled by Track Circuits

This section requires control circuits for aspects with indications more favorable than ''proceed at restricted speed'' to be controlled by track circuits extending through an entire block section. A block section would extend from signal to signal, or from signal to its defined limits at end of the system. This section is consistent with the Petition and U.S. practice.

Section 243.229 Circuits at Interlocking

This proposed section prevents circuits at interlockings from displaying aspects that would permit conflicting movements. FRA's proposal uses the term ''interlocking'' rather than the FOX term, ''control point,'' because the proposed system will actually consist of interlockings.

Section 243.230 Signals at Adjacent Interlockings

This proposed section requires signals at adjacent interlockings to be arranged so that movements at greater than restricted speed cannot be displayed simultaneously for conflicting movements. The intent of this section is to ensure that the maximum authorized speed between adjacent interlockings where signals can simultaneously display aspects indicating ''proceed at restricted speed'' may not exceed 20 mph, regardless of more favorable aspects displayed. This is consistent with U.S. practice.

Section 243.231 Track Signaled for Movements in Both Directions, Change of Direction of Traffic

This section requires that where track is signaled for train movement in both directions, occupancy of the track between opposing signals at adjacent interlockings must prevent changing the direction of traffic from that which was obtained at the time the track became occupied. After a train, locomotive, or power car has passed a signal displaying an aspect permitting it to proceed into and through an interlocking, the opposing signals at the adjacent interlocking will not be permitted to display any aspect with an indication other than ''stop,'' so long as the section of track between interlockings is occupied. The only exception to this applies in instances when a train is left on the main track while its locomotive, power car and/or cars move into an adjacent siding or yard for switching purposes and must, in returning to its train, reverse its direction for a short distance. It would be permissible in such instances to permit such movements to be made with a signal aspect indicating ''proceed not to exceed restricted speed'' into the occupied block.

Section 243.232 Route Locking

The section requires the Railroad to provide route locking at all interlockings where power-operated switches are located. When a train, locomotive, or power car passes a signal displaying any type of proceed aspect, including ''proceed at restricted speed,'' over power operated switches, track circuits and route locking would be required.

Section 243.233 Wayside Detectors

This section addresses all of the wayside detection systems that will be located in the FOX right-of-way and connected to the Railroad's central traffic control system. The Railroad must establish guidelines for the events that trigger the detection systems in such a way that all potentially hazardous occurrences are conveyed to the signal system or central traffic control.

Paragraph (c) of this section requires the Railroad to install fall intrusion detectors at all highway, animal, and non-Railroad equipment overpasses and underpasses. Fall intrusion detectors must be activated when the network of protective wiring located at each overpass and underpass experiences a partial or complete break, and this

information must be transmitted to central traffic control continuously. The Railroad's system safety plan must list the location of all fall intrusion detectors, and dictate the actions that will be taken when intrusions occur.

Paragraph (d) requires the Railroad to install an intrusion detection system in the protective fencing along the Railroad right-of-way that must restrict, to the fullest extent possible, unauthorized entry by trespassers, personnel, equipment, and animals. This system shall be installed at each location that is identified in the system safety plan as an area where intrusion is likely to occur. This system must be connected to the Railroad's signal system and to the central traffic control system, and must alert the Railroad to any intrusion. Also, the Railroad must explain in detail where intrusion is likely to occur and why, and set forth specific actions that will be taken when intrusion occurs.

Paragraph (e) requires the Railroad to install dragging equipment detectors at all locations where underframe repair or maintenance work is performed, and at other locations determined necessary by the system safety plan. This system must transmit data continuously to the central traffic control so that Railroad personnel can make appropriate adjustments in operations. The Railroad must explain, in detail, in the system safety plan where dragging equipment is likely to occur and why, and prescribe specific actions that will be taken when dragging equipment is located. The Petition proposed to locate these detectors only where underframe repair and maintenance work is completed, but FRA believes that dragging equipment may actually occur more often at other locations throughout the system. FRA believes that when a rail unit leaves a repair facility it is less likely to be in defective condition than when it travels other portions of the system. Also, equipment that is entering or leaving repair facilities will not be carrying passengers, and so the risk of injury at these locations is minimal. Therefore, FRA proposes in this section that the Railroad, in the process of the system safety analysis, determine where the risk of dragged equipment exists, and place detectors at those locations.

Paragraph (f) requires the Railroad to install flood detectors where determined necessary by the system safety plan. This determination must include consideration of drainage, culverts, bridges, overpasses, underpasses, and flood plain status along the right-of-way. The flood detection system must alert the signal system and central traffic control of any location where an accumulation of water exists in the right-of-way that may present a risk to a right-of-way structure or in-service railroad equipment. The Railroad's system safety plan must include specific actions that will be taken when high water is detected.

Paragraph (g) requires the Railroad to install wind detectors along the right-of-way, where it is determined to be necessary pursuant to area wind and weather patterns, topography, and proximity to large bodies of water. Wind speed data must be conveyed to the central traffic control continuously so that Railroad personnel may make operational changes when necessary. The Railroad's system safety plan must explain where and why wind detectors are located along the right-of-way, list the speeds and conditions at which operational safety is compromised; and set forth the specific actions that will be taken when those wind speeds occur.

Paragraph (h) requires the Railroad to install and maintain hot box detectors along the length of the right-of-way to detect the journal bearing temperature of all moving rail equipment. The wayside detectors must be arranged so that the journal bearing temperature on both sides of each train, and on each track, is monitored. The detectors must be located at least once every twenty-five miles, and must be linked to the signal system to alert the locomotive engineer or the central traffic control system, or both, depending on the level of the overheating, so that Railroad personnel can take appropriate action. This system shall include a hierarchy of alarms, which will alert the Railroad to the level of overheating that is occurring and bring about corresponding actions. For instance, when journal bearing temperature could cause safety-critical components to fail in operation, the detection system will cause the defective train to stop at a designated block marker, and cause all passing trains to slow to a speed of 50 mph or less. When the detectors reveal defective equipment that is less serious, but may result in unsafe operations, the system will require the equipment to move to the next siding, where it will be inspected before movement. Finally, the system will include inspection threshold alarms that will alert the Railroad to journal bearing temperature in a trainset that is significantly higher than the average temperature taken on the other journal bearings. This alarm will be transmitted to the central maintenance facility so that the appropriate inspection and repair can be completed.

The Petition contained several sections on wayside detection systems. FRA has consolidated the concept by placing them together in subpart C, and we require the Railroad to develop the detectors in conjunction with the system safety analysis required by subpart B of this NRPM. The Petition did not contain sufficient clarity concerning the detection systems, which conditions would trigger a Railroad response, and what the Railroad response would be, and so FRA invites comment from FOX and other interested parties on the language we propose in this section. It is difficult to predetermine what events may occur in Florida and how the Railroad should respond to varying levels of high wind or water, for instance. FRA believes that the system safety approach is the most effective way of dealing with all of the factors and conditions that may arise in Florida, and so we have added that connection to the proposed rule text. However, FRA is also concerned that this section may not yet be clear enough, in terms of providing notice to the Railroad and interested parties on the appropriate activity that must accompany potentially unsafe events, and what degree of safety is compromised before the activity is required. Therefore, FRA requests comments from the public on suggested language or concepts that may more fully address the risk factors presented.

Section 243.234 Protection of Maintenance-of-Way Personnel

This section requires that the signaling system include circuitry to lock-out particular block sections and restrict the speed of passing trains on these block sections or adjacent trackage for the protection of maintenance of way personnel, and that corresponding procedures be covered in the Operating Rules. This is consistent with the Petition and current U.S. requirements. FOX proposes that after receiving authorization from the CTC center, roadway workers would be able to ensure their safety by use of a local switch that will protect them from unsafe or inconsistent train movements.

Section 243.235 ATC Device Installation

This section requires that each power vehicle capable of being the lead vehicle be equipped with an automatic train control or ATC device that will operate when the trainset travels at a speed of more than 32 km/h (20 mph). This is consistent with the Petition and U.S. practice. It is important to note that FOX is designing the system to operate so that, if the ATC system does not operate correctly when the speed is greater than 32 km/h (20 mph), external backup

speed control equipment will limit the speed to 32 km/h (20 mph).

Section 243.236 Forestalling Device and Speed Control

Paragraph (a) of this section establishes the requirements of the ATC system arrangement. Paragraph (b) establishes required features of the ATC system, such as braking supervision and maximum speed supervision. This section is consistent with the Petition and U.S. practice, although the system is more advanced than systems in use in this country at the present time. FOX is designing the ATC system to incorporate the following: (1) Multiple processor architecture and on-board equipment; (2) Trackside encoders sending messages through the track beacons and short cable loops, providing notifications of upcoming curves and gradients in the next portion of the line, distances to point, and speed restrictions; (3) On-board equipment that calculates the braking curve requirements with respect to the data received.

Section 243.237 Cab Signal Indication in Accordance With Maximum Speed Limit

This section requires that while providing maximum speed supervision, the Railroad's ATC system will provide a cab signal indication of the maximum authorized speed. This will provide the locomotive engineer with valuable speed authorization information. The proposal is consistent with the petition and U.S. standards.

Section 243.238 Automatic Brake Application; Initiation When the Maximum Speed Limit Is Exceeded

This section requires that the Railroad's ATC system operate to initiate an automatic brake application when the speed of the train exceeds the maximum speed intervention curve. The Automatic brake application can be interrupted by the locomotive engineer only when the speed of the train is lower than the maximum authorized speed. This is consistent with the Petition and U.S. practice. The FOX design includes supervision for a local maximum authorized speed which will consist of: (1) Providing a cab indication of the maximum allowed speed; (2) issuing an audible and/or visual warning if the trainset speed exceeds the maximum allowed speed by a predefined margin and; (3) automatically applying the brake if the trainset speed exceeds the maximum authorized speed by a predefined margin.

Section 243.239 Advance Cab Signal Indication.

This section requires that the ATC system provide a cab signal indication of the target speed and distance before commencing the braking supervision, thus allowing the locomotive engineer to respond by a manual brake application. The section is consistent with the petition and U.S. standards. The opportunity for information enabling a manual brake application by the locomotive engineer is obviously more desirable than resorting to ATC system braking intervention.

Section 243.240 Automatic Brake Application Initiated by the ATC

This section requires that the ATC system initiate an automatic brake application to ensure compliance with target speed and target distance, in the absence of an appropriate response to a cab display indication on the part of the locomotive engineer. This is consistent with the Petition and U.S. practice. The FOX system will be designed so that prior to intervention, the ATC system will provide an audible and/or visual warning so that intervention will be avoided if the engineer reacts within a pre-defined delay.

Section 243.241 Cab Signal Indication After Authorization to Enter a Block Section Where Conditions Defined in § 243.219 Exist

Paragraph (a) of this section requires that if a trainset is authorized to enter a block section in which any condition listed in § 423.219 of this Part exists, the ATC system must display an indication to ''Proceed at Restricted Speed.'' Paragraph (b) requires if the restricted speed is exceeded, the ATC must initiate an automatic brake application. This is consistent with the Petition and U.S. practice. This section will ensure that if another trainset is occupying the block, a switch point is not closed in the proper position or something such as a broken rail is causing a track relay to be deenergized, the trainset authorized to enter such block will be protected from a collision or derailment.

Section 243.242 Audible Indicator

This section requires that the audible cab indicator have two distinctive sounds and be clearly audible throughout the cab under all operating conditions. When the cab display changes, the audible indicator will sound briefly (for approximately 0.5 seconds) to draw the locomotive engineer's attention to the change. This sound will be used to draw the engineer's attention when there is some change in the speed authorization, whether permissive or restrictive. There will be no acknowledgment necessary for this sound. A different audible warning will sound before an automatic brake application is initiated. The warning will be given in sufficient time to allow the locomotive engineer and the train brake equipment to respond to the change. This indicator will sound continuously until the warning condition disappears. The section is consistent with the Petition and U.S. practice. Methods to silence or muffle the audible indicator, such as tampering with the audible device, would be prohibited.

Section 243.243 Delay Time

This section requires that the delay time of the ATC train-borne equipment ensure that the trainset complies with the target speed and distance through the brake application initiated by the system. This section is consistent with the Petition. The principle of the ATC system does not factor in a preset delay time of 8 seconds, as is required by 49 C.F.R. 236.563. Instead, the system permanently checks the level of braking available on the train and takes into account these data to compute the warning and braking curves.

Section 243.244 Automatic Brake Application; Full Service

This section requires that an automatic brake application initiated by the ATC system will cause a full service application of the brakes. This is consistent with the Petition and U.S. practice. FRA will consider a full service brake application to be an application of the brakes, other than emergency, which develops the maximum brake cylinder pressure, as determined by the design of the brake equipment for the speed at which the train is operating.

Section 243.245 Interference With Application of Brakes by Means of Brake Valve

This section will ensure that the ATC apparatus is arranged so the automatic application of the brakes cannot be interfered with by means of the brake valve and the efficiency of the braking system will not be impaired, thus assuring safe train movements. This is consistent with the Petition and with U.S. practice.

Section 243.246 Control From Lead Vehicle

This section requires that each trainset be controlled and operated from the lead vehicle. Each lead vehicle will be equipped with an ATC device. This device will have a fail safe and fault

tolerant architecture, such as a two out of three voting architecture. This is consistent with the Petition and constitutes a desirable method of ensuring safety of train operation and system reliability.

As defined in this proposal, ''fault tolerant architecture'' means the built-in capability of a system to provide continued (full or limited) operation in the presence of a limited number of faults or failures of the system, such as a defect in a hardware device, component or an incorrect step, process or data definition in a computer program.

''Two out of three voting architecture'' means three independent processors operating on dissimilar software operating in such a manner so as to compare the software output from each processor to ensure safety critical results match. If one processor produces an answer inconsistent with the other two processors the conflicting processor is taken off-line and the two remaining processors continue to compare with each other and drive safety critical commands, only as long as they both agree. If the remaining two processors fail to agree, the system will cease to issue safety critical commands and will be shut down and assume a safe state.

Section 243.247 Proper Operative Relation Between Parts Along Roadway and Parts on Power Car

This section requires that ATC track-side and power car components be designed and operate in compatibility under all conditions of speed, weather, wear, oscillation, and shock. This section is consistent with the Petition and U.S. practice, and will ensure ATC system reliability under various outside influences.

Section 243.248 Visibility of Cab Signals

This section requires that cab signals be plainly visible to the locomotive or power car crew from their stations in the cab. The proposal is consistent with the Petition and U.S. practice. Cab signals will be required to be installed so that the crew member or members can plainly see aspects displayed from their normal position in the cab. The cab signal will be required to be properly illuminated, without cracked or broken roundels and its view not obstructed by other equipment installed in the cab.

Section 243.249 Power Supply

This section requires that the ATC system operate from a separate or isolated power supply. The proposal is consistent with the Petition and U.S. practice. Power supplies for ATC systems should be separate and distinct to eliminate interference from other electrical control circuits, thus ensuring reliable power to the ATC system.

Section 243.250 Seal, Where Required

This section requires that a seal be maintained on any device other than the brake-pipe cut-out cock (double-heading cock), where the operation of the pneumatic portion of the automatic train-control apparatus can be cut out. This is consistent with the Petition and U.S. practice. The seal is required to be applied in such a manner that the device cannot be operated to cut out the apparatus without breaking the seal. This provides a means to prevent tampering with the ATC system.

Section 243.251 Rate of Pressure Reduction; Equalizing Reservoir or Brake Pipe

This section will ensure that equalizing-reservoir pressure or brake-pipe pressure reduction during an automatic brake application will be at least equal to a manual service brake application. This is consistent with the Petition and U.S. practice, and will prevent an automatic brake application from being less effective than an application by the locomotive engineer.

Section 243.252 Restrictions Imposed When Device Fails and/or is Cut Out En Route

Paragraph (a) of this section provides instructions for train operation in the event of ATC system failure or when the ATC system is cut-out en route. It is important to note that, for purposes of Subpart C, the ATC system will be considered to be in failure when two or more of the on-board processors are not operating as intended. If one on-board processor malfunctions, the remaining two are designed to capably operate the train safety, and so this event will not be considered to be an ATC failure. It is also important to note that, for purposes of this Subpart, ATC failures are not limited to malfunctioning on-board processors. A variety of conditions may occur to result in ATC failure, and all of them are contemplated by the language in this Subpart.

Paragraph (b) requires that where an ATC system fails or is cut out en route, the Railroad must test the ATC, record the results in accordance with § 243.276 (departure test) and § 243.278 (results of tests), and determine that the ATC is fully operative before the trainset leaves its next initial terminal. This section is consistent with the Petition and U.S. practice.

Section 243.253 The Trackage

This section requires that the trackage over which the Railroad operates trains in revenue service be completely equipped with wayside equipment designed to interface with and provide safety control commands to the lead vehicle of trainsets which operate over that trackage. Signaling beacons and antennas will be installed and maintained in accordance with manufacturer's specifications. This is consistent with the Petition and U.S. practice. The ATC system wayside equipment proposed by FOX will consist of active beacons and cable loops which will be used to transmit intermittent and semi-continuous data from the track to the train. The appropriate quantity of beacons and loops will be calculated in order to meet performance targets and will be adapted to the local conditions. Wayside encoders will be used to store permanent data for the topology of the line, and the data sent to the train through beacons and loops will interface with the interlocking system.

Section 243.254 Cut Out of the ATC System

This section requires that any cut out of the ATC system or activation of the acknowledging device be registered in the on-board event recorder. This is consistent with the Petition and an improvement over current U.S. practice, which currently involves keeping a record of system cut-out. This section will ensure accurate data depicting any ATC system intervention.

Reporting Requirements

Section 243.255 Accidents Resulting from Signal Failure

This section requires that the occurrence of an accident/incident arising from the failure of an appliance, device, method or system to function or indicate as required by this NPRM that results in a more favorable aspect than intended or other conditions hazardous to the movement of a train, shall be reported within 24 hours to the FRA by toll free telephone number, 800–424–0201. This is consistent with the Petition and U.S. practice.

Section 243.256 Signal Failure Reports

This section establishes a time period of five days in which the Railroad must report each failure of an appliance, device, method, or system to function or indicate as required by these standards that results in a more favorable aspect than intended or other condition hazardous to the movement of a train. Form FRA F6180–14, ''Signal Failure

Report,'' must be used for this purpose and completed in accordance with instructions printed on the form. This section is consistent with the Petition and will constitute a recordkeeping requirement. Current U.S. requirements dictate a time period of fifteen days. However, since this is a controlled environment and proper ATC system operation will be vital to the safety of the passenger trains operating at high speeds, there is a need for faster notification by the Railroad and an FRA investigation concerning any unsafe signal failure.

Section 243.257 Annual Signal Systems Report

This section requires that the railroad file an annual signal systems report, which will detail current signal system information, on a form provided by FRA in accordance with instructions and definitions on the reverse side of the form. This section was not in the Petition, but is consistent with current U.S. practice.

Inspection, Testing and Maintenance

Section 243.258 General

This section requires that the Railroad's inspection, testing and maintenance program be designed to ensure that the safety of the Railroad's signaling system does not deteriorate over time, in accordance with § 243.107 of this proposal.

Section 243.259 Interference with Normal Functioning of Device

This section requires that inspection, testing and maintenance will not interfere with or alter the normal functioning of any signal device, except after measures are in place to provide for the safety of train operations that depend on normal functioning of such device. This is consistent with the petition and U.S. practice. Interference would be any condition that circumvents, hinders, impedes, or diminishes whatsoever the intended protection of a device, and may be done by testing, installing, repairing, replacing, operating, or manipulating a component indicating or affecting the indication of safe passage for trains. There will be no difference between accidental or intentional interference with respect to the enforcement of this rule.

Section 243.260 Operating Characteristics of Electromagnetic, Electronic, or Electrical Apparatus

This section requires that signal apparatus which affects the safety of train operations, be maintained in accordance with the design limits of the device. This is consistent with the Petition and U.S. practice. The railroad must have specifications setting forth the pick-up values, release values, working values, and condemning limits of these values for all applicable signal apparatus in use on its property. Manufacturer specifications or Railroad standards compatible with manufacturer specifications will be used to determine such values.

Section 243.261 Adjustment, Repair, or Replacement of Component

This section requires that when any component of a signal system that is essential to the safety of train operation fails to perform its intended signaling function or does not correspond with known operating conditions, the cause shall be determined and the faulty component adjusted, repaired or replaced as soon as possible. This is consistent with the Petition and U.S. practice. The Railroad would be required to determine the cause of each ''stop'' or ''stop and proceed'' aspect resulting from an unknown condition. If that condition is the result of the failure of a signaling component and is a hazard to safe operations, corrective action is required before the next train movement.

Section 243.262 Purpose of Inspection and Tests; Removal From Service of a Relay or Device Failing to Meet Test Requirements

This section requires all inspections and tests to be made in accordance with the specifications of the Railroad and approved by FRA as part of the system safety plan. Tests should be made to determine if the equipment is maintained in the appropriate condition so that it will consistently perform its intended function. Any electronic device, relay, or other electromagnetic device that fails to meet the requirements of the specified tests will be removed from service, and not returned to service until its operating characteristics are consistent with the design limits. This is consistent with the Petition and U.S. practice. This section would apply to all devices that effect the safety of train operations. It is understood and accepted throughout the railroad industry that all signal devices must be designed so that the limits of their operating characteristics provide adequate safety margins.

Section 243.263 Point Detector Test

This section requires the Railroad to test point detectors operated by power-operated switch movement at least once every three months. This test ensures that a safe tolerance of switch point closure is maintained. This section is consistent with the Petition and U.S. practice.

Section 243.264 Relays; Microprocessor Testing

Paragraph (a) of this section requires that each safety-critical, train-borne ATC relay be tested at least once each year to ensure the correct parameters of the relays. Paragraph (b) requires that each safety-critical, wayside relay be tested at least once every four years to ensure the correct parameters of the relays. Paragraph (c) requires the Railroad to test each safety-critical, train-borne electronic subsystem which is not verified internally on a continuous basis at least once each year. Paragraph (d) provides that each safety-critical, train-borne electronic subsystem, in which proper operation is verified internally in a closed loop fashion, will not require periodic tests. Subsystems that contain continuous verification will not need to be tested because of their fail safe design. Paragraph (e) requires the Railroad to test each safety-critical wayside electronic subsystem, which is not verified internally on a continuous basis, at least once every two years. Paragraph (f) provides that each safety-critical wayside electronic subsystem, in which proper operation is verified internally in a closed loop fashion, will not require periodic tests.

The paragraphs in this section are consistent with the Petition and U.S. practice. Although the relay testing requirements of this rule are based on 49 CFR part 236, new language has been added to this proposal in order to address microprocessors.

Section 243.265 Ground Tests

Paragraph (a) requires the Railroad to test for grounds on each safety-critical energy bus furnishing power to circuits at least once every three months. Paragraphs (b) and (c) provide exceptions to this requirement. Periodic ground tests would not be required if ground detection devices are properly functioning, or if the design of circuits is such that a grounded energy bus could not impact the safety of train operation. An inspection of the ground detection device to ensure proper operation of the device will be required at least once every three months. This section is consistent with the Petition, except for the inspection of ground detection devices, and with U.S. practice, except that ground tests are not required when automatic detection devices are used. If ground detection devices are used, such devices should

be verified for proper operation on a periodic basis.

Section 243.266 Insulation Resistance Tests; Wires in Trunking and Cables

Paragraph (a) of this section requires that an insulation resistance test of signal system wires and cables be made at least once every 10 years to ensure that circuit conductors are in proper working order for the safe operation of the signal system. Paragraph (b) provides that a circuit may not be permitted to function on a conductor that has an insulation resistance to ground or between conductors of less than 200,000 ohms. When a test reveals this condition, the conductor must be removed from service immediately to avoid the risk of an unsafe failure in the Railroad's signal system. This section is consistent with the FOX petition and U.S. practice.

Section 243.267 Time Releases, Timing Relays and Timing Devices

This section requires the Railroad to test time releases, timing relays, and timing devices at least once each year. The timing must be maintained at no less than 90 percent of the predetermined time interval, to ensure adequate predetermined parameters, such as train braking distance calculations. The predetermined time will be shown on the plans or marked on the time release, timing relay, or timing device. Where time releases are an integral part of a safety-critical, processor-based controller, and are specified in the applications program, such intervals must be tested only at the time of installation and whenever a change is made in the applications program. This section is consistent with the Petition and with U.S. practice.

Section 243.268 Time Locking

This section requires that where time locking is an integral part of a safety-critical, processor-based controller, and is specified in the applications program, the locking will be tested at the time of installation and whenever a change is made in the applications program. This is consistent with the Petition. The time locking test will determine that no route can be changed until a predetermined amount of time has expired, ensuring the safe movement of the train whose route has been established. There will be no periodic testing required under this rule, such as once every two years, which is required in 49 CFR part 236, because the vital logic processor of the interlocking controller will employ two processors that operate simultaneously in a redundant, checking-system architecture. All safety-critical operations will be continuously performed by both processors. The solid state controller will be based on closed loop principles, software diversity, and the use of vital hardware design techniques.

Section 243.269 Route Locking

This section similarly requires the Railroad to test route locking at the time of installation, whenever a change is made in the applications program, and when route locking has been disarranged. This is consistent with the Petition, except that FRA has included the test requirement ''when route locking has been disarranged.'' In this context, the term ''disarranged'' could apply to several circumstances. Route locking will be considered to be disarranged when: a vital relay, if used, in the route locking circuit is replaced with another; when two or more conductors are severed; when a cable or conductor in a locking circuit is replaced with another; or when wires are removed at the same time from more than one terminal of a relay or terminal board. The route locking test will determine that a train's route cannot be changed once the train has passed a signal indicating proceed until the train has cleared the track section of the route governed. No periodic testing is required by this proposal for the reasons previously stated in § 243.268.

Section 243.270 Indication Locking

This section similarly requires that indication locking be tested at the time of installation, whenever a change is made in the applications program and when the indication locking has been disarranged. This is consistent with the Petition and U.S. practice, except that no periodic testing is required for the reasons stated previously. The indication locking test will ensure that no conflicting route can be established, and no power-operated switch can be moved with a route already established for a train.

Section 243.271 Traffic Locking

This proposed section requires the Railroad to test traffic locking at the time of installation and whenever a change is made in the applications program. This is consistent with the Petition and U.S. practice, except that there will be no periodic testing required by this rule for the reasons stated previously. The traffic locking test will determine that the direction of train traffic cannot be changed, for instance, an opposing proceed signal displayed, where a route is already established for a train in one direction.

Section 243.272 Switch Obstruction Test

This section requires the Railroad to conduct a switch obstruction test of each switch when the lock rod is installed, and at least once every 3 months. This section is consistent with the Petition. This deviates from the monthly switch obstruction test currently required of existing railroads because of the differences in the FOX operating environment. FRA believes that switches will experience little or no variation from their original adjustments.

Section 243.273 Locomotive or Powercar Power Supply Voltage Requirement

This section requires that the output voltage of the power supply for FOX locomotive ATC will be maintained within 10 percent of rated voltage. This will ensure adequate and steady energy to operate the ATC system. This section is consistent with the Petition and U.S. practice.

Section 243.274 Power-Car or Locomotive Insulation Resistance; Requirement

This section requires that when the periodic test prescribed in § 243.266 is performed, insulation resistance between wiring and ground of the automatic train control system may not be less than one megohm. This deviates from the Petition by stating a value for minimum insulation resistance. This requirement is based on current practice for existing operations in this country. The standard referred to in the FOX Petition for insulation resistance (EN–50155) does not state a minimum value, and hence, provides no notice as to what the standard is and would be unenforceable.

Section 243.275 Antennas and Beacons

This section requires the Railroad to inspect and maintain signaling beacons and antennas in accordance with manufacturer's specifications. Also, antennas and beacons that have been repaired or rewound must adhere to the same operating characteristics which they possessed originally or as specified for new equipment. This proposal would ensure that the beacons or antennas are in condition sufficient to transmit reliable data to the on-board ATC equipment. This section is consistent with the Petition and U.S. standards.

Section 243.276 Departure Test

Paragraph (a) of this section requires the Railroad to test the train-borne ATC

equipment by operation over track elements, by operation over a test circuit, or by an on-board test device in order to ensure a reliable means of testing the apparatus. Paragraph (b) requires the Railroad to determine the extent of the departure test in accordance with the system safety analysis described in Subpart B, and include, at a minimum, ground-to-train transmission, the cab display indications, and the interface with the train brakes.

Paragraph (c) requires the Railroad to perform a departure test, and put on-board ATC equipment in service before the trainset operates over equipped territory. If the ATC is cut out, the Railroad must perform another departure test before the ATC equipment can be considered operative. Paragraph (d) provides only one departure test is required in each 24-hour period, except as provided in § 243.252(b) concerning failures or cut-outs en route. This is consistent with current U.S. practice and has provided a high level of safety.

Paragraph (e) requires the Railroad to record each test run and its outcome in the train-borne event recorder, downloaded and retained for at least one year. This will provide a database in the event that a determination of proper testing is needed.

This section is consistent with the Petition and U.S. practice, except for the train-borne event recorder requirement, which is a desirable feature of this ATC system that will enhance safety. ''On-board equipment'' will consist of the on-board unit, vehicle antenna, cab display, and systems that will interface with the train, including a speed measurement system, an event recorder, and an on-board microprocessor system network. The on-board unit consists of processing logic and receiving/transmitting equipment. The vehicle antenna will be mounted under the power-car frame and will receive line description data. The cab display will include the actual speed of train, target speed, target distance, and maximum authorized speed information.

Section 243.277 Periodic Test

This section requires the Railroad to perform a periodic test of the train-borne ATC equipment at least once every two months and on multiple-unit cars as specified by the Railroad, subject to approval by FRA. The Petition recommended a periodic test at least once each year. Current U.S. practice requires a periodic test at least once every 92 days. However, existing standards require a ''daily or after trip test,'' unless a periodic test is done at intervals of not more than two months. It is FRA's belief that, unless the Railroad intends to perform daily or after-trip tests, the ATC equipment should be tested on the same periodic basis as required by current U.S. industry standards. FRA sees nothing in the FOX system to make this requirement unnecessary, and believes that the test enhances safety with minimal cost.

Section 243.278 Results of Tests

This section requires the Railroad to record the results of tests made in compliance with §§ 243.252(b), 243.262 through 243.272 inclusive, 243.276, and 243.277. This section sets forth the required information for recording tests either via pre-printed or computerized forms, or by electronic means. This section is consistent with the Petition and U.S. practice.

Section 243.279 Independent Verification and Validation

This section describes the process by which an independent entity with known technical expertise will conduct an audit of all safety-critical, processor-based equipment in the Railroad's signal system. The audit must be done on the system as it is finally configured, and before revenue operations commence. Paragraph (b) lists the items that the audit must review, and paragraph (c) requires preparation of a report by the independent audit firm. Paragraph (d) describes the procedure by which the report and the Railroad's signal system will be accepted.

FRA believes that this process is necessary in order to ensure the integrity of the FOX signal system. As discussed earlier, the system is not currently in revenue service anywhere in the world, and although safety experts agree that it will likely improve railroad safety, there is no safety record available on which FRA can assess the system's reliability and endurance during operations. Of particular concern is the likelihood of severe weather in Florida, which could disrupt or obliterate the operation of the signal system. FRA believes that an independent audit of the system's software and processors will reveal any system weakness and assist the Railroad in mitigating hazards. FRA does not have the expertise at this time to conduct such an audit, and so seeks appropriate input from recognized, independent experts in the field before the system is approved for revenue service. FRA has required other companies to undergo similar independent validation and verification inspections, and believes that such an inspection is equally wise in the case of FOX. FRA understands that the FOX signal system is being tested presently in Belgium, and will likely be used in revenue service in Europe prior to the commencement of FOX operations. FRA anticipates that the European testing will reveal and correct potential problems, which will benefit FOX and help to focus the review done on the system in the U.S. However, FRA expects that the right-of-way chosen for Florida and the extreme weather conditions that exist, present new factors that will not be considered during the testing in Europe. For all of these reasons, FRA believes that an independent audit would greatly enhance the safety of the system, and will ultimately work to the Railroad's advantage. This proposal was not included in the Petition. FRA seeks comment from the public concerning the value of the audit and any other information that the Agency should evaluate concerning the FOX signal system.

FRA suggests as a guide a verification and validation study commissioned by the Volpe Transportation Systems Center, and completed by Battelle in 1995, entitled Safety of High Speed Ground Transportation Systems, Analytical Methodology for Safety Validation of Computer Controlled Subsystems, Volume 1: State-of-the-Art and Assessment of Safety Verification/ Validation Methodologies (Battelle Volume 1 Report), and Volume 2: Development of a Safety Validation Methodology (Battelle Volume 2 Report).

Subpart D—Track Safety Standards

Subpart D of the NPRM sets forth minimum track safety standards for the FOX system. These proposed standards are based on the Petition, the Agency's proposed high speed track standards for general application in the U.S. railroad industry (62 FR 36138, July 3, 1997) known as ''Track Subpart G,'' and other pertinent standards used internationally. A brief discussion of each of these is warranted, in order to understand the standards proposed in this NPRM for application on FOX.

FRA's Railroad Safety Advisory Committee (RSAC) convened a working group to revise, where appropriate, the existing track standards that govern track safety in the general railroad system (49 CFR part 213). The working group included representatives from rail labor, railroads, trade associations, state government groups, track equipment manufacturers, and FRA. The working group established a special task group, which consisted of individuals with

high speed track expertise, to focus specifically on new high speed track standards.

The high speed task group recognized that high speed track safety standards should be based on sound engineering research, and foreign and domestic practice, and, be understandable, cost beneficial, and enforceable. With these principles in mind, the task group concluded early on that it could not consider high speed track or high speed vehicles in isolation but must consider them as an integral system. This approach led to the development of vehicle/track interaction performance limits—the cornerstone of the group's recommended standards.

The task group asked FRA's Office of Research and Development to organize an effort to provide recommendations on vehicle/track interaction and track geometry. An informal group of experts, including members of the FOX consortium, contributed to this effort. Engineering studies conducted by the experts included evaluation of the use of measuring track geometry with offsets from several chord lengths, computer simulations of vehicle response to track surface and alignment variations, application of the proposed specifications to previously measured track geometry, and comparison of specifications to foreign practice.

The work began with general acceptance of established parameters for vehicle/track interaction (VTI). Then, through analysis of modelling, test data, and foreign practice, the group of experts selected a small number of descriptors adequate to assure freedom from derailment and other hazardous vehicle/track interactions. For the most part, these proposals were considered appropriate for both dedicated track and mixed-traffic environments. The recommendations of the experts on the topics of VTI and track geometry were considered by the high speed task group and incorporated into its recommendation to the RSAC track working group for Track subpart G. The RSAC track working group also accepted the recommendations of the high speed task group, and they became part of Track subpart G, as it was published by FRA for comment on July 3, 1997.

After the track working group forwarded its recommendations to RSAC, members of the high speed task group and its supporting panel of experts met with a separate group who were working on FRA's proposed passenger equipment standards for high speed rail (Tier II). The purpose of this meeting was to ensure that the proposed track standards and the proposed equipment standards would not conflict. The conclusions reached during this meeting are pertinent to this NPRM and are discussed in detail below.

Members of the FOX consortium and FRA staff participated in the development of Track subpart G, and did so with the knowledge that those standards would apply generally to high speed operations across the country. However, it was understood that portions of the FOX Petition and FRA's proposed track standards for FOX might vary from Track subpart G, in this rule of particular applicability, in order to accommodate and assess accurately the specific safety needs in Florida. Therefore, it is not surprising that FOX incorporated many of the Track subpart G proposals in the Petition, that FRA proposes many of those recommendations here, and that both FRA and FOX believe portions of Track subpart G may not adequately address safety standards for the system planned for Florida.

In its Petition, FOX altered some of the proposals that are contained in Track subpart G, based on the operating characteristics that will exist in Florida, such as the absence of freight equipment, and the French TGV practice. The Petition, however, is not identical to the French TGV practice either. As FRA understands it, FOX believes that the lower train density, detection systems, and other operating conditions that will exist in Florida that are not also present in France, merit some reconsideration of the French general practice on high speed lines.

FRA believes that the majority of Track subpart G is applicable to all high speed environments, including the environment proposed in the Petition. FRA is in agreement with FOX that certain specific standards, particularly those pertaining to inspection methods and frequencies, are largely dependent on the loads associated with the types and amount of traffic on the high speed line. The dynamic loads associated with different types of traffic affect the rate of track degradation, which is an important factor to consider when selecting an inspection strategy. Any comprehensive inspection strategy must include automated and visual inspections, which together ensure that the track maintains a high quality, so that it will not induce adverse vehicle response and will withstand the dynamic loads imparted to the track.

In this NPRM, FRA alters some of the inspection frequencies that were set forth in Track subpart G, due to the fact that the FOX system will not include freight traffic, and because of the other operating features that are unique to FOX. Also, FRA reviewed practices utilized on the French TGV and on Japan's high speed rail system, and weighed the appropriateness of those standards to the Florida system. Finally, as discussed previously in this document, FRA recognizes that there are unknown factors, which may present risks or benefits to passengers and employees, that arise because the French system works in a very different financial and legal framework; the US workforce does not possess great institutional knowledge of the system; the Florida topography and weather differ greatly from France; and the FOX system will include features that do not exist now, and have no reliable safety record on which to predict safety. FRA proposes a track safety program that reflects all of the available relevant information, and consideration of the unknown elements outlined above.

Subpart D of this proposal represents FRA's best judgment on appropriate track safety standards that will effectively protect passengers and employees in Florida. FRA anticipates that FOX will object to some of the inspection intervals set forth in this NPRM. FRA believes that the minimal costs associated with the increased inspection frequencies are outweighed by the safety benefit that will accrue to the system, and take into account some of the unknown risks that result from moving this system from France to North America that were discussed previously in this document.

Section 243.301 Restoration or Renewal of Track Under Traffic Conditions

This section, except for minor editing, mirrors the Petition. There are two elements of concern addressed in this section: the track structure stability must not significantly degrade, and roadway worker safety may not be compromised. Only track maintenance involving replacement of worn, broken, or missing components or fastenings, which does not affect safe train movement is permitted. Paragraph (b) prohibits specific activities during train operations, which would compromise track stability and railroad safety.

Section 243.303 Measuring Track not Under Load

This section is identical to the Petition and is consistent with the present track safety standards, which require that any rail movement occurring while the track is loaded must be added to the measurement of the unloaded track.

Section 243.305 Drainage

This section is identical to the Petition and current U.S. practice. The Railroad must design and maintain the right-of-way so that water drains without obstruction, and to such an extent that safe train operations are not jeopardized.

Section 243.307 Vegetation

This section corresponds to the Petition and current U.S. practice. The Railroad must restrict the growth of vegetation along the right-of-way so that it will not interfere with safe train operations.

Section 243.309 Track Geometry; General and Section 243.311 Track Gage

FRA's proposal for §§ 243.309 and 243.311 concerning track geometry and track gage differs from the Petition. FRA's proposal essentially incorporates and expands upon the geometry table found in the Petition, which follows the French TGV's geometry inspection techniques. However, FRA includes a second intervention table to address multiple defects, the requirement to make an additional chordal measurement, additional requirements for the geometry measurement system, and other changes that FRA believes are necessary for safety.

FOX asserts that the values used in the Petition are identical to those used by the French TGV, which permit wider and narrower gage than would be acceptable for railroad operations in this country. Gage limits are extremely important to railroad safety because high wheel forces and wheel climb can occur in tight gage conditions, and high wheel forces and sudden wide gage can occur in wide gage conditions. These conditions can cause train derailments and incidents.

FOX proposes to use the European combination of rail and wheelset profiles, including the wheelset flange back-to-back dimensions, which are slightly different than standard US designs. The significance of these dimensional variations is that the distance between the flange points on a nominal FOX-style wheelset will be very close to the distance between flange points on a standard US wheelset. There is an increase in the tread cone angle of the FOX wheel profile from a 1-in-40 slope to a 1-in-6.67 slope for the last 20 mm of the tread, which would tend to increase any gage widening forces if the wheel experiences very wide gage. The flange back-to-back dimension is larger than permitted under current US practice and should be considered when designing guard rails and flange ways.

FRA is concerned that the Petition would allow tight gage up to 170 km/h (105 mph). The use of 1420 mm gage with wheelsets in nominal condition would cause more than ½″ wheel climb on both wheels. Based on these dimensional analyses, FRA recommends that the minimum gage be modified to 12 mm less than nominal for speeds below 105 mph.

FRA has concluded that several modifications to the Petition are necessary to address additional key safety concerns in this regard. The Petition does not include a provision for multiple or repeating defects, but FRA believes that such provisions are essential to a comprehensive set of minimum track safety standards. The basis of this concept is that safe railroad operations are jeopardized by a series of track defects that in isolation may not be troublesome, but in combination may result in train incidents or accidents. The panel of experts who advised the high speed track task group considered the case of multiple alignment defects and their ability to excite harmonic motion in the carbody. Multiple deviations were considered to occur when three or more non-overlapping deviations from uniformity in track alignment occurred within a distance equal to five times the specified chord length.

FOX states that the Mauzin car, (or track geometry measurement system, as it is called in the proposed rule text), which is a geometry car used in French TGV track inspection, will be used to measure track geometry in Florida. This car does not detect multiple defects. Therefore, FRA proposes provisions in this document to compensate for this deficiency, based on French practice and Track Subpart G, so that a level of safety equivalent to the proposals of Track Subpart G is maintained. In § 243.309, FRA modifies the geometry table FOX proposed in the Petition.

FRA's modifications are consistent with FRA's understanding of French TGV practice, which includes several levels of track geometry defects that require varying levels of remedial action over different periods of time, as determined by the magnitude of the measurements from the Mauzin car. FRA's proposal makes these French maintenance practices the minimum safety requirements for track geometry measurement. FRA believes that it is important to include these practices in the two-table approach proposed by FRA, because the two intervention tables, in combination will prevent multiple defects from occurring. Multiple defects are addressed in a different manner in Track Subpart G, where specific thresholds are established when more than one defect occurs in rapid succession.

The use of these multiple intervention levels identify deteriorating track conditions before they become critical track defects. This practice makes the occurrence of critical multiple defects less likely to occur than would otherwise be expected with a single, safety-level strategy. To capture the desired level of safety, the high speed task group recommended adopting a multiple defect table. Another approach would be a bi-level intervention table, in which the first level would require remedial action within a reasonable period of time to correct defects, and the second level would require immediate action to correct critical defects. FRA's proposal incorporates these concepts.

Aside from the differences outlined above between the Petition and FRA's proposal, FRA adds a chordal measurement that would not be required under the Petition. The FOX petition proposes two chordal measurements to identify critical alignment defects. Careful dynamic analyses indicate that track anomalies with wavelengths at approximately 20 meters can cause unacceptable vehicle responses and may not be detected by the thresholds proposed in the Petition for the 10-meter and 31-meter chordal measurements. FOX engineers have informed FRA that French TGV maintenance practice and use of the Mauzin car, particularly the use of 20-meter chordal measurements by the equipment, precludes the existence of these critical track defects. However, such maintenance practice is not covered by the Petition, and so does not provide the level of assurance desired in this important area. FRA proposes here that the measurements obtained through use of the Mauzin car be processed in a manner similar to the process used to create the 31 meter chord offsets to create a 20-meter chordal measurement. FRA proposes appropriate thresholds for this chord in the tables provided in § 243.309.

For the reasons explained above concerning multiple defects, warp, and related geometry considerations, FRA has concluded that the approach to track geometry that is proposed in the Petition would be acceptable only if the measurements are performed with a measurement vehicle that is similar to the Mauzin car, or the track geometry measurement system. Therefore, as set forth in § 243.331, the standards proposed in this document apply if FOX uses a Mauzin-type vehicle. If FOX does not use a Mauzin car or the track geometry measurement system, the

requirements of Track Subpart G would apply.

Section 243.313 Curves, elevation and speed limitations

This section of the NPRM is unchanged from Track Subpart G and the Petition. The section provides for a procedure in which the Railroad may seek approval to operate equipment at higher curving speeds, based on engineering data. FRA utilizes these procedures when processing waivers for higher cant deficiencies. In order to operate with higher cant deficiencies, the Railroad must submit specified engineering data and analysis to FRA that determines safe operations at the new level of cant deficiency. This information would also be part of the Railroad's determinations concerning safe curving speeds.

Section 243.315 Track Strength

This section is identical to Track Subpart G and the Petition. FRA concurs that the track must be of very high quality to withstand the vertical and lateral loads associated with high speed trains. During the high speed task group discussions, the subject of track modulus was discussed at great length. Track modulus is a physical measurement of the strength of the track. However, it is difficult to measure track modulus with present technology. Track Subpart G and FRA's proposal do not include a specific numeric value for the vertical and lateral strength of the track. Rather, FRA relies on the track's safety performance, as determined by the monitoring of vehicle/track interaction and track geometry measurements required in §§ 243.309, 243.311, and 243.333.

Section 243.317 Crossties

The Petition would require concrete ties for all tracks that carry passenger service trains and FRA includes this proposal in this NPRM. FRA has made a small change from the Petition concerning all other track, by increasing the number of non-concrete ties from 14 ties in each 39 foot segment of track, to 18 ties in each segment. The remainder of this section mirrors the tie requirements contained in Track Subpart G for higher track classes, and the existing track safety standards for the lower classes. This section also lists characteristics of defective concrete or non-concrete ties, which must be replaced by the Railroad. In all cases, the ties must be capable of holding gage, maintaining surface, and maintaining alignment within the geometry limits specified in § 243.309.

Section 243.319 Continuous Welded Rail (CWR)

This section is consistent with Track Subpart G and the Petition and lists requirements for effectively installing, adjusting, and maintaining CWR. The Railroad must submit a plan to address CWR installation, adjustment, maintenance and inspection, and a training program for the application of those procedures. The procedures must follow the detailed guidelines set forth in this section of the NPRM, which represent current industry practice to protect against track buckling.

Section 243.321 Rail End Mismatch

This section of FRA's proposal is identical to Petition. The values listed in this section for rail end mismatch represent pervasive industry practice in the U.S. and abroad. Controlling mismatched rail is essential for the safety of a high speed operation. If a wheel flange would encounter a mismatch of the rail on the gage corner, an accident or incident would be likely. The limits included for this condition follow FRA's present track safety standards for Class 6 track.

Section 243.323 Rail Joints and Torch Cut Rails

FRA's proposal concerning rail joints and torch cut rails differs from the Petition. FOX stated in its petition that the requirements pertaining to rail joints found in Track Subpart G were not included in the Petition because they would not be utilized at all on the Railroad in Florida. As FRA understands it, the French TGV practice does not permit rail joints and so FOX would also not permit them on the system in Florida. However, FRA believes that it is essential to include minimum Federal standards for the condition of joint bars, because joint bar failures or disturbances can quickly lead to train accidents or incidents. If the operating and maintenance practices employed by FOX do not permit unsafe joint bar conditions to develop, the Railroad will have no difficulty in maintaining compliance with this proposal.

In addition, the Petition would permit torch cutting, even in routine welding tasks on the Railroad's track. Based on its own expertise and consistent with the high speed task group's recommendations in Track Subpart G, FRA permits torch cutting rails only in emergency situations. Current U.S. practice utilizes torch cutting only where needed for emergency repairs. It is generally believed in this country that technology has advanced to the point that cutting rail with the available variety of rail saws is more efficient than torch cutting.

Torch cuts present safety hazards in the railroad environment. In 1983, following its investigation of an Amtrak derailment in Texas where torch cut rails became an issue, the National Transportation Safety Board (NTSB) recommended that railroads remove all torch cut rail and that trains travel at 10 mph over any new torch cuts that were made in emergency situations, or as a preparatory step in field welding. It should be noted, however, that the rail involved in the Texas accident had a high alloy content, which tends to increase the rail's resistance to wear, but decreases the rail's resistance to fracture. Torch cutting is no longer used in the U.S. industry because analysis reveals that torch cut rails have a greater tendency to develop fractures, and FRA believes that FOX should not utilize torch cutting on its system. FRA's proposal lists emergency or temporary conditions in which torch cutting may be used, but otherwise prohibits the practice.

Section 243.325 Turnouts and Crossovers, Generally

FRA's proposal is identical to the Petition and Track Subpart G. The members of the high speed task group discussed many types of turnout designs and fastenings, which may be in use today or developed in the future. The group believed, and FRA adopts in this proposal, that the best way to address turnouts would be to require each railroad to prepare a detailed, comprehensive Guidebook on the inspection and maintenance for all turnouts and crossovers. The book would contain, at a minimum, inspection frequency, inspection methodology, limiting measurement values for all components subject to wear or requiring adjustment, and maintenance techniques. The Guidebook must be submitted to the FRA and FRA will monitor the Railroad's compliance with the identified procedures. FRA believes that most major railroads currently provide their employees with instructions for the maintenance of turnouts, and this requirement in the NPRM creates minimal additional paperwork for the Railroad.

Section 243.329 Derails

This section is identical to Track Subpart G and the Petition. It is absolutely critical to safe railroad operations to prevent equipment standing on side tracks from fouling the main track. Each derail must be

operable, clearly visible, and linked to the Railroad's signal system.

Section 243.331 Track Geometry Measurement Systems

This section of FRA's proposal varies from the Petition. As discussed in the section-by-section analysis for § 243.309, FRA developed geometry tables for this proposal that differ from the tables set forth in Subpart G and the FOX submission. This is due to the fact that the Mauzin car, used by the French and probably by FOX, measures track characteristics in different ways than track geometry measurement systems in this country. Therefore, the table set forth in § 243.309, which lists parameters for alignment, surface, gage, gage variation, cant, and warp, is acceptable, so long as the Railroad measures these parameters with a Mauzin, or Track Geometry Measurement System, car. Use of FRA's T–10 geometry car, which measures geometry in a different manner than the Mauzin car used on the French TGV, would not correspond accurately to the geometry table set forth in § 243.309. Therefore, FRA's specific requirements for the Railroad's Track Geometry Measurement System included in this section describe a Mauzin car. FRA believes that the table in § 243.309 and use of the Mauzin car will provide a level of safety equivalent to that of Subpart G. If FOX ultimately elects to substitute another geometry vehicle with different properties than those identified in the Mauzin car, the Railroad must comport with the equivalent requirements set forth in Track Subpart G.

Track Subpart G contains a requirement for a geometry inspection once per month, with at least 15 days between inspections. The Petition proposed geometry vehicle inspections at least twice within 200 calendar days, with at least 30 days between inspections, or nearly once every three months. In this NPRM, FRA proposes to make this requirement twice within 180 days, with at least 30 days between inspections, so that the requirement is clearly done once every three months. In its determination of the recommended frequency of geometry car inspections, the RSAC high speed task group considered the possibility of mixed passenger-freight service, which would likely accelerate the rate of track degradation. FRA concludes that, in view of the light loads and dedicated traffic on the proposed FOX line, an inspection with a geometry car once every three months sufficiently provides for the necessary monitoring of geometry parameters. If the Railroad discovers exceptions to the geometry limits, the Railroad must field verify the exceptions and institute remedial action within two days.

This section also requires the Railroad to maintain continuous plots of all measured track geometry parameters and exception reports that contain a systematic listing of all track geometry conditions that constitute an exception to the speed limits over the track segments surveyed, for at least one year.

Section 243.333 Track/Vehicle Performance Measurement Systems.

This section proposes requirements for the periodic measurement of carbody and truck accelerations using a Track Acceleration Measurement System (TAMS), which differs from the FOX Petition. The Petition and Track Subpart G differ in a variety of ways concerning track/vehicle measurement systems. FOX did not incorporate many of the Track Subpart G proposals with respect to condemning safety limits and corresponding remedial actions. FOX did not include a requirement for the measurement of wheel/rail forces, beyond the qualification phase of the project. Track Subpart G, on the other hand, proposes an annual requirement for the measurement of wheel/rail forces to verify that the track/vehicle system remains within safe performance limits throughout the life of the system. Also, Track Subpart G requires immediate action when minimum performance limits are exceeded, regardless of speed, while FOX proposed to set different safety limits for various speed ranges. In the Petition, FOX states that ''Each exception must lead to an immediate slow order on the corresponding portion of track'' but later states that ''within two days after the inspection, field verify and institute remedial action for all recorded exceptions.'' Track Subpart G also includes filtering characteristics that are not apparent in the Petition's discussion of the TAMS car and proposed safety thresholds. Finally, the Petition uses ''zero-to-peak'' thresholds and the Track Subpart G uses ''peak-to-peak.'' Under most circumstances, an interpretation of an accelerometer trace using a ''zero-to-peak'' measurement results in approximately one-half of the magnitude of a ''peak-to-peak'' threshold. In the development of the proposed high speed standards contained in Track Subpart G, the high speed experts recommended using the peak-to-peak criterion.

FRA believes that an immediate speed reduction must be imposed when vehicle/track performance limits are exceeded. The intent of track and carbody acceleration limits is to limit vehicle response, regardless of track condition and vehicle speed. FRA proposes to adopt the approach contained in Track Subpart G for vehicle/track interaction safety limits. The measurement of wheel/rail forces and accelerations is required. Many experts advise that derailments may be imminent if these limits are exceeded. An immediate speed reduction must be imposed until the Railroad determines the cause of the adverse vehicle/track interaction and corrects the condition.

The Petition suggests, and FRA proposes, using the term ''TAMS'' to describe a vehicle with capabilities such as the ''Melusine'' car in France to measure accelerations. Although this term is not used in Track Subpart G, the frequency of inspection recommended in Track Subpart G is approximately the same as the Petition. For speeds over 125 mph, Track Subpart G requires the measurement of accelerations at a frequency of at least twice within sixty days, with not less than fifteen days between inspections. FOX proposed an inspection frequency of at least twice within 45 calendar days, with not less than seven days between inspections. FRA has adopted the frequency set forth in the Petition.

To summarize, FRA's proposal differs from the Petition in several significant ways. The Petition would require the measurement of wheel/rail forces once during system qualification, and would not require periodic re-measurement of wheel/rail forces. FRA believes renewed, periodic measurements are necessary to ensure safety. The Petition does incorporate a requirement for the periodic measurement of accelerations, but uses threshold descriptors, thresholds, and remedial actions that differ from FRA's view and proposal. These measurement systems and remedial measures are important to demonstrate continued vehicle/track safety performance—the cornerstone of high speed track standards.

Section 243.335 Wheel/rail Force Measurement System.

In this section, FRA proposes that FOX conduct bi-annual wheel/rail force measurements and that FOX equipment not exceed limits established in the vehicle/track interaction chart in this section. The Petition did not contain a similar section or requirement.

The FOX petition and Track Subpart G would require a qualification procedure for vehicles on the high speed track, using instrumented wheelsets. The high speed task group concluded that the interaction of the high speed vehicle on the track must not exceed wheel/rail force, truck side

accelerometer, and carbody accelerometer performance thresholds during the qualification phase and during the life of the railroad. The Petition includes a requirement for the use of instrumented wheelsets to measure wheel/rail forces during the system qualification phase, but does not include a requirement for a periodic re-measurement of wheel/rail forces during the life of the system because ''forces are proportional to accelerations,'' which are monitored every two weeks. FRA believes that wheel/rail force measurements, and carbody and truckside accelerometer measurements relate to different safety concerns and so, the measurements are not appropriate substitutes for one another.

Vehicle/track interaction has critical consequences in railroad safety, and so establishing safe parameters and developing a measurement system to adhere to those parameters is highly important for any track safety program. The high speed task group considered several hazardous and unacceptable vehicle/track interaction events that are well-known in railroad engineering, and for the most part, occur on existing high speed operations. These unsafe events include wheel climb, rail rollover, vehicle overturning, gage widening, and track panel shift. Truck hunting is a dynamic phenomenon that results from unstable motion of railroad wheelsets, and may result in wheel climb or other unsafe events.

FRA's proposed vehicle/track interaction chart includes provisions for truck hunting and carbody accelerometers. Truck hunting is typically measured by truck-mounted lateral accelerometers. Carbody accelerations measurements address different concerns. Large carbody accelerations can be hazardous to standing or walking passengers; large vertical accelerations may cause passengers to fall. The primary and secondary suspension characteristics of a particular car and truck spacing influence the natural frequency of vertical motion and, therefore, the wavelength of profile variations become of interest. Carbody vertical acceleration is also an indicator of variation in vertical force applied to the rails.

FRA believes that an annual or biannual inspection using instrumented wheelsets must be considered as part of a high speed inspection strategy that includes visual inspections, pilot (sweeper) train, geometry car inspections, periodic carbody and truck-mounted accelerometer measurements, and other inspections deemed necessary. All of these requirements are largely dependent on track and vehicle degradation. Paragraph (a) of this section requires FOX to complete a wheel/rail force measurement system inspection biannually, with at least 240 days between each inspection, to ascertain whether the vehicles respond to the existing track within the limit defined. FRA agrees with FOX that its axle loads, minimization of unsprung mass, high quality track, and low cant deficiency would probably not lead to the sort of track or vehicle degradation that would become hazardous within one year after the Railroad's trainsets meet the pre-revenue qualification phase of the system. However, the track or vehicle degradation rate is an unknown and FRA, therefore, believes that an inspection frequency of once every two years, as required by paragraph (b) in this section, is a prudent requirement.

This section requires the Railroad to maintain for one year after a qualifying track acceleration measurement is done, a copy of the plot and exception printout for the track segment involved, the date the inspection was made, the track segment involved, and the remedial action taken, for all listed exceptions. The Railroad must maintain a list of locations where the limits are exceeded.

Section 243.337 Daily Inspection Trainset

In this section, FRA proposes a daily inspection trainset that must be operated each morning over the Railroad's entire system, prior to revenue service. FRA also proposes that the inspection train be equipped with on-board truck side and carbody accelerometers to measure track conditions, and that the Railroad develop procedures to notify track personnel when track conditions warrant attention. In its petition, FOX described the French TGV practice of operating a daily sweep train to visually inspect the track and ensure that the right-of-way is free from obstacles, and included such a requirement for Florida. FRA agrees that this is a valuable safety measure. However, FRA added the requirements for minimal instrumentation on the daily inspection train in order to more closely reflect the expertise of the high speed task group and the Tier II passenger equipment group.

Track Subpart G requires accelerometers in at ''least two cars in every train.'' At the latter stages of the development of Track Subpart G, the high speed task group met with a group of experts working on the Tier II equipment standards. This group consisted of members from labor, the rail industry, and private associations. Many members from both groups concluded that requirements for carbody accelerometers on every train would generate voluminous data that would not be necessary for safety. Members of both groups noted that a requirement for lateral truck-mounted accelerometers already existed in the Tier II passenger equipment standards.

Instead, many members of both groups felt that accelerometer measurements could better be addressed with a requirement for lateral and vertical carbody accelerometers and lateral truckside accelerometers on at least one train each day. Truck and carbody accelerometers on one train per day would detect settlement or other geometry conditions, such as culvert settlement or an anomaly inadvertently introduced by a maintenance crew, before they became serious. Several of the members believed that safety would be enhanced if track personnel were dispatched to investigate the track whenever the accelerometers indicated possible track concerns. These members felt that these conditions could be identified and corrected before the next regularly scheduled periodic ride quality inspection with an instrumented car, and concluded that the threshold to trigger notification and the procedures for the notification of the track personnel should be left up to the high speed railroad.

The requirement here for the daily monitoring of accelerations was included in order to provide an instrumented ''rough track report.'' It is normal practice in this country for train engineers or crews who sense an irregularity in the track, to communicate their concerns to track personnel who then perform a follow-up inspection. The accelerometers on the daily inspection train would remove the subjectivity from this process, and would more accurately identify areas that should be investigated by track personnel. However, because of time limitations, the high speed task group was ultimately unable to change the requirement from accelerometers on every train to accelerometers on one train per day.

FOX believes that a requirement for daily carbody accelerometer measurements is unnecessary because the TGV equipment comes equipped with truck-side accelerometers on each power and trailer truck, and the truck-side accelerometers would identify the defect as being track related. However, carbody accelerometers perform an entirely different function than truck-side accelerometers. FOX recognizes this distinction by recommending an

inspection with carbody and truckside inspections once every two weeks.

FRA believes that a requirement for accelerometers on the daily inspection train would enhance safety at minimal cost and so, includes the requirement in the NPRM. However, FRA invites comment on this section, as on all others in the NPRM.

Section 243.339 Inspection of Rail in Service

This section proposes that the Railroad develop and implement written inspection procedures for internal defects, joint bars, and defective rails. The section includes a chart of specific defects with corresponding remedial measures, and requires the Railroad to adhere to appropriate remedial actions.

In this NPRM, FRA replaced the section in the FOX petition entitled ''Defective Rails'' with this section, with substantial change. The Petition stated that the frequency of inspection for rail defects should be once per year in view of French TGV practice and the fact that the track will be newly constructed in Florida. Track Subpart G proposes an inspection frequency of twice per year for high speed rail in the general system, which is higher than the annual inspection required in the current track standards for lower speed operations.

In view of the load characteristics proposed for the FOX project, the occurrence of rail flaws are not expected to be high. In addition, since rail flaw growth is largely dependent on accumulated tonnage, the growth of flaws is expected to be minimal. However, there are concerns relating to new rail due to possible weld defects that may occur in the factory or field, and the potential for damage to the rail during installation. In addition to the requirements for the initial inspection of new rail at the mill and an inspection of welds required by proposed § 243.341 discussed below, FRA's proposal includes a requirement in § 243.339 for the Railroad to conduct a continuous inspection of all rail within ninety days after the initiation of revenue service. This inspection will verify that the mill inspection and plant weld inspections accurately located any rail flaws present in the new rail and will confirm that the rail was not damaged during installation. FRA concurs with the language of the Petition, in which it is determined that a rail inspection frequency of once each year is appropriate, considering the absence of freight traffic and the presence of relatively light axle loads on the proposed FOX lines.

FOX proposed a remedial action table for rail flaws based on French TGV practice and somewhat vague standards that ''take into account the quality of the track to be restored once the defect is fixed.'' The defect table in the Petition largely does not categorize all defects in terms of the size of the defect, and so does not include corresponding remedial actions that are based on the size or severity of the defect. For example, the FOX proposal does not specify different remedial actions for transverse defects of varying sizes.

FRA believes it would be unwise to deviate from the rail flaw procedures that developed in this country to control rail-caused accidents. They are included in Track Subpart G and are identical for high and low speed track. These requirements are the result of railroad experience in this country, rail flaw research, and recommendations from the NTSB.

FRA does not anticipate that adoption of this rail flaw table and with accompanying remedial actions will negatively impact FOX maintenance policies. Given the axle loads associated with the FOX system, the rail flaws of the size specified in the table may never occur in Florida, and so FOX would have no difficulty in complying with this section. However, if these serious rail flaws do arise, this section will secure the safety of passengers and employees.

Section 243.341 Initial Inspection of New Rail and Welds

This section sets forth minimum standards for the Railroad's in-service rail and weld inspections, mill inspections, welding plant inspections, and field weld inspections. FRA has made a minor change in this section from what was set forth in the Petition, by correcting an error in the rule text that would have permitted an in-service inspection, conducted ninety days after the rail is installed, for a mill or welding plant inspection. FRA believes that FOX intends to conduct a mill and welding plant inspection prior to installation, which is common practice on US railroads. Rail defects discovered in the course of these inspections must be handled in accordance with the actions set forth in § 243.339 of the proposal.

Section 243.343 Visual Inspections

This section requires the Railroad to conduct a visual track inspection once each seven days by riding in a vehicle at a speed that facilitates visual inspection of the track structure. This section is not consistent with the Petition, which proposed a visual inspection once each six weeks.

FOX proposed a six-week visual inspection based on French TGV practice. However, the practice in this country historically has been to conduct a visual inspection at least twice each week on all passenger lines. For example, Amtrak performs walking visual inspections on the Northeast Corridor at a frequency of at least two times per week. Amtrak also conducts automated inspections in a manner similar to the French TGV practice, which includes geometry car and acceleration measurements.

In the lower speed classes of track in the US, present track safety standards require two visual inspections per week on passenger tracks, but do not mandate the use of automated inspections to supplement the visual inspections. Freight railroads also typically inspect main tracks at least twice each week. Many railroad maintenance officials believe that this inspection frequency facilitates early identification of conditions that require maintenance. However, it is also important to note that, while many major railroads use geometry cars, the use of the automated inspection techniques proposed by FOX are generally not used on freight railroads.

Track Subpart G requires two inspections per week for track speeds between 110 mph and 160 mph, and three times per week for speeds between 160 mph and 200 mph. These frequency levels developed through consideration of all available automated and visual inspection methods. Some members of the high speed task group emphasized that state-of-the-art automated inspections techniques enhance, but cannot replace visual inspections. Walking or hi-rail inspections identify certain conditions, such as loose or missing fastenings and blocked culverts, that are not discovered by geometry, acceleration, rail flaw, or other automated equipment. Visual and automated inspections compliment one another, and should both be part of a high speed track safety system.

In support of its position of performing visual inspections at a frequency of once every six weeks, FOX discusses its concern for the hazards inspectors might face along the high speed line. In addition, FOX argues that more frequent visual inspections are unnecessary in view of its total inspection program, which is based on French TGV practices. FOX also asserts the daily ''sweeper'' train conducts a visual inspection of the track and ensures that the right-of-way is clear.

FRA acknowledges the hazards associated with inspecting high speed track and urges FOX to take every

precaution to ensure the safety of its inspectors. (This NPRM adopts and incorporates safety standards for roadway workers in 49 CFR part 214, which should address these safety concerns if followed properly.) Also, FOX may wish to conduct inspection activities during low traffic periods, and perhaps at night as is done in France. Amtrak routinely accomplished track work during evening hours, and has policies in place to protect inspection crews.

FRA has considered the factors discussed above and believes that a prudent, initial standard would include one weekly visual inspection of the track and turnouts. This is consistent with the visual inspections conducted in Japan on high speed, dedicated lines. However, FRA invites comment on this inspection frequency from safety experts and members of the public. FRA considered, but did not succeed in devising, an objective performance standard for adjusting inspection frequency. Commenters are invited to suggest such a performance standard.

Section 243.345 Special Inspections

This section requires the Railroad to make special track inspections where emergency or extreme events occur that could cause damage to the track structure. This section is consistent with Petition.

Section 243.347 Inspection Records

This section sets forth minimum requirements for treatment of the Railroad's track inspection records. The section is consistent with the Petition and Track Subpart G. However, this proposal contains a noteworthy change from the present track safety standards for records inspections. Paragraph (d) of this section requires the Railroad to record any location where a proper rail inspection cannot be performed because of rail surface conditions. The new language in this section requires a recordkeeping of those instances.

Paragraph (f) of this section also proposes a provision for maintaining and retrieving electronic records of track inspections. The provision permits Railroad to design its own electronic system, so long as the system meets specified criteria to safeguard the integrity and authenticity of each record. The provision also requires that railroads make available paper copies of electronic records when needed by FRA or by railroad track inspectors.

Subpart E—Rolling Stock

Subpart E sets forth minimum safety standards for the design, performance, and maintenance of the FOX rolling stock. For the most part, the Railroad's compliance with the design and performance requirements of this Subpart will be demonstrated by the pre-revenue qualification tests required in Subparts B and G of this proposal. However, FRA will closely monitor the operation of the FOX equipment throughout the life of the system in order to ensure compliance with the equipment inspection, test, and maintenance requirements.

The rolling stock safety standards set forth in the NPRM are very similar to the Petition, and are based on 15 years of safe operating experience in France. As discussed previously in this document, the French design, operation, and maintenance practices have resulted in an exceedingly safe passenger system. FRA proposes standards in this Subpart that will facilitate development of an equally safe system in Florida. It is extremely important to note, as we do throughout this NPRM, that these standards would not be appropriate for any other operation in this country. The standards set forth in this Subpart relate to a specific system with unique safety characteristics. This proposal reflects the combination of many operating features, and if any one feature disappears, all of the standards would have to be reevaluated.

Section 243.401 Clearance Requirements

This subsection requires the rolling stock to be designed to meet all applicable clearance requirements of the Railroad, including the static clearance diagram, the dynamic clearance diagram and the obstacle clearance diagram. Rolling stock clearance of all natural or infrastructure obstacles is a basic safety requirement. Adequate clearance of all obstacles will be demonstrated during the pre-revenue service system qualification tests. At a minimum, the Railroad must make the following diagrams available to FRA upon request: rolling stock static clearance diagram, rolling stock dynamic clearance diagram, and obstacle clearance diagram.

Section 243.403 Structural Strength of Trainset

This section sets forth the structural design or performance requirements for the FOX passenger equipment. This section is patterned after FRA's proposed Tier II Passenger Equipment Safety Standards, which were published on September 23, 1997 (62 FR 49728). The Tier II passenger proposals are based equipment that would travel at high speed (125 to 150 mph) in existing North American rail corridors, which may include grade crossings used by heavy highway vehicles, and mixed rail traffic that includes heavy freight or commuter trains.

FRA recognizes that existing North American corridors which contain grade crossings or mixed freight-commuter rail operations may be less conducive to safe operation of passenger trains at speeds greater than 150 mph. Due to the high degree of kinetic energy that must be dissipated in the event of a collision or derailment, structural mitigation of the effects of the accident are very difficult to achieve in high speed passenger equipment. Therefore, combining very high speed operations with slow, heavy rail traffic, or heavy highway vehicles at grade crossings, produces a relatively high risk of collision and passenger injury. As discussed previously, to counter these risks, the French TGV system operates on an accident-avoidance, rather than accident-mitigation philosophy. FOX plans to utilize this philosophy in Florida, and the standards that FRA proposes concerning rolling stock reflect this approach to safety.

FRA proposes structural standards for the FOX passenger trainsets that are based on International Union of Railways (UIC) standards for the design of passenger equipment in Europe, and on SNCF specifications that adapt UIC standards to the TGV trainset configuration. The European structural standards result in a lighter trainset, which facilitates travel at high speeds with minimal track forces and lower track degradation.

Paragraph (a) proposes two very important general structural requirements. First, the passenger cars in each trainset must be semi-permanently coupled with articulated trucks between the trailer cars. These trainsets may be uncoupled only in repair facilities, in accordance with the operating procedures set forth in § 243.433. When a derailment occurs at high speed, trains containing individually coupled passenger cars tend to buckle, accordion style, which exposes individual cars to side impacts or rollover. The articulated connection between trailer cars has been shown to be extremely effective in keeping the trainset in-line and upright during derailments, even at high speed. The articulated connection also provides significant anti-climbing resistance between each passenger car.

The second proposed general requirement is essentially an operating requirement with strong structural implications. FRA requires the Railroad to operate every trainset with a power

car at each end of the train. FOX proposed to operate in this manner, and FRA believes that these high speed trainsets should not be operated in a push-pull mode. The presence of a power car in the lead maximizes the protection provided for the cab crew and passengers, in the event of a head-on or rear end collision.

Paragraph (b) proposes the structural requirements for power cars. Paragraph (b)(1) lists the basic carbody structural strengths of the power car, which represent European design practice and the UIC standards. Equipment built to these standards provides structural protection for the operator and passengers during low speed train-to-train collisions that might occur in station or yard operations. Also, equipment built to these standards provides structural protection for the operator and passengers during collisions at moderate speeds with highway vehicles. The proposal establishes the magnitude of the force that the power car structure must resist, and how that force must be applied during the testing and analysis that will be done to ensure that the design complies with each safety standard.

Paragraph (b)(2) proposes that each power car be equipped with an anti-penetration wall ahead of the operator's cab. This anti-penetration wall serves the function of a collision post in North American design practice, or of a forward end structure, as proposed in the Tier II passenger equipment NPRM. This anti-penetration wall in the power car cab plays a vital role in protecting personnel and the equipment in a collision with another object. This structure must resist override, prevent the entry of fluids into occupied spaces of the cab, and allow the crash energy management system to function. FRA proposes the following specific design parameters for the anti-penetration wall: resist a longitudinal compressive load of 3000 kN (675,000 lb) at the top of the underframe, without exceeding the ultimate strength of the joint; and resist a longitudinal compressive load of 1500 kN (337,000 lb) applied at a height of 760 mm (30 in) above the top of the underframe, and reacted at the rear of the cab structure, without exceeding the ultimate strength of the structure. FRA also requires that the Railroad verify compliance with these requirements by either linear static analysis or equivalent means.

Paragraph (b)(3) sets forth the crash energy management requirements for the power car. Crash energy management is an equipment design technique used to provide controlled deformation and collapse of designated sections of the unoccupied volumes of a passenger train, to absorb energy that occurs in a collision. This permits collision energy to dissipate before any structural damage occurs to the occupied volumes of the train, and reduces the decelerations experienced by passengers and crew members in a collision. Reduced decelerations mitigate the force of any secondary collision between passengers and objects in the train's interior, such as seats. The French equipment incorporates a crash energy management design that has been demonstrated to be safe and commercially feasible. This is the sort of design that will likely develop on the Amtrak lines in the Northeast Corridor.

FRA proposes that in unoccupied areas, each power car shall be designed to absorb a minimum 4.2 megajoules through controlled structural deformation. This requirement can be met using existing technology and provides an adequate level of safety.

Paragraph (b)(4) proposes a basic longitudinal compressive strength for the power car cab. Specifically, FRA proposes that in occupied areas, each power car must be designed to resist, without permanent deformation of the sidesill, contrail, and side post structural members, a longitudinal compressive load of 3560 kN (800,000 lb) when applied uniformly at the front of the cab between the underframe and waist level, and reacted at the cross section of the carbody at the back of the cab. This proposed requirement provides a degree of crash refuge or structural shelter to the operator equivalent to that typical of North American design practice.

Paragraph (b)(5) requires each power car to be designed to withstand a uniformly distributed vertical load of 1.3 times its static laden weight, when supported at the truck centers, without permanent deformation. This requirement essentially sets the vertical stiffness of the car body as it is supported between the two trucks.

Paragraph (b)(6) proposes the rollover strength for the FOX power cars. Specifically, power cars must be designed to rest on their sides, uniformly supported at the top (cantrail) and the bottom (sidesill) chords of the side frame with the allowable stress in the main structural members for occupied volumes for this condition limited to one-half yield stress. In addition, power cars must be designed to rest on their roofs, with damage limited to roof sheathing and framing. Deformation of the roof sheathing and framing, to the extent necessary to permit the vehicle to be supported directly on the top chords of the side frames and end frames, are permitted. The permissible stress in the main structural members for occupied volumes for this condition are one-half yield. These rollover strength requirements are equivalent to the requirements proposed in the Tier II NPRM for passenger cars. Presently, there are no North American standards for rollover strength of locomotives.

Paragraph (c) proposes the structural requirements for trailer cars. Paragraph (c)(1) lists the basic carbody structural strengths of the trailer car. These parameters represent European design practice as reflected in UIC standards. Equipment built to these standards provides structural protection for the passengers during low speed, train-to-train collisions typical of station or yard operations. Equipment built to these standards also provide structural protection for the passengers during collisions at moderate speeds with most highway vehicles. The proposed requirements specify the magnitude of the force that the trailer car structure must resist and how that force is to be applied during the test and analysis done to prove that the design complies with each requirement.

Paragraph (c)(2) requires each trailer car to be designed to withstand a uniformly distributed vertical load of 1.3 times its static laden weight, when supported at the truck centers, without permanent deformation. This requirement essentially sets the vertical stiffness of the car body as it is supported between the two trucks.

Paragraph (c)(3) proposes that the occupied volumes of trailer cars be designed to resist, without permanent deformation of the sidesill, cantrail, and side post structural members, a longitudinal compressive load of 3560 kN (800,000 lb.) when applied as distributed over the carbody cross section at the seated passenger compartment. This requirement is equivalent to North American practice for passenger coach design.

Paragraph (c)(4) proposes that trailer cars possess the same rollover strength as power cars. This rollover strength requirement is equivalent to the requirements set forth in the Tier II standards of FRA's Passenger Equipment Safety Standards NPRM for passenger coaches.

Section 243.405 Trailer Car Interior

This section contains proposed requirements for interior fittings and surfaces in passenger trailer cars. Research indicates that passengers striking interior objects in trains, principally during collisions and

derailments, account for 57% of the serious injuries and 7% of the fatalities on passenger trains.[1] Once survivable space is ensured by basic vehicle structural strength and crash energy management, the design of the interior becomes an important factor in preventing or mitigating serious injury. To reduce the injury and fatality numbers, FRA proposes that passenger seats and other interior fittings be securely attached to the car body; interior fittings be recessed or flush-mounted; overhead storage racks provide restraint for stowed articles; and sharp edges be padded or otherwise avoided.

FRA and NTSB investigations of passenger train accidents have revealed that luggage, seats, and other interior objects that break or loosen during an accident often cause passenger and crew injuries. During a collision, the greatest decelerations, and thus the likeliest forces to cause potential failure of interior fitting attachment points, occur in the longitudinal direction, *i.e.,* in the direction parallel to the normal direction of train travel. Current North American design practice consists of seats and other interior fittings that withstand the forces due to accelerations of 6g in the longitudinal direction, 3g in the vertical direction, and 3g in the lateral direction. Due to injuries caused by broken seats and other loose fixtures, FRA believes that the current design practice is inadequate. Accordingly, FRA's NPRM for Passenger Equipment Safety Standards proposed that each seat in a passenger car remain firmly attached to the car body when subjected to individually applied accelerations of 4g in the vertical direction and 4g in the lateral direction acting on the deadweight of the seat or seats, if a tandem unit. In addition, the attachment must resist a longitudinal inertial force of 8g acting on the mass of the seat, plus the impact force of the mass of a 95th-percentile male occupant(s) being decelerated from a relative speed of 25 mph and striking the seat from behind. By resisting the force of an occupant striking the seat from behind, a potential domino effect of seats breaking away from their attachments is avoided.

In addition, the NPRM for Passenger Equipment Safety Standards proposes that overhead storage racks provide longitudinal and lateral restraint for stowed articles to minimize the potential for these objects to come loose and injure train occupants. Further, to prevent overhead storage racks from breaking away from their attachment points to the carbody, the racks must have an ultimate strength capable of resisting individually applied accelerations of 8g longitudinally, 4g vertically, and 4g laterally acting on the mass of the luggage stowed.

Paragraph (a)(1) proposes that Fox trainset seat backs be designed to withstand, with deflection and permanent deformation allowed, but without total failure, the load due to a 95th-percentile male seat occupant accelerated with the following pulse: 0 to 6g in 0.05 s; 6g for 0.125 s; and 6 to 0g in 0.05 s.

Paragraph (a)(2) proposes that the ultimate strength of a seat attachment to the trailer carbody be sufficient to withstand the following individually-applied accelerations acting on the mass of the seat, plus the mass of a seat occupant who is a 95th-percentile male: 6 g, longitudinal; 2 g, lateral; and 2 g, vertical.

Paragraph (b)(1) proposes that other interior fittings be attached to the trailer carbody with sufficient strength to withstand the following individually-applied accelerations acting on the mass of the fitting: 3 g, longitudinal; 2 g, lateral; and 2 g, vertical.

Paragraph (b)(2) requires, to the extent possible, that interior fittings be recessed or flush-mounted, and corners and sharp edges avoided altogether or padded to mitigate the consequences of impact with such surfaces.

Paragraph (c) proposes that luggage stowage compartments include a means to restrain luggage, and have sufficient strength to resist loads due to the following individually-applied accelerations acting on the mass of the luggage that the compartment is designed to accommodate: 3 g, longitudinal; 2 g, lateral; and 2 g, vertical.

These seat attachment, interior fitting attachment, and luggage compartment strengths that FRA proposes for the FOX system are lower than those set forth in FRA's Passenger Equipment Safety Standards for Tier II equipment. Also, FRA is not proposing for FOX enclosed overhead luggage racks, as are proposed for the generic Tier II equipment. FRA believes that the standards we propose here for FOX provide an equivalent level of safety for passengers and employees on the FOX equipment for several reasons.

First, the Railroad's operation is based on principles of accident-avoidance. As discussed previously, this safety philosophy will be implemented on FOX through a variety of operating features, including the dedicated right-of-way, the absence of grade crossings, low train density, and an advanced signaling system. In combination, these characteristics of the system provide a very high level of safety performance and a very low risk of an accident.

Second, FOX could not find any record of passenger injury caused by loose seats, loose interior fixtures or fallen luggage on TGV trainsets, including the high speed derailments. Given the high number of passenger-miles covered by the TGV in France since 1981, this fact tends to indicate that such injuries are unlikely.

Third, the trainset provides several alternate stowage areas so that all luggage need not be stored on the overhead racks. The TGV trainsets will have two locations, at the first and last passenger units, where heavy or large pieces of baggage may be checked into a dedicated compartment for stowage. Also, two of the passenger units will include stowage racks for large carry-on luggage. Finally, stowage will also be available throughout the trainset between back-to-back seats. The overhead racks would typically be used for smaller and lighter luggage, which is less likely to cause injury in an accident.

Fourth, the TGV trainsets inherently provide excellent ride quality at high speed due to the articulated design, the quality and geometry of the track, the suspension characteristics, and the large curve radii. The articulated design eliminates in-train forces due to slack; the quality and geometry of the track provide smooth high speed operation; and the large curve radii facilitates high speed travel through curves at low cant deficiency. These combined factors result in very low longitudinal, lateral, and vertical forces on trainsets throughout the speed range.

Finally, the estimated increase in weight, per trailer car, of nearly 456 kg (1,000 lb.) that would be required to meet the more stringent, generic standards would be detrimental to the operational design limits for this high speed transportation system.

Section 243.407 Glazing

Paragraph (a) proposes the glazing impact and ballistic requirements for the trainset, which are based on French TGV standards. The end facing (engineer's front windshield) must resist an energy of 30 kJ at 20° C (72° F) and 25 kJ at 0° C (32° F). As a comparison, the proposed Tier II equipment standards would require the end facing glazing to resist 12.2 kJ of energy for operation at 240 kph (150 mph) and 21.7 kJ for 322 kph (200 mph) operation. These glazing standards are more

[1] ''Rail Safety/Equipment Crashworthiness.'' M. J. Reiley, R. H. Jines, & A. E. Tanner. (FRA/ORD–77/73, Vol. I, July 1978).''

stringent than those proposed for Tier II equipment, and have proven effective in service in France.

Paragraph (b) requires interior glazing to meet the minimum requirements of AS1 type laminated glass, as defined in American National Standard ''Safety Code for Glazing Materials for Glazing Motor Vehicles Operating on Land Highways,'' ASA Standard Z26.1–1966. This requirement alleviates the need for interior glazing to meet the stringent impact resistance requirements placed on exterior glazing, but ensures that the glazing will shatter in a safe manner in the event of an accident, much like automotive glazing.

Paragraph (c) proposes that the glazing frame will hold glazing in place against all forces that are generated in the tests required by this proposal.

Section 243.409 Brake System

Paragraph (a) requires the FOX brake system to be capable of stopping trainsets with a service application of the brakes from its maximum authorized operating speed, within the signal spacing that exists on the track. This proposed requirement is the fundamental performance standard for any train brake system. This section merely codifies a requirement which is current industry practice, and is the basis for safe train operations in the U.S. Paragraph (a) also defines the test conditions for braking under low adhesion levels as defined in UIC leaflet 541.05. This standard requires a specific quantity of detergent to be sprayed on the rails during the braking test. In addition, paragraph (a) requires the flow rate, defined by UIC 541.05, to be doubled at speeds in excess of 180 km/h (112 mph). This meets the French TGV requirement to minimize the attainable adhesion level during a high speed test, in order to ensure a high margin of safety for high speed braking.

Paragraph (b) proposes that the braking on each truck shall be independently controlled by the brake pipe. Unlike conventional North American brake systems which have a brake manifold on each car, the FOX trainset braking system has a separate manifold for each truck. The brakes are applied through a brake pipe pressure reduction, controlled by the engineer's brake valve. A uniform distribution of the pressure reduction throughout the train is enhanced by an electro-pneumatic control. An electric trainline signal is used to activate an electro-pneumatic valve on the brake manifold for each truck, which provides a quick and uniform control of the brake pipe pressure. This arrangement also minimizes the operational effects of a failure of a brake manifold, in that only one truck in the consist is inoperative if a brake manifold has failed or has cut out.

Paragraph (c) proposes to require that the electric brake be completely independent on each powered truck and shall operate with the loss of the overhead power supply. The kinetic energy of a train, and hence the energy that must be dissipated in stopping a train, is proportional to its mass and the square of its speed. Therefore, there is a radical increase in energy to be dissipated for a very high speed train, compared to that required for a typical North American train. As an example, the energy that must be dissipated to stop the Railroad's trainset (1–8–1; or one power car, eight trailer cars, and one power car) from 322 km/h (200 mph), is about 1.7×10^6 kJ (1.3 billion ft-lb). To put this in perspective, this is approximately 3 times the energy required to stop a 1–8–1 Amfleet consist from 161 km/h (100 mph). Unlike conventional North American equipment, very high speed trainsets rely to a great extent on the electric brake. Therefore, paragraph (c) requires the electric brake to be independent on each powered truck and be able to operate if power from the catenary is lost. To achieve this, separate batteries and battery chargers are used for field excitation of the traction motors on each truck. There are two power cars on each FOX trainset, each with two powered trucks; each trainset will have four completely independent electric brakes, which provides for a high level of redundancy and safety.

In addition, paragraph (d) proposes that any failure of the electric brake on any powered truck must be displayed to the train operator. This important safety feature will alert the operator so that s/he can take compensating action to prevent accident or incident.

Paragraph (e) requires the brake system to be designed to prevent thermal damage to wheels or discs. The purpose of this requirement is to ensure that the brake system is designed and operated to prevent dangerous cracks in wheels. Passenger equipment wheels are normally heat treated so that the wheel rim is in compression. This condition forces small cracks that form in the rim to be closed. Heavy tread braking can heat wheels to the point that a stress reversal occurs and the wheel rim is in tension to a certain depth. Rim tension is a dangerous condition because it promotes surface crack growth. In 1994, FRA published an NPRM on power brakes, which proposed a wheel surface temperature limit to prevent this condition. (See 59 FR 47729). Several brake manufacturers and railroads objected to this approach, claiming that the temperature limit was too conservative and did not facilitate the development of new materials that can withstand higher temperatures. Based on these comments and concerns, FRA is proposing a more flexible performance requirement here, rather than a wheel tread surface temperature limit. This is an extremely important safety requirement because a cracked wheel that fails at high speed can have catastrophic consequences. In addition, the proposed requirement will lead to longer wheel life, and so should provide maintenance savings to the Railroad.

Paragraph (f) proposes to require the Railroad to demonstrate, through analysis and test, the maximum safe operating speed of the trainset where no thermal damage occurs to wheels or discs, for various combinations of electric and friction brake failure. The railroad must also demonstrate that no thermal damage results to the wheels or discs under conditions resulting in maximum friction braking effort being exerted. Unlike conventional North American passenger trains which may vary in weight, length and braking capability, FOX will use fixed consists. This significantly simplifies the task of determining the braking characteristics for various modes of degraded braking. Demonstrating that the requirements of paragraph (e) have been met will be an important objective of the pre-revenue service system qualification tests.

Paragraph (f) also requires the Railroad to develop a matrix that lists a variety and combination of brake failures and corresponding safe speeds that must be followed in the event of brake failures. This matrix must be completed in conjunction with the Railroad's system safety plan analysis, and must be displayed prominently in each power car. This process is employed by the French TGV to assess accurately appropriate braking distances and train speed for each route on the TGV line. This paragraph requires FOX to complete this analysis for the entire right-of-way in Florida, and to adhere to the train speeds that are determined to be safe for all potential brake failures.

Paragraph (g) requires that when a failure of the electric or friction portion of the brake occurs en route, the trainset must proceed at the speed determined appropriate by the matrix prepared in accordance with paragraph (f), and confirmed by the pre-revenue service system qualification tests required by § 243.21 and Subpart G of this proposed rule. Also, the engineer must notify central traffic control of any combination of brake failure that

requires a speed restriction. On the FOX system, these speed limitations will be automatically enforced by the signal system.

In paragraph (h), FRA proposes that the trainset be equipped with an emergency application feature that produces an irretrievable stop, using a brake rate consistent with prevailing adhesion, passenger safety, and brake system thermal capacity. In addition, an emergency application shall be available at any time, and a means to apply the emergency brake must be provided at two locations in each trainset that are accessible to the train crew. This paragraph merely codifies current industry practice and ensures that passenger equipment will continue to be designed with an emergency brake application feature. In FRA's 1994 NPRM on power brakes, FRA proposed a requirement that all trains be equipped with an emergency application feature capable of increasing the train's deceleration rate a minimum of 15 percent. See 59 FR 47729. Comments received indicated that passenger brake equipment should provide a deceleration rate with a full service application that is close to the emergency brake rate, and that the proposed requirement would require lowering full service brake rates, which would compromise safety and reduce train speeds. Based on these comments, FRA proposes the current requirement, which is in accordance with suggestions made by several U.S. passenger railroads.

Paragraph (i) proposes that FOX trainsets be designed so that an inspector would not be on, under, or between components of the equipment in order to observe brake actuation or release. The proposal grants the Railroad flexibility to use a reliable indicator in place of direct observation of the brake application or piston travel. The current design of many passenger car brake systems make direct and safe observation extremely difficult. FRA wishes to avoid this and the employee injuries that may result. Brake system piston travel or piston cylinder pressure indicators have been used with satisfactory results for many years. Although indicators do not provide 100 percent certainty that train brakes are effective, FRA believes that they provide a high degree of assurance and are preferable to placing an inspector in a dangerous position.

Paragraph (j) requires the trainset brake design to permit a disabled train's pneumatic brakes to be controlled by a rescue locomotive through brake pipe control alone. This feature will facilitate easy and safe removal of disabled trainsets to an appropriate repair shop.

Paragraph (k) proposes that the Fox trainset be equipped with a hand or parking brake that can be set and released manually and can hold the equipment on the maximum grade anticipated by the operating railroad. A hand or parking brake is an important safety feature, which prevents parked equipment from rolling or runaway. In the 1994 NPRM on power brakes, FRA proposed requiring a hand brake on cars and locomotives. See 59 FR 47729. FRA received several comments suggesting that the term ''parking brake'' be added to the requirement, because that is the term used in many passenger operations. Based on those suggestions, FRA has added the term in this proposal. This requirement differs from typical North American practice, which calls for a hand brake on each car. FOX trainsets are a fixed consist that can not be uncoupled in the field, and so this proposal treats the trainset as a single vehicle.

Paragraph (l) proposes an independent failure detection system to compare brake commands with brake system output to determine if a failure has occurred. The failure detection system shall report brake system failures to the automated train monitoring system. This requirement ties the brake system to the automatic monitoring system, as required by § 243.425(a) discussed below. Also, this important safety feature will alert the operator to potential brake system problems so that timely compensating action.

Paragraph (m) requires that each truck of the trainset be equipped with a wheelslide system designed to automatically adjust the braking force on each wheel to prevent axle-locking during braking. In the event of failure of a truck's wheelslide system, control will be automatically provided by the wheelslide system of an adjacent truck. This redundancy is necessary, because at very high speeds, the available adhesion between the wheel and the rail is lower than exists at slower, conventional speeds. This factor increases the possibility of wheelslide during braking at high speeds. The FOX trainset has a separate and independent microprocessor to control wheelslide on each truck. If a microprocessor fails, an adjacent microprocessor takes over wheelslide control for the truck with the inoperative microprocessor. The trainset is also equipped with a system that detects non-rotating axles and removes pressure from the brake cylinders until rotation resumes. Paragraph (m) also proposes that a visual and/or audible alarm be provided in the cab of the controlling power car if a blocked axle is detected.

Section 243.411 Truck and Suspension System

This section contains the proposed requirements for trucks and suspension systems. Truck and suspension system performance are crucial to the safe operation of high speed passenger equipment. The suspension system requirements proposed in this section were also used for the successful demonstrations of the X–2000 and the ICE trainsets on the Northeast Corridor at speeds up to 135 mph. These proposed requirements are also likely to be part of the suspension system performance Amtrak's passenger future equipment.

Paragraph (a)(1) requires the truck-to-car-body attachment on the FOX trainset to resist, without failure, a force of 250,000 pounds acting in any horizontal direction. The requirement for the attachment to resist a horizontal force is intended to allow the truck to act as an anti-climbing device during a collision. With the truck attached to the car body, the truck of an overriding rail vehicle is likely to be caught by the underframe of the overridden rail vehicle, thus arresting the override. The parameter selected represents the current North American design practice, which has proven effective in preventing horizontal shear of trucks from car bodies.

Paragraph (a)(2) requires each component of the truck must to remain attached to the truck when a force equivalent to 2g acting on the mass of the component is exerted in any direction on that component. Paragraph (a)(1) is intended to keep the truck attached to the car body, and paragraph (a)(2) is intended to keep truck components attached to the truck.

To ensure safe, stable performance and ride quality, paragraph (b) requires suspension systems to be designed to prevent wheel climb, wheel lift, rail rollover, rail shift, and to prevent vehicles from overturning. These requirements must be met in all operating environments, and under all track and loading conditions as determined by the operating railroad. In addition, these requirements must be met under all track speeds and conditions, consistent with the requirements of Subpart D, up to the maximum operating speed and maximum cant deficiency of the equipment. These broad suspension system performance requirements address the operation of equipment at both high speed over well maintained track and at low speed over lower

classes of track. Suspension system performance requirements are needed at both high and low speeds, in order to prevent derailments while negotiating curves. Compliance with paragraph (b) must be demonstrated during the Railroad's pre-revenue service system qualification testing of the equipment as described in Subpart G.

Paragraph (c) requires the steady-state lateral acceleration of passenger cars to be less than 0.1g, as measured parallel to the car floor inside the passenger compartment, under all operating conditions. Passenger cars must not operate when the steady-state lateral acceleration is 0.1g or greater. FRA originally considered limiting the cant deficiency to effect this requirement, but members of the RSAC track working group concluded that this steady-state lateral acceleration requirement would ensure safe operation.

Paragraph (d) requires each truck to be equipped with a permanently installed lateral accelerometer mounted on the truck frame. If hunting oscillations are detected, the train monitoring system shall provide an alarm to the locomotive engineer and the train shall be slowed by the locomotive engineer to a speed of 8 km/h (5 mph) less than the speed at which hunting oscillations stopped. Also, this requirement must be included in the Railroad's operating rules.

Paragraph (e) provides ride vibration, or quality, limits for vertical accelerations, lateral accelerations, and the combination of lateral and vertical accelerations. These limits must be met while the equipment is traveling at the maximum operating speed over its intended route during the qualification phase of the system. The limiting parameters and the means to measure them are a result of the consensus recommendations from the RSAC high speed track task group and the passenger equipment working group. These standards have proven effective during the demonstrations of the X–2000 and ICE trainsets here in the U.S. Compliance with ride quality requirements contained in this paragraph must be demonstrated during the pre-revenue service qualification tests required by § 243.113 and Subpart G of this proposal. One of the most important objectives of pre-revenue service system qualification testing is to demonstrate that suspension system performance requirements have been met.

Paragraph (f) requires bearing overheat sensors to be provided on-board the equipment, or at reasonable wayside intervals. FRA prefers sensors on-board the equipment, in order to eliminate the risk of a hotbox that develops between wayside locations. However, FRA recognizes that on-board sensors have a history of falsely detecting overheat conditions, which have caused operating difficulties for some passenger railroads.

Section 243.413 Fire Safety

This section contains the fire safety requirements proposed for the FOX system. In 1984, FRA published guidelines recommending testing methods and performance criteria for the flammability, smoke emission, and fire endurance characteristics for categories and functions of materials to be used in the construction of new or rebuilt rail passenger equipment. 49 FR 33076 (Aug. 20, 1984); 49 FR 44582 (Nov. 7, 1984). The guidelines mirrored fire safety guidelines developed by the Federal Transit Administration (formerly known as the Urban Mass Transit Administration).

The intent of the guidelines is to prevent fire ignition and to maximize the time available for passenger evacuation where fire does occur. FRA subsequently reissued the guidelines in 1989 in order to update the recommended testing methods. 54 FR 1837 (Jan. 17, 1989). Testing methods cited in the current FRA guidelines include those of the American Society of Testing and Materials (ASTM) and the Federal Aviation Administration (FAA). In particular, the ASTM and FAA testing methods provide a useful screening device to identify materials that are especially hazardous.

FRA sought comments in the Advance Notice of Proposed Rulemaking (ANPRM) for Passenger Equipment Safety Standards on the need for more thorough fire safety guidelines. 61 FR 30672 (June 17, 1996). FRA noted that fire resistance, detection, and suppression technologies have all advanced since the guidelines were first published. In addition, FRA explained that a trend toward a systems approach to fire safety is evident in most countries with modern rail systems. In response, the National Fire Protection Association (NFPA) commented that perhaps more thorough guidelines are needed, or at least should be evaluated.

Paragraph (a) addresses fire safety by proposing to make FRA's fire safety guidelines mandatory in the construction of FOX trainsets. In addition, the proposed rule would also require that fire safety be furthered through a fire protection plan and program carried out by the railroad. Paragraph (b) proposes that the Railroad require certification from the equipment supplier that combustible materials used in the construction of trainset interiors have been tested by a recognized independent testing laboratory, and that the results comply with the requirements of paragraph (a) of this section.

Paragraphs (c)–(e) link the fire safety analysis portion of the system safety program required by Subpart B to the trainset design requirements. These paragraphs require the Railroad to ensure that good fire protection practice is used during the design and operation of the equipment. These paragraphs require the Railroad to install various detection and suppression equipment where the Railroad's written analysis determines they are required.

Paragraph (f) requires the Railroad to comply with all elements of its written procedures designated as mandatory under Subpart B for the inspection, testing, and maintenance of all fire safety systems and equipment.

Section 243.415 Doors

This section contains the requirements for exterior side doors on FOX trailer cars. These doors are the primary means of egress from the train. During an NTSB investigation of the February 16, 1996, collision between the MARC and Amtrak trains in Silver Spring, Maryland, that agency identified unsafe conditions on MARC's rail cars that had been manufactured by Sumitomo. Concerned that the unsafe conditions identified on these rail cars may exist on other commuter lines subject to FRA oversight, on March 12, 1996, the NTSB recommended that FRA:

> Inspect all commuter rail equipment to determine whether it has: (1) Easily accessible interior emergency quick-release mechanisms adjacent to exterior passageway doors; (2) removable windows or kick panels in interior and exterior passageway doors; and (3) prominently displayed retro-reflective signage marking all interior and exterior emergency exits. If any commuter equipment lacks one or more or these features, take appropriate emergency measures to ensure corrective action until these measures are incorporated into minimum passenger car safety standards. (Class I, Urgent Action) (R–96–7).

The requirements proposed in this section respond to this NTSB recommendation.

Paragraph (a) proposes requirements for powered, exterior side doors. In paragraph (a)(1) FRA proposes that each trailer car have a minimum of four exterior side doors, or the functional equivalent of four side doors, that each permit at least one 95th-percentile male to pass through at a single time. FRA believes that such a requirement is

necessary, at least as an interim measure, so that each passenger car have a sufficient number of exits to allow passengers to quickly exit in an emergency. This requirement would be met by providing two sets of double-wide doors that permit two 95th-percentile males to pass through at the same time. However, FRA invites comment concerning the extent to which the design of the FOX trainsets cannot comply with this proposed section. FRA may modify this proposal based on information provided by FOX or other interested parties. As a long term approach, FRA is investigating an emergency evacuation performance requirement similar to that used in commercial aviation where a sufficient number of emergency exits must be provided to evacuate the maximum passenger load in a specified time for various types of emergency situations.

Paragraph (a)(2) proposes that the status of each powered, exterior door shall be displayed to the crew in the operating power car and if door interlocks are used, the sensors used to detect train motion shall be nominally set to operate at 5 km/h (3 mph). Such a proposal would enable a crew member in the operating cab to determine whether train doors are closed before departure. This capability is well within current technology and complies with the emergency exit requirements proposed in the NPRM for Tier II Passenger Equipment Safety Standards.

In paragraph (a)(3) FRA proposes that powered, exterior doors be powered by the compressed air system or by electricity. If powered by electricity, the doors shall be connected to an emergency back-up power system. The back-up power system should facilitate rapid evacuation through the doors in the event of primary power failure.

Paragraph (a)(4) requires that each powered, exterior door be equipped with a manual override that is: Located adjacent to the door that it controls; capable of opening the door without power from inside and outside the car; and designed and maintained so that a person may access the override device from inside and outside the car, without the use of any tool or other implement. FRA believes this requirement is necessary to ensure that passengers are able to quickly evacuate the train.

Paragraph (a)(5) requires that instructions for manual override be clearly posted in the car interior at door locations. As a result of the MARC/Amtrak accident in Silver Spring, Maryland, the NTSB stated that several train passengers were unaware of the locations of emergency exits, and none knew how to operate them. The NTSB found that the interior emergency window decals were not prominently displayed and that one car had no interior emergency window decals.

Paragraph (a)(6) addresses this concern by requiring a means for emergency responders to access the manual override from outside the car be provided. In addition, instructions for access and use of the handle must be clearly posted outside the car at all door locations. As a result of the Silver Spring accident, the NTSB had found that the exterior emergency decals were often faded or obliterated, and the information on them, when legible, directed emergency responders to another sign at the end of the car for instructions on how to open emergency exits.

Paragraph (a)(7) requires that manual door releases be activated easily. To ensure that most passengers are capable of opening the doors using the manual releases, FRA proposes that they be easily operable by a 5th-percentile female, without the use of any tool to accomplish the manual override, in the event of head-end power loss.

To ensure that manual override devices are easily accessible by passengers, FRA is proposing requirements in paragraph (a)(8) to address covers and screens used to protect such devices from casual or inadvertent use. FRA desires to balance the concern that passengers may unnecessarily exit cars when no emergency is present with the need for passengers to easily access a door-release mechanism in a life-threatening situation. Thus, the Railroad may protect a manual override device used to open a powered, exterior door with a cover or a screen capable of removal by a 5th-percentile female without requiring the use of a tool or other implement. If the method of removing the protective cover or screen entails breaking or shattering it, the cover or screen must be scored, perforated, or otherwise weakened so that a 5th-percentile female can penetrate the cover or screen with a single blow of her fist without injury to her hand.

In paragraph (b), FRA proposes that passenger compartment end doors be equipped with a kick-out panel, pop-out window or other equivalent means of egress in the event the door will not open. The NTSB noted that none of the car doors on the MARC train involved in the Silver Spring, Maryland, accident had removable windows or pop-out emergency escape panels (''kick panels'') for use in an emergency.

FRA shares the NTSB's concern about passenger egress in an emergency; however, FRA believes that the NTSB's suggestion to install kick panels is best limited to interior doors to ensure passage through a train in an emergency—and not applied to exterior doors. To the best of FRA's knowledge, the concept of kick panels has not been utilized in North American rail equipment. Installing kick panels below the window levels in exterior doors was evaluated by FRA—with concurrence from the Passenger Equipment Safety Standards Working Groups—as unacceptable for safety reasons. Because passenger railroads have encountered recurring situations in which passengers have inappropriately exited moving trains, leading to death or serious injury, introducing kick panels in exterior doors would create an unacceptable risk of inadvertent use, particularly by children.

Use of kick panels to open passageways through a train has merit. If panels can be made sufficiently large without decreasing the functionality of doors in normal operation, such a feature may facilitate evacuation through the length of the train if exterior side doors are jammed. Evacuation throughout the length of the train is often the safest route of egress in situations such as fires, derailments in multiple track territory, and incidents in third-rail powered commuter service. Accordingly, FRA proposed in the NPRM for Passenger Equipment Safety Standards that Tier II passenger car end doors be equipped with a kick-out panel, pop-out window or other similar means of egress in the event the doors will not open.

Section 243.417 Emergency Equipment

Paragraph (a) proposes that the emergency system requirements given in this section apply to each FOX trailer car. Experience gained during rescues conducted after recent passenger train accidents indicates that emergency lighting systems either did not work or failed after a short time, greatly hindering rescue operations. Paragraph (b) requires FOX trailer cars to be equipped with emergency lighting providing a minimum average illumination level of 55 lux (5.1 ft-candles) at floor level for all potential evacuation routes, and a back-up power feature capable of operation for a minimum of two hours after loss of normal power.

The two-hour time duration for availability of back-up power is based on experience gained during rescue operations for passenger train accidents in remote locations. In such accidents, fully-equipped emergency response forces can take an hour or more to arrive at the site, and additional time is

required to deploy and reach people trapped or injured in the train. In addition, the back-up power system must be able to operate in all orientations and after experiencing a shock due to a longitudinal acceleration of 3g and vertical and lateral accelerations of 2g. The shock requirement will ensure that the back-up power system has a reasonable chance of operating after the initial shock caused by a collision or derailment.

Paragraph (c) requires an emergency communication system within the train with back-up power. This safety feature will allow the train crew to provide evacuation and other instructions to passengers. Such a system can help prevent panic that often occurs during emergency situations. FRA is proposing that transmission locations be located throughout the trainset and that the locations be marked with clear instructions for the use of the emergency communication system.

Paragraph (d) proposes that locations of emergency equipment and exits be clearly marked with luminescent material that makes the identity and location of the emergency exit recognizable from a distance equal to the width of the car. This requirement is intended to allow passengers and crew to easily locate emergency equipment and exits, even under poor visibility conditions. The requirement will aid an orderly evacuation of the train in the event of an emergency.

Paragraph (e) contains the proposed requirements for FOX emergency exits. Paragraph (e)(2) requires clear and understandable instructions for the use of emergency exits to be posted at each emergency exit and be visible from a distance of 30 inches. This provision should aid passengers unfamiliar with the operation of emergency exits to operate them and evacuate train quickly.

Paragraph (e)(3) proposes that each trailer car have a minimum of four emergency window exits, arranged in a staggered configuration, or with one located at each end of each side of the trailer car. Each FOX trailer car will be equipped with 4 emergency windows, 2 at each end and one on each side, to comply with this requirement. An emergency window is also located in each FOX trailer car side entrance door to provide emergency access in the event of a blocked door. This configuration complies with the emergency exit requirements proposed in the NPRM for Passenger Equipment Safety Standards.

Paragraph (e)(4) proposes that each trailer car window emergency exit shall have a minimum free opening of 1.6 m (63 in) wide by 0.6 m (24 in) high. This configuration complies with the emergency window exit requirements proposed in the NPRM for Passenger Equipment Safety Standards and is the minimum size that will allow a fully equipped emergency responder to enter the car through the window. The FOX trainsets will have emergency windows much larger than this minimum size.

Paragraph (e)(5) requires that emergency window exits be capable of activating easily. The FOX system trainsets will employ breakable emergency windows, rather than the conventional North American removable type. This will facilitate use of a window-to-carbody seal that will withstand the large pressure variation between passing trainsets, and use of a flush-mounted window seal that will minimize air drag for high speed operations. A small pointed hammer will be located at each end of the passenger compartment, beside each window and door, to break the emergency window. FRA proposes that each emergency window exit shall be easily operable by a 5th-percentile female using this hammer. No other tool or implement may be required for this purpose.

Paragraph (e)(6) proposes that each power car have an emergency roof hatch with a minimum opening of 0.45 m (18 in) by 0.6 m (24 in) and an emergency escape exit in the cab sidewall. Such features should aid in removing passengers and crew members from a vehicle that is either on its side or upright in water. This proposed requirement exceeds the requirements for Tier II equipment proposed in the NPRM on Passenger Equipment Safety Standards.

In paragraph (f) FRA requires the Railroad to have in place a redundant means for the train crew to communicate with the pertinent railroad operations center to summon aid in the event of an emergency situation. These redundant methods may include operating portable radios or cellular telephones. This requirement will ensure that emergency response forces can be quickly summoned in the event of an emergency.

Section 243.419 Operator's Controls and Power Car Layout

FRA believes that power car cab interior features play an important role in safety, because they affect employee response and performance. Given the speed that FOX trainsets will travel, FRA believes it would be appropriate to establish minimum standards for the cab layout, in order to maximize employee cab performance. The proposed requirements set forth in this section attempt to capture sound ergonomic design practice for cab layout in order to minimize the risk of human error, attention loss, and operator fatigue. These standards are self-explanatory, and consistent with the FOX high speed equipment.

Section 243.421 Exterior Lights

Paragraph (a) proposes that each power car be equipped with two or more headlights, each capable of producing 12,000 or more candela. Paragraph (b) proposes the following taillight requirements: each trailing power car shall be equipped with two or more red taillights; each taillight shall be located at least 1.2 m (3.9 ft) above rail; each taillight shall produce 15 or more candela; and taillights of the trailing power car must be on when the trainset is on a section of the system that is in revenue service.

The intensity of the headlights and taillights proposed here for the FOX trainsets are lower than exist on standard North American equipment. Due to all of the unique operating characteristics that are part of the FOX system, (no grade crossings, a fenced right-of-way with intrusion detection systems, no mixed traffic, advanced signal system), the high speed equipment can be (and often is in France) operated at full speed without the locomotive engineer having sight of the right-of-way. The intensity of the TGV lights have provided safe operation for fifteen years of revenue service in France, and FRA believes this will be sufficient for the system in Florida.

Section 243.423 Electrical System Design

This section contains the proposed requirements for the FOX electrical system design. These requirements reflect common electrical safety practice and are widely recognized as good electrical design practice. They include provisions for circuit protection against surges, overload and ground faults; electrical conductor sizes and properties to provide a margin of safety for the intended application; battery system design to prevent the risk of overcharging or accumulation of dangerous gases that can cause an explosion; and design of resistor grids that dissipate energy produced by dynamic braking with sufficient electrical isolation and ventilation to minimize the risk of fires. These proposed electrical system design requirements are consistent with the FRA's NPRM for Tier II Passenger Equipment Safety Standards.

Section 243.425 Automated Monitoring

This section contains proposed requirements for automated monitoring of the status or performance of the Railroad's safety-related equipment systems and subsystems. Investigations of past passenger train accidents reveal that many accidents were caused, in some measure, by human error. FOX's high operating speeds will reduce the time train operators will have to react to nonconforming conditions, and evaluate potentially dangerous situations. Therefore, the potential for accidents increases. Automated monitoring systems can reduce the risk of accidents by alerting the operator to abnormal conditions and advising the operator of necessary or recommended corrective action as soon as the abnormalities appear. These systems can even be designed to make automatic corrective action in certain situations. FRA proposes that the FOX trainsets be equipped with an automated system to monitor various train systems and components. The requirements that FRA proposes are consistent with the requirements for FRA's NPRM for Tier II Passenger Equipment Safety Standards.

Paragraph (a) requires the train to be equipped to monitor the performance of a minimum set of safety-related systems and components that includes the following: Reception of cab signals and train control signals; truck hunting; electric brake status; friction brake status; fire detection systems; head end power status; alerter; horn; and wheel slide. This monitoring system will also provide information to the Railroad for use in trouble-shooting, maintenance, and to accumulate reliability data that will form the basis for establishing required periodic maintenance intervals.

Paragraph (b) requires that the locomotive engineer be alerted when any of the monitored parameters are out of predetermined limits. The Railroad's operating rules, developed pursuant to § 243.117 and Subpart F of the rule, will govern the engineer's activities if the equipment malfunctions. If the engineer does not act in accordance with the Railroad operating rules for this situation, the Railroad's central traffic control must initiate corrective action.

Paragraph (c) requires the Railroad to develop, in the course of its system safety plan analysis, appropriate operating rules that will address engineer and train performance if a trainset's automated monitoring system becomes defective en route, or is defective when the daily inspection required by § 243.433 is completed. The automated monitoring system greatly enhances safe operations. Although trains may operate safety without this system, FRA believes that specific practices must be developed and followed by the Railroad to address such items as train speed, braking distances, and communications when the system becomes defective. As stated earlier in this document, FRA is unclear whether this monitoring system is designed to function in redundant fashion. If that is the case, it may be very unlikely that the monitoring system will ever fail. Nonetheless, FRA believes that the added precaution of standards to cover that event is necessary to ensure safety.

Paragraph (d) proposes that each lead power car be equipped with an event recorder that monitors and records safety data as required by § 243.425(a) of this proposal and 49 CFR 229.135, Event Recorders.

Paragraph (e) requires that each of the systems monitored, and listed in paragraph (a), must be inspected during the daily inspection that is required by § 243.433 of this Subpart. This works in conjunction with § 243.433(f)(1), which requires the Railroad to inspect these monitored systems in the daily inspection of each trainset. If for some reason, conditions cannot be determined through the automated monitoring system, the Railroad must perform a visual inspection before the trainset can be placed in revenue service.

Section 243.427 Trainset System Software and Hardware Integration

This section contains the proposed requirements for the Railroad's rolling stock hardware and software. This section reflects the growing role of automated systems to control passenger train safety functions. Paragraph (a) proposes that the trainset system hardware and software integration conform with CF–001, On-Board Electronic Equipment and Computer Hardware. In addition, paragraph (b) proposes that the trainset system hardware and software integration conform with Pr CF–67–004, Methodology for the Development of On-Board Micro-Computer Equipment.

These requirements represent accepted practice, and will not limit the flexibility of the Railroad's equipment designers. However, these standards reflect good design, that has led to reliable, safe computer hardware and software control systems in the European railroad industry. Computer hardware and software systems designed to meet these standards may require an initial investment, but it has shown that such an investment is quickly recovered by the reduction in hardware and software integration problems, minimizing trouble-shooting, debugging of equipment.

Section 243.429 Control System Design Requirements

This section requires that the rolling stock computer be designed and function pursuant to the software safety program developed as part of the Railroad's system safety plan in Subpart B of this proposal, discussed previously.

Section 243.431 Safety Appliance

This section contains proposed requirements for safety appliances on FOX trainsets. The proposal is consistent in concept with existing requirements, but is tailored specifically for application to this new and somewhat unconventional equipment. These requirements are also consistent with those proposed for Tier II equipment in the FRA's Passenger Equipment Safety Standards.

Paragraph (a) of this section contains the proposed requirements for couplers that are positioned at either end of the trainset, which will be used to connect to other locomotives for hauling or rescue purposes. Paragraph (a) requires automatic couplers at the leading and trailing ends of the trainset to couple on impact, and uncouple by use of uncoupling lever or other means that does not require a person to go on, under, or between equipment units. This requirement prevents employee exposure to the safety hazards that arise from working on or between rail equipment. The leading and trailing automatic couplers of the trainset must be compatible with the Railroad's rescue locomotive couplers, without the use of special adapters. This would facilitate rapid movement of disabled trains and protects employees from the hazards of going between the locomotive units. Paragraph (a) also proposes that all couplers be equipped with an anti-climbing mechanism capable of resisting an upward or downward vertical force of 250 kN (56,200 lb) without permanent deformation. This is common European design and is appropriate in an operating environment such as the FOX system, where the risk of a collision has been greatly reduced through strict collision-avoidance measures, and the articulated train formation that resists climbing in the event of an accident.

Paragraph (b) of this section sets forth minimum requirements for safety appliance mechanical strength and fasteners. Handrails and sill steps must be made of steel pipe that is 1 inch in

diameter, and fasteners must have a mechanical strength of at least a M10-diameter SAE steel bolt. These standards are consistent with European and U.S. practice, and provide a high degree of safety for employees who must utilize the safety appliances in the course of their duties.

Paragraph (c) sets forth the minimum standards for handrails and handholds. All handrails and handholds must be made of stainless steel, which provides optimum strength and durability for equipment exposed to all sorts of environmental elements. This paragraph also establishes minimum clearance requirements that will facilitate safe employee usage. Handrails and handholds are not required on units of a trainset that are semi-permanently connected, as the FOX trainsets are. The reason for this exclusion is that these units can be disconnected only in repair facilities with the use of special tools, and employees have no reason to position themselves between units and so, have no need for the handholds and handrails for that process. Similarly, handrails and handholds are not required on the leading and trailing units, which are equipped with automatic couplers that are coupled or uncoupled with the use of tools that do not require employees to work between the units. However, handrails and handholds are required at both sides of the doors used to board and depart the trainset. This will provide passengers and employees additional stability and safety as they enter or leave the equipment.

Paragraph (d) of this section sets forth the minimum requirements for sill steps on the FOX passenger equipment. Sill steps must be present below each side door on all power and trailer cars, and must be made of expanded metal or equivalent anti-skid material, in order to protect employees and passengers from slipping from the step. Sill steps must conform to the clearance requirements set forth in order to accommodate safety the average foot, and must be securely fastened to prevent collapse when under load. Sill steps are not required on cars that are semi-permanently connected, or on the leading and trailing units, which are equipped with automatic couplers. FOX may utilize these devices, but is not required to do so, so long as the equipment remains semi-permanently connected, and possesses automatic couplers at each end of each trainset.

Finally, paragraph (e) of this section describes the manner in which the FOX trailer and power cars are connected to one another. The system does not use traditional couplers that are common in U.S. railroading. Cars are connected through articulated semi-permanent connections that can be disengaged only in repair facilities, with the use of special tools. These connectors between trainset vehicles are an integral design characteristic of the French TGV equipment, and one which will be duplicated on the FOX system. Employees are not placed in danger from the hazards that arise from unexpected rail car movements, and these connectors tend to resist buckling and rolling in the event of a derailment. They greatly enhance employee and passenger safety, and this proposal requires their use.

Section 243.433 Trainset Inspection, Testing and Maintenance Requirements

This section sets forth the minimum standards for the FOX inspection, testing, and maintenance program. FRA proposes general guidelines for the Railroad to follow in order to develop a comprehensive inspection, testing, and maintenance program that will assure the safety of the system's rolling stock. However, FRA proposes to exercise final approval of the inspection, testing, and maintenance program developed by the Railroad and to enforce the safety-critical inspection, testing, and maintenance procedures, criteria, and maintenance intervals that result from the approval process.

FRA sets forth this proposed cycle of preventive maintenance for the FOX trainsets, which is based on the operational experience acquired in France throughout the last fifteen years. The French inspection and maintenance program utilizes accumulated mileage and degradation rates as indicators for inspection needs, and FRA adopts those criteria in this proposal.

Paragraph (a) requires the Railroad to obtain FRA approval of the written inspection program for the rolling stock prior to implementation of that program and prior to commencing operations. At a minimum, this program must include the complete inspection, testing, and maintenance program for the TGV trainsets as it is performed in France, including all inspections set forth in § 243.433(d) of this rule. This information shall include a detailed description of: safety inspection procedures, intervals and criteria; test procedures and intervals; scheduled preventive maintenance intervals; maintenance procedures; special test equipment or measuring devices required to perform safety inspections and tests; and training and qualification of employees and contractors to perform safety inspections, tests and maintenance.

Paragraph (b) requires the Railroad to designate which inspection and maintenance criteria are safety-critical, and deems all emergency equipment safety-critical. ''Safety-critical'' requirements are those that, if not fulfilled, increase the risk of damage to equipment or personal injury to a passenger, crew member, or other person. The Railroad must identify the items in the inspection, testing, and maintenance program that are safety-critical, and must submit the program to FRA.

Paragraph (c) requires the Railroad to obtain FRA approval for any changes to the safety-critical portion of the program required in this section. Paragraph (d) requires the Railroad to adopt and implement the inspection, testing, and maintenance program that FRA approved and paragraph (e) mandates that the Railroad's program must ensure that all systems and components are free from hazardous conditions.

Paragraph (f) sets forth specific inspections and maintenance programs that FOX must complete throughout the life of the system. These are identical to the French practice, which have produced a high level of safety on the TGV system. Paragraph (f)(1) sets forth the daily inspection that each trainset must undergo before it can begin revenue operations. This paragraph lists a series of conditions that, if not corrected, would prevent the trainset from commencing passenger service. These conditions are: Malfunction of the driving assistance system (SIAC); malfunction of the fire detection system; indication of an unbalanced tripod; indication of a broken tripod; indication of blocked axle; a single phase pantograph or its circuit breaker out of order; power car failure or cut-out; isolated roof disconnecting switch H(HT); transformer cooling or ventilation out of order; two or more motor blocks isolated; mechanical brake on one or more trucks isolated; total failure of the anti-slide device on one truck; failure of locomotive engineer's vigilance system (VACMA); speedometer failure; failure of on-board signaling system; failure of the speed measuring system (the warning flag of the speedometer does not disappear when the driving cab is activated); locomotive engineer's console out of order; locomotive engineer's brake valve not operating; leak in the main reservoir line; leak in the main brake pipe; failure indication during the required brake test; any battery charger out of order; and total failure of the trainset interior lighting.

The daily inspection is required prior to placing a trainset in service for the

first time during a calendar day. As FRA understands it, this inspection will utilize the automated, electronic test features that are part of the FOX equipment, rather than rely on visual or manual inspections. As rail technology improves, reliance on electronic sensors will naturally increase, and benefits flow from this progression. Electronic devices can often detect imperfections or potential problems that are invisible to the human eye. Also, some of the equipment that the automated testing devices inspect are difficult or impossible to view on the TGV trainsets. Therefore, this electronic capability reduces the risk of injury to employees who might otherwise crawl on, under, or between equipment subject to movement, and dramatically reduces the risk that defective equipment could be released for service.

Paragraph (f)(1) also requires that if any of the conditions listed above cannot be detected through the equipment's on-board automated monitoring system, the Railroad must conduct a visual inspection to verify that the condition does not exist and the equipment is safe for use. As FRA understands the FOX equipment, the automated monitoring system should have the capability to detect all of the potentially unsafe conditions that are listed in the daily inspection requirement. However, this in unclear from the FOX submission. Also, if the on-board monitoring system malfunctions, all of the conditions listed in this paragraph could not be detected from the cab and a visual inspection would be the only method of ensuring that the conditions do not exist. As discussed previously, the Railroad must develop appropriate operating rules, pursuant to § 243.117 and § 243.425 of this proposal, to address the safety risks that may arise if an on-board monitoring system fails en route or during this daily inspection. FRA believes that, in the interest of safety, the Railroad must conduct a visual inspection to detect the items listed in this paragraph if the on-board monitoring system is not capable of detecting them.

FRA is considering making all or some of these items part of a trip inspection, rather than a daily inspection, which would be completed before each trainset begins a new trip. FRA is concerned that some of the items listed in the daily inspection are so critical to the safety of the system, that a train should not be in service for any period of time when those items are not functioning properly. A recent passenger train collision in England, in which six fatalities occurred, may have been prevented if the railroad had conducted a trip inspection and then prevented the train's departure when the defective condition was discovered. Because the items inspected here in the daily inspection are inspected electronically, as FRA understands it, requiring the inspection to occur at the beginning of each trip would impose few, if any, financial or operational burdens on the Railroad. However, FRA seeks comment on the merit of this proposal and any changes to it. Also, FRA requests commenters to discuss which, if any, items should be required to be inspected on a trip basis.

Paragraph (f)(2) describes the examination in service which is a walking visual inspection conducted by qualified personnel every 4000 km (2,485 mi), at a location where there is a repair pit and access to the top of the trainset. The purpose of the examination in service is to detect anomalies that have occurred and correct them so that the trainset can be returned to service without any safety risk. This examination focuses on the systems keenly involved in trainset trackworthiness, including running gear, trucks, and components under the carbody. As FRA understands it, this may become a daily visual inspection if the ridership studies commissioned by FOX become a reality, and the system operates so that each trainset will complete four round-trip journeys each day.

At a minimum, the items listed below must be inspected during an examination in service. All conditions found that do not comply with the safety inspection criteria required by § 243.433(a)(1) of this rule must be corrected before the trainset is put into revenue service: Condition of the pantographs and roof insulators; condition of sanding nozzles; fixation and condition of dampers; condition of suspension springs; fixation and condition of grounding straps; condition of side skirts and underbody panels; condition of trucks; oil levels; traction motor-to-carbody securement; presence of brake pads; condition of brake shoes; condition of wheel tread; and condition of drive train.

Paragraph (f)(3) proposes the running gear inspection which must be done by qualified personnel once every 18 days. The purpose of the running gear inspection is to guarantee running safety by monitoring wear conditions on wheels, bearings, brakes and suspension systems. The inspection is to be conducted once every 18 days on each trainset, independent of distance traveled.

At a minimum, the items listed below must be inspected during a running gear inspection. All conditions found that do not comply with the safety inspection criteria required by § 243.433(a)(1) of this proposal must be corrected before the trainset is put into revenue service: A visual inspection of trucks; an inspection of the operation of flange-lubricating devices; an inspection of the condition and attachment of dampers, roof mounted elements, and suspension components; an inspection of the brake rigging, journal bearings, and tripod transmission; a visual inspection of the condition and attachment of brake pads; an inspection of the oil levels on drive train; an inspection of the securement of drive train and wheel slide sensors; an inspection of the condition of the pantographs and roof insulators; and check for audible leaks on pneumatic system.

Paragraph (f)(4) sets requirements proposed for the wheel inspection (also called Systematic Work). Each trainset wheel and wheel profile must be inspected by qualified personnel at an interval not to exceed 50,000 km of travel. Equipment not in compliance with the inspection criteria established in paragraph (a) must be corrected or replaced before trainset returns to revenue service. The purpose of the wheel inspection is to ensure safety and ride comfort at high speeds.

Paragraph (f)(5) describes the Minor Inspection which must be done by qualified personnel at an interval not to exceed 150,000 km of travel or 7 months of time, whichever comes first. The Minor Inspection must be equivalent to the Minor (Limited) Inspection performed on TGV trainsets in France and performed in accordance with the tests procedures and inspection criteria established in paragraph (a). All conditions found that do not comply with the safety inspection criteria required by paragraph (a) must be corrected before the trainset is put into revenue service. The Minor Inspection must complete the following for electrical parts: Inspect current return devices, antennas, transponders; examine batteries; check operation of lighting; check operation of speedometer unit and of cab signal receptor; check sensors and sensor protectors; check roof switches and contacts; check circuit breakers; and check traction motors and main transformers. For mechanical parts, the Railroad must: Inspect axles, axle boxes and trucks; check tightening torque of shock absorber and support mounting bolts; check buffing gear; inspect pantographs; check attachment of anti-roll bars; examine condition of guard-irons; check setting of sanders; verify proper operation of flange-lubricating

devices; check level and condition of oil on motor and reducing gears; check attachment of geared motors; check for grease projections from the motive force transmission components, and carrying and fixed rings of the articulation joint; check attachment of motive force transmission components and tripod transmission; check condition of motorized axle torque reaction rods; check condition of brake-units and brake shoes; check condition of disk brake pads and of the brake rigging cylinder assembly; check condition of bellows; check for attachment defects and/or distortions on carbody components such as underside panels, skirts, windows, fairings, etc.; verify proper operation of doors including locking devices; check for defects on front windows; inspect extinguishers, tooling and safety equipment; and inspect tachometer and odometer sensors. For pneumatic parts, the Railroad must check main compressor; check the oil level and check for leaks on main compressor; check condition of pneumatic suspension components; and check brake equipment and brake indicator lamps.

Paragraph (f)(6) describes the general inspection which must be conducted at an interval not to exceed 300,000 km of travel or 13 months of time, whichever comes first. The Railroad must perform a General Inspection (equivalent to the General Inspection performed on TGV trainsets in France) in accordance with the tests procedures and inspection criteria established in paragraph (a). All conditions found that do not comply with the safety inspection criteria required by paragraph (a) must be corrected before the trainset is put into revenue service. The General Inspection must consist of the following steps for electrical parts: Inspect circuit breaker; examine insulators; inspect main transformers; inspect braids and connecting shunts, sensors and sensor protectors; examine electro-pneumatic and electromagnetic contacts; inspect freon enclosures; check for anomalies on resistors; check operation of various signaling lights; visual inspection of diodes and antennas; check condition of electronic plug-in units; check condition of switches, controls, joints; check condition of master controller; check operation of clock, indicator of imposed speed; check operation of ground-to-train radio link and speed supervision by transponder; check operation of passenger alarms; inspect antenna; verify that headlights (full and dimmed), tail lights, other indicators, lighting, desks operate properly; verify power supply to electrical outlets available to passengers and service personnel; check operation of lights and telltale indicators in electrical cabinets; inspect various motors (traction, main, auxiliary compressors, ventilation); check operation of refrigeration system and circuit breakers. For mechanical parts, the Railroad must: Check operation of pantographs; check for defects on trucks (cracks, distortions); check for defects and check play on fixed and carrying rings of articulation joint; check for defects on intercar passageways; check for defects on doors, locks and joints; check interbody and anti-tilt dampers; check tread brake units; check underbody rotation stops. For pneumatic parts, the Railroad must: Check pressure gauge; check operation of braking gear; check operation of the anti-wheelslide device; check operation of the emergency brake valve; clean driver's brake valve and check its operation; inspect various flexible and half-couplings; check operation of valves which control alarms, windshield washers, windshield wipers, and of differential valves; check brake indicator lights.

Paragraph (f)(7) proposes the Major Inspection which must be conducted at an interval not to exceed 600,000 km of travel or 25 months of time, whichever comes first. The Railroad must perform a Major Inspection (equivalent to the Major Inspection performed on TGV trainsets in France) in accordance with the tests procedures and inspection criteria established in paragraph (a) of this section. All conditions found that do not comply with the safety inspection criteria required by paragraph (a) shall be corrected before the trainset is put into revenue service. The Major Inspection must include the following steps for electrical parts: Inspect roof cable and lightning arresters; check operation of the roof switch; inspect battery switches; inspect battery charger and battery voltmeter; inspect inverters; examine coils; clean electronic gear; inspect couplers and connecting cables; check driver's console switch box; test driver's vigilance system; pre-departure checks (pantograph uplift, air conditioning, etc.); check operation of cab signal; clean switchgear cabinets; lubricate traction motors; check ammeters, key switch panel; check 30 KVA inverter; check spare light bulb supply.

For mechanical parts, the Railroad must: Check calibration of pantographs; check for defects on motorized axle reaction rods; check the constituents of fixed and carrying rings of articulation joint; check that headlight covers are tightly secured; check for defects on carbody exterior paint. For pneumatic parts, the Railroad must inspect air and oil filters; inspect main compressor couplings; check operation of the main air dryer; check operation of pressure gauges; inspect pneumatic suspension reservoirs; check operation of power car and trailer car brakes; check operation of pneumatic pressure regulators; inspect truck-to-carbody coupling and pneumatic suspension connections; and check operation of the spring-applied parking brake.

Paragraph (g) proposes that the Railroad designate brake system repair point(s) in the inspection criteria established in paragraph (a) of this section. FRA proposes that no trainset depart a brake system repair point unless that trainset has a 100% operational brake system.

Paragraph (h) proposes that the Railroad's program established pursuant to paragraph (a) must include the Railroad's scheduled maintenance intervals for equipment based on TGV operations in Europe, and on an analysis required the system safety program set forth in Subpart B of this rule. FRA proposes to allow the maintenance intervals for safety-critical components to be changed only when justified by accumulated acceptable operating data. Changes in maintenance cycles of safety-critical components must be based on verifiable data made available to all interested parties and shall be reviewed by FRA. This proposal is another attempt to balance the needs of the operating railroad to run efficiently and the concern of rail labor organizations that railroads have the ability to unilaterally make safety decisions.

Paragraph (i) requires the Railroad to establish a training and qualification program as defined in Subpart H of this proposal to qualify individuals to perform inspections, testing, and maintenance on the rolling stock. Only qualified individuals may perform inspections, testing, and maintenance of the rolling stock. An employee or contractor employee shall have knowledge of standard procedures described in paragraph (h) of this section in order to qualify to perform a task. FRA does not prescribe a detailed training program or qualification and designation process.

Paragraph (j) proposes that the Railroad's program required by this section include the Railroad's written standard procedures for performing all safety-critical equipment inspection, testing, maintenance, or repair tasks. This paragraph proposes various broad requirements relating to the content and enforceability of the standard operating procedures. FRA has drawn on the

experiences of other heavy industries and in the military, where inherently dangerous tasks are common, which have proven that standard operating procedures are an effective tool in reducing work-related injuries. Further, standard operating procedures can form the basis for periodic safety refresher training. FRA does not propose to prescribe the detailed procedures to be used. The proposed rule is designed to have the detailed procedures developed by those with most knowledge of how to safely perform the tasks—the operators and employees.

These standard procedures must: Describe in detail each step required to safely perform the task; describe the knowledge necessary to safely perform the task; describe any precautions that must be taken to safely perform the task; describe the use of any safety equipment necessary to perform the task; be approved by the railroad's chief mechanical officer; be approved by the railroad's official responsible for safety; be enforced by supervisors with responsibility for accomplishing the tasks; and be reviewed annually by the railroad.

Paragraph (k) requires the Railroad to establish an inspection, testing, and maintenance quality control program, which will be enforced by the Railroad, to reasonably ensure that inspections, tests, and maintenance are performed in accordance with Federal safety standards and the procedures established by the Railroad. In essence, this creates the need for the Railroad to perform spot checks of the work performed by its employees and contractors to ensure that the work is performed in accordance with established procedures and Federal requirements. FRA believes that this is a very important management function that, if neglected will surely lead to safety problems.

Paragraph (l) of this section requires the Railroad to make and maintain a written or electronic record of each of the inspections required in this Subpart. The record must be maintained for at least one year. Inspection records are extremely helpful to railroads and FRA in determining the natural life of equipment and components, and appropriate safety limits that should be imposed because of those natural restrictions. These records will assist the Railroad and FRA to determine whether all inspection and replacement intervals are understood and followed by the system employees and supervisory staff. Also, these records are often helpful, in the event of an accident, to determine probable causation factors.

Subpart F—Operating Practices

Operating rules and practices play a vital role in assuring railroad safety. This Subpart proposes requirements for the Railroad's operating rules and practices, which for the most part, mirror the Petition and general U.S. practice. However, FRA makes some important changes to our treatment of the FOX operating rules, based on the peculiarities of this operation.

Section 243.501 Purpose

First, this proposal grants FRA authority to approve the FOX operating rules prior to revenue operations. FRA believes that approval authority is necessary to ensure that FOX follows, to the maximum extent possible, the safety-critical operating rules used in France on the TGV, which have helped to create the TGV's admirable safety record. FRA has not had the opportunity to review these rules, though they exist, and believes that Federal approval of the FOX operating rules should not occur until a comparison between the TGV rules and the FOX operating rules can take place. Therefore, this section proposes that FRA must approve FOX operating rules before revenue operations commence.

Section 243.503 Operating Rules; Filing and Recordkeeping

Section 243.503 of the proposal sets forth the filing and recordkeeping requirements for the Railroad. Paragraph (a) requires FOX to file its operating rules with FRA six months prior to commencing internal operations, and one year prior to revenue operations. The reason for this distinction is that FRA would like to review the Railroad's operating rules when the equipment first travels across the system, when the potential for employee injury exists. This requirement would ensure that the Railroad has in place appropriate operating rules at that time to protect employees from moving equipment and operating systems, and the potential for injury that may arise as a result of initial disorganization, inconsistent movements, or faulty equipment. FRA requests comment from FOX and other interested parties as to whether the operating rules prepared for internal operations will vary greatly from the rules for revenue operations. If the rules are strikingly different, modifications may need to be made to this proposed requirement.

Paragraph (a) also requires the Railroad to designate which of its operating rules are safety-critical, and states that FRA will adopt and incorporate the safety-critical rules as Appendix C to this Part. Paragraph (b) of the proposal requires the Railroad to file any amendment to its operating rules with FRA within 30 days of the day it takes effect. Section 243.509 of this Subpart, discussed below, permits the amendment to remain in effect until or unless FRA disapproves the amendment. Therefore, this Subpart grants FRA the authority to approve the Railroad's operating rules, as well as all changes that are made to the rules after initial approval.

Paragraph (c) requires the Railroad to keep one copy of the operating rules at headquarters and make the records available to FRA for inspection or duplication. Paragraph (d) authorizes FRA to issue civil penalties or take other enforcement action against any person who violates a safety-critical operating rule, which has been adopted and incorporated by reference in Appendix C to this rule under paragraph (a) discussed above. This proposal marks an important change from the way in which FRA currently addresses operating rules for existing railroads. This authority will underscore the importance of Railroad, employee, and contractor adherence to safety-critical rules that have been developed thoughtfully and in connection with development of a system safety plan. FRA has no desire to meddle unnecessarily into non-safety issues on railroad property, and the authority proposed in this paragraph will not facilitate such Federal action. FRA may only initiate enforcement actions under this section where clear safety hazards arise due to the violation of a safety-critical rule. This authority will enhance the system's performance for passengers, employees, and the Railroad.

Section 243.505 Program of Operational Tests and Inspections; Recordkeeping

Section 243.505 requires the Railroad to conduct periodic tests and inspections to determine the extent of compliance with its code of operating rules, timetables, and timetable special instructions in accordance with the program filed with and approved by the FRA. This section is consistent with the Petition and current U.S. practice, and will ensure that FRA will be informed of the Railroad's internal validation that employees are complying with the operating rules.

The testing and inspections refer to operational field tests and inspections, not qualifying tests or examinations of employees in operating rule classes. Also, the terms ''inspection'' and ''test'' are not functional equivalents. The term ''inspection'' is broader in scope and

may include varying numbers and types of specific ''tests.'' Each terminal, division, or other organizational category would be inspected periodically for compliance with operating rules. The number and variety of specific ''tests'' comprising each periodic inspection may vary according to the size and nature of the component, local operating conditions, and safety problems uncovered in past inspections or that have developed since the previous inspections. The documents listed in paragraphs (a-d) must be kept at system headquarters, for specified time periods, and must be available to FRA for inspection and copying during normal business hours.

Paragraph (d) requires the Railroad, before March 1, to maintain an annual summary covering the previous year's activities. This must include the number, type and result of each operational test and inspection that was conducted in accordance with paragraphs (a) and (b) of this section.

Paragraph (e) facilitates retaining the required information in an electronic format. This format may be utilized only where certain procedures are in place. There must be restricted access to the electronic database, and identification of those personnel granted access to the information. Also, a terminal with a central processing unit attached to either a fax or printer, that can retrieve and produce information in a usable format for immediate review by FRA representatives must be present. The Railroad must designate a person who is authorized to authenticate retrieved information from the electronic system as true and accurate copies of such electronic records.

Section 243.507 Program of Instruction on Operating Rules; Recordkeeping; Electronic Recordkeeping

Section 243.507 contains the requirements for the Railroad to develop and implement a program of instruction on its code of operating rules. The Railroad must ensure that its employees understand and comply with its code of operating rules. Many railroad accidents are attributable to a lack of compliance with railroad operating rules or a misinterpretation of their intended application. If the Railroad's employees have a better understanding of the operating rules, the chances for non-compliance or misinterpretation should be reduced.

Paragraph (a) requires that a written instructional program, kept at system headquarters and at the division headquarters, will be the basis of instruction on the Railroad's operating rules for those employees governed by such rules. FRA does not intend to prescribe every detail of what the program must contain. However, the program should be based on the specific safety needs and operating environment of the high speed rail system being developed.

Paragraph (b) covers the gradual implementation schedule of its program of periodic instruction. Each amendment to the original program will be retained at the system headquarters and at the division headquarters. The program must be available to representatives of the FRA for inspection and copying during normal business hours. The program must include a description of the means and procedures for instruction of different classes of affected employees. The frequency of instruction and the rationale on which it is based, must also be explained. A schedule for completing initial instructions for employees who are already employed and for those hired at a later date also must be included in the program.

Paragraph (c) states that the Railroad is authorized to retain, via electronic recordkeeping, its program for periodic instruction of its employees on operating rules provided that the conditions and requirements set forth in § 243.505 of this proposal are met.

Section 243.509 Operating Rules Approval

Section 243.509 proposes the approval process for the Railroad's operating rules. Within ninety days of receipt, FRA must notify the Railroad, in writing, of the operating rules' approval or disapproval. If FRA disapproves the entire package or individual operating rules, FRA must explain in its written response the reasons for the disapproval, and the actions needed to obtain FRA approval. Paragraph (b) of this section requires the Railroad to submit any operating rule amendment to FRA for review, within thirty days after it was issued by the Railroad. The amendment will remain in effect, unless FRA notifies the Railroad, in writing, that the amendment has been disapproved. This section also states that the Railroad must submit supporting documentation to FRA that FRA believes is necessary to make an enlightened determination of the Railroad's proposed operating rules. FRA anticipates that the TGV operating rules, for instance, would be one document necessary to determine whether the FOX operating rules are comprehensive and likely to provide a high level of safety on the Railroad.

Subpart G—System Qualification Tests

This Subpart sets forth pre-revenue qualification testing requirements that the Railroad must complete for a period of four months prior to commencing passenger service. This testing program developed pursuant to this Subpart is required by Subpart B of the proposal, and will be approved as part of the system safety plan approved by FRA. The testing program will provide the Railroad assurance that the system is safe, as designed and constructed, so that passengers are not put at risk when operations begin. For the most part, this Subpart is self-explanatory.

Section 243.601 Responsibility for Verification Demonstrations and Tests

Section 243.601 requires the Railroad to comply with the pre-revenue service testing plan, which must meet the specific requirements of this Subpart and the determinations made during the system safety plan analysis required by Subpart B of this proposal.

Section 243.603 Preparation of Test Plan

Section 243.603 requires FOX to develop a test plan that covers every aspect of the system. The plan must include a clear set of objectives, and the Railroad's primary objective should be to demonstrate that the system, as constructed and operated, meets all design and performance standards required by this proposal. The test plan must set a schedule for the testing, describe all property and facilities that will be used, detail how the tests will be conducted, describe how the data obtained will be analyzed, create quality control procedures to ensure that the testing is done correctly, and demonstrate the inspection criteria developed for revenue service. Paragraph (d) requires that the test program include steps to verify the results of the installation and performance tests performed by contractors and manufacturers, conduct pre-operational testing of individual components and subsystems, and to conduct the full system tests.

Section 243.605 Pre-operational Qualification Tests

Section 243.605 details the pre-operational qualification tests that the Railroad must complete on all safety-critical components of the system. The components must be shown to meet performance specifications and verify specified operational functions. This section is consistent with the Petition.

Section 243.607 Integrated Operational Testing of Systems.

This section outlines the testing that FOX must complete with respect to the integrated systems. These tests include vehicle clearances to structures along the right-of-way; mechanical performance of the overhead catenary system; and the integrated performance of the track, signal, power supply, vehicle, software, and communications. Also, this section requires the Railroad to demonstrate safe system performance during normal and degraded operating conditions. These tests must verify power supply protection; catenary and pantograph interaction; incremental increases in train speed; braking rates; and wheel suspension characteristics.

Paragraph (b)(10) of this section requires the Railroad to verify the track and civil structure under dynamic load. FOX must conduct qualification testing to ensure that the equipment will not exceed the wheel/rail force safety limits specified in the table in Subpart D and the limits for ride vibration specified in Subpart E at any speed less than 10 mph above the maximum authorized speed. During the qualification of the vehicle/track system, the ride vibration levels in § 243.411 will be used rather than the accelerometer levels contained in § 243.335. During a joint meeting of RSAC's High Speed Task Group and a group working on the Tier II Passenger Equipment standards, many members of both groups concluded that the lower ride vibration quality levels should apply when a railroad wishes to initially qualify a system, but that the accelerometer levels in the table as represented in § 243.335 should apply during daily operation of the system. Equipment and track tolerances are expected to loosen slightly during operation, but the vehicle/track system must be monitored during the life of the system to ensure that the wheel/rail force measurement and accelerations specified in § 243.335 are not exceeded. These concepts are discussed in greater detail in the analysis of Subpart D.

The Railroad must establish a testing speed at least 10 mph above the maximum operating speed, as well as target test and operating conditions, and conduct a test program sufficient to evaluate the operating limits of the track and equipment. The test program must demonstrate safe vehicle dynamic response as speeds are incrementally increased from 100 mph to the target maximum speed. The test must be suspended where any of the vehicle/track performance limits in this section are exceeded.

At the conclusion of the test, when the maximum safe operating speed is known, along with permissible levels of cant deficiency, a test run will be made over the entire route at the speeds the Railroad will request FRA to approve for such service, and a second run again at 10 mph above this speed. A report of the test procedures and results must be submitted to FRA upon completion of the tests. The test report must also show the design flange angle of the equipment, because this flange angle is used to calculate the safety limit for the ratio of the lateral force to the vertical force exerted by the same wheel on the rail. FRA believes that this testing, in combination with all of the other tests, will reveal any weaknesses in the system or construction of the components, and will greatly enhance the overall safety of high speed passenger line.

Section 243.609 Pre-revenue Service Testing

Section 243.609 requires the Railroad to conduct the pre-revenue service tests for four months prior to operations. The testing will expose problems before passengers are at risk, and will also give operational experience to the Railroad and its employees. This section is consistent with the Petition.

Section 243.611 Verification of Compliance

Section 243.11 requires the Railroad to prepare a report that details the results of all pre-operational tests, and outlines the remedial measures necessary to correct any deficiencies discovered during the testing. This section also requires the Railroad to implement the improvement measures discussed in the report, and to submit the report to FRA sixty days prior to commencing railroad operations.

This Subpart, as proposed, is very similar in concept to the Petition. FRA has made some subtle changes, primarily to streamline the requirements and avoid duplication with Subpart B of the proposal. The requirement proposed in paragraph (c) of § 243.611, which mandates report filing with FRA sixty days prior to revenue operations, was not included in the Petition. FRA invites comment on the timing set forth in paragraph (c), and may consider alternatives to this proposal. FRA believes that Federal review of the verification report is necessary to ensure that all problems encountered during testing are corrected, and additional time may be warranted in order to conduct that review adequately and thoughtfully. FRA has no desire to prevent timely commencement of revenue operations, and would take that into consideration in determining a different time period.

Subpart H—Personnel Qualification Requirements

Section 243.701 General Requirements

This Subpart sets forth specific requirements for the Railroad's personnel qualification program. This Subpart works in conjunction with Subpart B of the proposal, which requires that the Railroad's system safety plan consider the sort of training and qualifications that will be necessary to maintain the appropriate level of safety in the Railroad's revenue operations. This program takes on particular importance with respect to FOX because the American workforce generally does not have thorough knowledge of the FOX equipment and practices. Also, if FOX follows through with plans to bring representatives from the French TGV to Florida to train American workers, there will be language differences that must be overcome during the training process. In addition, the American workforce may not be accustomed to heavy reliance on metric measurements, which are prevalent in Europe and used throughout the FOX system. All of these factors make the Railroad's employee training and testing program critical to the safety of the high speed system. Also, it is important to repeat that all contractor employees must be trained and qualified by the Railroad for the tasks that they are required to complete.

This section sets forth specific parameters for the Railroad's employee qualification program. The Railroad must develop and implement a program that prepares employees to complete their safety-related tasks effectively, and requires supervisory personnel to understand fully the Railroad system and exercise prudent judgment to ensure that the system runs safely. The program must provide ''hands-on'' testing and refresher training of all employees. The Railroad must designate, in writing, that each employee possesses the knowledge to assume his or her assigned duties, and maintain these records for the duration of each employee's employment. Paragraph (c) states that the Railroad's personnel qualification program must explain the process by which the Railroad will confirm that employees are fully capable of handling assigned tasks, and must explain how the Railroad will measure employee skills. Paragraph (e) requires the Railroad's training program for locomotive engineers to follow existing regulations,

49 CFR part 240, as discussed previously. Paragraph (f) prohibits the Railroad from using unqualified or untrained personnel from completing tasks on the Railroad's system.

Section 243.703–Section 243.709 Personnel Qualifications for Track Maintenance and Inspection Personnel

Section 243.703 of Subpart H describes the qualifications that Railroad track personnel must possess in order to maintain and inspect track. Work on or about track structure supporting qualified high speed passenger trains demands the highest awareness about the need to perform work properly. Section 243.703 sets forth requirements for the Railroad to designate qualified individuals responsible for the maintenance and inspection of track in compliance with the safety requirements for Subpart D. The Railroad must maintain records of each designation in effect, the basis for the designation (including training and test results), and the records of the track inspections made by the qualified individuals.

Three categories of qualifications are set forth: § 423.705 establishes the qualifications for the individuals who supervise restorations and renewals; § 423.707 establishes the qualifications for those individuals who inspect track for defects; and § 243.709 sets forth qualifications for persons who inspect and restore continuous welded rail.

A person may be qualified to perform restorations and renewals under § 243.705 in three ways. First, the person may combine five or more years of supervisory experience in track maintenance for track Class 4 or higher and the successful completion of a course offered by the employer or by a college level engineering program, supplemented by special on-the-job training. Second, a person may be qualified by a combination of at least one year of supervisory experience in track maintenance of Class 4 or higher, 80 hours of specialized training or in a college level program, supplemented with on-the-job training. Third, an employee with at least two years of experience in maintenance of high speed track can achieve qualification status by completing 120 hours of specialized training in maintenance of high speed track, provided by the employer or by a college level engineering program, supplemented by special on-the-job training. The third option is intended to provide a means for the railroad to promote and qualify an outstanding employee who has the prerequisite experience in maintenance of high speed track.

Pursuant to § 243.707, a person may be qualified to perform track inspections by attaining five or more years of experience in inspection in track Class 4 or higher and by completing a course taught by the employer or by a college level engineering program, supplemented by special on-the-job training. Or, the person may be qualified by attaining a combination of at least one year of experience in track inspection in Class 4 and higher and by successfully completing 80 hours of specialized training in the inspection of high speed track provided by the employer or by a college level engineering program, supplemented with on-the-job training. Finally, a person may be qualified by attaining two years of experience in track maintenance in Class 4 and above and by successfully completing 120 hours of specialized training in the inspection of high speed track provided by the employer or by a college level engineering program, supplemented by special on-the-job training provided by the employer with emphasis on the inspection of high speed track. The third option is intended to provide a way for employees with two years of experience in the maintenance of high speed track to gain the necessary training to be qualified to inspect track.

For both categories of qualifications, the person must have experience in Class 4 track or above. To properly maintain and inspect Class 4 track or higher requires a level of knowledge of track geometry and track conditions that are not as readily obtained at lower classes. Persons who are qualified for high speed track must know how to work, maintain, and measure high quality track. Experience in Class 4 track is established as a lower limit to provide a pool of candidates, who may be drawn from freight railroads, who would provide the necessary experience on well-maintained track. Each person must demonstrate annually to the Railroad that he or she understands the requirements of Subpart D, can detect deviations, and can prescribe appropriate remedial action to correct or safely compensate for those deviations. A recorded examination on Subpart D is required.

Section 243.709 proposes specific requirements for qualifications of persons charged with maintaining and inspecting continuous welded rail (CWR). Training of employees in CWR procedures is essential for high speed operations. Each person inspecting and maintaining CWR must understand how CWR behaves and how to prevent track buckles and other adverse track reactions to thermal and dynamic loading. As part of the qualification, each employee who restores and inspects CWR must have an examination on the procedures for the handling of CWR required by § 243.329.

Section 243.711—§ 243.717 Personnel Qualifications for Signal Maintenance and Inspection Personnel

These sections describe the minimum qualifications for the Railroad's signal personnel. The Railroad must designate that signal employees have been qualified to perform their assigned tasks, and the designated employees must meet the specified standards in these sections.

FRA is reluctant to dictate specific education or experience levels that would be required for various employment categories. FRA believes it more appropriate to set broad minimum standards that provide FOX flexibility to choose the best work force available. However, each employee designated as qualified must demonstrate annually, and preferably in writing, that she or he understands the signal safety standards set forth in Subpart C, that he or she can detect deviations from the standards, and that he or she can prescribe appropriate remedial measures. Signal supervisors must successfully complete the program that the employees complete, and must possess the ability to exercise judgment and make rational decisions concerning the Railroad's signal system.

Section 243.719–§ 243.723 Personnel Qualifications for Rolling Stock Maintenance and Inspection Personnel

These sections establish minimum standards for the Railroad's rolling stock personnel. Again, FRA is reluctant to dictate specific education or experience levels, and so sets broad categories that provide FOX flexibility and ensure that qualified individuals are secured to work on the system's rolling stock. The Railroad must give rolling stock personnel written procedures to follow, hands-on training on the equipment, and periodic refresher training.

FRA invites comment from interested parties on these proposed qualification standards. The proposal varies slightly from discipline to discipline, and reflects, to some extent, the existing qualification programs in this country. Because we are dealing with a new system, however, where specialized training will be very important, FRA seeks suggestions from the safety community on alternate methods to guarantee an informed and prepared workforce.

Subpart I—Power Distribution

This Subpart of the proposal sets minimum requirements for the Railroad's power distribution system. As is explained in the system description of this proposal, the Railroad will operate on electric power generated and transferred to the equipment from an overhead catenary system. The catenary will maintain high voltage power throughout the length of the right-of-way, which can create an extremely hazardous work environment if not handled properly. The proposed standards in this Subpart follow generally accepted principles found in the National Electric Safety Code and the U.S. Occupational Safety and Health Administration's (OSHA) existing employee protection requirements, and also are generally consistent with the Petition. FRA wishes to make very clear that nothing in this proposal displaces OSHA's authority over employees working on, around, or with the Railroad's electrical generation, distribution, or transmission systems or subsystems. Furthermore, it is important to note that this proposal does not displace OSHA's authority over any working condition that the Railroad's employees face that have not been specifically addressed in the final standards that follow this proposal.

Section 243.801 Warning Signs

This section of the proposal requires the Railroad to post warning signs throughout the right-of-way, at underpasses and overpasses, and at each catenary mast to provide notice to employees, trespassers, and other individuals that high voltage lines are present. FRA believes that plentiful warnings will go a long way to prevent injuries to unauthorized individuals, and will also serve as a necessary reminder to employees working along the right-of-way.

Section 243.803 Clearance Requirements

This section requires all electrical clearances to meet the European standard, UIC 606–2 OR, which references formulas and values that are consistent with the system configuration that will develop in Florida, and that has safely guided the operation of the TGV in France. This standard includes references to other European standards, such as UIC 505–6, which must also be followed by FOX. The consideration of appropriate clearances in not a trivial matter, and many factors influence the development of safe, adequate clearances. Because the catenary system is dynamic, the task becomes that much more complicated. Therefore, FRA proposes that FOX adhere to the pertinent European standards, which we know safely accommodate the equipment that will be utilized in Florida and the employees who work along the right-of-way.

Section 243.805 Catenary Connections

This section requires the Railroad to ground the catenary masts to the ground or rail. Grounding of the catenary masts to the rail should be coordinated with the signaling system installation to insure that they function properly together, and FOX should design and construct this portion of the system in conjunction with the system safety plan. This is consistent with the Petition, which states that FOX will ground each catenary pole to the earthling wire, which will run the length of the right-of-way, and will be grounded to earth approximately every 10 km or 6.2 miles. This is consistent with common safe practice. This section also states that the electrical impedance of the connection must meet the step and touch requirements set forth in international standards to prevent electrical shock. At a system level, the lower the impedance of the grounding system, the quicker the fault energy is diverted to ground, and the sooner the protection equipment, or circuit breakers, will isolate the faulty section of catenary/power distribution system. At an individual level, current takes the path of least resistance, and therefore, if someone was in contact with an object that had current running through it, we would want the grounding system to divert as much energy away from objects that potentially could come in contact with members of the public and railroad employees.

Section 243.807 Access to Stations

Section 243.807 of Subpart I requires the Railroad to prevent unauthorized personnel from entering power supply stations, substations, and autotransformer stations. This provision aims at protecting employees and members of the public from exposing themselves to high voltage hazards, and also ensuring that the power system will not be harmed or disrupted by intruders. FOX states in the Petition that they intend to follow the National Electrical Safety Code with respect to station access and FRA believes that would provide an adequate measure of safety.

Section 243.809 Actuators

This section of the proposal requires the Railroad to protect the operator from electrical shock, direct or induced, that may occur in the actuators of high voltage switches. The operation of the high voltage switch may induce current or voltage surges that may cause voltage surges between the switch control and ground. The person operating the switch much be protected against these surges.

Section 243.811 Power Feeding

Section 243.811 requires the Railroad to protect the power distribution system from short circuits and over voltage that may occur as a result of lightning or utility surges. FRA is reluctant to dictate the specific method that FOX uses to accomplish this task, but believes that the system must be protected from interruptions or breakdowns that can occur on any electrical system, and may surely occur in Florida where electrical storms are commonplace.

Section 243.813 Emergency Devices

Section 243.813 provides for communication and power disconnection abilities in the event of an emergency along the right-of-way. This section requires the Railroad to place emergency devices that are capable of disconnecting and isolating power, or grounding the catenary to the rail, or both, at every underpass, overpass, emergency entrance, supply station, substation, and autotransformer station along the right-of-way. Also, the Railroad must install telephones at each of these locations, and they must be connected to the Railroad's central power dispatching center.

Section 243.815 Overpass Protection

Section 243.815 requires the Railroad to install fencing or other suitable device at each overpass that is adjacent to, above, or beneath the catenary. This section should protect the public, employees, and the electrical system by preventing accidental, hazardous contact with the catenary.

Section 243.817 Safety Work Rules

Section 243.817 states FRA's expectation that FOX will provide for the safety of all employees by following all work practices covered by pertinent regulations issued by OSHA concerning the generation, distribution, and transmission of electrical power. The Petition states that FOX intends to follow the National Electrical Safety Code (NECS) in this regard. FRA believes that FOX should and will be able to comply with both sets of standards. FOX must comply with pertinent OSHA regulations, as they constitute the enforceable standard for working conditions that other federal agencies have not regulated. FRA has not exercised jurisdiction over the

working conditions that arise in the course of maintaining or inspecting power distribution systems, and therefore the pertinent OSHA standards apply to these employee working conditions. The NESC is a professional reference standard, commonly followed by all entities that operate, maintain, and inspect power distribution systems. As FRA understands it, the OSHA regulations and the NESC are not identical in scope and content, but complement one another. FRA invites comment as to whether compliance with each standard would be difficult to accomplish on the FOX system, and the reasoning for it. FRA anticipates that the Railroad's system safety plan analysis will devote attention to the development of appropriate employee work rules and protections vis-a-vis power distribution that are consistent with the OSHA and NESC safety standards.

Section 243.819 Inspection, Testing, and Maintenance of Power Distribution System

Section 243.819 requires the Railroad to develop an inspection, testing, and maintenance program for the power distribution system. This section works in conjunction with Subparts B and H of the proposal, which also require the Railroad to establish and adhere to a comprehensive program that facilitates proper operation of the equipment and system, and which guarantees that employees receive adequate training to perform their duties safety. This section also includes specific inspection items and intervals, which comport with general industry practice and the Petition.

Appendix A—Schedule of Civil Penalties

This appendix is being reserved until promulgation of the final rule of particular applicability. At that time, FRA will include a schedule of civil penalties to be used in connection with enforcement of the standards in the rule of particular applicability. Because such schedules are statements of policy, notice and comment are not required prior to their issuance. See 5 U.S.C. 553(b)(3)(A). Nevertheless, commenters are invited to submit suggestions to FRA describing the types of actions or omissions under each regulatory section that would subject a person to the assessment of a civil penalty. Commenters are also invited to recommend what penalties may be appropriate, based upon the relative seriousness of each type of violation.

Regulatory Impact

Executive Order 12866 and DOT Regulatory Policies and Procedures

FRA prepared a cost/benefit analysis of the NPRM for the FOX high speed rail system, and determined that the NPRM imposes no new costs on FOX. The analysis hinges on the establishment of what constitutes a baseline level of regulatory cost. The assumptions were:

- FOX will operate as it proposed in the Petition.
- There is no cost or benefit if FOX intended or intends to follow the proposal under its current practices. Where it was not clear what FOX intends to do as a business practice, the FRA assumed that FOX would follow procedures established by TGV operations in France.
- There is no cost or benefit where FOX would have to follow the requirements of the proposal under current or proposed regulations applying to all railroad operations. (For example, FOX will be required to file accident reports.)
- There is no cost or benefit where FOX has proposed, and FRA has accepted, provisions which are less strict than current or proposed regulations, but for which FOX has proposed limitations on its operations or other practices which directly affect the safety issue in question. (For example, because FOX will limit the weight of its trains and exclude freight operations, the dynamic load on the track will be less than on other track Class 4 and higher, so FRA will permit FOX to make one visual inspection a week, where other high-speed lines would be subject to visual inspection two or three times a week.)
- There is no cost or benefit where FOX would have to follow restrictions FRA now places on other railroads under waivers to accomplish the same end. (For example, FRA is requiring that railroads participating in the ITCS demonstration program validate their software.)
- The proposed rules FRA considered as part of the base case include track standards for high-speed operations, emergency preparedness and passenger equipment safety standards for Tier II equipment.

The proposed rule will not impose any costs on FOX beyond those above, so the FRA does not anticipate that the proposed rule will create any benefits. If the first assumption, that FOX will operate as it represented in the Petition, is not true, then the public safety would be ensured by this proposal, and it would create benefits.

Regulatory Flexibility Act

The Regulatory Flexibility Act of 1980 (5 U.S.C. 601, *et seq.*) requires an assessment of the impacts of proposed rules on small entities. FRA has determined that this proceeding will not have a significant impact on a substantial number of small entities. The NPRM and any final standards that evolve in this proceeding relate only to the FOX high speed rail system, and FOX is not a small entity.

Paperwork Reduction Act

In accordance with the Paperwork Reduction Act of 1995, 44 U.S.C 3501–3520, and its implementing regulations, 5 CFR part 1320, when information collection requirements pertain to nine or fewer entities, Office of Management and Budget (OMB) approval of the collection requirements is not required. This regulation pertains to one railroad, and therefore, OMB approval of the paperwork collection requirements in this proposed rule is not required.

Environmental impact

FRA has evaluated these proposed standards in accordance with its procedures for ensuring full consideration of the environmental impact of FRA actions, as required by the National Environmental Policy Act (NEPA) (42 U.S.C. 4321, *et seq.*), and related laws and regulations. FRA has determined that this NPRM does not in and of itself have a direct impact on the environment. These proposed standards establish an improved framework for safety oversight of the system proposed by FOX, but FOX could build or operate a similar high speed rail network in the State of Florida under existing Federal railroad safety regulations of general applicability. It is expected that there will be other Federal approvals. The FRA has entered into a Memorandum of Understanding with the Federal Highway Administration (FHWA) and the Florida Department of Transportation (FDOT) through which the parties have established a process for considering the environmental impact of the implementation of the FOX high speed rail system in Florida to the extent that Federal approvals are required. The FHWA and FRA have agreed to serve as joint lead agencies for the purpose of complying with the statutory requirements of NEPA and related statutes, and such compliance will be completed prior to the proposed rule having practical effect. FDOT has agreed to coordinate the development of environmental studies at the state level. Appropriate notices, including a notice of the intent to prepare an

environmental analysis, will be provided to the public by the FRA and FHWA in accordance with FRA and FHWA procedures implementing NEPA.

Federalism Implications

This proposed rule has been analyzed in accordance with the principles and criteria contained in Executive Order 12612, and it has been determined that the proposed rule does not have sufficient federalism implications to warrant the preparation of a Federalism Assessment. It should be noted that the U.S. Supreme Court in *CSX* v. *Easterwood*, 507 U.S. 658 (1993), upheld Federal preemption of any state or local attempts to regulate train speed. Nothing in this notice proposes to change that relationship.

List of Subjects in 49 CFR Part 243

French TGV, High Speed Rail, Railroad safety, System safety

The Proposed Rule

In consideration of the foregoing, FRA proposes to amend Title 49 of the Code of Federal Regulations by adding Part 243, as follows:

PART 243—FLORIDA OVERLAND EXPRESS HIGH SPEED RAIL SAFETY STANDARDS

Subpart A—General Requirements

Sec.

Subpart B—System Safety Program and Plan

Subpart C—Signal System

Wayside and cab signals

Track circuits

Wires and cables

Standards

Reporting Requirements.

Inspection, Testing, and Maintenance

Subpart D—Track Safety Standards

Geometry

Track Structure

Inspection

Authority: Subtitle V of Title 49 of the United States Code; 49 CFR 1.49(m).

Subpart A—General Requirements

§ 243.1 Purpose and scope.

This Part prescribes minimum Federal safety standards for the high speed transportation system described in detail in § 243.13 of this rule, known as the Florida Overland Express and hereinafter referred to as the ''Railroad.'' The purpose of this rule is to prevent accidents, casualties, and property damage which could result from operation of this system.

§ 243.3 Applicability.

(a) This Part applies only to the Railroad operating between Miami, Orlando and Tampa in the State of Florida, as described § 243.13. The Railroad shall operate only within the system defined in § 243.13. Any operations outside the system as defined in § 243.13 are prohibited without prior approval by the FRA.

(b) Except as stated in paragraph (c) below, this rule, rather than the generally applicable Federal railroad safety regulations, shall apply to the Railroad.

(c) Effective on the date the Railroad begins revenue operations, the following generally applicable Federal railroad safety regulations, all of which are found in Title 49 of the Code of Federal Regulations, and in the case of paragraph (c)(14), which will be codified in the near future, and any amendments thereto, are hereby made applicable to the Railroad, regardless of any statements of limited application that they may contain:

(1) Part 209, Railroad Safety Enforcement Procedures;

(2) Part 210, Railroad Noise Emission Compliance Regulations;

(3) Part 211, Rules of Practice;

(4) Part 212, State Safety Participation Regulations;

(5) Part 214, Railroad Workplace Safety;

(6) Part 216, Special Notice and Emergency Order Procedures;

(7) Part 218, Railroad Operating Practices;

(8) Part 219, Control of Alcohol and Drug Use;

(9) Part 220, Radio Standards and Procedures;

(10) Part 225, Railroad Accidents/Incidents: Reports, Classification, and Investigations;

(11) Part 228, Hours of Service of Railroad Employees;

(12) Part 229, Section 135, Event Recorders;

(13) Part 235, Instructions Governing Applications for Approval of a Discontinuance or Material Modification of a Signal System or Relief from the Requirements of Part 236, except § 235.7; Any reference in Part 235 to Part 236 shall be read to be a reference to Subpart C, Signal Standards, of this rule;

(14) The emergency preparedness requirements set forth in FRA's proposed Passenger Train Emergency Standards, 62 FR 8330 (February 24, 1996), which shall be codified as modified after consideration of all comments received at 49 CFR part 239;

(15) Part 240, Qualification and Certification of Locomotive Engineers, except sections 240.227 and 240.229; and

(16) Part 215, Railroad Freight Car Safety Standards; Part 229, Railroad Locomotive Safety Standards; Part 230, Locomotive Inspection; Part 231, Railroad Safety Appliance Standards; and Part 232 Railroad Power Brakes and Drawbars shall apply to the Railroad's conventional locomotive and freight fleet as it is used in work trains, rescue operations, yard movements, and other non-passenger functions.

(d) The Federal railroad safety statutes apply to all railroads, as defined in 49 U.S.C. 20102. The Railroad covered by this Part is a railroad under that definition. Therefore, the Federal railroad safety statutes, Subtitle V of Title 49 of the United States Code, apply directly to the Railroad. However, pursuant to authority granted under 49

U.S.C. 20306 (formerly the Rock Island Railroad Transition and Employee Assistance Act), FRA has exempted the Railroad from certain requirements of 49 U.S.C. 20301, *et seq.* (formerly the Safety Appliance Acts).

(e) The Système International, or metric measurement system, is the measuring system used throughout this rule. For clarification, United States' standard values typically follow the metric values in parentheses, and a soft conversion has been used.

§ 243.5 Definitions.

As used in this Part:

Adjusting/destressing, track means the procedure by which a rail's temperature is readjusted to the desired value. It typically consists of cutting the rail and removing rail anchoring devices, which provides for the necessary expansion and contraction, and then re-assembling the track.

Administrator means the Administrator of FRA, the Deputy Administrator of FRA, or the delegate of either.

Alerter means a device or system installed in the locomotive engineer cab to promote continuous, active locomotive engineer attentiveness by monitoring select locomotive engineer control activities, providing alarms, and stopping the train, if necessary. If fluctuation of a monitored locomotive engineer control is not detected within a predetermined time, a sequence of audible and visual alarms is activated to progressively prompt a response by the locomotive engineer. Failure by the locomotive engineer to institute a change of state in a monitored control, or acknowledge the alerter alarm activity through a manual reset provision, results in a penalty brake application, bringing the power car, locomotive, consist or trainset to a stop.

Anti-climbing mechanism means parts of the ends of adjoining trainset units that are designed to engage, when the units are subjected to large buff loads, to prevent override of one unit by another.

Associate Administrator means the Associate Administrator for Safety, FRA, or a Deputy Associate Administrator for Safety, FRA.

Automatic train control (ATC) means equipment installed on the power car or locomotive working in conjunction with a track-side system, so arranged that its operation will automatically result in the application of the brakes to stop a train or control its speed at designated speed or location restrictions, should the locomotive engineer not respond.

Block means a length of track of defined limits, the use of which trains, trainsets, or any other on-track, self-propelled equipment are governed by block signals, or cab signals, or both.

Block signal means a manual signal at the entrance of a block to govern trains, trainsets, or any other on-track, self-propelled equipment entering and operating in that block.

Block, absolute means a block in which no train is permitted to enter while it is occupied by another train, trainset, or any other on-track, self-propelled equipment.

Brake, air means a combination of devices operated by compressed air, arranged in a system and controlled manually, electrically, or pneumatically, by means of which the motion of a power car, trailer car, or trainset is retarded or arrested.

Brake, disc means a retardation system used on some rail vehicles, primarily passenger equipment, that utilizes flat metal discs as the braking surface, instead of the wheel tread.

Brake, dynamic or electric means a train or trainset braking system in which the kinetic energy of a moving train or trainset is used to generate electric current at the power car or locomotive traction motors, which is then dissipated through banks of resistor grids.

Brake, emergency application means a brake application that results in the maximum designed retarding force for the train brake system.

Brake, full service application means an application of the brakes resulting from a continuous or a split reduction in brake pipe pressure at a service rate until maximum brake cylinder pressure is developed. As applied to an automatic or electro-pneumatic brake with speed governor control, an application other than emergency which develops the maximum brake cylinder pressure, as determined by the design of the brake equipment for the speed at which the train is operating.

Brake, tread means a braking system that uses a brake shoe that acts on the tread of the wheel to retard the vehicle.

Brake control system means the components, including software, that either automatically or under the control of the engineer cause changes in the retarding force applied to the trainset by the brake system.

Brake pipe means the system of piping, including branch pipes, angle cocks, cutout cocks, dirt collectors, hose, and hose couplings, that connects power cars and all trailer cars and permits the passage of air to control the power car and trailer car brakes.

Brake system failure means the brake system not applying or releasing in response to commands, or other significant departure from intended operation.

Braking supervision means a function of the ATC system whereby the speed and position of the trainset are monitored in relation to its effective braking performance to ensure compliance with the target speed and target distance.

Broken base means any break in the base of the rail.

Broken rail means a complete break of the rail.

Buckling incident/buckling rail mean the formation of a lateral mis-alignment sufficient in magnitude to constitute a deviation of 125 mm (4.9 in.) measured within a 20 m (65.6 ft.) chord. These normally occur when rail temperatures are relatively high and are caused by high longitudinal compressive forces.

Cab means the compartment of the power car or locomotive designed to be occupied by the crew, and from which the propelling power and power brakes of the trainset are manually controlled.

Cab signal means a signal located in the locomotive engineer's compartment or cab, indicating a condition affecting the movement of a trainset, power car or locomotive and used in conjunction with interlocking signals, and in conjunction with or in lieu of block signals.

Calendar day means any period beginning at 12:01 a.m. and ending at midnight on a given date.

Cant means the vertical distance of the outer rail above the inner rail in a curve.

Cant deficiency means the additional height, which if added to the outer rail in a curve, at the designated vehicle speed, would provide a single resultant force, due to the combined effects of weight and centrifugal force on the vehicle, having a direction perpendicular to the plane of the track.

Cant, rail means a rail's inward inclination.

Cantrail means the longitudinal structural member at the intersection of the side wall and the roof of a rail vehicle.

Central traffic control means the system of railroad operation in which the movement of trains over routes and through blocks on a designated section of track or tracks is directed by signals controlled from a designated point.

Compound fissure means a progressive fracture originating in a horizontal split rail head which turns up or down in the head of the rail as a smooth, bright, or dark surface progressing until substantially at a right angle to the length of the rail. Compound fissures require examination of both faces of the fracture to locate the

horizontal split head from which they originate.

Continuous welded rail (CWR) means rail that has been welded together into lengths exceeding 120 m (394 ft).

Crack, rolling stock means a fracture without complete separation into parts, except that castings with shrinkage cracks or hot tears that do not significantly diminish the strength of the member are not considered to be cracked.

Crash energy management means an approach to the design of passenger rail equipment which controls the dissipation of energy during a collision to protect the occupied volumes from crushing, and to limit the decelerations on passengers and crew in those volumes. This may be accomplished by designing energy-absorbing structures of low strength in the unoccupied volumes of a rail vehicle or passenger train to collapse in a controlled fashion, while providing higher structural strength in the occupied volumes. Energy deflection can also be part of a crash energy management approach. Crash energy management can be used to help provide anticlimbing resistance and to reduce the risk of train buckling during a collision.

Crew means the complement of crew members assigned to operate a train.

Crew member means a Railroad employee called to perform service covered by 49 U.S.C. 21103 and subject to the Railroad's operating rules and program of operational tests and inspections required in this rule.

Critical buckling stress, means the minimum stress necessary to initiate buckling of a structural member.

Critical software means software whose failure could have an impact on safety, or could cause large social or financial loss.

Damaged rail means any rail broken or injured by accidents, wrecks, broken wheels, flat wheels, unbalanced wheels, slipping or similar causes.

Desired rail installation temperature range means the rail temperature range in a specific geographical area, at which forces in CWR installed in that temperature range should not cause a track buckle in extreme heat, or a pull-apart during extreme cold weather.

Detail fracture means a progressive fracture originating at or near the surface of the rail head. These fractures do not include transverse fissures, compound fissures, or other defects which have origins internal to the rail. Detail fractures may arise from shelling, head checks, or flaking of the rail.

Disturbed track means track having reduced resistance to lateral or longitudinal movement, or both, as a result of the disturbance of the roadbed or ballast by track maintenance or any other event.

Emergency application means a brake application which results from an emergency reduction.

Emergency reduction means a depletion of brake pipe pressure at a rate sufficiently rapid to move the operating valve to emergency position.

Employee or Railroad employee means any employee of, contractor of, or employee of a contractor of, the Railroad.

End structure means the main support projecting upward from the floor or underframe of a power car, locomotive, trailer car or other rail vehicle. The end structure is securely attached to the underframe at each end of a rail vehicle.

Engine burn fracture means a progressive fracture originating in spots where driving wheels have slipped on top of the rail head. In developing downward, such fractures frequently resemble the compound or transverse fissures, with which they should not be confused or classified.

Event recorder means a device, designed to resist tampering, that monitors and records data on train speed, direction of motion, time, distance, throttle position, brake applications and operations (including train brake, independent brake, and, if so equipped, electric brake applications and operations) and, where the locomotive, including a power car, is so equipped, cab signal aspect(s), over the most recent 48 hours of operation of the electrical system of the locomotive on which it is installed.

Failsafe means a characteristic of a system or its elements that, upon any failure or malfunction affecting safety, will cause the system to revert to a state that is known to be safe.

Fault tolerant architecture means the built-in capability of a system to provide continued full or continued limited operation in the presence of a limited number of faults or failures of the system, such as a defect in a hardware device or component, or an incorrect step, process or data definition in a computer program.

Flattened head or flattened rail means a short length of rail, not a joint, which has flattened out across the width of the rail head to a depth of 10 mm (0.4 in) or more below the rest of the rail. Flattened rail occurrences have no repetitive regularity and thus do not include corrugations, and have no apparent localized cause such as a weld or engine burn. Their individual length is relatively short, as compared to a condition such as head flow on the low rail of curves.

Full service application means a brake application which results from one or more brake pipe reductions sufficient in amount to cause a full service reduction.

Full service reduction means a service reduction sufficient in amount to cause equalization of pressure in brake cylinder with pressure in the reservoir from which compressed air is supplied to brake cylinder.

Glazing, end-facing means a glazing panel located where a line perpendicular to the exterior surface of the panel makes a vertical or horizontal angle of 50 degrees or less with the longitudinal center line of the rail vehicle in which the panel is installed. A glazing panel that curves so as to meet the definition for both side-facing and end-facing glazing is end-facing glazing.

Glazing, exterior means a glazing panel that is an integral part of the exterior skin of a rail vehicle with a surface exposed to the outside environment.

Glazing frame means the arrangement used to install the glazing into the structure of a rail vehicle.

Glazing, interior means a glazing panel with no surface exposed to the outside environment and which is protected from projectiles by the structure of a rail vehicle.

Glazing, side-facing means a glazing panel located where a line perpendicular to the exterior surface of the panel makes an angle of more than 50 degrees with the longitudinal center line of the rail vehicle in which the panel is installed.

Grade Crossing means a location where a public highway, road, or street or private roadway, including associated sidewalks and pathways, crosses one or more railroad tracks at grade.

Handrails means safety appliances installed on either side of a rail vehicle's exterior doors to assist passengers and crew to safely board and depart the vehicle.

Head end power means electrical power provided on board the locomotive of a passenger train to serve the train.

High voltage means an electrical potential of more than 150 volts.

Home signal means a roadway signal at the entrance to a route or block to govern trains entering and using that route or block.

Horizontal split head means a horizontal progressive defect originating inside of the rail head, usually 6 mm (0.25 in) or more below the running surface and progressing horizontally in all directions, and generally accompanied by a flat spot on the running surface. The defect appears as

a crack lengthwise of the rail when it reaches the side of the rail head.

Hunting oscillations means a sustained cyclic oscillation of the truck which is evidenced by lateral accelerations in excess of 0.4g root mean square, mean-removed, for 2 seconds.

In passenger service/in revenue service means a train or passenger equipment that is carrying, or available to carry, passengers. Passengers need not have paid a fare in order for the equipment to constitute in passenger or revenue service.

In service means equipment subject to this that is in passenger or revenue service, unless the equipment:

(1) Is being handled in accordance with § 243.15, as applicable;

(2) Is in a repair shop or on a repair track; or

(3) Is on a storage track and is not carrying passengers.

Indication locking means electric locking which directly prevents the operation of a switch or other operative unit, in case another unit which should operate first fails to make the required movement.

Interior fittings means any component in the passenger compartment which is mounted to the ceiling, sidewalls or end walls and which projects into the passenger compartment more than 25 mm (1 in.) from the surface or surfaces to which it is mounted. Interior fittings do not include seats, windows, side wall, end wall, floor, door pockets and ceiling lining materials.

Interlocking means an arrangement of signals and signal appliances so interconnected that their movements must succeed each other in proper sequence and which may be operated manually or automatically.

Interlocking block limits means the tracks between the opposing home signals of an interlocking.

Knowingly means having actual knowledge of the facts that give rise to a violation, or knowledge that a reasonable person acting in the circumstances and exercising reasonable care would have.

Linear static analysis means an analysis of the stresses in a structure under load, for which the loads are constant and the loads do not cause permanent deformation to the structure.

Locomotive means a piece of on-track equipment other than hi-rail, specialized maintenance or other similar equipment that may consist of one or more units operated from a single control stand—

(1) With one or more propelling motors designed for moving other equipment;

(2) With one or more propelling motors designed to transport freight, passenger traffic or both; or

(3) Without propelling motors but with one or more controls. This term does not include locomotives propelled by steam power.

Locomotive, controlling means the locomotive from which the locomotive engineer exercises control over the train.

Longitudinal means in a direction parallel to the normal direction of travel of a rail vehicle.

Luminescent material means a material that absorbs light energy when ambient levels of light are high and emits this stored energy when ambient levels of light are low, making the material appear to glow in the dark.

L/V ratio means the ratio of the lateral force that any wheel exerts on an individual rail to the vertical force exerted by the same wheel on the rail.

MIL–STD–882C means a military standard issued by the United States Department of Defense to provide uniform requirements for developing and implementing a system safety program to identify and then eliminate the hazards of a system or reduce the associated risk to an acceptable level.

Main track means a principal track, other than an auxiliary track, designated by timetable or special instructions, and upon which trains are authorized to operate by one or more of the following explicit methods of control: timetable/train order, signal indication, yard limits, or some form of direct train control.

Marker, block section means a marker located at the boundary between adjoining block sections.

Marker, route origin means a marker that is equipped with a proceed light signal, located at the beginning of a route.

Marker, shunting means a special marker, which is equipped with a shunting light, that is used for turn back operations where no route origin marker exists.

Marker, signaling means a marker used in open track, located at the boundaries between each block, to indicate spacing information.

Mechanical stabilization means a procedure used to restore track resistance to disturbed track following certain maintenance operations. This procedure may incorporate dynamic track stabilizers or ballast consolidators, which are units of work equipment that are used as a substitute for the stabilization action provided by the passage of tonnage trains.

Occupied volume means the spaces of a vehicle where passengers or crew are normally located during service operation, such as the operating cab and passenger seating and sleeping areas. Vestibules are typically not considered occupied, except when in use as a control cab.

Override means to climb over the normal coupling or side buffers and linking mechanism and impact the end of the adjoining vehicle or unit above the underframe.

Permanent deformation means a permanent change in the shape of a structural member.

Person means all categories of entities covered under 1 U.S.C. 1, including but not limited to the following: a railroad; a manager, supervisor, official, or other employee or agent of a railroad; any owner, manufacturer, lessor, or lessee of railroad equipment, track, or facilities; any independent contractor providing goods or services to a railroad; and any employee of such owner, manufacturer, lessor, lessee, or independent contractor.

Piped rail means a vertical split in a rail, usually in the web, due to failure of the shrinkage cavity in the ingot to unite in rolling.

Power car means a type of locomotive at the leading or trailing end, or both, of a trainset which has a locomotive engineer cab and propelling motors that move the trainset; when at the leading end of the trainset, the unit from which the locomotive engineer controls the trainset.

Qualified person means a person determined by the Railroad to have the knowledge and skills necessary to perform one or more functions required by this rule. The Railroad determines the qualifications and competencies for employees designated to perform various functions in the manner set forth in this rule.

Rail anchors means those devices which are attached to the rail and bear against the side of the crosstie to control longitudinal rail movement. Certain types of rail fasteners also act as rail anchors and control longitudinal rail movement by exerting a downward clamping force on the upper surface of the rail base.

Rail temperature means the temperature of the rail, measured with a rail thermometer.

Railroad equipment means all trains, trainsets, rail cars, locomotives, and maintenance vehicles owned or used by the Railroad.

Railroad operation means any movement of a train, trainset, locomotive, on-track equipment, or track motor car, singly or in combination with other equipment, on the track owned or operated by the Railroad.

Railroad, the means the company, also known as the Florida Overland eXpress (FOX), which owns and operates the high speed rail transportation system connecting Orlando, Miami, and Tampa and which is responsible for compliance with all aspects of this rule.

Redundancy means the existence in a system of more than one means of accomplishing a given function, with those means so arranged that if one means of accomplishing a function fails then another performs the function.

Redundancy, active means that all redundant items are operating simultaneously rather than being activated when needed.

Redundant system means a piece of equipment or a system that duplicates the essential function of another piece of equipment or system to the extent that either may perform the required function regardless of the state of operation or failure of the other.

Refresher training means periodic retraining required and imposed by the Railroad for employees or contractors to remain certified to perform specific equipment inspection, testing, or maintenance functions.

Repair point means a location designated by the Railroad where repairs of the type necessary occur on a regular basis, and that contains all facilities, tools, and qualified employees required to make necessary repairs.

Rollover strength means strength needed to protect the structural integrity of a rail vehicle in the event the vehicle leaves the track and impacts the ground on its side or roof.

Roof rail means the longitudinal structural member at the intersection of the side wall and the roof sheathing.

Route locking means electric locking, effective when a train passes a signal displaying an aspect for it to proceed, which prevents the movement of any switch, movable-point frog, or derail in advance of the train within the route entered. It may be so arranged that as a train clears a track section of the route, the locking affecting that section is released.

Safety appliance means an appliance, required under 49 U.S.C. chapter 203, excluding power brakes. The term includes automatic couplers, handbrakes, sill steps, handholds, handrails, or ladder treads which are made of steel or a material of equal or greater mechanical strength used by the traveling public and Railroad employees that provides a means for safe coupling, uncoupling, or ascending or descending Railroad equipment.

Safety-critical means a component, system or task that, if not available, not performed, or not performed correctly, increases the risk of damage to equipment or injury to a passenger, crew member, or other person.

Safety measurement criterion means a measurement limit or observation threshold used to trigger the duty to take corrective action to prevent a serious safety problem from developing. Measurements may be taken manually or by reliable sensors.

Semi-permanently coupled means coupled by means of a drawbar or other coupling mechanism that requires tools to perform the uncoupling operation. Coupling and uncoupling of each unit in a train can be performed safely only while at a maintenance or shop location where personnel can safely get under a unit or between units.

Service application means a brake application which results from one or more service reductions.

Service reduction means a decrease in brake-pipe pressure, usually of from 5 to 25 pounds, at a rate sufficiently rapid to move the operating valve to service position, but at a rate not rapid enough to operate the valve to emergency position. Quick service is that feature of the operating valve which provides for local reduction of brake-pipe pressure.

Shear strength means the ability of a structural member to resist forces or components of forces acting perpendicular to compression or tension forces, or both, in the member.

Shock absorbent material means material designed to prevent or mitigate injuries due to impact by yielding and absorbing much of the energy of impact.

Side posts means main vertical structural elements in the sides of a rail vehicle.

Side sills means that portion of the underframe or side at the bottom of the rail vehicle side wall.

Soft conversion means a dimension taken, typically from a product or component of a product, already designed and manufactured to English system dimensions, and expressing that dimension to nearly equivalent English or metric dimensions.

Spall, glazing means small pieces of glazing that fly off the back surface of glazing when an object strikes the front surface.

Speed, maximum authorized means the speed at which trains are permitted to travel safely, as determined by all operating conditions and signal aspects.

Speed, maximum revenue service means a speed of 200 mph.

Speed, maximum safe operating means the highest speed at which train braking may occur without thermal damage to the discs or wheels.

Speed, restricted means a speed that will permit stopping within one-half the range of vision, but not exceeding 20 mph.

Speed, slow means a speed not exceeding 20 mph.

Split web means a lengthwise crack along the side of the web of a rail and extending into or through it.

Superelevation means the actual elevation of the outside rail above the inside rail.

System headquarters means the location designated by the Railroad as the primary office for the Railroad system.

System safety plan means a document produced by the Railroad that states in detail the techniques, procedures, and tests to follow to reduce hazards and unsafe conditions to the lowest level possible through the most effective use of available resources. The system safety plan is used as part of the design process to ensure that the equipment and system meets all Federal safety standards and the Railroad's safety design requirements.

System safety program means the activities described in the system safety plan to be performed to ensure that the Railroad's equipment and operations meet all Federal safety standards and the Railroad's safety design requirements.

Target distance means the distance from the front of the train to the target.

Target speed means the maximum speed limit which takes effect at the target.

Terminal means the starting point or ending point of a single scheduled trip for a train. Normally, this location is where the trainset would reverse its direction.

TGV means a high speed rail system currently in use in France, on which some of the equipment and operations to be utilized by the Railroad subject to the requirements of this rule are based.

Thrust tube means the structural members in the trailer car end underframe that transmit longitudinal loads from the cross member located at the end of the trailer to the Car body side sills.

Tight/kinky rail means continuous welded rail that exhibits minute alignment irregularities, which indicate that the rail is undergoing a level of compression at which it may deform unacceptably.

Time locking means electric locking, which after a signal has been caused to display an aspect to proceed, prevents, until after the expiration of a predetermined time interval after such signal has been caused to display its most restrictive aspect, the operation of

any switch, movable-point frog, or derail in the route governed by that signal, and which prevents an aspect to proceed from being displayed for any conflicting route.

Track acceleration measurement system means an on-track vehicle used to measure lateral truck accelerations, lateral carbody accelerations, and vertical carbody accelerations. A Melusine car, used on the French TGV, is a type of track acceleration measurement system.

Track geometry measurement system means an on-track vehicle used to measure track surface, warp, alignment, and gage. The vehicle typically has eight axles spaced symmetrically from the centerline of the vehicle and conducts measurements by means of mechanical contact. A Mauzin car, used on the French TGV, is a type of track geometry measurement system.

Track lateral resistance means the resistance provided by the rail/crosstie structure against lateral displacement.

Track longitudinal resistance means the resistance provided by the rail anchors/rail fasteners and the ballast section to the rail/crosstie structure against longitudinal displacement.

Traffic locking means electric locking which prevents changing the direction of traffic on a section of track while that section is occupied or while a signal displays an aspect for a movement to proceed into that section.

Trailer car means a unit of a trainset designed to provide transportation for passengers, baggage, or mail.

Train means a combination of a single power car or locomotive with any other power car, locomotive, trailer car, or maintenance car. This term includes a trainset.

Train-induced forces means the vertical, longitudinal, and lateral dynamic forces which are generated during train movement and which can contribute to the buckling potential of track.

Trainset means a passenger train including the locomotive(s) and power car(s) and passenger cars that are semi-permanently coupled to operate as a single unit. The individual components are uncoupled only for emergencies or maintenance conducted in repair facilities.

Transmission beacon to locomotive (TBL) means the system which provides interface between the interlocking signal system and the automatic train control system used by the Railroad, resulting in the proper speed and location of all train movements.

Transverse fissure means a progressive crosswise fracture starting from a crystalline center or nucleus inside the head from which it spreads outward as a smooth, bright, or dark, round or oval surface substantially at a right angle to the length of the rail. The distinguishing features of a transverse fissure from other types of fractures or defects are the crystalline center or nucleus and the nearly smooth surface of the development which surrounds it.

Trip means the length of any single-direction, scheduled journey taken by a trainset. Once a trainset completes a turnaround at a station or predetermined location along the right-of-way, a new trip begins.

Two-out-of-three voting architecture means three independent processors operating on dissimilar software in such a manner so as to compare the software output from each processor to ensure that safety-critical results are identical. If one processor produces an answer inconsistent with the other two processors, the conflicting processor is taken off-line and the two remaining processors continue to compare with each other, and drive safety-critical commands, only so long as they both agree. If the remaining two processors fail to agree, the system ceases to issue safety-critical commands, shuts down, and assumes a safe state.

Uncoupling mechanism means the arrangement for operating the coupler by any means.

Underframe means the lower horizontal structure of a car body.

Unit means car, trailer car, power car or locomotive of any type. For articulated equipment a unit means a piece of equipment located between two trucks.

Unoccupied volume means the sections of the passenger vehicle or power vehicle which do not contain seating and are not normally occupied by passengers or crew.

Validation means the process of evaluating a system or component during or at the end of the development process to determine whether it satisfies specified requirements.

Vehicle, rail means a car, trailer car, locomotive, power car, or similar vehicle.

Verification means the process of evaluating a system or component to determine whether the products of a given development phase satisfy the conditions imposed at the start of that phase.

Vertical split head means a vertical split through or near the middle of the head of a rail, and extending into or through it. A crack or rust streak may show under the head close to the web or pieces may be split off the side of the head.

Vestibule means an area of a trailer or passenger car that normally does not contain seating, that leads from the seating area to the side exit doors.

Vital design method means a method of designing any device, circuit or software module used to implement a function essential to the safe operation of trains, such that the probability of its failing to return to the prescribed safe state is so low as to be considered practically nonexistent.

Vital logic processor means a processor designed and operated according to vital design method.

Warp means a measure of the change in track cant over a short distance.

Window, emergency means that segment of a side facing glazing location which has been designed to permit rapid and easy removal during a crisis situation.

Windshield means the combination of individual units of glazing material of the power car or locomotive that are positioned in an end facing glazing location.

Yard means a system of tracks within defined limits provided for the making up of trains, storing of cars and other purposes.

Yield strength means the stress under which a material will exhibit permanent deformation.

§ 243.7 Responsibility for compliance.

(a) The Railroad shall not—

(1) Use, haul, permit to be used or hauled on its line(s) any train or passenger equipment, that

(i) has one or more defects not in compliance with this Part; or

(ii) has not been inspected and tested as required by a provision of this Part; or

(2) Operate over any track, except as provided in paragraph (d) of this section, that has one or more conditions not in compliance with a provision of this Part, if the Railroad has actual knowledge of the facts giving rise to the violation, or a reasonable person acting in the circumstances and exercising reasonable care would have that knowledge; or

(3) Violate any other provision of this Part.

(b) For purposes of this rule, passenger equipment shall be considered in use prior to the train's departure as soon as it has received, or should have received, the inspection required under this Part for movement and is ready for service.

(c) Although many of the requirements of this Part are stated in terms of the duties of the Railroad, when any person (including, but not limited to, a contractor performing

safety-related tasks under contract to the Railroad subject to this part) performs any function required by this Part, that person (whether or not the Railroad) is required to perform that function in accordance with this Part.

(d) For purposes of this Part, the Railroad operator shall be responsible for compliance with all track safety provisions set forth in Subpart D. When the Railroad operator has actual knowledge of the facts giving rise to a violation, or a reasonable person acting in the circumstances and exercising reasonable care would have knowledge that the track does not comply with the requirements of this Part, it shall—

(1) Bring the track into compliance;

(2) Halt operations over that track;

(3) Continue operations over the segment of noncomplying track at a speed of 10 mph for a period not to exceed 30 days, under the authority of a person qualified under section 243.705 of this Part to supervise restorations and renewal of track under traffic conditions; or

(4) Operate in accordance with the appropriate operational limits established for track classes 1 through 5 as set forth in 49 CFR part 213.

§ 243.9 Enforcement.

(a) *Civil penalties.* Any person who violates any requirement of this Part or causes the violation of any such requirement is subject to a civil penalty of at least $500 and not more than $10,000 per violation, except that, where a grossly negligent violation or a pattern of repeated violations has created an imminent hazard of death or injury or has caused death or injury, a penalty of up to $20,000 per violation may be assessed. Penalties may be assessed against individuals only for willful violations. Each day a violation continues shall constitute a separate offense. See 49 CFR part 209, Appendix A for a detailed statement of agency civil penalty policy.

(b) *Criminal penalties.* Any person who knowingly and willfully falsifies a record or report required to be made under this Part, or knowingly and willfully fails to make, prepare, or preserve such a record or report may be liable for criminal penalties of a fine up to $5,000, imprisonment up to two years, or both, under the authority of 49 U.S.C. 21311.

(c) *Other remedies.* FRA has other enforcement remedies available to it, including the authority to seek injunctive relief and to issue compliance orders, special notices for repair, orders disqualifying individuals from safety-sensitive service, and emergency orders. FRA may use these other remedies, in addition to or instead of civil or criminal penalties, to ensure the system's compliance with the Federal railroad safety regulations and statutes, and to otherwise address safety concerns with respect to the system.

§ 243.11 Preemptive effect.

Under 49 U.S.C. 20106, issuance of this Part preempts any State law, rule, regulation, order, or standard covering the same subject matter, except for a provision directed at an essentially local safety hazard if that provision is consistent with this part and does not impose an undue burden on interstate commerce.

§ 243.13 System description.

(a) *General.* This section describes the components, operations, equipment, systems, and geographic limits of the Railroad's high speed rail system. Conditions that exceed or differ from the description set forth in this section are prohibited. In addition, the Railroad shall adhere to the following general requirements:

(1) The Railroad shall operate between Miami, Orlando, and Tampa, Florida only. Operation beyond these locations is prohibited without prior approval by FRA.

(2) The Railroad shall not under any circumstance exceed 200 mph, and at all times shall operate at speeds consistent with all requirements of this Part.

(3) The Railroad shall not transport or permit to be transported any product that has been established to be a hazardous material pursuant to 49 CFR part 172, as amended.

(4) The Railroad shall not permit smoking on any trainset while that trainset is in passenger service.

(b) *Right-of-Way.* (1) The Railroad shall operate on a completely dedicated right-of-way. The Railroad shall not operate or conduct joint operations with rail freight or other rail passenger traffic. Other than its passenger trainsets and power cars, only the equipment listed in paragraph (h)(6) of this section may be operated on the Railroad's tracks.

(2) There shall be no public at-grade crossings. Animal and non-Railroad equipment crossings shall be accomplished by means of an underpass or overpass. Private at-grade crossings shall be for the exclusive use of the Railroad's internal operations.

(3) The entire perimeter of the system's right-of-way shall be permanently fenced.

(4) The Railroad shall install fall intrusion, intrusion, flood, wind, hot box and dragging equipment detectors in accordance with the requirements set forth in Subpart C.

(5) Access to the right-of-way for roadway worker staff or emergency personnel shall be provided at intervals not to exceed 3.2 km (2 mi). This access shall be protected against entry by unauthorized persons.

(6) Throughout the length of the right-of-way, the Railroad shall install walkways, located at a safe distance from the tracks, at a minimum distance of 2.4 m (7.87 ft) from the outside rail for a design speed of 350 km/h (217 mph). The walkways shall be used primarily for track and right-of-way inspection, and when required by emergency crews.

(7) The right-of-way shall be designed for the high operating speeds planned which necessitate large curve radii in both the horizontal and vertical planes.

(8) The Railroad shall record all difficulties and special situations regarding geology, hydrology, settlement, landslide, concrete and quality criteria that arise during construction of the right-of-way. After construction, the Railroad shall monitor the stability and quality standards of structures such as bridges, viaducts and earth structures.

(9) The Railroad shall make available for review by the FRA the track layout drawings which show, at a minimum, the following information:

(i) Length of straight sections, spirals and curves, curve radius, superelevation, superelevation variations, gradients, vertical curve radii;

(ii) Turnouts and crossover location, technology and geometry;

(iii) Maximum operating speed and allowable cant deficiencies;

(iv) Signal boxes, block sectioning, wayside signal and communication devices;

(v) Power feeding equipment and cut-out devices;

(vi) Location of accesses to the right-of-way;

(vii) Designated track crossing locations for Railroad personnel; and

(viii) The Railroad shall also submit the specifications for the track layout, permissible track forces, components such as rail, ballast, ties, rail fasteners, switches.

(10) *Highway bridges.* In order to guarantee a clear view for drivers of motor vehicles, highway bridges shall be constructed in a straight line and sharp bumps shall be avoided. Protection devices shall be installed to restrict to the maximum extent possible motor vehicles from falling onto the right-of-way.

(11) *Rail bridges.* There shall be no movable bridges in the Railroad's system. Stationary rail bridges located over highways shall have their foundations protected against the impact of road vehicles.

(12) *Tunnels.* There shall be no tunnels in the Railroad's system.

(13) *Track Crossing Device for Roadway Workers.* Crossing of the tracks where operations occur above 160 km/h (100 mph) is not permitted except where designated track crossing devices are installed. Such track crossing devices shall be installed at all locations where the need for track crossing by workers is expected to occur on a regular basis, such as turnout areas and substations.

(14) *Emergency Traffic Stops.* Emergency traffic stopping or slowing devices, or both, shall be installed at regular intervals on both sides of the tracks, at intervals not to exceed 3.2 km (2 mi), and at all special locations including block section limits, turnouts, substations or autotransformers. These devices shall act directly on the signaling system and establish voice connection to the central traffic control system.

(c) *Railroad system components.* (1) *System safety program.* The Railroad shall develop, implement, and use a comprehensive system safety program, as described in detail in Subpart B of this Part, to ensure the identification, analysis, resolution, and documentation of all safety-critical processes and hazards.

(2) *Inspection, testing, and maintenance procedures and criteria.* The Railroad shall develop, implement and use a system of inspection, testing, maintenance procedures and criteria, which meet the standards set forth in this Part, to ensure the integrity and safe operation of the Railroad's equipment, infrastructure, signal system, and power distribution.

(3) *Operating practices.* The Railroad shall develop, implement, and use operating rules, which meet the standards set forth in Subpart F of this Part, which are based on the practices and procedures used on the French TGV system, to ensure the integrity and safe operation of the Railroad's system.

(4) *Emergency preparedness plan.* The Railroad shall develop, implement, and use an emergency preparedness plan, which meets the standards to be set forth in 49 CFR part 239, to reduce the risk of injury to passengers and employees in the event of an emergency. This emergency plan shall incorporate proven safety procedures used on the French TGV system.

(5) *Personnel qualification requirements.* The Railroad shall develop, implement, and use a training and testing program, which meets the standards set forth in Subpart H of this Part, to ensure that all personnel, including Railroad employees and employees of Railroad contractors, possess the skills and knowledge necessary to effectively perform their duties.

(6) *System qualification tests.* The Railroad shall develop, implement, and use a series of operational and design tests, which meet the standards set forth in Subpart G of this Part, to demonstrate the safe operation of system components, and the system as a whole.

(d) *Track and infrastructure.* (1) The Railroad shall construct its track and infrastructure to meet all material and operational design criteria, within normal acceptable construction tolerances, and to meet the requirements set forth in Subpart D of this Part.

(2) The Railroad shall operate on nominal standard gage, 1.435 m (56.5 in.), track.

(3) The Railroad shall install and operate on double track throughout its entire length, with a minimum nominal distance between track centerlines of 4.5 m (14.75 ft). Generally, each track will be used for a single direction of traffic, and trains will not overtake each other. The Railroad shall install crossover connections between the double track at each station, and at regular intervals along the line to permit flexibility in train operations, maintenance, and emergency rescue.

(4) The Railroad's track shall consist of continuous welded rail that is shop-welded in continuous welded strings of approximately 396 m (1,300 ft.). Once installed, the rail will be field-welded to form one continuous track segment. The rail shall be nominal 130-pound rail, or equivalent.

(5) The Railroad shall install concrete ties, nominally spaced at .6 m (23.6 in.) center-to-center.

(6) The Railroad shall use ballast to support the track structure, as required by Subpart D of this Part. The Railroad shall use ballast that does not excessively degrade when used in combination with concrete ties. The ballast shall be of 20–60 mm (.8 to 2.4 in.) specification and layered to a nominal depth of .35 m (14 in.) under the ties.

(7) The substructure layer shall consist of compacted sandy granular material, 20% maximum fines, layered to a depth selected on the basis of the prepared subgrade and ballast compatibility. The nominal depth of this layer will be .20 m (8 in.).

(8) The formation layer shall consist of compacted granular sandy material, 15% maximum fines, layered to a depth selected on the basis of embankment and ballast compatibility. The nominal depth of this layer shall be .70 m (27.6 in.).

(9) The embankment shall consist of compacted granular sandy material, 15% maximum fines, layered to a depth selected on the basis of embankment and ballast compatibility. The nominal depth of this layer will be .80 m (31.5 in.).

(10) Excavated decomposed organic materials shall be replaced with compacted granular sandy materials, 20% maximum fines.

(11) Mainline high speed movable frog turnouts shall be the same as those developed for and used on the TGV lines in France.

(12) In yards and maintenance facilities, where operations will be at lower speeds, the Railroad shall install 50 kg/m (100 lb/yd) rail, a reduced ballast thickness of 25 cm (10 in.), and concrete or timber ties at turnouts with 50 kg/m (100 lb/yd) rail or equivalent.

(e) *Signal system.* (1) The Railroad's signal system shall include an automatic train control system (ATC), interlocking equipment, wayside detectors, and centralized traffic control (CTC).

(2) The Railroad's ATC shall be a transmission beacon-to-locomotive system, and shall interface with the interlocking system. The interlocking system shall generate movement authorizations, and the transmission beacon system will notify the power car and locomotive engineer of movement information.

(3) The Railroad's ATC shall incorporate speed and distance-to-go principles; safety-based multiple processor architecture and on-board equipment; wayside encoders that send messages through the track beacons and short cable loops, and provide notifications of upcoming curves and gradients, distances to point, and speed restrictions; and on-board equipment that calculates the braking curve requirements with respect to the data received.

(4) The Railroad's ATC shall provide continuous speed monitoring and interface with the train braking systems. The ATC shall initiate braking to control speed in the event the locomotive engineer exceeds the maximum authorized speed.

(5) The on-board ATC computers shall be based on a two-out-of-three voting architecture. Operations shall be accomplished by the use of three processors that shall operate simultaneously.

(6) The Railroad's ATC shall receive information from interlockings, that shall be transmitted to on-board equipment through track beacons and short cable loops. Track beacons shall transmit speed limit and line data for each block section. Cable loops shall be used for specific local information and, at the end of each block section, for permission to proceed.

(7) Braking profiles shall be calculated in the on-board controller to comply with necessary speed limits and target points determined by the track profile and wayside equipment data.

(8) Each block section will be denoted by a block section marker. On open line, block sections shall be equipped with one train detection system each. In areas managed by interlockings, the length of the section will vary according to the configuration of the line.

(9) Track circuits shall be of two types:

(i) Jointless audio frequency track circuits shall be used on the main line; in crossover areas, these circuits will be combined with sequential release logic in the interlocking controllers to ensure protection against poor wheel-rail contact on little-used rail; and

(ii) Jointed high-voltage impulse track circuits shall be used in the yards and maintenance facilities.

(10) The interlocking equipment shall:

(i) interface with the wayside signal equipment, track circuits, switch machines, and wayside signals;

(ii) Monitor all track circuits;

(iii) Interface with the automatic train control system;

(iv) Exchange supervisory control and status information with central control;

(v) Provide local back-up control at each interlocking location; and

(vi) Control switch machines and monitor devices used to verify switch position.

(11) The vital logic processor module of the interlocking controller shall employ two processors that operate simultaneously in a redundant checking system architecture.

(12) All wayside detectors shall interface with the train control system and be monitored from the central traffic control facility through the interlocking equipment.

(13) The Railroad's central traffic control shall regulate, from a single point, all train routes and movements.

(f) *Communications.* (1) The Railroad shall install a dedicated, fiber-optic communication system along the right-of-way to transmit data, telephone, and radio communications. To ensure transmission reliability, the system shall include back-up transmission routes.

(2) For train operation and maintenance, the Railroad shall install:

(i) A dedicated telephone system with fixed telephones and field sockets along the tracks, yards, and platforms;

(ii) A portable radio system for maintenance and service use; and

(iii) A train radio, which shall facilitate communication between each trainset and central control at any time.

(g) *Power distribution.* (1) The Railroad shall install a 25 kV (60 alternating current) overhead catenary electrification system.

(2) The Railroad shall protect against local lightning conditions in the design and operation of the power distribution system.

(3) All power substations located along the right-of-way shall be provided with remote control operating features that permit operation from a centrally-located control center.

(4) Supervisory control equipment at remote locations and power substations shall have battery-powered back-up capability in the event of total utility service failure.

(h) *Rolling stock.* (1) The Railroad's rolling stock shall be designed, operated, and maintained in accordance with the requirements set forth in Subpart E of this Part.

(2) The Railroad's trainsets shall be bi-directional, articulated, fixed-consist trains with a power car at each end and eight passenger or trailer cars between the power cars. The power cars and trailer cars shall not be coupled together, but shall be semi-permanently connected into one unit that is capable of being disconnected only in a repair facility. The trailing and leading ends of each trainset shall be equipped with automatic couplers. The trailer cars shall be arranged so that adjacent car body ends are supported by a common truck. The end trailers shall be supported by a separate truck at the carbody end adjacent to the power car.

(3) Each truck of a trainset shall be continuously monitored by on-board computer while in operation to ensure proper function. The on-board computer screen shall alert the locomotive engineer if malfunction occurs.

(4) Each trainset shall be equipped with wheelslide control, independent trucks, and fault-tolerant braking.

(5) All trainsets shall include operating smoke and fire detection systems.

(6) The Railroad shall operate other rail vehicles for maintenance and rescue purposes, including a grinding train, a tamping lining machine, a track stabilizing machine, a track geometry measurement car or Mauzin car, a track acceleration measurement car or Melusine car, an ultrasonic test car to measure the integrity of the rails, a ballast-plowing railway car, and electric and diesel locomotives for shunting and rescue purposes.

(7) Each maintenance center and maintenance employee shall be fully equipped with tools, autonomous motorized railway motorized cars, and road vehicles needed for performance of duties required by this Part.

(8) Each power car and trailer car shall incorporate crash energy management, and each power car shall contain a structural anti-penetration wall ahead of the locomotive engineer cab, and energy absorbing structures at the front and rear of the car body.

(9) The power cars shall be equipped with an alternating current propulsion system. Two self-commutated, synchronous traction motors on each truck of each power car shall provide maximum power at the wheel rims.

(10) The locomotive engineer cab shall be arranged to enhance safety of operation, range of vision, visibility and readability of controls and indicators, accessibility of controls, climate control, noise control, engineer comfort and vigilance, and efficiency. The engineer's control stand shall be centrally located.

(11) The Railroad's passenger equipment brake system shall meet the following standards:

(i) Each trainset shall be equipped with a two-pipe, electro-pneumatic brake system, which shall ensure that each truck respond independently to a brake demand from a reduction.

(ii) The pressure in each brake pipe shall be controlled by the locomotive engineer's automatic brake valve in the leading cab. In the event of a failure of this device, a purely pneumatic control shall be available for use by the locomotive engineer.

(iii) The maximum brake cylinder pressure shall vary depending on the speed range. At speeds above 200 km/h (125 mph), the maximum brake cylinder pressure will be reduced to avoid excessive demand of the adhesion.

(iv) Independent of the automatic brake valve, the ATC, deadman control, two emergency brake valves located in each cab, and emergency brake valves located in two trailer cars, shall each be capable of producing a rapid and complete evacuation of the brake pipe and initiate an emergency application.

(v) Each powered truck shall be independently controlled by the brake pipe, and shall have electric braking that is battery operated as a back-up in case of main power failure. The brake system shall perform so that the electric brake shall have priority action. The electric brake control shall be performed by the same electronic equipment that

controls the traction equipment on each truck. During emergency braking, electro-mechanical relays, independent of electronic control, shall check the level of electric braking and in case of failure, the friction brake shall be automatically applied at its maximum value. If the electronic equipment controlling the powered truck is out of service, friction braking shall be available in an emergency through a pneumatic application.

(vi) The control of the powered truck electric brake shall be available to the locomotive engineer through the traction-braking master controller to slow the trainset or maintain speed down a gradient. This brake application shall be provided with an electric signal without any reduction in the brake pipe pressure.

(vii) A separate microprocessor shall control the traction and the braking functions on each powered truck. Each microprocessor for the traction motor units shall be programmed so that the retarding force is distributed effectively between motors and air brake equipment. Each microprocessor shall also monitor the power dissipation in the rheostats.

(viii) Each power car and trailer car shall be equipped with wheelslide protection.

An anti-skid device for each truck shall be included in the traction system controls. The anti-skid function shall be controlled by a separate microprocessor for each power car truck. The anti-skid function for each truck shall be backed up a system that detects and notifies the engineer of nonrotating axles.

(ix) Each trainset shall be equipped with an operative on-board detection system. During operation, all power equipment shall be continuously monitored by microprocessor. The detection system shall store all failures detected. Failures of the nature described in § 243.425 of Subpart E of this Part shall appear on the display screen in the locomotive or power car cab.

(x) The Railroad's system safety plan shall establish a maximum authorized speed and brake reduction matrix to address brake failures that occur in service or in passenger service. In the event of any brake failure on a trainset, the locomotive engineer shall reduce train speed to the maximum authorized speed for that failure, as established in the Railroad's safety system plan.

(xi) The brake system on each trainset shall be designed and operated fail-safe. System redundancy and notification procedures shall ensure continuous monitoring and back-up in the event of failure.

(12) *Hot box detectors.* The Railroad shall install and maintain hot box detectors along the length of the right-of-way that detect the journal bearing temperature of all moving rail equipment. The detectors shall be interconnected to the central traffic control and shall alert the Railroad and the locomotive engineer of defective equipment.

§ 243.15 Movement of defective equipment.

(a) Except as provided in paragraphs (b) and (c) of this section and after departure in compliance with the daily inspection required by section 243.433(f)(1), a trainset with one or more conditions not in compliance with the list in section 243.433(f)(1) of this Part may be moved in revenue service only after the Railroad has complied with all of the following:

(1) A qualified person determines that it is safe to move the trainset, consistent with the Railroad's operating rules developed and approved in accordance with the requirements of Subpart F of this Part;

(2) The qualified person making the non-compliance determination notifies the locomotive engineer in charge of movement of the trainset and crew, in writing, that the trainset is non-complying, but safe to move, and of the maximum authorized speed, and any other restrictions that may apply; and

(3) A tag bearing the words ''non-complying trainset'' and containing the following information, are securely attached to the control stand on each control cab of the trainset:

(i) The trainset number;

(ii) The name and signature of the qualified person making the non-compliance determination;

(iii) The location and date of the inspection that led to the non-compliance determination;

(iv) A description of each defect;

(v) Movement restrictions, if any; and

(vi) The authorized destination of the trainset.

A copy of this tag may be used to provide the notification required by paragraph (a)(2) above.

(b) A trainset that develops a non-complying condition en route may continue in revenue service, so long as the requirements of paragraph (a) are otherwise fully met, until the next daily inspection, examination in service, running gear inspection, wheel inspection, minor inspection, general inspection, or major inspection, whichever is required by this Part to occur first. Where en route defects or failures of the brake system occur, trainset movement shall be governed by section 243.409 of this Part.

(c) A non-complying trainset, power car, or locomotive may be moved without passengers within a yard, at speeds not in excess of 16 km/h (10 mph), without meeting the requirements of paragraph (a) of this section where the movement is solely for the purpose of repair. The Railroad shall insure that the movement is made safely.

Subpart B—System Safety Program and Plan

§ 243.101 General system safety requirements.

(a) One year after the date that this Part takes effect, the Railroad shall adopt a written system safety plan that describes the railroad's system safety program, using MIL–STD–882(C) as a guide. The Railroad shall submit the system safety plan to FRA for approval. The Railroad shall update the system safety plan as new information and knowledge concerning systems and equipment arise in the course of operations. The Railroad shall brief FRA's Associate Administrator for Safety annually on the status of the system safety program, including any changes proposed for the system safety plan.

(b) The system safety plan shall describe the system safety program to be conducted as part of the Railroad's system design and construction process to ensure that the Railroad identifies, addresses, and documents all safety issues and Federal safety requirements. The system safety plan shall also describe the system safety program to be conducted as part of the operation, maintenance, and overhaul of all system components. The system safety plan shall take into account the operation of system components as they operate in isolation, as well as how they operate within the system. The system safety program shall ensure that safety issues are considered as important as cost and performance issues in the design, construction, operation, maintenance, and overhaul of the Railroad's system.

(c) The system safety plan shall be the Railroad's principal safety document. It shall be used as guidance or, as applicable, as a requirement for the development and operation of the Railroad's system and subsystems. At a minimum, the system safety plan shall address:

(1) Fire protection;

(2) Software safety;

(3) Inspection, testing, and maintenance;

(4) Training and qualifications;

(5) Emergency preparedness;

(6) Pre-revenue service system qualification testing;

(7) Hazard identification and reduction;

(8) Operating procedures in the event of equipment that becomes defective while in passenger service;

(9) Identification of safety-critical subsystems;

(10) Relationships between safety-critical subsystems; and

(11) Adequate staffing.

(d) The system safety plan shall describe the approaches and processes to be used to:

(1) Identify all safety requirements, including Federal requirements governing the design of passenger equipment and its supporting systems;

(2) Evaluate the total system, including hardware, software, testing, and support activities, to identify known or potential safety hazards over the life cycle of the Railroad's system;

(3) Identify safety issues during design reviews;

(4) Eliminate or reduce the risk posed by the hazards identified;

(5) Monitor the progress made toward resolving safety issues, reducing hazards, and meeting safety requirements; and

(6) Develop a program of testing or analysis, or both, to demonstrate that safety requirements have been met.

(e) As part of the system safety program, adequate documentation shall be maintained to audit how the design and operation of the Railroad's system meets safety requirements, and to monitor how safety issues are raised and resolved.

(f) The system safety plan shall address how operational limits may be imposed on the use of the Railroad's system if the system design cannot meet certain safety requirements.

(g) The Railroads shall make the system safety plan and documentation required by paragraph (e) of this section available for inspection and copying by FRA.

§ 243.103 Fire protection program.

(a) As part of the system safety program, the Railroad shall include fire safety considerations and features in the design of the Railroad's system that reduce the risk of personal injury and equipment damage caused by fires on-board to a level established as acceptable in MIL–STD–882(C).

(b) As part of the system safety program, the Railroad shall complete a detailed, written analysis of the fire protection problem. In conducting this analysis, the Railroad shall:

(1) Ensure that good fire protection practice is used as part of the equipment design process;

(2) Take effective steps to design equipment to be sufficiently fire resistant so that fire detection devices permit evacuation of the equipment before fire, smoke, or toxic fumes cause injury to a passenger or crew member;

(3) Identify, analyze, and prioritize the fire hazards inherent in the design of equipment;

(4) Document and explain how safety issues are resolved in relation to cost and performance in the design of equipment so that the risk of fire hazard is minimized;

(5) Describe the analysis and tests necessary to demonstrate how the fire protection approach taken in the design of equipment will enable a train to meet the fire protection standards of this Subpart and of the Railroad's system safety plan;

(6) Describe the analysis and tests necessary in order to select materials that will provide sufficient fire resistance to ensure adequate time for fire detection and safe evacuation;

(7) Reasonably ensure that a ventilation system does not contribute to the lethality of a fire;

(8) Identify in writing the trainset components that are a risk of initiating fire and which require overheat protection. As prescribed in § 243.413(c), overheat detectors shall be installed in all components where the analysis determines that such equipment is necessary. If overheat protection is not provided for a component at risk of being a source of fire, the written rationale and justification for the decision shall be included as part of the system safety program documentation;

(9) Identify in writing all unoccupied train compartments that contain equipment or material that pose a fire hazard, and analyze the benefit provided by including a fire or smoke detection system in each compartment identified. As prescribed in § 243.413(d), fire or smoke detectors shall be installed in unoccupied compartments where the analysis determines that such equipment is necessary to ensure sufficient time for the safe evacuation of a train. The written analysis shall explain why a fire or smoke detector is not necessary, if the decision is made not to install one in any of the unoccupied compartments identified as a potential source of fire;

(10) Perform an analysis of the occupied and unoccupied spaces which require portable fire extinguishers. The analysis shall include the proper type and size of fire extinguisher for each location;

(11) Identify in writing all unoccupied train compartments that contain equipment or material that poses a fire hazard. On a case-by-case basis, analyze the benefit provided by including a fixed, automatic fire-suppression system in each compartment identified. The type and size of the automatic fire-suppression system for each necessary application shall be determined. As prescribed in § 243.413(e) a fixed, automatic fire suppression system shall be installed in unoccupied compartments where the analysis determines it is necessary and practical to ensure sufficient time for the safe evacuation of the train. The analysis shall provide the reasoning why a fixed, automatic fire-suppression system is not necessary or practical if the decision is made not to install one in any of the unoccupied compartments identified in the plan; and

(12) Develop and adopt written procedures for the inspection, testing, and maintenance of all fire safety systems and equipment. As prescribed in § 243.413(f), the Railroad shall comply with those procedures that it designates as mandatory.

(c) The Railroad shall reasonably ensure that the design criteria is followed and that the tests required by the fire protection portion of the Railroad's system safety plan and program are performed.

§ 243.105 Software safety program.

(a) The Railroad shall develop and maintain a software safety program to guide the design, development, testing, integration, and verification of computer programs used to control or monitor the Railroad's equipment, operations and systems.

(b) The software safety program shall:

(1) Treat system software that controls or monitors safety functions as safety-critical, unless a completely redundant, failsafe, non-software means to perform the same function is provided; and

(2) Describe the following items, objectives, or tasks to ensure that safe, reliable, and impenetrable system software is used to monitor or perform safety functions:

(i) The software design process to be used;

(ii) The software design documentation to be produced;

(iii) The software hazard analysis that will be performed, including a detailed explanation of the measures needed and taken by the Railroad to prevent the risk of penetration by unauthorized individuals or entities;

(iv) The software safety reviews that will be performed;

(v) The software hazard monitoring and tracking that will occur;

(vi) The hardware and software integration safety tests that will be conducted; and

(vii) The demonstration of overall software safety as part of the pre-revenue service tests of the Railroad's system.

(c) The Railroad shall adhere to the design criteria, and perform the tests required by the software safety portion of the system safety program. To fulfill this obligation in part, the Railroad shall include software safety requirements in each of its contracts for the purchase of new equipment or new components of existing equipment that contain safety-critical software.

(d) The Railroad shall use a formal safety methodology to develop electrical and electronic control systems that control safety functions. The safety methodology shall include a Failure Modes, Effects, Criticality Analysis (FMECA) and verification tests for all components of the control system and its interfaces, including computer software.

(e) Safety-related control systems driven by computer software shall include hardware and software design features that result in a control system that fails safe.

(f) The Railroad shall develop and comply with a comprehensive hardware and software integration program for safety-critical systems to ensure that the software functions as intended when installed in a hardware system identical to that to be used in service.

(g) The Railroad shall follow the software safety procedures required by the software safety portion of the system safety program.

§ 243.107 Inspection, testing, and maintenance program.

(a) *General.* The Railroad shall provide to FRA detailed information, consistent with the requirements of this rule and including those set forth in § 243.433(a), §§ 243.331 through 243.347, and §§ 243.258 through 243.279 of this Part, on the inspection, testing, and maintenance procedures necessary for the Railroad to safely operate its system. This information shall include a detailed description of:

(1) Safety inspection procedures, intervals, and criteria;

(2) Test procedures and intervals;

(3) Scheduled preventive maintenance intervals;

(4) Maintenance procedures; and

(5) Special testing equipment or measuring devices required to perform safety inspections and tests.

(b) *General inspection, testing, and maintenance procedures.* The inspection, testing, and maintenance program shall contain procedures that reasonably ensure that the Railroad's system is free from general conditions that endanger the safety of the crew, passengers, or equipment. This program shall include procedures to ensure that the system, all subsystems, and components are free from the following conditions that may endanger the safety of the crew, passengers, or equipment:

(1) A continuous accumulation of oil or grease on the rolling stock;

(2) Improper functioning of any component in the track, signal, rolling stock, or communication systems;

(3) A crack, break, excessive wear, structural defect, or weakness of a component in the track, signal, or rolling stock systems;

(4) A leak in any portion of the rolling stock;

(5) Use of a component or system under a condition that exceeds the design capabilities of that component or system; and

(6) Insecure attachment of a component of the track, signal or rolling stock systems.

(c) *Maintenance intervals.* Initial scheduled maintenance intervals should be based on analysis completed as part of the system safety program. The intervals should be changed only when justified by accumulated, verifiable operating data, and approved in conjunction with the system safety plan approval.

(d) *Standard procedures for safely performing inspection, testing, and maintenance, or repairs.* The Railroad shall establish written standard procedures for performing all safety-critical or potentially hazardous inspection, testing, maintenance, and repair tasks. These standard procedures shall be available to FRA upon request and shall:

(1) Describe in detail each step required to safely perform the task;

(2) Describe the knowledge necessary to safely perform the task;

(3) Describe any precautions that shall be taken to safely perform the task;

(4) Describe the use of any safety equipment necessary to perform the task;

(5) Be approved by the Railroad's official responsible for safety;

(6) Be enforced by the Railroad's supervisors responsible for accomplishing the tasks; and

(7) Be reviewed annually by the Railroad.

§ 243.109 Training, qualification, and designation program.

The Railroad shall adopt and comply with a training, qualification, and designation program for employees and contractors that perform emergency preparedness tasks or safety-related inspections, tests, or maintenance duties on the Railroad's system. This program shall meet the minimum requirements set forth in Subpart H of this Part, and it shall be submitted to FRA for approval as part of the Railroad's system safety plan.

§ 243.111 Emergency Preparedness Program.

The Railroad shall develop, adopt, and implement an emergency preparedness plan that complies with the requirements of FRA's proposed Passenger Train Emergency Standards as ultimately codified in 49 CFR part 239, as amended.

§ 243.113 Pre-revenue service system qualification testing plan.

The Railroad shall submit a pre-revenue service qualification testing plan, as part of the system safety plan, prior to testing the system. The pre-revenue service qualification testing plan shall cover all systems, including the signal, communication, infrastructure and track, rolling stock, software, and operating practices systems. The testing plan shall include all of the elements required by Subpart G of this Part and shall be approved in conjunction with the Railroad's system safety plan, prior to commencement of testing.

§ 243.115 Hazard identification and reduction.

(a) The Railroad shall include in its system safety program, an identification of all hazards that may arise in the system, which shall be reduced to writing and available for review and copying by FRA.

(b) The Railroad shall include in its system safety program, a written analysis of how the identified safety hazards may be reduced or eliminated through design, construction, equipment, or operations. Through system safety analysis, the Railroad shall choose the reduction or elimination method most appropriate for the safety of the system. A solution based in operations shall be discouraged. The Railroad's written analysis shall be available for review and copying by FRA.

§ 243.117 Operating procedures in the event of component failures.

(a) The Railroad shall include in its system safety program consideration of appropriate operating procedures in the event that rolling stock or any other system component becomes defective while in passenger service. The Railroad's system safety program shall include, at a minimum, appropriate operating procedures for all major component failures under all potential

operating conditions; a description of the limits of the fault tolerance for each fault-tolerant system; and the development of a process by which the Railroad and any locomotive engineer operating a trainset will become aware that a system is approaching the limits of its fault tolerance before those limits are reached or surpassed.

(b) As part of the system safety program, the Railroad shall complete a written explanation of the considerations completed under paragraph (a). The Railroad's written explanation shall be available for review and copying by FRA.

§ 243.119 Safety-critical subsystems.

The Railroad shall include in its system safety program an identification of all safety-critical subsystems. The Railroad shall also prepare an explanation of the relationship between all safety-critical subsystems. The Railroad's written identification and explanation shall be available for review and copying by FRA.

§ 243.121 Approval procedure.

(a) *General.* The following procedures govern consideration and action upon requests for approval of the Railroad's system safety plan and safety-critical changes to the Railroad's existing system safety plan.

(b) *Petitions for approval.* The Railroad's petition for approval of the system safety plan, or petition for approval of safety-critical changes to the system safety plan shall contain—

(1) The name, title, address, and telephone number of the Railroad's primary person to be contacted with regard to review of the petition;

(2) The system safety plan proposed, in detail, which addresses the Railroad's entire system as described in this Part; and

(3) In the case of the Railroad's initial petition for approval, appropriate data or analysis, or both, establishing that the system safety plan will provide a high level of safety; and in the case of petitions for approval of safety-critical changes to the system safety plan, data or analysis, or both, which establishes that the requested change(s) provides an equivalent or greater level of safety than provided in the Railroad's previous system safety plan.

(c) *Service.* The Railroad's petition for approval under paragraph (b) of this section shall be submitted in triplicate to the Associate Administrator for Safety, FRA, 400 7th Street, S.W., Stop 25, Washington, D.C. 20590.

(d) *Disposition of petition.* (1) If FRA finds that the petition complies with the requirements of this section and that the proposed plan is acceptable or proposed changes are justified, the petition shall be granted, normally within 90 days of its receipt. If the petition is neither granted nor denied within 90 days, the petition remains pending for decision. FRA may attach special conditions to the approval of the petition. Following the approval of a petition, FRA may reopen consideration of the petition for cause stated.

(2) If FRA finds that the petition does not comply with the requirements of this section and that the proposed plan is not acceptable or that the proposed changes are not justified, the petition shall be denied, normally within 90 days of its receipt.

(3) When FRA grants or denies a petition, or reopens consideration of the petition, written notice shall be sent to the petitioner.

(e) *Publication of Changes.* If FRA determines that changes to safety-critical standards, procedures, or inspection frequencies set forth in this rule are justified, the Administrator shall publish in the **Federal Register** a notice which explains those changes. The changes to the Railroad's system safety plan shall take effect 60 days after publication of such notice.

Subpart C—Signal System

General

§ 243.201 Plans, where kept.

As required for maintenance, plans shall be kept at all interlockings and intermediate track circuit cases. Plans shall be legible and correct.

§ 243.202 Grounds.

Each circuit, the functioning of which affects the safety of train operations, shall be kept free of any ground or combination of grounds which will permit a flow of current equal to or in excess of 75 percent of the release value of any relay or other electromagnetic device in the circuit, except circuits which include any track rail and except the common return wires of single-wire, single-break, signal control circuits using a grounded common, and alternating current power distribution circuits which are grounded in the interest of safety.

§ 243.203 Locking of signal apparatus housings.

Signal apparatus housings shall be secured against unauthorized entry.

§ 243.204 Design of control circuits on the failsafe principle.

The failure of a safety-critical control circuit shall not cause a condition more permissive than intended. Safety-critical circuits shall be designed on the failsafe principle.

§ 243.205 Power-operated switch use.

All switch movements shall be operated by power-operated electric switch machines. Hand-operated switches are prohibited in territory controlled by ATC.

§ 243.206 Yard operations.

Yard operations shall be controlled through the traffic control center for the yard, and movements in the yard shall be made at restricted speed. Relevant provisions of 49 CFR 236.1 through 236.109 shall apply to signals that are used in yard operations.

§ 243.207 Timetable instructions.

Interlockings, automatic train control territory, and yard limits shall be designated in timetable instructions.

Wayside and Cab Signals

§ 243.208 Location of wayside signals.

Each wayside signal shall be positioned and aligned so that its aspects can be visually associated with the track it governs.

§ 243.209 Aspects and indications.

(a) Aspects of wayside signals shall be shown by the color of lights, position of lights, flashing of lights, or any combination thereof. They may be qualified by marker plate, number plate, letter plate, marker light, or any combination thereof.

(b) The fundamental indications of wayside signal aspects shall conform to the following:

(1) A red light or a series of horizontal lights shall be used to indicate stop; and

(2) A yellow light or a lunar light shall be used to indicate that speed is to be restricted and stop may be required.

(3) A green light or a series of vertical lights shall be used to indicate proceed at authorized speed.

(c) The names, indications, and aspects of wayside and cab signals shall be defined in the Railroad's Operating Rule Book or Special Instructions. Modifications shall be filed with the FRA within thirty days after such modifications become effective.

(d) The absence of a qualifying appurtenance or the failure of a lamp in a light signal shall not cause the display of a less restrictive aspect than intended.

(e) Cab display:

(1) The aspects of the cab display shall include:

(i) the maximum authorized speed, shown by a bar-graph or a needle in periphery of the dial used for the indication of train speed;

(ii) the target speed, shown by numbers; and

(iii) the target distance corresponding to the indicated target speed, shown by a continuously refreshed bar-graph and numbers in case of overflow of the bar-graph.

(2) [Reserved]

(f) All bar-graphs and numbers shall be illuminated well enough to read clearly in all lighting conditions in which the equipment will be used.

§ 243.210 Markers.

(a) Block section markers and route origin markers shall be provided on high speed lines.

(b) Block section limits shall be indicated by marker plates installed along the right-of-way. The markers shall be located at adjoining block sections. Marker plates shall be illuminated for train operations that occur between one hour before sunset and one hour after sunrise, and during all other hours when weather conditions restrict visibility.

(c) Where route origin markers are used, the markers shall be located at the beginning of each route and each shall be equipped with a proceed light.

(d) Special shunting markers shall be provided at locations not equipped with route origin markers where turn-back operations may be required. Each such marker shall be equipped with a shunting light.

§ 243.211 Spacing of beacons.

The ATC system and beacon spacing shall be designed and operate such that:

(a) The locomotive engineer can comply with any imposed speed restriction through the use of a service brake application;

(b) if the locomotive engineer fails to react appropriately in response to speed restrictions or other safety-critical information conveyed, the safety of the trainset shall be ensured by an automatic brake application.

Track Circuits

§ 243.212 Track circuit requirements.

(a) The track relay controlling home signals or beacons shall be in de-energized position, or a device that functions as a track relay controlling home signals or beacons shall be in its most restrictive state, and the track circuit shall be de-energized where any of the following conditions exist:

(1) When a rail is broken or a rail or switch-frog is removed. It shall not be a violation of this requirement if a track circuit is energized:

(i) When a break occurs between the end of rail and track circuit connector; within the limits of rail-joint bond, appliance or other protective device, which provides a bypath for the electric current, or;

(ii) As a result of leakage current or foreign current in the rear of a point where a break occurs.

(2) When any portion of a trainset occupies any part of a track circuit.

(b) [Reserved]

§ 243.213 Track circuit shunting sensitivity.

Each track circuit controlling a home signal shall be maintained so that the track relay is in a de-energized position, or a device that functions as a track relay shall be in its most restrictive state if, when the track circuit is dry, a shunt is connected across the track rails of the circuit, including fouling sections of turnouts. The electric resistance of the shunt shall be:

(a) 0.15 Ohm on open track, for use with a ballast of 8 Ohm per kilometer (0.62 mi) resistance.

(b) 0.25 Ohm in interlocking areas, for use with a ballast of 8 Ohm per kilometer (0.62 mi) resistance.

§ 243.214 Insulated rail joints.

Insulated rail joints shall be maintained in a condition to prevent the failure of any track circuit due to track circuit current that flows between insulated rails.

§ 243.215 Fouling Wires.

Fouling wires shall consist of at least two discrete conductors, and each shall be of sufficient conductivity and maintained in such condition that the track relay will be in de-energized position, or device that functions as a track relay will be in its most restrictive state, when the circuit is shunted.

§ 243.216 Turnout, fouling section.

Rail joints within the fouling section shall be bonded, and fouling section shall extend at least to a point where sufficient track centers and allowance for maximum car overhang and width will prevent interference with trainset movement on an adjacent track.

Wires and Cables

§ 243.217 Protection of insulated wire; splice in underground wire; aerial cable.

Insulated wire shall be protected from mechanical injury. The insulation shall not be punctured for test purposes. A splice in underground wire shall have insulation resistance at least equal to the wire spliced. Aerial cable shall be supported by messenger.

§ 243.218 Tagging of wires and interference of wires or tags with signal apparatus.

Each wire shall be tagged or otherwise so marked that it can be identified at each terminal. Tags and other marks of identification shall be made of insulating material and so arranged that tags and wires do not interfere with moving parts of apparatus.

Standards

§ 243.219 Control circuits; requirements.

The circuits shall be so installed that each signal or beacon which governs train movements into a block section will convey its most restrictive state as long as any of the following conditions exist within the block:

(a) Occupancy by any portion of a trainset;

(b) When points of a switch are not closed in proper position; or

(c) When a track relay is in de-energized position or a device which functions as a track relay is in its most restrictive state; or when signal control circuit is de-energized.

§ 243.220 Control circuits for signals, selection through point detector operated by switch movement.

The control circuit for each signal aspect or beacon, which conveys an indication more favorable than ''proceed at restricted speed'' for a signal governing movement(s) over switches, shall be selected through a point detector operated directly by switch points for each switch, movable-point frog, and derail in the routes governed by such signal or beacon. Circuits shall be arranged so that such a signal or beacon can convey an indication more favorable than ''proceed at restricted speed'' only when each switch, movable-point frog, and derail in the route is in proper position.

§ 243.221 Time locking; where required.

Time locking shall be provided in conjunction with signal aspects or beacons which convey indications more favorable than ''proceed at restricted speed''. Time locking shall be provided for all interlocking signals where route or direction of traffic can be changed.

§ 243.222 Indication locking.

Indication locking shall be provided for switches, movable-point frogs and derails.

§ 243.223 Electric locking circuits.

Vital design methods in interlocking circuitry shall prevent ''proceed'' aspects from being displayed for conflicting movements.

§ 243.224 Loss of shunt protection; where required.

A loss of shunt protection shall not permit the release of the route locking circuit of each power-operated switch. The loss of shunt protection shall be based on a sequential release logic. Sequential release logic requires that when any track circuit becomes occupied in logical sequence from a previous track circuit, in combination with an established train route, its status will not be allowed to return to unoccupied, even though the detected shunt may be lost, until a specified safe time interval after the next track circuit in the route becomes occupied.

§ 243.225 Signal control circuits, selection through track relays or devices functioning as track relays.

The control circuits for signal aspects or beacons which convey indications more favorable than ''proceed at restricted speed'' shall be selected through track relays, or through devices that function as track relays, for all track circuits in the route governed.

§ 243.226 Switch, movable-point frog or split-point derail.

A switch, movable-point frog, or split-point derail shall be equipped with clamp locks and shall be maintained so that it cannot be locked when the point is open 6 mm (.25 in) or more.

§ 243.227 Point detector.

Point detectors shall be maintained so that when switch mechanisms are locked in normal or reverse position, contacts cannot be opened by manually applying force at the closed switch point. Point detector circuit controllers shall be maintained so that the contacts will not assume the position corresponding to switch point closure if the switch point is prevented by an obstruction from closing to within 6 mm (0.25 in).

§ 243.228 Signals controlled by track circuits.

The control circuits for aspects with indications more favorable than ''proceed at restricted speed'' shall be controlled by track circuits extending through the entire block.

§ 243.229 Circuits at interlocking.

Circuits at an interlocking shall be so interconnected that aspects to proceed cannot be displayed simultaneously for conflicting movements.

§ 243.230 Signals at adjacent interlockings.

Signals at adjacent interlockings shall be so interconnected that aspects to proceed on tracks signaled for movements at greater than restricted speed cannot be displayed simultaneously for conflicting movements.

§ 243.231 Track signaled for movements in both directions, change of direction of traffic.

On track signaled for movements in both directions, occupancy of the track between opposing signals at adjacent interlockings shall prevent changing the direction of traffic from that which was obtained at the time the track became occupied.

§ 243.232 Route locking.

Route locking shall be provided at all interlockings where power-operated switches are located.

§ 243.233 Wayside detectors.

(a) All wayside detectors, including flood, wind, hot box, fall intrusion, intrusion, and dragging equipment detection systems, shall be linked to the central traffic control system or to the signaling system, or both.

(b) The Railroad shall design and implement the wayside detection systems so that any detection of a potentially unsafe condition will be immediately conveyed to the central traffic control system or to the signaling system, or both.

(c) *Fall intrusion detectors.* The Railroad shall install fall intrusion detectors at all highway, animal, and non-Railroad equipment overpasses and underpasses. Fall intrusion detectors shall be activated when the network of protective wiring located at each overpass and underpass experiences a partial or complete break. The fall intrusion detectors' data output shall be transmitted to the central traffic control facility such that sensor information is continuously available to Railroad operations personnel. The Railroad's system safety plan shall list all locations where fall intrusion detectors are installed, and shall set forth the actions to be taken when specific conditions are detected.

(d) *Intrusion detectors.* The Railroad shall install a wayside intrusion detection system in the protective fencing along the Railroad right-of-way that shall restrict, to the maximum extent possible, all non-Railroad intrusion. The wayside intrusion detection system shall be installed at each location identified by the system safety plan as an area where intrusion is likely to occur. This system shall be connected to the Railroad's signal system and to the central traffic control system, and shall alert the Railroad when an intrusion occurs. The Railroad's system safety plan shall explain in detail where intrusion is likely to occur and why, and set forth specific actions to be taken by the Railroad when intrusion occurs.

(e) *Dragging equipment detectors.* The Railroad shall install dragging equipment detectors at all locations where underframe repair or maintenance work is performed, including locations where maintenance facility track joins the main line, and at other locations determined necessary by the system safety plan. The dragging equipment detector data output shall be transmitted to the central traffic control facility such that sensor information is continuously available to railroad operations personnel. The Railroad's system safety plan shall explain in detail where dragging equipment is likely to occur and why, and shall set forth specific actions to be taken by the Railroad when such dragging equipment is detected.

(f) *Flood detectors.* The Railroad shall install flood detectors along the right-of-way where determined necessary by the system safety plan, taking into account factors of drainage, culverts, bridges, overpasses, underpasses, and flood plain status. The flood detection system shall notify the signal system and central traffic control of any location where an accumulation of water exists in the right-of-way that may present a risk to a right-of-way structure, in service equipment, or passenger service equipment. The Railroad's system safety plan shall include specific actions to be taken when such water is detected.

(g) *Wind detectors.* The Railroad shall install wind detectors along the right-of-way where determined necessary by the system safety plan, taking into account area wind and weather patterns, topography, and proximity to large bodies of water. This wind speed data output shall be transmitted to the central traffic control facility such that sensor information is continuously available to Railroad operations personnel. The Railroad's system safety plan shall explain in detail the locations chosen for wind detectors and why; list the speeds and conditions at which operational safety is compromised; and set forth specific actions to be taken when those wind speeds are detected.

(h) *Hot box detectors.* The Railroad shall install and maintain hot box detectors along the length of the right-of-way that detect the journal bearing temperature of all moving rail equipment. Wayside detectors shall be arranged so as to check the journal bearing temperature on both sides of the trains, on each track. Detectors shall be located at intervals not to exceed 40 km

(25 mi). Hot box detectors shall be linked to the signal system to alert the locomotive engine or the central traffic control system, or both, depending on the level of the overheating, so that proper action will be taken by the Railroad. The hot box detector system shall include a tiered alarm system, as set forth below, to ensure that appropriate action accompanies journal box overheating.

(1) Danger alarms shall alert the Railroad when any journal box or journal box component fails in operation, which shall cause the defective train to stop at a designated block marker, and shall cause all passing trains to slow to a speed not in excess of 80 km/hr or 50 mph;

(2) Simple alarms shall alert the Railroad when journal box overheating that is likely to compromise safety occurs, which shall cause the defective trainset to reach the next siding where it shall be parked and inspected prior to resuming operations; and

(3) Inspection threshold alarms shall alert the Railroad when the temperature of the journal bearing is significantly higher than the average temperature taken on the other journal bearings. This alarm shall be transmitted to the central maintenance facility and the appropriate inspection and repair shall be completed.

The Railroad shall develop the hot box detection system in conjunction with the system safety plan, and shall explain in detail the location of the detectors and the temperatures that trigger corresponding remedial measures.

§ 243.234 Protection of maintenance-of-way personnel.

To protect maintenance-of-way personnel, the signaling system shall include circuitry to lock-out particular block sections and restrict the speed of passing trains on these block sections or adjacent trackage. The Railroad shall develop signal Operating Rules, as required in section 6 of this rule, in accordance with this requirement.

§ 243.235 ATC device installation.

Each power vehicle capable of being the lead vehicle in a trainset shall be equipped with an automatic train control (ATC) device which shall be operative at all times the trainset operates at a speed of more than 32 km/h (20 mph).

§ 243.236 Forestalling device and speed control.

(a) The ATC system shall be so arranged that if the authorization to proceed is not received from the wayside equipment and the train has reached the limit of its authorized progression, the trainset will be brought to a complete stop. The system shall not allow movement except upon the operation of an acknowledging device, and then only at slow speed until an authorization to proceed is received by the onboard train control device.

(b) The ATC system shall include the following features:

(1) Braking supervision, requiring the train to proceed at a speed ensuring compliance with the target speed at the target distance.

(2) Maximum speed supervision, effecting an automatic brake application whenever the maximum speed limit is exceeded.

§ 243.237 Cab signal indication in accordance with maximum speed limit.

While providing maximum speed supervision, the ATC system shall provide a cab signal indication of the maximum authorized speed.

§ 243.238 Automatic brake application; initiation when the maximum speed limit is exceeded.

The ATC system shall operate to initiate an automatic brake application when the speed of the train exceeds the maximum speed intervention curve. The automatic brake application can be interrupted by the locomotive engineer only when the speed of the train is lower than the maximum authorized speed. Absent intervention by the engineer, an automatic brake application shall bring the train to a speed of less than maximum authorized speed. Mere acknowledgment by the engineer does not constitute intervention.

§ 243.239 Advance cab signal indication.

The ATC system shall provide a cab signal indication of the target speed and distance before commencing the braking supervision, thus allowing the locomotive engineer to respond by a manual brake application.

§ 243.240 Automatic brake application initiated by the ATC.

In the absence of an appropriate response to a cab display indication on the part of the locomotive engineer, the ATC system shall initiate an automatic brake application to ensure compliance with target speed and target distance. The automatic brake application can be interrupted by the engineer only when the speed of the train is lower than the maximum authorized speed. Absent intervention by the engineer, an automatic brake application shall bring the train to a speed of less than maximum authorized speed. Mere acknowledgment by the engineer does not constitute intervention.

§ 243.241 Cab signal indication after authorization to enter a block section where conditions defined in § 243.219 exist.

(a) If a trainset is authorized to enter a block section in which any condition listed in § 243.219 of this Part exists, the ATC system shall display an indication to ''Proceed at Restricted Speed'.

(b) If the restricted speed is exceeded, the ATC shall initiate an automatic brake application. Absent intervention by the engineer, an automatic brake application shall bring the train to a speed of less than maximum authorized speed. Mere acknowledgment by the engineer does not constitute intervention.

§ 243.242 Audible indicator.

The audible cab indicator shall have two distinctive sounds as noted in (a) and (b) below, and be clearly audible throughout the cab under all operating conditions.

(a) When the cab display changes, the audible indicator shall sound briefly (for approximately 0.5 seconds) to draw the engineer's attention to the change.

(b) An audible warning shall sound before an automatic brake application is initiated. The warning shall be given in sufficient time to allow the engineer and the train brake equipment to respond to the change. The indicator shall sound continuously until the warning condition disappears.

§ 243.243 Delay time.

The delay time of the ATC train-borne equipment shall be such as to ensure that the trainset shall comply with the target speed and distance through the brake application initiated by the system.

§ 243.244 Automatic brake application; full service.

An automatic brake application initiated by the ATC system shall cause a full service application of the brakes.

§ 243.245 Interference with application of brakes by means of brake valve.

The ATC apparatus shall be so arranged as not to interfere with the application of the brakes by means of the brake valve and not to impair the efficiency of the brake system.

§ 243.246 Control from lead vehicle.

Each trainset shall be controlled and operated from the lead vehicle. Each lead vehicle shall be equipped with an ATC device. This device shall have a fail-safe and fault tolerant architecture, such as a two-out-of-three voting architecture.

§ 243.247 Proper operative relation between parts along roadway and parts on power car.

ATC track-side and power car components shall be designed and shall operate in compatibility under all conditions of speed, weather, wear, oscillation, and shock.

§ 243.248 Visibility of cab signals.

The cab signals shall be plainly visible to the locomotive crew or power car crew from their stations in the cab.

§ 243.249 Power supply.

The ATC system shall operate from a separate or isolated power supply.

§ 243.250 Seal, where required.

A seal shall be maintained on any device other than the brake-pipe cut-out cock (double-heading cock), by means of which the operation of the pneumatic portion of the automatic train-control apparatus can be cut out.

§ 243.251 Rate of pressure reduction; equalizing reservoir or brake pipe.

The equalizing-reservoir pressure or brake-pipe pressure reduction during an automatic brake application shall be at a rate not less than that which results from a manual service application.

§ 243.252 Restrictions imposed when device fails and/or is cut out en route.

(a) When the ATC system fails or is cut out en route, the train may proceed at restricted speed to the next available point of communication or siding, where a report must be made to a designated officer. An ATC system failure may result from a variety of conditions; for purposes of this Subpart, the failure of two or more of the on-board processors will be considered an ATC failure. Where an absolute block is established in advance of the train on which the device is inoperative, the train may proceed at a speed not to exceed 127 km/h (79 mph).

(b) Where an ATC system fails or is cut out en route, the Railroad shall test the ATC and record the results in accordance with §§ 243.276 and 243.278, and determine that the ATC is fully operative before the trainset leaves its next initial terminal.

§ 243.253 The trackage.

The trackage over which the Railroad operates trains in revenue service shall be completely equipped with wayside equipment designed to interface with and provide safety control commands to the lead vehicle of trainsets which operate over that trackage. Signaling beacons and antennas shall be installed and maintained in accordance with manufacturer's specifications.

§ 243.254 Cut out of the ATC system.

Any cut out of the ATC system or activation of the acknowledging device shall be registered in the on-board event recorder.

Reporting Requirements

§ 243.255 Accidents resulting from signal failure.

The occurrence of an accident/incident arising from the failure of an appliance, device, method or system to function or indicate as required by this rule that results in a more favorable aspect than intended or other conditions hazardous to the movement of a train, shall be reported within 24 hours to the FRA by toll free telephone number, 800–424–0201.

§ 243.256 Signal failure reports.

Each failure of an appliance, device, method, or system to function or indicate as required by this rule that results in a more favorable aspect than intended or other condition hazardous to the movement of a train shall be reported to the FRA within five days from the date of occurrence. Form FRA F6180–14, ''Signal Failure Report,'' shall be used for this purpose and completed in accordance with instructions printed on the form.

§ 243.257 Annual signal systems report.

The Railroad shall file an annual report with FRA which details the signal system configuration and operation, on a form provided by FRA in accordance with instructions and definitions on the reverse side of the form. The report shall be filed annually on or before April 1 of each year.

Inspection, Testing, and Maintenance

§ 243.258 General.

The Inspection, Testing and Maintenance program shall be designed to ensure that the safety of the railroad's signaling system does not deteriorate over time, in accordance with § 243.107 of this Part.

§ 243.259 Interference with normal functioning of device.

Inspection, testing and maintenance shall not interfere with or alter the normal functioning of any signal device except after measures are in place to provide for the safety of train operations that depend on normal functioning of such device. Where interference or alteration has occurred, the device must be functioning normally before train operations dependent on such functioning resume.

§ 243.260 Operating characteristics of electromagnetic, electronic, or electrical apparatus.

Signal apparatus, the functioning of which affects the safety of train operations, shall be maintained in accordance with the limits within which the device is designed to operate.

§ 243.261 Adjustment, repair, or replacement of component.

When any component of a signal system, the proper functioning of which is essential to the safety of train operation, fails to perform its intended signaling function or is not in correspondence with known operating conditions, the cause shall be determined and the faulty component adjusted, repaired or replaced without undue delay.

§ 243.262 Purpose of inspection and tests; removal from service of a relay or device failing to meet test requirements.

Inspections and tests shall be made in accordance with specifications of the Railroad, subject to approval by FRA in conjunction with the System Safety Plan set forth in Subpart B, to determine if the equipment is maintained in the proper condition to perform its intended function. Any electronic device, relay, or other electromagnetic device which fails to meet the requirements of specified tests shall be removed from service, and shall not be restored to service until its operating characteristics are in accordance with the limits within which such device or relay is designed to operate.

§ 243.263 Point detector test.

Point detectors operated by power-operated switch movement shall be tested at least once every three months.

§ 243.264 Relays; microprocessor testing.

(a) Each safety-critical, train-borne ATC relay shall be tested at least once each year.

(b) Each safety-critical, wayside relay shall be tested at least once every four years.

(c) Each safety-critical, train-borne electronic subsystem which is not verified internally on a continuous basis shall be tested at least once each year.

(d) Each safety-critical, train-borne electronic subsystem in which proper operation is verified internally in a closed loop fashion shall not require periodic tests.

(e) Each safety-critical wayside electronic subsystem which is not verified internally on a continuous basis shall be tested at least once every two years.

(f) Each safety-critical wayside electronic subsystem, in which proper

operation is verified internally in a closed loop fashion, shall not require periodic tests.

§ 243.265 Ground tests.

(a) Except as provided in paragraphs (b) and (c) below, a test for grounds on each safety-critical energy bus furnishing power to circuits shall be made at least once every three months.

(b) The provisions of this section 315 shall not apply to track circuit wires, common return wires of grounded common single-break circuits, or alternating current power distribution circuits grounded in the interest of safety.

(c) Periodic ground tests are not required if ground detection devices are properly functioning, or if the design of circuits is such that a grounded energy bus could not impact the safety of train operation. An inspection of each ground detection device to ensure proper operation of such device shall be made at least once every three months.

§ 243.266 Insulation resistance tests; wires in trunking and cables.

(a) Insulation resistance of wires and cables, except conductors connected directly to track rails, shall be tested when wires, cables, and insulation are dry. Insulation resistance tests shall be made between all conductors and ground, and between conductors in each multiple conductor cable, and between conductors in trunking, when wires or cables are installed and at least once every 10 years.

(b) In no case shall a circuit be permitted to function on a conductor having an insulation resistance to ground or between conductors of less than 200,000 ohms.

§ 243.267 Time releases, timing relays, and timing devices.

Time releases, timing relays, and timing devices shall be tested at least once each year. The timing shall be maintained at not less than 90 percent of the predetermined time interval, which shall be shown on the plans or marked on the time release, timing relay, or timing device. Where time releases are an integral part of a safety-critical, processor-based controller and are specified in the applications program, such intervals shall be tested only at the time of installation and whenever a change is made in the applications program.

§ 243.268 Time locking.

Where time locking is an integral part of a safety-critical, processor-based controller and is specified in the applications program, such locking shall be tested at the time of installation and whenever a change is made in the applications program.

§ 243.269 Route locking.

Where route locking is an integral part of a safety-critical, processor based controller and is specified in the applications program, such locking shall be tested at the time of installation, whenever a change is made in the applications program, and when route locking has been disarranged.

§ 243.270 Indication locking.

Where indication locking is an integral part of a safety-critical, processor based controller and is specified in the applications program, such locking shall be tested at the time of installation, whenever a change is made in the applications program, and when the indication locking has been disarranged.

§ 243.271 Traffic locking.

Where traffic locking is an integral part of a safety-critical, processor based controller and is specified in the applications program, such locking shall be tested at the time of installation and whenever a change is made in the applications program.

§ 243.272 Switch obstruction test.

A switch obstruction test of each switch shall be made when a lock rod is installed and at least once every 3 months.

§ 243.273 Locomotive or power car power supply voltage requirement.

The output voltage of power supply for power car or locomotive ATC shall be maintained within 10 percent of rated voltage.

§ 243.274 Power car or locomotive insulation resistance; requirement.

When the periodic test prescribed in § 243.266 is performed, insulation resistance between wiring and ground of the automatic train control system shall be not less than one megohm.

§ 243.275 Antennas and beacons.

(a) Signaling beacons and antennas shall be inspected and maintained in accordance with the manufacturer's specifications.

(b) Antennas and beacons which have been repaired or rewound shall have the same operating characteristics which they possessed originally or as specified for new equipment.

§ 243.276 Departure test.

(a) The train-borne ATC equipment shall be tested using one of the following methods:

(1) Operation over track elements;

(2) Operation over a test circuit; or

(3) Onboard test device.

(b) The extent of the departure test shall be defined by the Railroad in accordance with the system safety plan required by Subpart B of this Part, but shall include at least the following:

(1) Ground-to-train transmission;

(2) The cab display indications; and

(3) The interface with the train brakes.

(c) The Railroad shall perform a departure test, and onboard ATC equipment shall be put in service, before the trainset operates over equipped territory. If the ATC is cut out, the Railroad shall perform another departure test before the ATC equipment is considered operative.

(d) If a locomotive or power car makes more than one trip in a 24-hour period, only one departure test is required in such a 24-hour period, except as provided in section 3.119(b) concerning failures or cut-outs en route.

(e) Each test run and its outcome shall be recorded in the train-borne event recorder. These records shall be downloaded and retained for at least one year.

§ 243.277 Periodic test.

A periodic test of the train borne ATC equipment shall be performed at least once every two months and on multiple-unit cars as specified by the Railroad, subject to approval by the FRA.

§ 243.278 Results of tests.

(a) Results of tests made in compliance with § 243.252(b), §§ 243.262 through 243.272, § 243.276, and § 243.277, shall be recorded on pre-printed or computerized forms provided by the Railroad or by electronic means. Such forms shall show the name of the Railroad, place and date, equipment tested, results of tests, repairs, replacements, adjustments made, and condition in which the apparatus was left. Each record shall be signed by the employee making the test and shall be filed in the office of a supervisory official having jurisdiction. Results of tests shall be retained until the next record is filed, but in no case less than one year.

(b) For purposes of compliance with the requirements of this section, the Railroad may maintain and transfer records through electronic transmission, storage, and retrieval provided that:

(1) The electronic system be designed so that the integrity of each record is maintained through appropriate levels of security such as recognition of an electronic signature, or other means, which uniquely identify the initiating person as the author of that record. No two persons shall have the same electronic identity;

(2) The electronic system shall ensure that each record cannot be modified in any way, or replaced, once the record is transmitted and stored;

(3) Any amendment to a record shall be electronically stored apart from the record which it amends. Each amendment to a record shall be uniquely identified as to the person making the amendment;

(4) The electronic system shall provide for the maintenance of inspection records as originally submitted without corruption or loss of data; and

(5) Paper copies of electronic records and amendments to those records, that may be necessary to document compliance with this Subpart, shall be made available for inspection and copying by the FRA.

§ 243.279 Independent verification and validation.

(a) *General.* The Railroad shall undergo a third-party safety audit of all safety-critical processor-based equipment and system elements as finally configured, prior to commencing operations. In order to complete this requirement, the Railroad shall contract with an independent reviewer, deemed ''Reviewer'' for purposes of this section, that is experienced in conducting verification and validation audits of safety-critical processor-based equipment and systems. The Reviewer shall use as a comparable standard for appropriate methodology and performance, all of the following standards:

(1) *Railway Applications: The specifications and demonstration of dependability, reliability, availability, maintainability and safety.* prEN 50126, European Committee for Electrotechnical Standardization (November 1995).

(2) *Railway Applications: Software for Railway Control and Protection Systems.* prEN 50128, European Committee for Electrotechnical Standardization (August 1996).

(3) *Railway Applications: Safety Related Electronic Systems for Signaling, version 0.9.* prEN 50129, European Committee for Electrotechnical Standardization (March 1996).

(4) *On-board Electronic Equipment and Computer Hardware.* CF 67–001, Societe Nationale des Chemins de Fers Francais (June 1990).

(5) *Methodology for the Development of On-board Micro-computer Equipment.* prCF 67–004, and NF F71–004, Societe Nationale des Chemins de Fers Francais (February 1989).

(6) *Railway Applications: Electronic Equipment used on Rolling Stock.* EN 50155, European Committee for Electrotechnical Standardization (November 1995).

(b) *Items included in audit.* (1) The Reviewer shall assess and comment on the adequacy of the processes which the Railroad applied to the design and development of the signal system. The Reviewer shall identify and document any safety vulnerabilities that are not adequately mitigated by the Railroad's processes.

(2) The Reviewer shall evaluate the adequacy of the Railroad's system safety plan concerning the signal system.

(3) The Reviewer shall analyze the Railroad's hazard analysis for comprehensiveness and adherence to the system safety plan.

(4) The Reviewer shall analyze the Railroad's fault tree analysis for completeness, accuracy, and adherence to the system safety plan.

(5) The Reviewer shall randomly select various safety-critical modules for audit to verify whether the Railroad's system safety plan were followed. The number of modules selected should be determined jointly by the Railroad and the Reviewer to ensure that a representative number sufficient to provide confidence that all unaudited modules were developed in adherence to the Railroad's system safety plan.

(6) The Reviewer shall evaluate and comment on the Railroad's plan for installation and test procedures for revenue service.

(c) *Reviewer's report.* (1) The Reviewer shall prepare a report of the audit and provide copies to the Railroad and FRA.

(2) The Reviewer's report shall be submitted to the Railroad and FRA prior to the commencement of installation testing and contain, at a minimum, the following:

(i) The Reviewer's evaluation of the adequacy of the Railroad's system safety program concerning the signal system, including any vulnerabilities that were not adequately mitigated;

(ii) The method by which the Railroad would assure system safety in the event of hardware or software failures, including an explanation of how the Railroad will assure that all potentially hazardous operating circumstances are identified;

(iii) The method by which the Railroad addresses the comprehensiveness of the system design for the requirements of the railroad operations it will govern, including an explanation of how the Railroad will assure that all potentially hazardous operating circumstances are identified, how the Railroad records deficiencies identified in the design process, and how the Railroad tracks the correction of these deficiencies;

(iv) The identification of any documentation that was denied, incomplete, or inadequate;

(v) The identification of each system procedure or process that was not properly followed;

(vi) The identification of each deficiency or criticism not adequately mitigated in which the positions of the Reviewer and Railroad are clearly stated;

(vii) The identification of the Railroad's software verification and validation procedures for its safety-critical applications, and adequacy of these procedures;

(viii) The methods used by the Railroad to develop safety-critical software, such as the use of structured language, code checks, modularity, or other similar techniques; and

(ix) A brief outline of what would be required to determine a mean time between unsafe failure value for the Railroad's hardware, a mean time between unsafe execution of the Railroad's software, and a mean time between hazardous events of the Railroad's system.

(d) *FRA acceptance.*

(1) FRA shall analyze the Reviewer's report upon receipt. Based on its analysis of the report, FRA shall notify the Railroad in writing that the signal system as finally configured is accepted or not accepted.

(2) In the event that FRA does not accept the signal system as finally configured, FRA shall provide a written explanation of the reasons for the non-acceptance.

(3) In the event that FRA does not accept the signal system as finally configured, the Railroad shall have an opportunity to respond to the Reviewer's report and to FRA's non-acceptance.

(4) The Railroad shall conform the signal system to the Reviewer's recommendations and FRA acceptance prior to revenue operations.

Subpart D—Track Safety Standards

§ 243.301 Restoration or renewal of track under traffic conditions.

(a) Restoration or renewal of track under traffic conditions is limited to the replacement of worn, broken, or missing components or fastenings that do not affect the safe passage of trains.

(b) The following activities are expressly prohibited under traffic conditions:

(1) Any work that interrupts rail continuity, e.g., as in joint bar replacement or rail replacement;

(2) Any work that adversely affects the lateral or vertical stability of the track with the exception of spot tamping an isolated condition where not more than 5 m (16.4 lineal ft) of track are involved at any one time and the ambient air temperature is not above 35 C (95 F); and

(3) Removal and replacement of the rail fastenings on more than one tie at a time within 5 m (16.4 ft).

§ 243.303 Measuring track not under load.

When unloaded track is measured to determine compliance with requirements of this Part, evidence of rail movement, if any, that occurs while the track is loaded shall be added to the measurements of the unloaded track.

§ 243.305 Drainage.

Each drainage or other water carrying facility under or immediately adjacent to the roadbed shall be maintained and kept free of obstruction, to accommodate expected water flow for the area concerned.

§ 243.307 Vegetation.

Vegetation on railroad property which is on or immediately adjacent to roadbed shall be controlled so that it does not:

(a) Become a fire hazard to track-carrying structures;

(b) Obstruct visibility of railroad signs and signals;

(c) Interfere with railroad employees performing normal trackside duties;

(d) Prevent proper functioning of signal and communication lines; or

(e) Prevent railroad employees from visually inspecting moving equipment from their normal duty stations.

Geometry

§ 243.309 Track Geometry; General.

If any value listed in the following Safety Level One Geometry Table are exceeded, the Railroad shall initiate remedial action within two calendar days. If the values listed in the following Safety Level Two table are exceeded, the Railroad shall initiate immediate remedial action. For either the Level One or Level Two tables, a reduction in operating speed so that the condition complies with the limits listed for a lower speed shall constitute bringing the track into compliance.

SAFETY LEVEL ONE GEOMETRY TABLE

	Max. speed km/h (mph)	322 (200)	230 (143)	170 (105)	100 (62)	80 (50)	60 (37)	40 (25)
Alignment (mm)	10	9	10	13	16	17	21	24
	20	9	10	13	16	17	21	24
	31	15	18	18	NA	NA	NA	NA
Surface (mm)	[5] 12.2	11	13	16	18	19	21	52
	31	18	22	22	NA	NA	NA	NA

SAFETY LEVEL ONE GEOMETRY TABLE

	Max. speed km/h (mph)	322 (200)	230 (143)	170 (105)	100 (62)	80 (50)	60 (37)	40 (25)
Gage (mm) [1]	minimum	−7	−9	−12	−12	−12	−12	−12
	min. mean value [2]	−4	−7	−7	−7	NA	NA	NA
	maximum [3]	+27	+27	+35	+35	+35	+35	+37
Gage Variation [4]	mm on 10 m base	15	15	15	15	NA	NA	NA
Cant (mm)	maximum Chord (m)	180	180	180	180	180	180	180
Alignment (mm)	10	12	14	17	21	23	28	32
	20	12	14	17	21	23	28	32
	31	20	24	24	NA	NA	NA	NA
Surface (mm)	[5] 12.2	15	18	22	24	26	28	70
	31	24	30	30	NA	NA	NA	NA
Warp (mm)	[6] 10	15	15	18	18	18	24	24

[1] With respect to the nominal track gage, 1435 mm (56.5 in).
[2] Mean value on a 100 m (328 ft) length of track.
[3] Local defect value > +20 mm (0.79 in) has to be corrected.
[4] Gage variation is defined as the difference between the minimum and maximum gage measurements within 10 meters.
[5] The maximum values indicated on this line are not mid-chord offsets but are the difference between the average level at eight locations spaced symmetrically from the center at 0.675 m, 2.075 m, 3.64 m, and 6.11 m and a location at 0.675 m from the center. $Surface_{12.2} = \frac{1}{8}(Z_{-6.11} + Z_{-3.64} + Z_{-2.075} + Z_{-0.675} + Z_{0.675} + Z_{2.075} + Z_{3.64} + Z_{6.11}) - Z_{0.675}$
[6] Difference between the cross level value at any location and the mean value of the crosslevel over a distance of +/−5.0 m (16.4 ft).

§ 243.311 Track gage.

(a) Gage is measured between the heads of the rails at right-angles to the rails in a plane 15 mm (0.6 in) below the top of the rail head.

(b) The minimum gage, maximum gage, minimum mean value, and gage variation shall comply with the requirements defined in the Safety Level Two Geometry table given in Section 4.11.

§ 243.313 Curves, elevation and speed limitations.

(a) The maximum operating speed for each curve shall be determined by the following formula:

$$V_{max} = 3.6 * \sqrt{g * R * \frac{E_a + E_u}{D}}$$

where:

V_{max} = Maximum allowable operating speed (km/h).

E_a = Actual elevation of the outside rail above the inside rail (mm) 1.

R = Curve radius (m) 2.

E_u = Maximum allowable unbalanced elevation (mm).

D = Distance between wheel contact circles (mm).

g = acceleration due to gravity (m/s2).

In U.S. Engineering Units this formula becomes:

$$V_{max} = \sqrt{\frac{E_a + E_u}{0.0007 * D}}$$

where:

V_{max} = Maximum allowable operating speed (mph).

E_a = Actual elevation of the outside rail above the inside rail (in).[1]

D = Degree of curvature (degrees).[2]

E_u = Unbalanced elevation.

(b) Equipment meeting the standards of this section may be operated at curving speeds determined by the formula in paragraph (a) of this section, provided:

(1) It is demonstrated that when positioned on a track with uniform superelevation, Ea, reflecting the intended target cant deficiency, Eu, no wheel of the equipment unloads to a value of 60 percent or less of its static value on perfectly level track and the roll angle between the floor of the vehicle and the horizontal does not exceed 5.7 degrees;

(2) It is demonstrated that when positioned on a track with a uniform 180 mm (7 in) superelevation, no wheel unloads to a value less than 60% of its static value on perfectly level track and the angle, measured about the roll axis, between the floor of the vehicle and the horizontal does not exceed 8.6 degrees;

(3) The Railroad provides a complete description of the class of equipment involved, including schematic diagrams of the suspension system and the location of the center of gravity above top of rail;

(4) The Railroad provides a complete description of the test procedure and instrumentation used to qualify the equipment and the maximum values for wheel unloading and roll angles which were observed during testing; the test procedure may be conducted in a test facility, where all wheels on one side (right or left) of the equipment are raised or lowered by the intended cant deficiency, the vertical wheel loads under each wheel are measured, and a level is used to record the angle through which the floor of the vehicle has been rotated;

(5) The Railroad describes the procedures or standards in effect which detail the maintenance of the suspension system for the particular class of equipment; and

(6) The Railroad identifies the line segment on which the higher curving speeds are proposed to be implemented.

(c) Upon receipt of the information contained in paragraph (b), FRA shall approve use of the equipment and curving speeds established pursuant to paragraph (a). The Railroad shall notify the FRA Associate Administrator for Safety, in writing, no less than thirty calendar days prior to any proposed implementation of curving speeds higher than Vmax when the ''Eu'' term (above) will exceed 100 mm (4 in).

Track Structure

§ 243.315 Track strength.

(a) Track shall have a sufficient vertical strength to withstand the maximum vehicle loads generated at maximum permissible train speeds, cant deficiencies and surface limitations. For purposes of this section, vertical track strength is defined as the track capacity to constrain vertical deformations so that the track shall return, following maximum load, to a configuration in compliance with the track performance and geometry requirements of this Part.

(b) Track shall have sufficient lateral strength to withstand the maximum thermal and vehicle loads generated at maximum permissible train speeds, cant deficiencies and lateral alignment limitations. For purposes of this section lateral track strength is defined as the track capacity to constrain lateral deformations so that track shall return, following maximum load, to a configuration in compliance with the track performance and geometry requirements of this Part.

§ 243.317 Crossties.

(a) Crossties shall be made of a material to which rail can be securely fastened. They shall be of concrete construction for all tracks over which trains run in revenue service.

(b) Each 12 m (39 ft) segment of track shall have:

(1) A sufficient number of crossties which, in combination, provide effective support that will:

(i) Hold gage within the limits prescribed in § 243.311;

(ii) Maintain surface within the limits prescribed in Safety Level Two Geometry Table prescribed in § 243.309; and

(iii) Maintain alignment within the limits prescribed in Safety Level Two Geometry Table prescribed in § 243.309.

(2) The minimum number and type of crossties specified in paragraph (c) or (d) of this section effectively distributed to support the entire segment; and

(3) Crossties of the type specified in paragraph (c) or (d) of this section that are located at a joint location as specified in paragraph (f) of this section.

(c) For non-concrete tie construction, each 12 m (39 ft) segment of track shall have 18 crossties which are not:

(1) Broken through;

(2) Split or otherwise impaired to the extent the crossties would allow the ballast to work through, or would not hold spikes or rail fasteners;

(3) So deteriorated that the tie plate or base of rail could move laterally 10 mm (0.4 in) relative to the crossties;

(4) Cut by the tie plate through more than 40 percent of the thickness of the tie; or

(5) Configured with less than 2 rail holding spikes or fasteners per tie plate.

(6) So unable, due to insufficient fastener toe load, to maintain longitudinal restraint and maintain rail hold down and gage.

(d) For concrete-tie construction, each 12 m (39 ft) segment of track shall have 16 crossties which are not:

(1) So deteriorated that the pre-stress strands are ineffective or withdrawn into the tie at one end and the tie exhibits structural cracks in the rail seat or in the gage of track;

(2) Configured with less than 2 fasteners on the same rail;

(3) So deteriorated in the vicinity of the rail fastener that the fastener assembly may pull out or move laterally more than 10 mm (0.4 in) relative to the crosstie;

(4) So deteriorated that the fastener base plate or base of rail could move laterally more than 10 mm (0.4 in) relative to the crossties;

(5) So deteriorated that rail seat abrasion is sufficiently deep to cause loss of rail fastener toeload;

(6) Completely broken through; or

(7) So unable, due to insufficient fastener toe load, to maintain longitudinal restraint and maintain rail hold down and gage.

(e) The following speed limitation shall apply in case the number of

[1] 1 Actual elevation for each 50 m (164 ft) track segment in the body of the curve is determined by averaging the elevation for 10 points through the segment at 5 m (16.4 ft) spacing. If the curve length is less than 50 m (164 ft), the points through the full length of the body of the curve shall be averaged. If Eu exceeds 100 mm (4 in), the Vmax formula applies to the spirals on both ends of the curve.

[2] Curve radius (Degree of curvature) is determined by averaging the degree of curvature over the same track segment as the elevation.

nondefective ties on each 12 m (39 ft) segment defined in paragraph (c) and (d) of this section is not achieved:

Max. speed	Number of non defective ties
170 km/h (110 mph)	14
145 km/h (90 mph)	12
95 km/h (60 mph)	8
25 km/h (15 mph)	5

(f) Service track, including sidings, yards, sheds, and workshops, shall have at least one non-defective crosstie, the centerline of which is within 0.5 m (1.6 ft) of the rail joint location, or two crossties, the center lines of which are within 0.65 m (2.1 ft) either side of the rail joint location. All other tracks shall have two non-defective ties within 0.65 m (2.1 ft) each side of the rail joint.

(g) For track constructed without crossties, such as slab track and track connected directly to bridge structural components, the track structure shall meet the requirements of paragraphs (b)(1)(i), (ii) and (iii).

(h) On all tracks where the operating speeds exceed 170 km/hr (105 mph), there shall be at least three non-defective ties each side of a defective tie.

(i) Where wooden crossties are used there must be tie plates under the running rails on at least nine of ten consecutive ties.

(j) No metal object which causes a concentrated load by solely supporting a rail shall be allowed between the base of the rail and the bearing surface of the tie plate.

§ 243.319 Continuous welded rail (CWR).

The Railroad shall have in effect written procedures which address the installation, adjustment, maintenance and inspection of CWR, and a training program for the application of those procedures, in accordance with § 243.107 of this Part. These procedures shall be submitted to the FRA Associate Administrator for Safety as part of the Railroad's system safety plan, and shall include:

(a) Procedures for the installation and adjustment of CWR which include:

(1) Designation of a desired rail installation temperature range for the geographic area in which the CWR is located; and

(2) Destressing procedures/methods which address proper attainment of the desired rail installation temperature range when adjusting CWR.

(b) Rail anchoring or fastening requirements that will provide sufficient restraint to limit longitudinal rail and crosstie movement to the extent practical, and that specifically address CWR rail anchoring or fastening patterns on bridges, bridge approaches, and at other locations where possible longitudinal rail and crosstie movement—associated with normally expected train-induced forces—is restricted.

(c) Procedures which specifically address maintaining a desired rail installation temperature range when cutting CWR including rail repairs, in-track welding, and in conjunction with adjustments made in the area of tight track, a track buckle, or a pull-apart. Rail repair practices shall take into consideration the existing rail temperature so that:

(1) When rail is replaced, the length installed shall be determined by taking into consideration the existing rail temperature and the desired rail installation temperature range; and

(2) Under no circumstances should rail be added when the rail temperature is below that designated by paragraph (a)(1) of this section, without provisions for adjustment.

(d) Procedures which address the monitoring of CWR in curved track for inward shifts of alignment toward the center of the curve as a result of disturbed track.

(e) Procedures which control train speed on CWR track when:

(1) Maintenance work, track rehabilitation, track construction, or any other event occurs which disturbs the roadbed or ballast section and reduces the lateral or longitudinal resistance of the track.

(2) In formulating the procedures under this paragraph, the track owner shall:

(i) Determine the speed required, and the duration and subsequent removal of any speed restriction based on the restoration of the ballast, along with sufficient ballast re-consolidation to stabilize the track to a level that can accommodate expected train-induced forces. Ballast re-consolidation can be achieved through either the passage of train tonnage or mechanical stabilization procedures, or both; and

(ii) Take into consideration the type of crossties used.

(f) Procedures which prescribe when physical track inspections are to be performed to detect conditions prone to buckling in CWR track. At a minimum, these procedures shall address inspecting track to identify:

(1) Locations where tight or kinky rail conditions are likely to occur; and

(2) Locations where track work of the nature described in paragraph (e)(1) of this section has recently been performed.

(3) In formulating the procedures under this paragraph, the Railroad shall—

(i) Specify the timing of the inspection; and

(ii) Specify the appropriate remedial actions to be taken when conditions prone to buckling are found.

(g) The Railroad shall have in effect a comprehensive training program for the application of these written CWR procedures, with provisions for periodic retraining for those individuals designated as qualified in accordance with Subpart H to supervise the installation, adjustment, and maintenance of CWR track and to perform inspections of CWR track.

(h) The Railroad shall prescribe recordkeeping requirements in order to maintain a history of track constructed with CWR. At a minimum, these records shall include:

(1) Rail laying temperature, location and date of CWR installations. This record shall be retained for the life of the rail; and

(2) A record of any CWR installation or maintenance work that does not conform with the written procedures. Such record must include the location of the rail and be maintained until the CWR is brought into conformance with such procedures.

§ 243.321 Rail end mismatch.

Any mismatch of rails at joints may not be more than that prescribed by the following table:

Any mismatch of rails at joints may not be more than the following—	
On the tread of the rail ends	On the gage side of the rail ends
3 mm (.13 in).	3 mm (.13 in).

§ 243.323 Rail joints and torch cut rails.

(a) Each rail joint, insulated joint, and compromise joint shall be of a structurally sound design and appropriate dimensions for the rail on which it is applied.

(b) If a joint bar is cracked, broken, or permits excessive vertical movement of either rail when all bolts are tight, it shall be replaced.

(c) If a joint bar is cracked or broken between the middle two bolt holes it shall be replaced.

(d) Each rail shall be bolted with at least two bolts at each joint.

(e) Each joint bar shall be held in position by track bolts tightened to allow the joint bar to firmly support the abutting rail ends and to allow longitudinal movement of the rail in the joint to accommodate expansion and

contraction due to temperature variations.

(f) No rail shall have a bolt hole which is torch cut or burned.

(g) No joint bar shall be reconfigured by torch cutting.

(h) No rail having a torch cut or flame cut end may be used, except as a temporary repair during emergency situations. When a rail end is torch cut in emergency situations, speed over that rail end must not exceed 25 km (40 mph) until removed.

§ 243.325 Turnouts and crossovers, generally.

(a) In turnouts and track crossings, the fastenings shall be intact and maintained to keep the components securely in place. Also, each switch, frog, and guard rail shall be kept free of obstructions that may interfere with the passage of wheels.

(b) The track through and on each side of track crossings and turnouts shall be equipped with rail anchoring to restrain rail movement affecting the position of switch points and frogs. Elastic fasteners designed to restrict longitudinal rail movement are considered rail anchoring.

(c) Each flangeway at turnouts shall be at least 38 mm (1.5 in) wide.

(d) For all turnouts and crossovers, the Railroad shall prepare an inspection and maintenance Guidebook for use by Railroad employees which shall be submitted to the FRA Associate Administrator for Safety. The Guidebook shall contain at a minimum:

(1) Inspection frequency and methodology, including limiting measurement values for all components subject to wear or requiring adjustment; and

(2) Maintenance procedures and techniques.

§ 243.327 Frog guard rails and guard faces; gage.

The guard check and guard face gages in frogs shall be within the limits prescribed in the following table, applicable for a nominal track gage of 1435 mm (56.5 in).

Guard check gage	*Guard face gage*
The distance between the gage line of a frog to the guard line [1] of its guard rail or guarding face, measured across the track at right angles to the gage line,[2] may not be less than— 1435 − 45=1390 mm	The distance between guard lines,[1] measured across the track at right angles to the gage line,[2] may not be more than— 1435 − 80=1355 mm

[1] A line along that side of the flangeway which is nearer to the center of the track and at the same elevation as the gage line.

[2] A line 10 mm (0.4 in) below the top of the center line of the head of the running rail, or corresponding location of the tread portion of the track structure.

§ 243.329 Derails.

(a) All sidetracks connecting with main tracks shall be equipped with protection switches or functioning derails of the correct size and type, unless Railroad equipment on the track cannot move to foul the main track because of grade characteristics.

(b) Each derail shall be clearly visible to Railroad personnel operating rail equipment on the affected track and to Railroad personnel working adjacent to the affected track. When in a locked position, a derail shall be free of any lost motion that would allow it to be operated without removal of the lock.

(c) If a track protected by a derail is occupied by standing railroad rolling stock, the derail shall be in derailing position.

(d) Each derail shall be interlocked with the signal system so as to produce a maximally restrictive signal aspect if the device is not deployed in a completely functional position.

Inspection

§ 243.331 Track Geometry Measurement Systems.

(a) A Track Geometry Measurement System (TGMS) vehicle shall be operated at least twice within each 180 calendar days with not less than 30 days between inspections to demonstrate compliance with the geometry requirements in § 243.309.

(b) The TGMS Car shall have the following capabilities:

(1) It shall be equipped with three bogies and have a rigid body which acts as the datum plane for all measurements.

(2) The body shall rest on two end bogies which are spaced at 9.700 m (31.82 ft) between center lines.

(3) The four-axle middle bogie shall move laterally when the vehicle travels through a curve.

(4) The TGMS car shall have eight axles spaced symmetrically from the centerline of the vehicle at 0.675 m, 2.075 m, 3.64 m, and 6.11. Each axle shall have a 9 tonne (20 kips) axle load.

(5) Information shall be gathered at rail level by means of mechanical contact:

(i) vertically, through the 16 high carbon steel wheels with a cylindrical profile; and

(ii) laterally, through double sensors, each with a roller which follows the rail head's internal profile at an angle of 70 degrees placed between the outer bogies, 5 meters from the centerline of the vehicle.

(6) Measurements shall be recorded by two means on the vehicle:

(i) A continuous plot, on a constant distance basis, of the geometry parameters identified in the tables in § 243.309; and

(ii) Electronic records of elementary signals from transducers measuring displacements of different cables from the measuring points. In addition, the electronic record shall include all the computed track geometry parameters developed to determine compliance with the geometry tables in § 243.309. Calculations of the extended base measurements are performed through real-time analog or digital processing of the alignment and level signals and are electronically recorded and displayed on charts.

(7) The following parameters shall be measured vertically:

(i) Surface: The surface or longitudinal level must be developed over two rail bases; the fundamental base of 12.2 m (40 ft) and the extended base of 31 m (102 ft) base. The fundamental surface measurement is the difference between the average level at eight locations spaced symmetrically from the center of the vehicle at 0.675 m, 2.075 m, 3.64 m, and 6.11 m and the level at 0.675 m. $Surface_{12.2} = \frac{1}{8}(Z_{-6.11} + Z_{-3.64} + Z_{-2.075} + Z_{-0.675} + Z_{0.675} + Z_{2.075} + Z_{3.64} + Z_{6.11}) - Z_{0.675}$. The extended base measurement is calculated using the same transducers as used in the fundamental measurement. The displacement must be combined and appropriately filtered to produce a signal equivalent to the offset from the middle of a 31 meter chord.

(ii) Warp: The cant variation shall be obtained by calculating the difference between the cant of an axle on the middle bogie and the average cant of the 4 axles of the end bogies.

(8) The following parameters shall be measured laterally:

(i) Alignment: The alignment for each rail must be developed based on three chords; the fundamental chord of 10 m

(32.8 ft), a middle distance chord of 20 m (65.6 ft) and an extended chord of 31 m (102 ft) base. The fundamental chord is measured through three double sensors: one at the center of the vehicle and the others symmetrically spaced 5 meters from the center. The long chords are developed through combinations and appropriate filtering of the fundamental measurements.

(ii) Gage: The gage is measured by a pair of central double sensors.

(9) The extended base graph shall be obtained by analog or digital computation of the level and alignment signals, and shall be printed out in real time on-board the vehicle.

(10) Long wavelength values of level and alignment are calculated by low-pass filtering of the actual measurements with a transfer function specific to the signals for level (12.20 m (40 ft) base) and alignment (versine of 10 m (32.8 ft) chord) recorded by the TGMS vehicle.

(11) The low-pass filtering shall be accomplished in the spatial frequency range, due to the monitoring of the cut-off frequency of the low-pass filters as a function of the running speed.

(c) The TGMS shall, at a minimum, meet design requirements which specify that—

(1) Track geometry measurements shall be taken no more than 1 m (3.3 ft) away from the contact point of wheels carrying a vertical load of no less than 4500 kg (10,000 lb) per wheel;

(2) Track geometry measurements shall be taken and recorded on a distance-based sampling interval which shall not exceed 0.6 m (2 ft);

(3) Calibration procedures and parameters assigned to the system assure that measured and recorded values accurately represent track conditions; and

(4) Track geometry measurements recorded by the system shall not differ by more than 3 mm (0.13 in) on repeated runs at the same site at the same speed.

(d) A qualifying TGMS shall measure and process the necessary track geometry parameters that enable the system to determine compliance with:

(1) Track gage; mean gage within 100 m (328 ft.); and gage variation within 10 m (32.8 feet);

(2) Alignment; 10 m (32.8 ft.), 20 m (65.6 ft.), and 31 m (102 ft.) Mid Chord Offsets;

(3) Curvature, Cant and V_{max};

(4) Surface; 12.2 m (40 ft.) averaged chord; 31 m (102 ft.) Mid Chord Offset; and

(5) Warp.

(e) A qualifying TGMS shall be capable of producing, within 24 hours of the inspection, output reports that:

(1) Provide a continuous plot, on a constant-distance axis, of all measured track geometry parameters required in paragraph (d) of this Section; and

(2) Provide an exception report containing a systematic listing of all track geometry conditions which constitute an exception to the speed limits over the segment surveyed.

(f) The output reports required under paragraph (e) of this Section shall contain sufficient location identification information so that maintenance workers may easily locate indicated exceptions.

(g) Following a track inspection performed by a qualifying TGMS, the Railroad shall, within two days after the inspection, field verify and institute remedial action for all exceptions.

(h) The Railroad shall maintain a record for a period of one year following an inspection performed by a qualifying TGMS that includes a copy of the plot, the track segment involved, a copy of the exception printout, the date of the inspection, and the location, date, and type of remedial action taken for all listed exceptions.

(i) If the Railroad elects to substitute a geometry vehicle with different properties than those identified in paragraphs (b) and (c) of this section for the TGMS car, the Railroad shall use a geometry vehicle consistent with the requirements of Subpart G, Train Operations at Track Classes 6 and Higher of FRA's proposed Track Safety Standards, 62 FR 36138 (July 3, 1997), and as ultimately codified in 49 CFR part 213.

§ 243.333 Track/vehicle performance Measurement Systems.

(a) A Track Acceleration Measurement System (TAMS) vehicle shall be operated at least twice within each 45 calendar days, with not less than 7 days between inspections, to determine whether a representative vehicle responds to the existing track conditions within the limits defined in the Vehicle/Track Interaction Performance Limits table for accelerations.

(b) A TAMS vehicle must operate within 5% of the maximum authorized speed over any section of track in order to qualify as a valid survey.

(c) A qualifying TAMS shall be capable of measuring and processing the necessary acceleration parameters, at an interval which shall not exceed 0.6 m (2 ft), which enables the system to determine compliance with:

(1) Lateral truck acceleration;

(2) Lateral carbody acceleration; and

(3) Vertical carbody acceleration.

(d) A qualifying TAMS shall be capable of producing, within 24 hours of the inspection, output reports that:

(1) Provide a continuous plot, on a constant-distance axis, of all measured acceleration parameters required in paragraph (c) of this section; and

(2) Provide an exception report containing a systematic listing of all acceleration conditions which constitute an exception to the speed limits over the segment surveyed, as indicated in the table of Vehicle/Track Interaction Performance Limits contained in § 243.335.

(e) If the carbody lateral, carbody vertical, or truck frame lateral accelerations exceed the safety limits as stated in the table, the Railroad must immediately initiate remedial action, which shall include reducing the maximum authorized speed for that section of track to a speed at least 8 km/h (5 mph) below the speed at which the acceleration limits were reached.

(f) The Railroad shall maintain a record for a period of one year following an inspection performed by a qualifying TAMS that includes, a copy of the plot, a description of the track segment involved, the exception printout for the track segment involved, the date of the inspection, and the location, date, and remedial action taken for all listed exceptions to the class.

§ 243.335 Wheel/Rail Force Measurement System.

(a) A Wheel/Rail Force Measurement System (WRFMS) shall be operated over the track bi-annually with not less than 240 days between inspections to determine whether a representative vehicle responds to the existing track conditions within the limits defined in the Vehicle/Track Interaction Performance Limits table for wheel rail forces.

(b) A WRFMS vehicle must operate at the revenue speed profile speed for a section of track to qualify as a valid survey.

(c) A qualifying WRFMS shall be equipped with instrumented wheelsets to measure wheel/rail forces and shall be capable of measuring and processing the necessary wheel rail force parameters, at an interval which shall not exceed 0.6 m (2 ft), which enables the system to determine compliance with:

(1) Minimum vertical wheel load;

(2) Wheel L/V ratio, the ratio of the lateral wheel load to the vertical wheel load;

(3) Net axle lateral load; and

(4) Truck side L/V ratio.

(d) A qualifying WRFMS shall be capable of producing, within 24 hours of the inspection, output reports that:

(1) Provide a continuous plot, on a constant-distance axis, of all measured wheel force and force ratio parameters required in paragraph (c) of this section;

(2) Provide an exception report containing a systematic listing of all wheel force and force ratio conditions which constitute an exception to the speed limits over the segment surveyed, as indicated in the following table of Vehicle/Track Interaction Performance Limits.

(e) If the wheel forces or force ratios exceed the safety limits as stated in the table, the Railroad must immediately initiate remedial action, which may include reducing the maximum authorized speed for that section of track, until these wheel forces and force ratios are within the safety limits.

(f) The Railroad shall maintain a record for a period of two years following an inspection performed by a qualifying WRFMS that includes, a description of the track segment involved, the exception printout for the track segment involved, the date of the inspection, and the location, date, and remedial action taken for all listed exceptions to the class, and at a copy of the plot specified in paragraph (d) of this section for a distance along the track of at least 10 feet, centered on each exception.

VEHICLE/TRACK INTERACTION LIMITS

Parameter	Safety limit	Filter/window	Requirements
Wheel/Rail Forces:[1]			
Single Wheel Vertical Load Ratio	≤0.1	5 ft	No wheel of the equipment shall be permitted to unload to less than 10% of the static vertical wheel load. The static vertical wheel load is defined as the load that the wheel would carry when stationary on level track. The vertical wheel load limit shall be increased by the amount of measurement error.
Single Wheel L/V Ratio	≤ (tan − .5)/ (1 + .5 tan).	5 ft	The ratio of the lateral force that any wheel exerts on an individual rail to the vertical force exerted by the same wheel on the rail shall be less than the safety limit calculated for the wheel's flange angle ().
Net Axle L/V Ratio	≤0.5	5 ft	The net lateral force exerted by any axle on the track shall not exceed 50% of the static vertical load that the axle exerts on the track.
Truck Side L/V Ratio	≤0.6	5 ft	The ratio of the lateral forces that the wheels on one side of any truck exert on an individual rail to the vertical forces exerted by the same wheels on that rail shall be less than 0.6.
Accelerations:[2]			
Carbody Lateral	≤0.5 g peak-to-peak.	10 Hz 1 sec window.	The peak-to-peak accelerations, measured as the algebraic difference between the two extreme values of measured acceleration in a one second time period, shall not exceed 0.5 g.
Carbody Vertical	≤0.6 g peak-to-peak.	10 Hz 1 sec window.	The peak-to-peak accelerations, measured as the algebraic difference between the two extreme values of measured acceleration in a one-second time period, shall not exceed 0.6 g.
Truck Lateral[3]	≤0.4 g RMS mean-removed.	10 Hz 2 sec window.	Truck hunting[4] shall not develop below the maximum authorized speed.

[1] The lateral and vertical wheel forces shall be measured with instrumented wheelsets with the measurements processed through a low pass filter with a minimum cut-off frequency of 25 Hz. The sample rate for wheel force data shall be at least 250 samples/sec.

[2] Carbody lateral and vertical accelerations shall be measured near the car ends at the floor level.

[3] Truck accelerations in the lateral direction shall be measured at a position directly above the axle. The measurements shall be processed through a filter having a pass band of 0.5 to 10 Hz.

[4] Truck hunting is defined as a sustained cyclic oscillation of the truck which is evidenced by lateral accelerations in excess of 0.4 g root mean square, mean-removed, for 2 seconds.

§ 243.337 Daily inspection trainset.

(a) An inspection trainset shall be operated each morning over the Railroad's system prior to commencing revenue service. The inspection trainset shall operate at a speed no greater than 170 km/h (105 mph) to conduct a visual inspection of the track and ensure that the right of way is clear of obstacles within the clearance envelope and to identify conditions that could cause accidents.

(b) The inspection trainset shall be equipped with on-board truck side and carbody accelerometers. The Railroad shall have in effect written procedures for the notification of track maintenance personnel when the acceleration measurements indicate a possible track-related condition.

§ 243.339 Inspection of rail in service.

(a) Prior to revenue service and as part of the system safety plan, the Railroad shall submit to the FRA Associate Administrator for Safety written procedures for the inspection of rails.

(b) A continuous search for internal defects shall be made of all rail within 90 days after initiation of revenue service and, thereafter, at least annually, with not less than 240 days between inspections.

(c) Inspection equipment shall be capable of detecting defects between joint bars and within the area enclosed by joint bars.

(d) Each defective rail shall be marked with a highly visible marking on both sides of the rail.

(e) If the person assigned to operate the rail defect detection equipment being used determines that, due to rail surface conditions, a valid search for internal defects could not be made over a particular length of track, the test on that particular length of track cannot be considered as a search for internal defects under this section.

(f) When an owner of track to which this part applies learns, through inspection or otherwise, that a rail in that track contains any of the defects listed in the following table, a person designated under § 243.705 or § 243.707

shall determine whether or not the track may continue in use. If he determines that the track may continue in use, operation over the defective rail is not permitted until—

(1) The rail is replaced; or

(2) The remedial action prescribed in the table is initiated—

REMEDIAL ACTION

Defect	Length of defect (inch)		Percent of rail head cross-sectional area weakened by defect		If defective rail is not replaced, take the remedial action prescribed in note
	More than	But not more than	Less than	But not less than	
Transverse fissure	.....	.....	70	5	B.
	.....	.....	100	70	A2.
	.....	.....	.....	100	A.
Compound fissure	.....	.....	70	5	B.
	.....	.....	100	70	A2.
	.....	.....	.....	100	A.
Detail fracture	.....	.....	25	5	C.
Engine burn fracture	.....	.....	80	25	D.
Defective weld	.....	.....	100	80	A2 or E and H.
	.....	.....	.....	100	A or E and H.
Horizontal split head	1	2	.....	.....	H and F.
Vertical split head	.....	4	.....	.....	I and G.
Split web	2	.....	.....	.....	B.
Piped rail	4	(1)	(1)	.....	A.
Head web separation	(1)	.....	.....	.....	
Bolt hole crack	½	1	.....	.....	H and F.
	1	1½	.....	.....	H and G.
	1½	.....	.....	.....	B.
	(1)	(1)	(1)	.....	A.
Broken base	1	6	.....	.....	D.
	6	.....	.....	.....	A or E and I.
Ordinary break	.....	.....	.....	.....	A or E.
Damaged rail	.....	.....	.....	.....	D.
Flattened rail	.....	.....	.....	.....	H.

[1] Break out in rail head.
[2] Depth ≥ ⅜ and Length ≥ 8.

Notes

A. Assign person designated under § 243.705 or § 243.707 to visually supervise each operation over defective rail.

A2. Assign person designated under § 243.705 or § 243.707 to make visual inspection. That person may authorize operation to continue without visual supervision at a maximum of 10 mph for up to 24 hours prior to another such visual inspection or replacement or repair of the rail.

B. Limit operating speed over defective rail to that as authorized by a person designated under § 243.705. The operating speed may not exceed 30 mph.

C. Apply joint bars bolted only through the outermost holes to defect within 20 days after it is determined to continue the track in use. Limit operating speed over defective rail to 30 mph until angle bars are applied; thereafter, limit speed to 50 mph. When a search for internal rail defects is conducted under this section and defects are discovered which require remedial action C, the operating speed shall be limited to 50 mph, for a period not to exceed 4 days. If the defective rail has not been removed from the track or a permanent repair made within 4 days of the discovery, limit operating speed over the defective rail to 30 mph until joint bars are applied; thereafter, limit speed to 50 mph.

D. Apply joint bars bolted only through the outermost holes to defect within 10 days after it is determined to continue the track in use. Limit operating speed over the defective rail to 30 mph or less as authorized by a person designated under § 243.705 until angle bars are applied; thereafter, limit speed to 50 mph.

E. Apply joint bars to defect and bolt in accordance with § 243.323.

F. Inspect rail 90 days after it is determined to continue the track in use.

G. Inspect rail 30 days after it is determined to continue the track in use.

H. Limit operating speed over defective rail to 50 mph.

I. Limit operating speed over defective rail to 30 mph.

§ 243.341 Initial inspection of new rail and welds.

(a) The Railroad shall provide for the initial inspection of newly manufactured rail, and for initial inspection of new welds made in either new or used rail. The Railroad may demonstrate compliance with this section by providing for:

(1) *Mill inspection.* A continuous inspection at the rail manufacturer's mill shall constitute compliance with the requirement for initial inspection of new rail, provided that the inspection equipment meets the applicable requirements specified in § 243.339 of this Part. The Railroad shall obtain a copy of the manufacturer's report of inspection and retain it as a record until the rail receives its first scheduled inspection under § 243.339 of this Part;

(2) *Welding plant inspection.* A continuous inspection at a welding plant, if conducted in accordance with the provisions of paragraph (a)(1) of this section, and accompanied by a plant operator's report of inspection which is retained as a record by the Railroad, shall constitute compliance with the requirements for initial inspection of new rail and plant welds, or of new plant welds made in used rail; and

(3) *Inspection of field welds.* Initial inspection of new field welds, either those joining the ends of CWR strings or those made for isolated repairs, shall be conducted not less than one day and not more than 30 days after the welds have been made. The initial inspection may be conducted by means of portable test equipment. The Railroad shall retain a record of such inspections until the welds receive their first scheduled inspection under § 243.339 of this Part.

(b) Each defective rail found during inspections conducted under paragraph (a)(3) of this section shall be marked with highly visible markings on both sides of the rail and the appropriate remedial action as set forth in § 243.339 of this Part will apply.

§ 243.343 Visual inspections.

(a) All track shall be visually inspected in accordance with the schedule prescribed in paragraph (c) of this section by person qualified under § 243.705 or § 243.707.

(b) With the exception of paragraph (e) below, each inspection shall be made by riding over the track in a vehicle at a speed that allows the person making the inspection to visually inspect the track structure for compliance with this rule. However, mechanical, electrical, and other track inspection devices may be used to supplement visual inspection. If a vehicle is used for visual inspection, the speed of the vehicle may not be more than 8 km/h (5 mph) when operating over track crossings or turnouts.

(c) Each inspection shall be made at a minimum frequency of once every seven days with at least three days between inspections.

(d) If a deviation from the requirements of this rule is found during the visual inspection, remedial action shall be initiated immediately.

(e) Each turnout and crossover shall be inspected on foot at least once each week. The inspection shall be in accordance with the guidebook prepared as required under § 243.325 of this Part.

§ 243.345 Special inspections.

In the event of fire, flood, severe storm, temperature extremes or other occurrence which might have damaged track structure, a special inspection shall be made of the track and ROW involved as soon as possible after the occurrence.

§ 243.347 Inspection records.

(a) The Railroad shall keep a record of each inspection required to be performed on that track under this Subpart.

(b) Except as provided in paragraph (f) of this section, each record of an inspection under § 243.343 shall be prepared on the day the inspection is made and signed by the person making the inspection.

(c) Records shall specify the track inspected, date of inspection, location and nature of any deviation from the requirements of this part, and the remedial action taken by the person making the inspection.

(d) Rail inspection records shall specify the date of inspection, the location and nature of any internal defects found, the remedial action taken and the date thereof, and the location of any intervals of track not tested pursuant to § 243.339 of this Part. The Railroad shall retain a rail inspection record for at least two years after the inspection and for one year after remedial action is taken.

(e) The Railroad required to keep inspection records under this section shall make those records available for inspection and copying by the FRA.

(f) For purposes of compliance with the requirements of this section, the Railroad may maintain and transfer records through electronic transmission, storage, and retrieval provided that:

(1) The electronic system be designed so that the integrity of each record may be maintained through appropriate levels of security such as recognition of an electronic signature, or other means, which uniquely identify the initiating person as the author of that record. No two persons shall have the same electronic identity;

(2) The electronic storage of each record shall be initiated by the person making the inspection within 24 hours following the completion of that inspection;

(3) The electronic system shall ensure that each record cannot be modified in any way, or replaced, once the record is transmitted and stored;

(4) Any amendment to a record shall be electronically stored apart from the record which it amends. Each amendment to a record shall be uniquely identified as to the person making the amendment;

(5) The electronic system shall provide for the maintenance of inspection records as originally submitted without corruption or loss of data; and

(6) Paper copies of electronic records and amendments to those records, that may be necessary to document compliance with this part, shall be made available for inspection and copying by the FRA and qualified State track inspectors. Such paper copies shall be made available to the track inspectors and at the locations specified in paragraph (c) of this section.

(g) Track inspection records shall be kept available to persons who performed the inspection and to persons performing subsequent inspections.

(h) Each Track/Vehicle Performance record required under § 243.333 and § 243.335 of this Part shall be made available for inspection and copying by the FRA at the locations specified in paragraph (c) of this section.

Subpart E—Rolling Stock

§ 243.401 Clearance requirements.

The rolling stock shall be designed to meet all applicable clearance requirements of the Railroad. At a minimum, the Railroad shall make the following diagrams available to FRA upon request:

(a) Rolling stock static clearance diagram;

(b) Rolling stock dynamic clearance diagram; and

(c) Obstacle clearance diagram.

§ 243.413 Structural strength of trainset.

(a) *General.* (1) The trainset shall be permanently coupled with articulated trucks between the trailer cars. Trainsets shall be uncoupled only in repair facilities, in accordance with the operating procedures set forth in § 243.433.

(2) The trainset shall be operated with a power car at each end.

(b) *Power Car.* (1) Each power car shall resist, without permanent deformation, the following loads:

(i) A compressive load of 2000 kN (450,000 lb.) applied at the underframe level;

(ii) A compressive load of 700 kN (157,500 lb.) uniformly distributed and applied on a 100 mm (4 in.) high band to the cab end of the carbody at any height between the underframe and the structure below the front window, reacted at the buffer location at the opposite end of the car;

(iii) A compressive load of 300 kN (67,500 lb.), applied on the rear end of the power car shell, at the carbody waist level, reacted at the coupler position at the cab end;

(iv) A uniformly distributed compressive load of 300 kN (67,500 lb.), applied on the cab end of the power car shell, at cantrail level, reacted at the buffer location at the rear of the power car;

(v) A compressive load of 300 kN (67,500 lb.), applied at the middle of the obstacle deflector over a width of 500 mm (20 in.) at a height of 500 mm (20 in.) above top of rail, reacted at buffer location at the rear of the power car;

(vi) A compressive load of 250 kN (56,200 lb.) applied at the side edges of the obstacle deflector over a width of 500 mm (20 in.) at a height of 500 mm (20 in.) above top of rail, reacted at the buffer location at the rear of the power car;

(vii) A tensile load of 1000 kN (225,000 lb.) applied on the front and rear coupling devices.

(2) Each power car shall be equipped with an anti-penetration wall ahead of the cab which is capable of resisting:

(i) A longitudinal compressive load of 3000 kN (675,000 lb) at the top of the underframe, without exceeding the ultimate strength of the joint; and

(ii) A longitudinal compressive load of 1500 kN (337,000 lb) applied at a height of 760 mm (30 in) above the top of the underframe, and reacted at the rear of the cab structure, without exceeding the ultimate strength of the structure. Compliance shall be verified by either linear static analysis or equivalent means.

(3) In unoccupied areas, each power car shall be designed to absorb a minimum 4.2 MJ through controlled structural deformation.

(4) In occupied areas, each power car shall be designed to resist without permanent deformation of the sidesill, cantrail, and side post structural members, a longitudinal compressive load of 3560 kN (800,000 lb) when applied uniformly at the front of the cab between the underframe and waist level, and reacted at the cross section of the carbody at the back of the cab.

(5) Each power car shall be designed to withstand a uniformly distributed vertical load of 1.3 times its static laden weight, when supported at the truck centers, without permanent deformation. Compliance shall be verified by either linear static analysis or equivalent means.

(6) Rollover strength of power cars shall be designed to permit those cars to:

(i) Rest on their sides, uniformly supported at the top (cantrail) and the bottom (sidesill) chords of the side frame. The allowable stress in the main structural members for occupied volumes for this condition shall be one-half yield; and

(ii) Rest on their roofs with damage limited to roof sheathing and framing. Deformation of the roof sheathing and framing to the extent necessary to permit the vehicle to be supported directly on the top chords of the side frames and end frames shall be allowed. The allowable stress in the main structural members for occupied volumes for this condition shall be one-half yield.

Compliance with this requirement shall be verified by either linear static analysis or equivalent means.

(c) *Trailer Car.* (1) Each trailer car of the trainset shall resist, without permanent deformation, the following loads:

(i) A compressive load of 2000 kN (450,000 lb) applied at the level of the thrust tubes;

(ii) A uniformly distributed compressive load of 300 kN (67,500 lb), applied to the end of the trailer carshell, at cantrail level; and

(iii) A tensile load of 1000 kN (225,000 lb) applied at the level of the thrust tube. and

(2) Each trailer car shall be designed to withstand a uniformly distributed vertical load of 1.3 times its static laden weight, when supported at the truck centers, without permanent deformation.

(3) The occupied volumes of trailer cars shall be designed to resist without permanent deformation of the sidesill, cantrail, and side post structural members, a longitudinal compressive load of 3560 kN (800,000 lb.) when applied as distributed over the carbody cross section at the seated passenger compartment. Compliance with this requirement shall be verified by either linear static analysis or equivalent means.

(4) Rollover Strength of trailer cars shall be designed to permit those cars to:

(i) Rest on their sides, uniformly supported at the top (cantrail) and the bottom (sidesill) chords of the side frame. The allowable stress in the main structural members for occupied volumes for this condition shall be one-half yield; and

(ii) Rest on their roofs with damage limited to roof sheathing and framing. Deformation of the roof sheathing and framing to the extent necessary to permit the vehicle to be supported directly on the top chords of the side frames and end frames shall be allowed. The allowable stress in the main structural members for occupied volumes for this condition shall be one-half yield.

Compliance with this requirement shall be verified by either linear static analysis or equivalent means.

§ 243.405 Trailer car interior.

(a) *Seat and seat attachment strength.* (1) Seat backs shall be designed to withstand, with deflection and permanent deformation allowed, but without total failure, the load due to a 95th-percentile male (85 kg or 187 lb.) seat occupant accelerated with the following pulse:

(i) 0 to 6g in 0.05 s;

(ii) 6g for 0.125 s; and

(iii) 6 to 0g in 0.05 s.

(2) The ultimate strength of a seat attachment to the trailer carbody shall be sufficient to withstand the following individually-applied accelerations acting on the mass of the seat plus the mass of a seat occupant who is a 95th-percentile male (85kg or 187 lb.):

(i) Longitudinal: 6 g;

(ii) Lateral: 2 g; and

(iii) Vertical: 2 g.

(b) *Interior Fittings.* (1) Interior fittings shall be attached to the trailer carbody with sufficient strength to withstand the following individually-applied accelerations acting on the mass of the fitting:

(i) Longitudinal: 3 g;

(ii) Lateral: 2 g; and

(iii) Vertical: 2 g.

(2) To the extent possible, interior fittings shall be recessed or flush-mounted, and corners and sharp edges shall be either avoided or padded to mitigate the consequences of impact with such surfaces.

(c) *Luggage Stowage Compartments.* Luggage stowage compartments shall include a means to restrain luggage, and have sufficient strength to resist loads due to the following individually-applied accelerations acting on the mass of the luggage that the compartment is designed to accommodate:

(1) Longitudinal: 3 g;

(2) Lateral: 2 g; and

(3) Vertical: 2 g.

(g = 1 gravity; s = seconds)

§ 243.407 Glazing.

(a) *Exterior Impact Performance.* (1) End-facing exterior glazing shall resist the impact of a 10 kg (22 lb) solid aluminum sphere with an impact energy of 30 kJ at 22°C (72°F) and 25 kJ at 0°C (32°F).

(2) Driver's cab side-facing exterior glazing shall resist the horizontal impact of a 600g (1.3 lb) steel sphere with an energy of 15 kJ.

(3) Trailer car side-facing exterior glazing shall resist, without spall or penetration, the impact of a 2.46g (38 grains) bullet at an impact speed of 442 m/s (1,450 ft/s).

(4) Glazing and frame shall resist the forces due to air pressure differences under all operations caused by trains passing with the minimum separation for two adjacent tracks while traveling in opposite directions, each traveling at maximum operating speed.

(b) *Interior Performance.* Interior equipment glazing shall meet the minimum requirements of AS1 type laminated glass as defined in American National Standard ''Safety Code for Glazing Materials for Glazing Motor Vehicles Operating on Land Highways,'' ASA Standard Z26.1–1990.

(c) *Frame.* The glazing frame shall hold glazing in place against all forces generated in the tests specified in this section.

§ 243.409 Brake system.

(a) The brake system shall be capable of stopping the trainset within the prevailing signal spacing from its

maximum authorized speed, under test conditions of adhesion as defined in UIC leaflet 541.05, with flow of detergent. The flow rate of detergent shall be doubled for speeds in excess of 180 km/h (112 mph).

(b) The braking on each truck shall be independently controlled by the brake pipe.

(c) The electric brake on each powered truck shall be completely independent and shall operate with the loss of the overhead power supply.

(d) Any failure of the electric portion of the brake system on any power truck shall be displayed for the locomotive engineer in the control cab.

(e) The brake system shall be designed to prevent thermal damage to wheels or discs. The Railroad shall demonstrate, through analysis and test that is confirmed by the system safety plan and pre-revenue service tests, that no thermal damage results to the wheels or discs under conditions resulting in maximum friction braking effort being exerted.

(f) The Railroad shall demonstrate, through analysis and test that is confirmed by the system safety plan and pre-revenue service tests, the maximum authorized speed of the trainset at which no thermal damage to wheels or discs occurs, for various combinations of electric and friction brake failures. The Railroad shall develop a matrix that clearly lists potential brake failures or combinations of failures, to which each speed corresponds, that shall be displayed in each power car.

(g) In the event of an en route failure of the electric or friction portion of the brake, or both, a train may proceed at a speed no greater than the maximum authorized speed as set forth in the matrix required by paragraph (f) of this section. The locomotive engineer shall notify central traffic control of any brake failure that requires a speed restriction in a trip.

(h) The trainset shall be equipped with an emergency application feature that produces an irretrievable stop, using a brake rate consistent with prevailing adhesion, passenger safety, and brake system thermal capacity. An emergency application shall be available at any time. A means to apply the emergency brake shall be provided at two locations accessible to the train crew in each trailer car.

(i) The brake system shall be designed so that an inspector may determine whether the brake system is functioning properly without being placed in a dangerous position on, under or between the equipment. This determination may be made through automated inspection equipment that utilizes sensors to verify that the brakes have been applied and released.

(j) The brake system design shall allow a disabled train's pneumatic brakes to be controlled by a rescue locomotive through brake pipe control alone.

(k) The train shall be equipped with a spring-applied, air-released parking brake that is capable of holding the train on any part of the Railroad system and, at a minimum, on a 0.5% grade.

(l) An independent failure detection system shall compare brake commands with brake system output to determine if a failure has occurred. The failure detection system shall report immediately brake system failures to the automated train monitoring system.

(m) Each truck of the trainset shall be equipped with a wheelslide system designed to automatically adjust the braking force on each wheel to prevent axle-locking during braking. In the event of failure of a truck's wheelslide system, control shall be automatically provided by the wheelslide system of an adjacent truck. A visual or audible alarm, or both, shall be provided in the cab of the controlling power car if a blocked axle is detected.

§ 243.411 Truck and suspension system.

(a) *Truck-to-car-body attachment.* (1) For all power cars and trailer cars, the strength of the truck-to-car-body attachment shall be sufficient to resist without permanent deformation a longitudinal force equivalent to 2.5g acting on the mass of the truck.

(2) Components of the truck, which include axles, wheels, bearings, truck mounted brake system, suspension system components, and any other components integral to the design of the truck, shall remain attached to the truck when a force equivalent to 2g acting on a mass of any component is exerted in any direction on that component.

(b) *Wheel climb.* Suspension systems shall prevent wheel climb, wheel lift, rail roll-over, track shift, and vehicle over-turning and provide safe, stable performance and ride quality. Suspension systems shall meet these design requirements in all safety-critical operating environments, track conditions, and loading conditions. Compliance with these requirements shall be demonstrated as part of the System Qualification Tests set forth in Subpart G of this Rule.

(c) *Lateral accelerations.* The trainsets shall not operate under conditions that correspond to a steady-state lateral acceleration to the outside of the curve of 0.1g or greater, as measured parallel to the car floor.

(d) *Hunting oscillations.* Each truck shall be equipped with a permanently installed lateral accelerometer mounted on the truck frame. The accelerometer output signals shall be calibrated and filtered, and shall pass through signal conditioning circuitry designed to determine if hunting oscillations of the truck are occurring. If hunting oscillations are detected, the train monitoring system shall provide an alarm to the locomotive engineer and the train shall be slowed by the locomotive engineer to a speed 8 km/h (5 mph) less than speed at which hunting oscillations stopped. This requirement shall be included in the Railroad's Operating Rules.

(e) *Ride vibration.* Compliance with ride quality requirements contained in this paragraph shall be demonstrated during equipment pre-revenue service qualification tests in accordance with § 243.113 and Subpart G of this Part. The Federal Railroad Administration shall verify ride quality performance of trainset equipment through the use of instrumentation. While traveling at the maximum revenue service speed over the intended route, the train suspension system shall:

(1) Limit the vertical acceleration as measured by a vertical accelerometer mounted on the car floor to no greater than 0.55g single event, peak-to-peak.

(2) Limit the lateral acceleration as measured by a lateral accelerometer mounted on the car floor to no greater than 0.3g single event, peak-to-peak.

(3) Limit the combination of lateral acceleration (L) and vertical acceleration (V) occurring within any time period of 2 consecutive seconds as expressed by the square root of (V^2+L^2) to no greater than 0.604g, where L may not exceed 0.3g and V may not exceed 0.55g.

(f) *Bearing overheat sensors.* Bearing overheat sensors shall be provided on board each trainset or at wayside intervals, as determined by the system safety plan.

§ 243.413 Fire safety.

(a) All materials used in constructing the interior of both a trailer car and a power car shall meet the flammability and smoke emission characteristics testing standards contained in Appendix B to this rule, or alternative standards issued or recognized by an expert consensus organization after approval by FRA in conjunction with approval of the Railroad's system safety plan required by Subpart B of this Part. For purposes of this section, the interior of a trailer car and a power car includes walls, floors, ceilings, seats, doors, windows, electrical conduits, air ducts, and any other internal equipment.

(b) The railroad shall require certification that combustible materials to be used in the construction of trainset interiors have been tested by a recognized independent testing laboratory, and that the results comply with the requirements of paragraph (a) of this section.

(c) Overheat detectors shall be installed in all components of the trainset where the written analysis required by Subpart B determines that such equipment is necessary.

(d) Fire or smoke detectors shall be installed in unoccupied compartments of a train if the analysis required by Subpart B determines that such equipment is necessary to ensure sufficient time for the safe evacuation of the train.

(e) A fixed, automatic fire suppression system shall be installed in unoccupied compartments of a train if the analysis required by Subpart B determines that such a system is necessary and practical to ensure sufficient time for the safe evacuation of the train.

(f) The railroad shall comply with those elements of its written procedures, under Subpart B, for the inspection, testing, and maintenance of all fire safety systems and equipment that it has designated as mandatory.

(g) The Railroad shall prohibit smoking on all trainsets in passenger service.

§ 243.415 Doors.

(a) *Powered, exterior side doors.* (1) Each trailer car shall have a minimum of four exterior side doors, or the functional equivalent of four side doors, that each permit at least one 95th-percentile male to pass through at a single time.

(2) The status of each powered, exterior door shall be displayed to the crew in the operating power car. If door interlocks are used, the sensors used to detect train motion shall be nominally set to operate at 5 km/h (3 mph).

(3) Powered, exterior doors shall be powered by the compressed air system or by electricity. If powered by electricity, the doors shall be connected to an emergency back-up power system.

(4) Each powered, exterior door shall be equipped with a manual override that is:

(i) Located adjacent to the door that it controls;

(ii) Capable of opening the door without power from both inside and outside the car; and

(iii) Designed and maintained so that a person may access the override device from both inside and outside the car without the use of any tool or other implement.

(5) Instructions for manual override shall be clearly posted in the car interior at door locations.

(6) A means for emergency responders to access the manual override from outside the car shall be provided. Instructions for access and use of the handle shall be clearly posted outside the car at all door locations.

(7) Manual door releases shall be easily operable by a 5th-percentile female without requiring the use of any tools to accomplish the manual override in the event of head-end power loss.

(8) The Railroad may protect a manual override device used to open a powered, exterior door with a cover or a screen capable of removal by a 5th-percentile female without requiring the use of a tool or other implement. If the method of removing the protective cover or screen entails breaking or shattering it, the cover or screen shall be scored, perforated, or otherwise weakened so that a 5th-percentile female can penetrate the cover or screen with a single blow of her fist without injury to her hand.

(b) Passenger compartment end doors shall be equipped with a kick-out panel, pop-out window or other equivalent means of egress in the event the door will not open.

§ 243.417 Emergency equipment.

(a) Emergency system requirements set forth in this Subpart shall apply to each trailer car.

(b) Emergency lighting shall be provided and shall include the following:

(1) An illumination level of a minimum of 55 lux (5.1 ft-candles) at floor level for all normal passenger and crew evacuation routes from the equipment;

(2) A back-up power system capable of operating all emergency lighting for a period of at least two hours;

(3) A back-up power system capable of operating in all equipment orientations; and

(4) A back-up power system capable of operating after the initial shock of a collision or derailment due to individually applied shock loads at 3g/2g/2g, longitudinal/vertical/lateral respectively.

(c) A means of emergency communication throughout the trainset shall be provided and shall include the following:

(1) Transmission locations that are clearly marked with luminescent material at each end of each unit adjacent to the unit or car end doors;

(2) Back-up power for a minimum time period of two hours; and

(3) Clear and understandable operating instructions at or near each transmission location.

(d) Locations of emergency equipment shall be clearly marked with luminescent material that makes the identity and location of the equipment recognizable from a distance equal to the width of the car.

(e) *Emergency exits.* (1) Locations of all emergency exits shall be clearly marked with luminescent material that makes the identity and location of the emergency exit recognizable from a distance equal to the width of the car.

(2) Clear and understandable instructions for use of the emergency exits shall be posted at each emergency exit and they must be visible from a distance of 30 inches.

(3) Each trailer car shall have a minimum of four emergency window exits, arranged in a staggered configuration or with one located at each end of each side of the trailer car.

(4) Each trailer car sealed window emergency exit shall have a minimum free opening of 1.6 m (63 in) wide by 0.6 m (24 in) high.

(5) Each emergency window exit shall be easily operable by a 5th percentile female without requiring the use of a tool or implement other than a hammer designed to break the glazing that shall be located adjacent to each emergency window.

(6) Each power car shall have an emergency roof hatch with a minimum opening of 0.45 m (18 in) by 0.6 m (24 in) and an emergency escape exit in the cab sidewall.

(f) The Railroad shall have in place a redundant means for the train crew to communicate with the pertinent railroad operations center to summon aid in the event of an emergency situation. These may include operating portable radios or cellular telephones.

§ 243.419 Operator's controls and power car layout.

(a) Operator controls in the power vehicle or control cab shall be arranged to be comfortably within view and easy reach when the locomotive engineer is seated in the normal train control position.

(b) The control panels shall be laid out to minimize the risk of human error.

(c) An alerter (Vigilance Device System) shall be provided. This system shall be operative at all speeds above 8 km/h (5 mph). If not acknowledged, the alerter shall cause a brake application to stop the train.

(d) Cab information displays shall be designed with the following characteristics:

(1) Simplicity and standardization shall be the driving criteria for design of

formats for the display of information in the cab;

(2) Essential, safety-critical information shall be displayed as a default condition at the most visible place for the locomotive engineer.

(3) Operator selection shall be required to display other than default information.

(4) Cab or train control signals shall be displayed for the locomotive engineer.

(5) Displays shall be readable from the locomotive engineer's normal position under all lighting conditions.

(e) The power car shall be equipped with an obstacle deflector which extends across both rails of the track. The height of the obstacle deflector shall be more than 150 mm (5.9 in) and less than 300 mm (11.8 in) off the rails.

(f) The cab layout shall be arranged to meet the following requirements:

(1) The crew has an effective field of view in the forward direction, and the right and left of the direction of travel; and

(2) Field-of-view obstructions due to required structural members shall be minimized.

(g) Each seat provided for a crew member shall:

(1) Be secured to the carbody with an attachment having an ultimate strength capable of withstanding the loads due to individually applied accelerations of 3g/2g/2g acting longitudinally/ laterally/ vertically respectively on the mass of the seat and the crew member occupying it; and

(2) Be designed according to *Layout of Drivers' Cabs in Locomotives, Railcars, Multiple Unit Trains and Driving Trailers,* UIC 651, International Union of Railways Standard (First Edition, 1986), which requires that:

(i) All adjustments have the range necessary to accommodate a 5th-percentile to a 95th-percentile male;

(ii) The seat is equipped with a force-assisted 200 mm longitudinal adjustment, operated from the seated position; and

(iii) The seat has a 20 degrees manually reclining seat back, adjustable from the seated position.

(h) The ultimate strength of power car control cab interior fitting and equipment attachments shall be sufficient to resist without failure loads due to individually applied accelerations of 3g/2g/2g longitudinally/ laterally/vertically respectively acting on the mass of the fitting or equipment.

(i) Sharp edges and corners on interior surfaces of the cab likely to be impacted by the crew during a collision or derailment shall be eliminated, where possible, and if not, padded.

(j) Each power car used in revenue service shall be equipped with operating heat and air conditioning systems.

§ 243.421 Exterior lights.

(a) *Headlights.* Each power car shall be equipped with two or more headlights. Each headlight shall produce 12,000 or more candela.

(b) *Taillights.* (1) Each trailing power car shall be equipped with two or more red taillights;

(2) Each taillight shall be located at least 1.2 m (3.9 ft) above rail;

(3) Each taillight shall produce 15 or more candela; and

(4) Taillights of the trailing power car must be on when the trainset is on a section of the system that is in revenue service.

§ 243.423 Electrical system design.

(a) *Circuit protection.* (1) The main propulsion power line shall be protected with a lightning arrestor, automatic circuit breaker, and overload relay. The lightning arrestor shall be run by the most direct path possible to ground with a connection to ground of not less than No. 6 AWG. These overload protection devices shall be housed in an enclosure designed specifically for that purpose with arc chute vented directly to outside air.

(2) Head end power, including trainline power distribution, shall be provided with both overload and ground fault protection.

(3) Circuits used for purposes other than propelling the equipment shall be connected to their power source through circuit breakers or equivalent current-limiting devices.

(4) Each auxiliary circuit shall be provided with a circuit breaker located as near as practical to the point of connection to the source of power for that circuit. Such protection may be omitted from circuits controlling safety-critical devices.

(b) *Main battery system.* (1) The main batteries shall be isolated from the cab and passenger seating areas by a non-combustible barrier.

(2) Battery chargers shall be designed to protect against overcharging.

(3) Battery circuits shall include an emergency battery cut-off switch to completely disconnect the energy stored in the batteries from the load.

(4) If batteries are of the type to potentially vent explosive gases, the batteries shall be adequately ventilated to prevent accumulation of explosive concentrations of these gases.

(c) *Power dissipation resistors.* (1) Power dissipation resistors shall be adequately ventilated to prevent overheating under worst-case operating conditions.

(2) Power dissipation grids shall be designed and installed with sufficient isolation to prevent combustion between resistor elements and combustible material.

(3) Power dissipation resistor circuits shall incorporate warning or protective devices for low ventilation air flow, over-temperature and short circuit failures.

(4) Resistor elements shall be electrically insulated from resistor frames, and the frames shall be electrically insulated from the supports that hold them.

§ 243.425 Automated monitoring.

(a) Each trainset shall be equipped to monitor the performance of the following systems or components:

(1) Reception of cab and train control signals;

(2) Truck hunting;

(3) Electric brake status;

(4) Friction brake status;

(5) Fire detection systems;

(6) Head end power status;

(7) Alerter;

(8) Horn; and

(9) Wheelslide.

(b) The monitoring system shall alert the locomotive engineer immediately when any of the monitored parameters are out of predetermined limits. The Railroad's operating rules, developed pursuant to § 243.117 and Subpart F of this Part, shall control train movement when the monitored parameters are out of predetermined limits. If the locomotive engineer fails to act in accordance with these procedures, the Railroad's central traffic control shall initiate corrective action.

(c) The Railroad shall develop, in the course of the system safety analysis and pursuant to § 243.117 of this Part, appropriate operating rules to address locomotive engineer and equipment performance in the event that the automatic monitoring system becomes defective en route, or is defective when the daily inspection required by § 243.433 is completed.

(d) Each lead power car shall be equipped with an operative event recorder that monitors and records all safety data required by § 243.425(a) of this Part and 49 CFR 229.135, Event Recorders.

(e) All monitored systems set forth in paragraph (a) of this section shall be tested during each daily inspection required by § 243.433(f).

§ 243.427 Trainset system software and hardware integration.

(a) The trainset system hardware and software integration shall conform with *On-Board Electronic Equipment and*

Computer Hardware, CF 67–001, Bureau of Railroad Standards, (June 1990).

(b) The trainset system hardware and software integration shall conform with *Methodology for the Development of On-Board Micro-Computer Equipment,* Pr CF 67–004 and NF F71–004, Bureau of Railroad Standards, (February 1989).

§ 243.429 Control system design requirements.

The Railroad's trainset computer hardware and software shall meet the requirements set forth in § 243.105 of this Part.

§ 243.431 Safety appliance.

(a) *Couplers.* (1) The leading and trailing ends of each semi-permanently connected trainset shall be equipped with an automatic coupler that couples on impact and uncouples by either activation of a traditional uncoupling lever, or some other type of uncoupling mechanism that does not require a person to go between equipment units.

(2) The leading and trailing end couplers and uncoupling devices may be stored within a removable shrouded housing.

(3) Leading and trailing automatic couplers of trains shall be compatible with the Railroad's rescue locomotives without the use of special adapters.

(4) All couplers shall be equipped with an anti-climbing mechanism capable of resisting an upward or downward vertical force of 250 kN (56,200 lb) without permanent deformation.

(b) *Safety appliance mechanical strength and fasteners.* (1) All handrails and sill steps shall be made of approximately 25 mm (1 in.) diameter steel pipe.

(2) All safety appliances shall be securely fastened to the carbody structure with mechanical fasteners that have mechanical strength greater than or equal to that of a M10 diameter SAE steel bolt mechanical fastener.

(c) *Handrails and handholds.* (1) Handrails and handholds shall be made of stainless steel.

(2) Vertical handrails shall conform to the following:

(i) The maximum distance above top of rail to the bottom of the handrail shall be 1250 mm (49.2 in) and the minimum distance shall be 500 mm (19.7 in);

(ii) Minimum hand clearance distance between the handrail and the vehicle body shall be 50 mm (1.97 in) for the entire length; and

(iii) Vertical handrails shall be securely fastened to the vehicle body.

(3) Handholds and handrails are not required on units of the trainset which are semi-permanently connected, which can be disconnected only in a repair facility.

(4) Handholds and handrails are not required at the leading and trailing ends of the trainset equipped with automatic couplers, as these couplers are to be used only for rescue operations, and coupling can be achieved without requiring personnel to go between units.

(5) Passenger handrails or handholds shall be provided at both side access doors used to board or depart the train.

(6) Power vehicle side exits shall be equipped with handholds and handrails.

(d) *Sill steps.* (1) Each power vehicle or control cab shall be equipped with sill steps below each side door;

(2) Power vehicle or control cab sill steps shall be made of expanded metal or equivalent anti-skid material;

(3) Sill steps shall be designed and installed so that:

(4) The minimum tread length of the sill step shall be 250 mm (9.8 in);

(5) The minimum clear depth shall be 150 mm (5.9 in);

(6) Sill steps shall not have a vertical rise between treads exceeding 450 mm (17.7 in). The lowest sill step tread shall be not more than 500 mm (19.7 in) above the top of the rail;

(7) All sill steps shall be securely fastened;

(8) Sill steps are not required on units of the trainset that are semi-permanently connected, which can be disconnected only in a repair facility;

(9) Sill steps are not required at the leading and trailing ends of the trainset equipped with automatic couplers as these couplers are to be used only for rescue operations, and coupling can be achieved without requiring personnel to go between units.

(10) Power vehicle side exits shall be equipped with sill steps.

(e) *Semi-permanent connectors between trainset vehicles.* Each trailer car and power car in a trainset shall be connected to the adjacent trailer car or power car by use of a semi-permanent connector. Semi-permanent connectors may be disconnected only in repair facilities, with the use of special tools, and in such a manner that do not require employees to go on, under, or between equipment. Semi-permanent connectors are not couplers.

§ 243.433 Trainset inspection, testing and maintenance requirements.

(a) The Railroad shall develop a written inspection program for the rolling stock, in accordance with and approved under the requirements of Subpart B, prior to implementation of that program and prior to commencing operations. At a minimum, this program shall include the complete inspection, testing, and maintenance program for the TGV trainset as it is performed in France, including all inspections set forth in paragraph (f) below. This information shall include a detailed description of:

(1) Safety inspection procedures, intervals and criteria;

(2) Test procedures and intervals;

(3) Scheduled preventive maintenance intervals;

(4) Maintenance procedures;

(5) Special test equipment or measuring devices required to perform safety inspections and tests;

(6) Training and qualification of employees and contractors to perform safety inspections, tests and maintenance; and

(7) Methods of ensuring accurate records of required inspections.

(b) *Identification of safety-critical items.* In the program required by paragraph (a), the Railroad shall identify all inspection and testing procedures and criteria, and maintenance intervals that the Railroad deems to be safety-critical. Operation of emergency equipment, emergency back-up systems, and trainset exits shall be deemed safety-critical.

(c) *Program changes.* The Railroad must obtain FRA approval for any changes to the safety-critical portion of the trainset inspection, testing, and maintenance program required by paragraph (a).

(d) *Compliance.* After the Railroad's inspection, testing, and maintenance program is approved by FRA pursuant to the requirements and procedures set forth in Subpart B, the Railroad shall adopt the program and shall perform:

(1) All inspections and tests described in the program in accordance with the procedures and criteria that the Railroad identified as safety-critical; and

(2) All maintenance tasks and procedures described in the program in accordance with the procedures and intervals that the railroad identified as safety-critical.

(e) The inspection, testing, and maintenance program shall ensure that all systems and components of the equipment are free of conditions that endanger the safety of the crew, passengers, or equipment. These conditions include, but are not limited to:

(1) A continuous accumulation of oil or grease;

(2) Improper functioning of a component;

(3) A crack, break, excessive wear, structural defect or weakness of a component;

(4) A leak;

(5) Use of a component or system under conditions that exceed those for which the component or system is designed to operate; and

(6) Insecure attachment of a component.

(f) *Specific safety inspections.* The program under paragraph (a) of this section shall specify that all passenger equipment shall receive thorough safety inspections by qualified personnel at regular intervals. At a minimum, each trainset shall have:

(1) *Daily inspection.* Each trainset in use shall be inspected at least once each calendar day by qualified personnel. The inspection shall verify the correct operation of all on-board safety systems. If any of the conditions listed below are found during this inspection, the trainset shall not be put into revenue service until that condition is rectified. If the existence of any condition listed below cannot be determined by use of the on-board automated monitoring system, the Railroad shall perform a visual inspection to determine if the condition exists.

(i) Malfunction of the driving assistance system (SIAC);

(ii) Malfunction of the fire detection system;

(iii) Indication of an unbalanced tripod;

(iv) Indication of a broken tripod;

(v) Indication of blocked axle;

(vi) A single phase pantograph or its circuit breaker out of order;

(vii) Power car failure or cut-out;

(viii) Isolated roof disconnecting switch H(HT);

(ix) Transformer cooling or ventilation out of order;

(x) Two or more motor blocks isolated;

(xi) Mechanical brake on one or more trucks isolated;

(xii) Total failure of the anti-slide device on one truck;

(xiii) Failure of locomotive engineer's vigilance system (VACMA);

(xiv) Speedometer failure;

(xv) Failure of on-board signaling system;

(xvi) Failure of the speed measuring system (the warning flag of the speedometer does not disappear when the driving cab is activated);

(xvii) Locomotive engineer's console out of order;

(xviii) Locomotive engineer's brake valve not operating;

(xix) Leak in the main reservoir line;

(xx) Leak in the main brake pipe;

(xxi) Failure indication during the required brake test;

(xxii) Trailer car battery charger out of order; and

(xxiii) Total failure of the trainset interior lighting.

(2) *Examination in service.* A visual inspection conducted by qualified personnel every 4000 km (2,485 mi), at a location where there is a repair pit and access to the top of the trainset. At a minimum, the items listed below shall be inspected. All conditions found that do not comply with the safety inspection criteria required by paragraph (a) of this section shall be corrected before the trainset is put into revenue service.

(i) Condition of the pantographs and roof insulators;

(ii) Condition of sanding nozzles;

(iii) Fixation and condition of dampers;

(iv) Condition of suspension springs;

(v) Fixation and condition of grounding straps;

(vi) Condition of side skirts and underbody panels;

(vii) Condition of trucks;

(viii) Oil levels;

(ix) Traction motor-to-carbody securement;

(x) Presence of brake pads;

(xi) Condition of brake shoes;

(xii) Condition of wheel tread;

(xiii) Condition of drive train.

(3) *Running gear inspection.* The running gear shall be inspected by qualified personnel once every 18 days. At a minimum, the items listed below shall be inspected. All conditions found that do not comply with the safety inspection criteria required by paragraph (a) of this section shall be corrected before the trainset is put into revenue service.

(i) A visual inspection of trucks;

(ii) An inspection of the operation of flange-lubricating devices;

(iii) An inspection of the condition and attachment of dampers, roof mounted elements, and suspension components;

(iv) An inspection of the brake rigging, journal bearings, and tripod transmission

(v) A visual inspection of the condition and attachment of brake pads;

(vi) An inspection of the oil levels on drive train;

(vii) An inspection of the securement of drive train and wheel slide sensors;

(viii) An inspection of the condition of the pantographs and roof insulators; and

(ix) Check for audible leaks on pneumatic system.

(4) *Wheel inspection.* Each trainset wheel and reprofile shall be inspected by qualified personnel at an interval not to exceed 50,000 km of travel. Equipment not in compliance with the inspection criteria established in paragraph (a) of this section shall be replaced before the wheel or reprofile returns to revenue service.

(5) *Minor inspection.* At an interval not to exceed 150,000 km of travel or 7 months of time, whichever comes first, the Railroad shall perform a Minor Inspection on all trainsets in accordance with the test procedures and inspection criteria established in paragraph (a) of this section. All conditions found that do not comply with the safety inspection criteria required by paragraph (a) shall be corrected before the trainset is put into revenue service. The Minor Inspection shall include:

(i) Electrical Parts:

(A) Inspect current return devices, antennas, and transponders;

(B) Examine batteries;

(C) Check operation of lighting;

(D) Check operation of speedometer unit and of cab signal receptor;

(E) Check sensors and sensor protectors;

(F) Check roof switches and contacts;

(G) Check circuit breakers; and

(H) Check traction motors and main transformers.

(ii) Mechanical Parts:

(A) Inspect axles, axle boxes and trucks;

(B) Check tightening torque of shock absorber and support mounting bolts;

(C) Check buffing gear;

(D) Inspect pantographs;

(E) Check attachment of anti-roll bars;

(F) Examine condition of guard-irons;

(G) Check setting of sanders;

(H) Verify proper operation of flange-lubricating devices;

(I) Check level and condition of oil on motor and reducing gears;

(J) Check attachment of geared motors;

(K) Check for grease projections from the motive force transmission components, and carrying and fixed rings of the articulation joint;

(L) Check attachment of motive force transmission components and tripod transmission;

(M) Check condition of motorized axle torque reaction rods;

(N) Check condition of brake-units and brake shoes;

(O) Check condition of disk brake pads and of the brake rigging cylinder assembly;

(P) Check condition of bellows;

(Q) Check for attachment defects and distortions on car body components, including underside panels, skirts, windows, and fairings;

(R) Verify proper operation of all doors, including locking devices;

(S) Check for defects on front power car windows;

(T) Inspect fire extinguishers, emergency safety equipment and tools, including the tink hammer; and

(U) Inspect tachometer and odometer sensors.

(iii) Pneumatic Parts:
(A) Inspect main compressor for proper operation;
(B) Check oil level and leaks in the compressor;
(C) Inspect condition of pneumatic suspension components; and
(D) Inspect brake equipment and brake indicator lamps.

(6) *General inspection.* At an interval not to exceed 300,000 km of travel or 13 months of time, whichever comes first, the Railroad shall perform a General Inspection of all trainsets in accordance with the tests procedures and inspection criteria established in paragraph (a) of this section. All conditions found that do not comply with the safety inspection criteria required by paragraph (a) shall be corrected before the trainset is put into revenue service. The General Inspection shall include all items required in the Minor Inspection and:

(i) Electrical Parts:
(A) Inspect circuit breakers;
(B) Examine insulators;
(C) Inspect main transformers;
(D) Inspect braids and connecting shunts, sensors and sensor protectors;
(E) Examine electro-pneumatic and electromagnetic contacts;
(F) Inspect freon enclosures;
(G) Check for anomalies on resistors;
(H) Check operation of signaling lights;
(I) Visual inspection of diodes and antennas;
(J) Check condition of electronic plug-in units;
(K) Check condition of switches, controls, and joints;
(L) Check condition of master controller;
(M) Check operation of clock and indicator of imposed speed;
(N) Check operation of ground-to-train radio link and speed supervision by transponder;
(O) Check operation of passenger alarms;
(P) Inspect antenna;
(Q) Verify that headlights, tail lights, indicators, lighting, desks operate properly in full and dimmed status;
(R) Verify power supply to electrical outlets that are accessible to passengers and service personnel;
(S) Check operation of lights and indicators in electrical cabinets;
(T) Inspect traction, main, auxiliary compressor, and ventilation motors; and
(U) Check operation of refrigeration system and circuit breakers.
(ii) Mechanical Parts:
(A) Check operation of pantographs;
(B) Check for defects, including cracks and distortions, on trucks;
(C) Check for defects and check play on fixed and carrying rings of articulation joint;
(D) Check for defects on intercar passageways;
(E) Check for defects on doors, locks, and joints;
(F) Check interbody and anti-tilt dampers;
(G) Check tread brake units; and
(H) Check underbody rotation stops.
(iii) Pneumatic Parts:
(A) Check pressure gauge;
(B) Check operation of braking gear;
(C) Check operation of the anti-wheelslide device;
(D) Check operation of the emergency brake valve;
(E) Clean driver's brake valve and check its operation;
(F) Inspect flexible and half-couplings;
(G) Check operation of valves which control alarms, windshield washers, windshield wipers, and of differential valves; and
(H) Check brake indicator lights.

(7) *Major inspection.* At an interval not to exceed 600,000 km of travel or 25 months of time, whichever comes first, the Railroad shall perform a Major Inspection on all trainsets in accordance with the tests procedures and inspection criteria established in paragraph (a) of this section. All conditions found that do not comply with the safety inspection criteria required by paragraph (a) shall be corrected before the trainset is put into revenue service. The Major Inspection shall include all items required in the General Inspection and:

(i) Electrical Parts:
(A) Inspect roof cable and lightning arresters;
(B) Inspect operation of the roof switch;
(C) Inspect battery switches;
(D) Inspect battery charger and battery voltmeter;
(E) Inspect inverters;
(F) Examine coils;
(G) Clean electronic gear;
(H) Inspect couplers and connecting cables;
(I) Inspect driver's console switch box;
(J) Test driver's vigilance system;
(K) Pre-departure sensors;
(L) Inspect operation of cab signal;
(M) Clean switchgear cabinets;
(N) Lubricate traction motors;
(O) Inspect ammeters and key switch panel;
(P) Inspect 30 KVA inverter; and
(R) Inspect spare light bulb supply.
(ii) Mechanical Parts:
(A) Inspect calibration of pantographs;
(B) Inspect for defects on motorized axle reaction rods;
(C) Inspect the constituents of fixed and carrying rings of articulation joint;
(D) Inspect that headlight covers are tightly secured; and
(E) Inspect for defects on car body exterior paint.
(iii) Pneumatic Parts:
(A) Inspect air and oil filters;
(B) Inspect main compressor couplings;
(C) Inspect operation of the main air dryer;
(D) Inspect operation of pressure gauges;
(E) Inspect pneumatic suspension reservoirs;
(F) Inspect operation of power car and trailer car brakes;
(G) Inspect operation of pneumatic pressure regulators;
(H) Inspect truck-to-car body coupling and pneumatic suspension connections; and
(I) Inspect operation of the spring-applied parking brake.

(g) *Brake system repair points.* The Railroad shall designate brake system repair point(s) in the inspection criteria established in paragraph (a) of this section. No trainset shall depart a brake system repair point unless that trainset has a 100 percent operational brake system.

(h) *Maintenance intervals.* The Railroad's program established pursuant to paragraph (a) of this section shall include the Railroad's scheduled maintenance intervals for equipment based on TGV operations in Europe, and on an analysis required the system safety program set forth in Subpart B of this Part. The maintenance interval of a safety-critical components shall be changed only when justified by accumulated, verifiable operating data, and approved by FRA as part of a system safety plan amendment.

(i) *Training and qualification program*. The Railroad shall establish a training and qualification program as defined in Subpart H of this Part to qualify individuals to perform inspections, testing, and maintenance on the equipment. Only qualified individuals shall perform inspections, testing, and maintenance of the equipment. An employee or contractor employee shall have knowledge of standard procedures described in paragraph (h) of this section in order to qualify to perform a task.

(j) *Standard procedures for safely performing inspection, testing, maintenance, or repairs.* The Railroad's program required by paragraph (a) of this section shall include the Railroad's written standard procedures for performing all safety-critical equipment inspection, testing, maintenance, or repair tasks. These standard procedures shall:

(1) Describe in detail each step required to safely perform the task;

(2) Describe the knowledge necessary to safely perform the task;

(3) Describe any precautions that must be taken to safely perform the task;

(4) Describe the use of any safety equipment necessary to perform the task;

(5) Be approved by the railroad's chief mechanical officer;

(6) Be approved by the railroad's official responsible for safety;

(7) Be enforced by supervisors with responsibility for accomplishing the tasks; and

(8) Be reviewed annually by the Railroad.

(k) *Quality control program.* The Railroad shall establish an inspection, testing, and maintenance quality control program enforced by the Railroad or its contractor(s) to reasonably ensure that inspections, tests, and maintenance are performed in accordance with Federal safety standards and the procedures established by the railroad.

(l) *Recordkeeping.* The Railroad shall make and maintain a written or electronic record of each required inspection under this section. Each record shall be maintained for at least one year from the date of the inspection.

Subpart F—Operating Rules

§ 243.501 Purpose.

Through the requirements of this Subpart, FRA learns the condition of the operating and emergency preparedness rules and practices in use by the Railroad. The Railroad's operating rules, and any amendments thereto, are subject to FRA approval in accordance with the procedures set forth in § 243.509 of this Subpart. The rules and practices covered by this Subpart include the procedures for instruction and testing of all employees involved with the movement of rail vehicles, including locomotive engineers, on-board attendants, central control staff, and all maintenance staff, which are necessary to ensure that they possess the requisite skill and knowledge of the rules and operating practices to maintain the safety of the system.

§ 243.503 Operating rules; filing and recordkeeping.

(a) The Railroad shall file with FRA one copy of its code of operating rules, timetables, timetable special instructions six months prior to commencing internal operations, and one year prior to commencing any revenue passenger transportation operations. The Railroad shall designate those rules, practices, and procedures that it deems safety-critical. Upon FRA approval of the operating rules pursuant to the procedures set forth in § 243.509, FRA will adopt and incorporate the safety-critical operating rules as Appendix C to this Part. The Railroad's Emergency Preparedness Plan shall be filed in accordance with the requirements of FRA's Passenger Train Emergency Standards as ultimately codified in 49 CFR part 239, as amended.

(b) The Railroad shall file each amendment to its code of operating rules, each new timetable, and each new timetable special instruction within 30 days after it is issued.

(c) The Railroad shall keep one copy of its current code of operating rules, timetables, timetable special instruction, at its system headquarters, and shall make such records available to representatives of the FRA for inspection and copying during normal business hours. These records shall be retained at the Railroad's system headquarters for one year after the end of the calendar year to which they relate.

(d) Any person who fails to comply with a safety-critical operating rule or practice, including timetables, timetable special instructions, or operational directives, issued pursuant to this Subpart and adopted and incorporated by reference in Appendix C to this rule, is subject to a civil penalty or other enforcement action for violation of those safety-critical rules and practices, in accordance with § 243.9 of this Part.

§ 243.505 Program of operational tests and inspections; recordkeeping.

(a) *Requirement to conduct operational tests and inspections.* The Railroad shall periodically conduct operational tests and inspections to determine the extent of compliance with its code of operating rules, timetables, timetable special instructions, and inspection, testing, and maintenance program in accordance with a written program retained at its system headquarters.

(b) *Written program of operational tests and inspections.* Three months prior to commencing operations, and six months prior to commencing any revenue passenger service operations, the Railroad shall file and retain one copy of its current program for periodic performance of the operational tests and inspections required by paragraph (a) of this section, and shall file and retain one copy of each subsequent amendment to such program as amendments are made. These records shall be retained at the system headquarters of the Railroad for three calendar years after the end of the calendar year to which they relate. These records shall be made available to representatives of the FRA for inspection and copying during normal business hours. The program shall:

(1) Provide for operational testing and inspection under the various operating conditions on the Railroad;

(2) Describe each type of operational test and inspection adopted, including the means and procedures used to carry it out;

(3) State the purpose of each type of operational test and inspection;

(4) State, according to operating divisions where applicable, the frequency with which each type of operational test and inspection is conducted;

(5) Begin within 30 days after the date of commencing operations; and

(6) Include a schedule for making the program fully operative within 210 days after it begins.

(c) *Records of individual tests and inspections.* The Railroad shall keep a record of the date, time, place, and result of each operational test and inspection that was performed in accordance with its program. Each record shall specify the officer administering the test and inspection and each employee tested. These records shall be retained at the system headquarters of the Railroad for one calendar year after the end of the calendar year to which they relate. These records shall be made available to representatives of the Federal Railroad Administration for inspection and copying during normal business hours.

(d) *Annual summary on operational tests and inspections.* Before March 1 of each calendar year, the Railroad shall retain, at its system headquarters, one copy of a written summary of the following with respect to its previous year's activities: The number, type, and result of each operational test and inspection that was conducted as required by paragraphs (a) and (b) of this section. These records shall be retained for three calendar years after the end of the calendar year to which they relate and shall be made available to representatives of FRA for inspection and copying during normal business hours.

(e) *Electronic recordkeeping.* The Railroad is authorized to retain by electronic recordkeeping the information prescribed in paragraphs (b) through (d) of this section, provided that all of the following conditions are met:

(1) The Railroad adequately limits and controls accessibility to such information retained in its electronic

database system and identifies those individuals who have such access;

(2) The Railroad has a terminal at the system headquarters and at each division headquarters;

(3) Each such terminal has a desk-top computer (i.e., monitor, central processing unit, and keyboard) and either a facsimile machine or a printer connected to the computer to retrieve and produce information in a usable format for immediate review by FRA representatives;

(4) The Railroad has a designated representative who is authorized to authenticate retrieved information from the electronic system as true and accurate copies of the electronically kept records; and

(5) The Railroad provides representatives of the Federal Railroad Administration with immediate access to these records for inspection and copying during normal business hours and provides printouts of such records upon request.

§ 243.507 Program of instruction on operating rules; recordkeeping; electronic recordkeeping.

(a) To ensure that each Railroad employee whose activities are governed by the Railroad's operating rules understands those rules, the Railroad shall periodically instruct each such employee on the meaning and application of its operating rules in accordance with a written program retained at its system headquarters and at the division headquarters.

(b) Three months before commencing operations, and six months before commencing any revenue passenger service operations, the Railroad shall file and retain one copy of its current program for the periodic instruction of its employees as required by paragraph (a) of this section and shall file and retain one copy of any amendment to that program as amendments are made. These records shall be retained at the Railroad's system headquarters for one calendar year after the end of the calendar year to which they relate. These records shall be made available to representatives of the FRA for inspection and copying during normal business hours. This program shall:

(1) Describe the means and procedures used for instruction of the various classes of affected employees;

(2) State the frequency of instruction and the basis for determining that frequency;

(3) Include a schedule for completing the initial instruction of employees who are already employed when the program begins;

(4) Begin on the date of commencing operations; and

(5) Provide for initial instruction of each employee hired after the program begins.

(c) The Railroad to which this Subpart applies is authorized to retain by electronic recordkeeping its program for periodic instruction of its employees on operating rules, provided that the requirements stated in § 243.505(e)(1)–(5) of this Subpart are satisfied.

§ 243.509 Operating rules approval.

(a) The Railroad shall submit its operating rules to FRA's Associate Administrator for Safety for review, within the time intervals required by this Subpart. FRA shall notify the Railroad, in writing, within 90 days of receipt of the Railroad's submission, that the rules are approved, disapproved, or disapproved in part. If disapproved or disapproved in part, FRA shall explain the reason on which the disapproval is based, and the measures needed to obtain approval.

(b) The Railroad shall submit any amendment to its operating rules to FRA's Associate Administrator for Safety for review, within 30 days after it is issued. The Railroad's amendment shall go into effect until such time that FRA notifies the Railroad, in writing, that such amendment is disapproved or disapproved in part. If disapproved, FRA shall explain the reason on which the disapproval is based, and the measures needed to obtain approval.

(c) In the course of the approval process set forth in this section, the Railroad shall provide to FRA supporting documentation that FRA deems necessary to assess accurately the level of safety provided for in the Railroad's operating rules.

Subpart G—System Qualification Tests

§ 243.601 Responsibility for verification demonstrations and tests.

The Railroad shall comply with the pre-revenue qualification tests and verification requirements set forth in this Subpart and in Subpart B to demonstrate the overall safety of the system, prior to revenue operations.

§ 243.603 Preparation of test plan.

(a) Prior to commencing revenue service operations and in accordance with Subpart B of this Part, the Railroad shall develop a system-wide test plan, that includes testing procedures, to demonstrate the operability of all system elements, including track and infrastructure, signal, communications, rolling stock, software, and operating practices, and the system as a whole. After receiving FRA approval of the pre-revenue service test plan as part of the system safety plan approval, and prior to commencing revenue service, the Railroad shall adopt and comply with the approved plan, including completion of all tests required by the plan.

(b) The plan shall be made available to FRA for inspection and copying upon request.

(c) The plan shall include all of the following elements:

(1) A clear statement of the test objectives. One of the principal test objectives shall be to demonstrate that the Railroad's system meets the safety design and performance requirements specified in this Part when operated in the environment in which it will be used;

(2) A schedule for conducting the tests;

(3) A description of the Railroad property or facilities to be used to conduct the tests;

(4) A detailed description of how the tests are to be conducted. This description shall include:

(i) An identification of the systems and equipment to be tested;

(ii) The method by which the systems and equipment shall be tested;

(iii) The criteria to be used to evaluate the system's and equipment's performance; and

(iv) The means by which the test results will be reported to FRA.

(5) A description of any special instrumentation to be used during the tests;

(6) A description of the information or data to be obtained;

(7) A description of how the information or data obtained is to be analyzed or used;

(8) A clear description of any criteria to be used as safety limits during the testing;

(9) A description of the criteria to be used to measure or determine the success or failure of the tests. If system qualification is to be based on extrapolation of less than full-level testing results, the analysis done to justify the validity of the extrapolation shall be described.

(10) A description of any special safety precautions to be observed during the testing;

(11) A written set of standard operating procedures to be used to ensure that the testing is done safely;

(12) Quality control procedures to ensure that the inspection, testing, and maintenance procedures are followed; and

(13) A demonstration of the inspection criteria to be used for the revenue service operation of the Railroad's system.

(d) The test plan shall include steps to:

(1) Verify results of installation tests performed by contractors and manufacturers;

(2) Conduct pre-operational testing of individual safety-related equipment, facilities, and subsystems; and

(3) Conduct operational testing of the system safety.

(e) The test plan shall include detailed, written procedures for the testing and start-up of all safety-critical equipment, facilities, and subsystems installed on the line, in passenger stations, in maintenance shops, and on the trainsets.

§ 243.605 Pre-operational qualification tests.

(a) The Railroad shall conduct pre-operational qualification tests, prior to commencing revenue operations, to verify that all safety-critical components meet all functional and all performance specifications.

(b) The pre-operational qualification tests of equipment, facilities, and subsystems shall include, at a minimum:

(1) Verification of the correct utility supply circuits, procedures for energization and de-energization, and formal permit-to-work procedures;

(2) Verification of the installation of radio communication equipment that is compatible with existing systems and suitable for integration into the planned network; and

(3) Verification of the operation of the dedicated telephone systems in facilities and along the right-of-way;

(4) Verification of the operation of all safety-related equipment in the maintenance shop;

(5) Verification of local control of substation equipment;

(6) Energization of substations and verification of formal permit-to-work procedures;

(7) Continuity testing of the overhead catenary system and rail return circuits;

(8) High-potential testing of traction power supply feeders and the overhead catenary system;

(9) Energization of each section of the overhead catenary system and verification of formal permit-to-work procedures;

(10) Verification of yard and shop overhead catenary system sectionalizing for power isolation during vehicle maintenance;

(11) Verification of compliance with civil works and track standards;

(12) Verification that all civil works, support structures, and installations are correctly positioned with respect to mechanical and electrical clearance envelopes, and with the Railroad's structure and clearance diagrams;

(13) Verification that the dimensions of the vehicles are in compliance with the Railroad's structure and clearance diagrams;

(14) Verification of correct operation of all wayside detectors;

(15) Verification of safe operation of signal system and central traffic control functions;

(16) Verification of local operation of track switching and signal system equipment;

(17) Verification of all on-board trainset safety-critical components;

(18) Verification of all emergency preparedness procedures; and

(19) Verification that the system's software operates as intended, is reliable and crash-resistant, is impenetrable to unauthorized entry, and interacts redundantly as designed.

§ 243.607 Integrated operational testing of systems.

(a) Prior to commencing revenue operations, the Railroad shall conduct high speed tests of the trainsets throughout the system to:

(1) Apply dynamic loads to track and bridge structures;

(2) Verify vehicle clearances to structures and platforms;

(3) Verify mechanical positioning of the overhead catenary system; and

(4) Verify performance of the vehicle, track, power supply, signal and communication systems.

(b) The Railroad shall demonstrate safe operation of the system during normal and degraded-mode operating conditions. At a minimum, the following operation tests shall be performed:

(1) Short-circuit tests to check power supply protection circuits and signal system immunization;

(2) Slow-speed operation of a trainset;

(3) Verification of correct overhead catenary and pantograph interaction;

(4) Verification of vehicle clearance at structures and passenger platforms;

(5) Incremental increase of train speed;

(6) Performance tests on vehicles to verify braking rates;

(7) Verification that vehicle noise and vibration are in compliance with codes and regulations;

(8) Verification of correct vehicle suspension characteristics;

(9) Verification of ride quality at operating speeds established in test plan;

(10) Verification of track and civil structure performance under dynamic load, which shall meet the following requirements:

(i) Each rolling stock type shall be qualified for its intended speed in order to demonstrate that the vehicle dynamic response to track alignment and geometry variations are within acceptable limits to assure safe operation;

(ii) The qualification testing shall insure that the equipment will not exceed the wheel/rail force safety limits specified in the table in section 4.37 and the limits for ride vibration specified in section 5.13(e) at any speed less than 16 km/h (10 mph) above the proposed maximum operating speed;

(iii) The Railroad shall establish a target maximum testing speed that is at least 16 km/h (10 mph) above the proposed maximum revenue service speed, appropriate target test and operating conditions, and conduct a test program sufficient to evaluate the operating limits of the track and equipment in order to gather the test data required to support the analysis required above. The test program shall demonstrate vehicle dynamic response as speeds are incrementally increased from 160 km/h (100 mph) to the target maximum test speeds. The test shall be suspended at that speed where any of the vehicle/track performance limits in this section are exceeded;

(iv) At the conclusion of the testing phase, the Railroad shall complete test runs with the subject equipment over the entire route proposed for revenue service, when maximum safe operating speed has been determined taking into account permissible levels of cant deficiency. These concluding tests shall be conducted:

(A) At the speeds the Railroad will request FRA to approve for service; and

(B) At 16 km/h (10 mph) above such speed; and

(v) The Railroad shall submit a report of the test procedures and results to FRA upon completion of the tests. The test report shall include the design flange angle of the equipment that applied to the criteria for the ratio of lateral forces that any wheel exerts on an individual rail to the vertical force exerted on the rail. This flange angle shall be used in the determination of the lateral to vertical wheel load safety limit for the track/vehicle performance measurements required by Subpart D.

(11) Load tests with vehicles to verify relay settings and signal and communication system immunization;

(12) Monitoring of utility supply circuits and telephone circuits to ensure the adequacy of power supplies, and to verify that transit-related disturbances are within acceptable limits;

(13) Verification of vehicle detection due to shunting of signal system circuits;

(14) Verification of correct signal status indications;

(15) Verification of safe operation of automatic train control (ATC) system;

(16) Tests of vehicle radio reception during system-wide vehicle operation; and

(17) Verification that the system's software operates as intended, is reliable and crash-resistant, is impenetrable to unauthorized entry, and interacts redundantly as designed.

§ 243.609 Pre-revenue service testing.

For a period of four or more months prior to revenue operations, the Railroad shall conduct pre-revenue service tests that include simulation of full revenue service operation to verify overall system performance, and provide operating and maintenance experience. The frequency and duration of the tests shall be determined in conjunction with preparation of the Railroad's system safety plan and approved by FRA, as set forth in Subpart B of this Part.

§ 243.611 Verification of compliance.

(a) The Railroad shall prepare a report detailing the results of all pre-operational and pre-revenue service qualification tests. The report shall identify any problems encountered during testing, and alternative actions necessary to correct defects in workmanship, materials, equipment, design, or operating parameters.

(b) The Railroad shall implement all alternative actions necessary to correct defects, as identified by the report.

(c) The Railroad shall submit the report to FRA 60 days prior to commencing revenue operations.

Subpart H—Personnel Qualification Requirements

§ 243.701 General requirements.

(a) The Railroad shall develop and implement a personnel qualification training program to meet the requirements set forth in § 243.109 of this Part, to provide all employees who perform safety-related duties the knowledge and skills necessary to effectively complete safety-related duties.

(b) As part of this program, the Railroad shall, at a minimum:

(1) Identify the safety-related tasks that must be performed on the Railroad's system, including all emergency preparedness tasks required by this Part;

(2) Develop written procedures for the performance of the tasks identified;

(3) Identify the skills and knowledge necessary to perform each task;

(4) Develop a training course that includes classroom and ''hands-on'' instruction designed to impart the skills and knowledge identified as necessary to perform each task;

(5) Require all employees to successfully complete the training course that covers the system, equipment, and tasks for which they are responsible;

(6) Require all employees to pass a written examination covering the system, equipment, and tasks for which they are responsible;

(7) Require all employees to demonstrate ''hands-on'' capability to perform their assigned tasks;

(8) Require supervisors to complete the program that covers the employees that they supervise;

(9) Require supervisors to exercise oversight to ensure that all the identified tasks are performed in accordance with the Railroad's written procedures;

(10) Complete required training of the work force prior to the start of revenue service;

(11) Designate in writing that each employee has the knowledge and skills necessary to perform the safety-related tasks for which she or he is responsible;

(12) Require periodic refresher training at an interval not to exceed three years that includes classroom instruction, ''hands-on'' training, and testing;

(13) Add new systems and equipment to the qualification and designation program prior to introduction into revenue service; and

(14) Maintain records for the duration of the employee's employment which demonstrate that each employee performing safety-related tasks on the Railroad's system is currently qualified to do so. These records shall distinguish the qualifications of the employee as a qualified person.

(c) The personnel qualification training program shall define the process by which the Railroad will ensure that all employees who perform safety-related duties are qualified to complete those duties. The program shall define the method by which the Railroad measures the knowledge and skills of all employees who perform safety-related duties.

(d) With regard to the types of employees for whom specific qualification requirements are set forth in this Subpart, the Railroad's training program shall be designed and implemented to ensure that those employees meet those requirements.

(e) The Railroad's personnel qualification training program for locomotive engineers shall follow the requirements set forth in 49 CFR part 240.

(f) The Railroad may not permit any individual, whether an employee of the Railroad or of a contractor, to perform the functions described in this Subpart unless that individual meets the qualification standards of this Subpart and has been trained in a program that is designed to ensure that the individual meets those requirements.

(g) All records required by this Subpart shall be maintained by the Railroad and available for FRA review for the duration of an employee's employment.

Track Personnel

§ 243.703 Personnel qualifications for track maintenance and inspection personnel.

(a) *General.* The Railroad shall designate qualified individuals responsible for the maintenance and inspection of track in compliance with the safety requirements prescribed in Subpart D of this Part. Each designated individual, including contractors and their employees, must meet the minimum qualifications set forth in this Subpart.

(b) *Recordkeeping.* With respect to the designation of individuals under this section, the Railroad shall maintain written records of:

(1) Each designation in effect;

(2) The basis for each designation, including but not limited to:

(i) The exact nature of any training courses attended and the dates thereof;

(ii) The manner in which the Railroad has determined a successful completion of that training course, including test scores or other qualifying results;

§ 243.705 Personnel qualified to supervise track restoration and renewal.

(a) Each individual designated to supervise restorations and renewals of track shall have:

(1) At least five years of responsible supervisory experience in railroad track maintenance of FRA track Class 4 or higher, and the successful completion of a course offered by the employer or by a college level engineering program, supplemented by special on-the-job training that emphasizes the techniques to be employed in the supervision, restoration, and renewal of high speed track;

(2) A combination of at least one year of responsible supervisory experience in track maintenance in FRA Track Class 4 or higher and the successful completion of a minimum of 80 hours of specialized

training in the maintenance of high speed track provided by the employer or by a college level engineering program, supplemented by special on-the-job training provided by the employer with emphasis on the maintenance of high speed track; or

(3) A combination of at least two years of experience in track maintenance in FRA Track Class 4 or higher and the successful completion of a minimum of 120 hours of specialized training in the maintenance of high speed track provided by the employer or by a college level engineering program supplemented by special on the job training provided by the employer with emphasis on the maintenance of high speed track.

(b) Each individual designated to supervise restorations and renewals of track shall demonstrate annually to the Railroad that the individual:

(1) Knows and understands the requirements of Subpart D of this Part;

(2) Can detect deviations from those requirements; and

(3) Can prescribe appropriate remedial action to correct or safely compensate for those deviations.

(c) Each individual designated to supervise restorations and renewals of track shall have written authorization from the Railroad to prescribe remedial actions to correct or safely compensate for deviations from the requirements of Subpart D of this Part and shall have successfully completed a recorded examination on Subpart D as part of the qualification process.

§ 243.707 Personnel qualified to inspect track.

(a) Each individual designated to inspect track for defects, shall have:

(1) At least five years of responsible experience inspecting track in FRA Track Class 4 or above, and the successful completion of a course offered by the Railroad or by a college level engineering program, supplemented by special on-the-job training that emphasizes the techniques to be employed in the inspection of high speed track; or

(2) A combination of at least one year of responsible experience in track inspection in FRA Class 4 or above and the successful completion of a minimum of 80 hours of specialized training in the inspection of high speed track provided by the Railroad or by a college level engineering program, supplemented by special on-the-job training provided by the Railroad with emphasis on the inspection of high speed track; or

(3) A combination of at least two years of experience in track maintenance in FRA Class 4 or above and the successful completion of a minimum of 120 hours of specialized training in the inspection of high speed track provided by the Railroad or from a college level engineering program, supplemented by special on-the-job training provided by the Railroad with emphasis on the inspection of high speed track.

(b) Each individual designated to inspect track for defects shall demonstrate annually to the Railroad that the individual:

(1) Knows and understands the requirements of Subpart D of this Part;

(2) Can detect deviations from those requirements; and

(3) Can prescribe appropriate remedial action to correct or safely compensate for those deviations.

(c) Each individual designated to inspect track for defects shall have written authorization from the Railroad to prescribe remedial actions to correct or safely compensate for deviations from the requirements in Subpart D of this Part and shall have successfully completed a recorded examination on Subpart D as part of the qualification process.

§ 243.709 Personnel qualified to inspect and restore continuous welded rail.

(a) Individuals designated under §§ 243.705 and 243.707 may inspect continuous welded rail track (CWR) or supervise the installation, adjustment, and maintenance of CWR in accordance with the written procedures established by the Railroad, provided they have:

(1) Current qualifications under either § 243.705 or § 243.707;

(2) Successfully completed a training course of at least eight hours duration developed specifically for the application of written CWR procedures issued by the Railroad; and

(3) Demonstrated to the Railroad that the individual:

(i) Knows and understands the requirements of those written CWR procedures;

(ii) Can detect deviations from those requirements; and

(iii) Can prescribe appropriate remedial action to correct or safely compensate for those deviations.

(b) Individuals designated to inspect CWR or supervise the installation, adjustment, and maintenance of CWR shall have written authorization from the Railroad to prescribe remedial actions to correct or safely compensate for deviations from the requirements in those procedures and must have successfully completed a recorded examination on those procedures as part of the qualification process. The recorded examination may be written, or in the form of a computer file with the results of an interactive training course.

Signal Personnel

§ 243.711 Personnel qualifications for signal maintenance and inspection personnel.

(a) *General.* The Railroad shall designate qualified individuals responsible for the maintenance and inspection of the signal system in compliance with the safety requirements prescribed in Subpart C of this Part. Each designated individual, including contractors and their employees, shall meet the minimum qualifications set forth in this Subpart.

(b) *Recordkeeping.* With respect to the designation of individuals under this section, the Railroad shall maintain written records of:

(1) Each designation in effect;

(2) The basis for each designation, including but not limited to:

(i) The exact nature of any training courses attended and the dates thereof;

(ii) The manner in which the Railroad has determined a successful completion of that training course, including test scores or other qualifying results;

(3) Signal inspections made by each individual as required by Subpart C. These records must be made available for inspection and copying by the Federal Railroad Administrator during regular business hours.

§ 243.713 Personnel qualified signal inspector.

(a) Each individual designated to inspect the Railroad's signal system shall have:

(1) Six or more years of signal maintenance experience that includes specialized training in each three-year period provided by the Railroad; or

(2) Four or more years of signal maintenance experience, and an associate degree in electrical engineering or related technical specialization, that includes training in each three-year period provided by the Railroad; or

(3) Two or more years of signal maintenance experience and a bachelor's degree in electrical engineering or related technical specialization, that includes training in each three-year period provided by the Railroad.

(b) Each individual designated to inspect the signal system for defects shall demonstrate annually to the Railroad that the individual:

(1) Knows and understands the requirements of subpart C;

(2) Can detect deviations from those requirements; and

(3) Can prescribe appropriate remedial action to correct or safely compensate for those deviations.

§ 243.715 Personnel qualified as signal maintainer.

(a) Each individual designated as a signal maintainer by the Railroad shall complete a training program during the first two years of employment by the Railroad. Upon successful completion of the training program, the signal maintainer shall be authorized to work in the proximity of high voltage lines and on signal equipment.

(b) When required to maintain the signal system for defects, each individual designated must demonstrate annually to the Railroad that the individual:

(1) Knows and understands the requirements of subpart C;

(2) Can detect deviations from those requirements; and

(3) Can prescribe appropriate remedial action to correct or safely compensate for those deviations.

§ 243.717 Personnel qualified to supervise signal inspectors and maintainers.

When required to supervise the inspection and maintenance of signal systems, each designated supervisor must:

(a) Successfully complete the program that covers the employees they supervise; and

(b) Exercise oversight to ensure that all of the identified tasks are performed in accordance with the Railroad's qualification program.

Rolling Stock Personnel

§ 243.719 Personnel qualifications for rolling stock personnel.

(a) *General.* The Railroad shall designate qualified individuals responsible for the inspection and maintenance of the Railroad's rolling stock. Each designated individual, including contractors and their employees, shall meet the minimum qualifications set forth in this section.

(b) *Recordkeeping.* With respect to the designation of individuals under this section, the Railroad shall maintain written records of:

(1) Each designation in effect;

(2) The basis for each designation, including but not limited to:

(i) The exact nature of any training courses attended and the dates thereof;

(ii) The manner in which the Railroad has determined a successful completion of that training course, including test scores or other qualifying results;

(c) The Railroad's qualification program for rolling stock personnel shall, at a minimum:

(1) Identify the safety-related tasks that shall be performed on each type of equipment that the Railroad operates;

(2) Include written procedures for the performance of the tasks identified;

(3) Identify the skills and knowledge necessary to perform each task;

(4) Include classroom and ''hands-on'' lessons designed to impart the skills and knowledge identified as necessary to safely perform each task;

(5) Require periodic refresher training at an interval not to exceed three years that includes classroom and ''hands-on'' training, as well as testing; and

(6) Include new equipment in the qualification and designation program prior to its introduction to revenue service.

§ 243.721 Personnel qualified to inspect and maintain rolling stock.

Each designated individual required to inspect and maintain rolling stock shall, at a minimum:

(a) Successfully complete the training course that covers the equipment and tasks for which they are responsible;

(b) Pass a written examination covering the equipment and tasks for which they are responsible; and

(c) Successfully demonstrate ''hands-on'' capability to perform the assigned tasks on the type of equipment to which they are assigned.

§ 243.723 Personnel qualified to supervise the inspection and maintenance of rolling stock.

Each individual designated to supervise the inspection and maintenance of rolling stock personnel shall, at a minimum:

(a) Successfully complete the program that covers the employees that they supervise;

(b) Exercise oversight to ensure that all the identified tasks are performed in accordance with the Railroad's qualification program.

Subpart I—Power Distribution

§ 243.801 Warning signs.

(a) The Railroad shall post warning signs concerning the danger of high voltage lines along the right-of-way, at regular intervals not to exceed 183 m (600 ft).

(b) The Railroad shall post warning signs concerning the danger of high voltage lines at all underpasses and overpasses.

(c) The Railroad shall attach warning signs concerning the danger of high voltage lines to each catenary mast, at a height of 1.2 to 1.5 m (4 to 5 ft).

(d) The Railroad shall post warning signs concerning the danger of high voltage lines on catenary masts that are adjacent to all overpasses. These warning signs shall be positioned so that they are clearly visible from the overpass.

§ 243.803 Clearance requirements.

Electrical clearance between the catenary system and fixed equipment in the right-of-way shall meet all pertinent international standards, including UIC 606–2 OR, in order to avoid fault currents.

§ 243.805 Catenary connections.

All catenary masts shall be connected to the ground or the rail, as determined by the Railroad's system safety plan. The electrical impedance of the connection shall meet the step and touch potential requirements given in international standards to protect against an electrical shock hazard.

§ 243.807 Access to stations.

Access to supply stations, substations and autotransformer stations shall be restricted to authorized personnel only.

§ 243.809 Actuators.

The actuators of high voltage switches shall be designed to protect the operator against electrical shock, either direct or induced.

§ 243.811 Power feeding.

(a) The parallel power feeder shall be protected against short circuits along the catenary.

(b) The parallel power feeder shall be protected from over-voltage power surges due to lightning and from surges caused by the utility system.

§ 243.813 Emergency devices.

(a) The Railroad shall install at each underpass, overpass, emergency entrance to the right-of-way, supply station, substation, and autotransformer station devices capable of disconnecting and isolating power and/or grounding the catenary to the rail that may be used in the event of an emergency.

(b) The Railroad shall install telephones along the right-of-way that are connected directly to the central power dispatching center. One telephone shall be located at each device provided in accordance with paragraph (a) of this section.

§ 243.815 Overpass protection.

The Railroad shall install at each overpass fencing, or other suitable protective device or equipment that shall prevent any accidental contact with the catenary.

§ 243.817 Safety work rules.

All pertinent safety standards issued by the U.S. Occupational Safety and

Health Administration, concerning personal protective equipment, practices, and work rules for employees involved with the electric power generation, distribution, and transmission system, shall apply to the Railroad. FRA has not exercised jurisdiction over those working conditions.

§ 243.819 Inspection, testing, and maintenance of the power distribution system.

(a) The Railroad shall establish a training and qualification program as requires by Subparts B and H to qualify individuals to perform inspections, tests and maintenance of the power distribution system. Only qualified individuals shall perform inspections, tests and maintenance of the equipment.

(b) Qualified personnel shall perform a visual inspection of performance of the current collection through the pantograph-catenary interface.

(c) Qualified personnel shall perform a walking inspection of each suspension and anchoring or supporting structure of the catenary system, all switching devices, and all telephones located along the right-of-way at least once every four months.

(d) Qualified personnel shall inspect all emergency shutdown devices and all manual switches annually.

(e) The Railroad shall provide to FRA for review detailed information on the inspection, test, and maintenance procedures necessary for safe operation of the power distribution equipment. This information shall include a detailed description of:

(1) Safety inspection procedures, requirements, intervals and criteria;

(2) Test procedures and intervals;

(3) Scheduled preventive maintenance intervals;

(4) Maintenance procedures;

(5) Special testing equipment and measuring devices required to perform safety inspections and tests; and

(6) Training and certification of employees and contractors qualified to perform safety inspections, testing and maintenance.

Appendix A to Part 243—Schedule of Civil Penalties—[Reserved]

Appendix B to Part 243—Test Performance Criteria for the Flammability and Smoke Emission Characteristics of Materials Used in Constructing or Refurbishing Locomotive Cab and Passenger Car Interiors

This appendix provides the performance standards for testing the flammability and smoke emission characteristics of materials used in constructing or refurbishing locomotive cab and passenger car interiors, in accordance with the requirements of § 243.413.

(a) *Definitions.*

Critical radiant flux (CRF) means, as defined in ASTM E–648, a measure of the behavior of horizontally-mounted floor covering systems exposed to a flaming ignition source in a graded radiant heat energy environment in a test chamber.

Flame spread index (I_S) means, as defined in ASTM E–162, a factor derived from the rate of progress of the flame front (F_S) and the rate of heat liberation by the material under test (Q), such that $(I_S) = (F_S) \times Q$.

Flaming dripping means periodic dripping of flaming material from the site of material burning or material installation.

Flaming running means continuous flaming material leaving the site of material burning or material installation.

Specific optical density (D_S) means, as defined in ASTM E–662, the optical density measured over unit path length within a chamber of unit volume, produced from a specimen of unit surface area, that is irradiated by a heat flux of 2.5 watts/cm^2 for a specified period of time.

Surface flammability means the rate at which flames will travel along surfaces.

(b) *Required test procedures and performance criteria.*

The materials used in locomotive cabs and passenger cars shall be tested according to the procedures and performance criteria set forth in the following table. In all instances, the most recent version of the test procedures or the revision in effect at the time a vehicle is ordered should be employed in the evaluation of the materials specified.

Category	Function of material	Test procedure	Performance criteria
Passenger seats, Sleeping and dining car components.	Cushions, Mattresses [1, 2, 5, 9] *	ASTM D–3675	$I_s \leq 25$
		ASTM E–662	D_s (1.5)≤100; D_s (4.0)≤175
	Seat and/or Mattress Frame [1, 5, 8]	ASTM E–162	$I_s \leq 35$
		ASTM E–662	D_s (1.5)≤100; D_s (4.0)≤200
	Seat and Toilet Shroud, Food Trays [1, 5].	ASTM E–162	$I_s \leq 35$
		ASTM E–662	D_s (1.5)≤100; D_s (4.0)≤200
	Seat Upholstery, Mattress Ticking and Covers, Curtains [1, 2, 3, 5].	FAR 25.853 (Vertical)	Flame Time≤10 sec; Burn length≤6 inch
		ASTM E–662	D_s (4.0)≤250 coated; D_s (4.0)≤100 uncoated
Panels	Wall [1, 5, 10]	ASTM E–162	$I_s \leq 35$
		ASTM E–662	D_s (1.5)≤100; D_s (4.0)≤200
	Ceiling [1, 5, 10]	ASTM E–162	$I_s \leq 35$
		ASTM E–662	D_s (1.5)≤100; D_s (4.0)≤200
	Partition, Tables and Shelves [1, 5]	ASTM E–162	$I_s \leq 35$
		ASTM E–662	D_s (1.5)≤100; D_s (4.0)≤200
	Windscreen [2, 5]	ASTM E–162	$I_s \leq 35$
		ASTM E–662	D_s (1.5)≤100; D_s (4.0)≤200
	HVAC Ducting [1, 5]	ASTM E–162	$I_s \leq 35$
		ASTM E–662	D_s (1.5)≤100
	Window [4, 5]	ASTM E–162	$I_s \leq 100$
		ASTM E–662	D_s (1.5)≤100; D_s (4.0)≤200
	Light Diffuser [5]	ASTM E–162	$I_s \leq 100$
		ASTM E–662	D_s (1.5)≤100; D_s (4.0)≤200
Flooring	Structural [6]	ASTM E–119	Pass
	Covering [7, 10]	ASTM E–648	CRF≥0.5 w/cm^2
		ASTM E–662	D_s (1.5)≤100; D_s (4.0)≤200
Insulation	Thermal [1, 2, 5]	ASTM E–162	$I_s \leq 25$
		ASTM E–662	D_s (1.5)≤100
	Acoustic [1, 2, 5]	ASTM E–162	$I_s \leq 25$
		ASTM E–662	D_s (1.5)≤100
Elastomers	Window Gaskets, Door Nosing, Diaphragms, Roof Mat [1].	ASTM C–542	Pass
		ASTM E–662	D_s (1.5)≤100; D_s (4.0)≤200

Category	Function of material	Test procedure	Performance criteria
Exterior Plastic Components	End Cap, Roof Housings [1, 5]	ASTM E–162	$I_s \leq 35$
		ASTM E–662	D_s (1.5)≤100; D_s (4.0)≤200
Component Box Covers	Interior, Exterior Boxes [1, 3, 5]	ASTM E–162	$I_s \leq 35$
		ASTM E–662	D_s (1.5)≤100; D_s (4.0)≤200

[1] Materials tested for surface flammability must not exhibit any flaming running or flaming dripping.
[2] The surface flammability and smoke emission characteristics must be demonstrated to be permanent by washing, if appropriate, according to FED–STD–191A Textile Test Method 5830.
[3] The surface flammability and smoke emission characteristics must be demonstrated to be permanent by dry-cleaning, if appropriate, according to ASTM–D–2724. Materials that cannot be washed or dry cleaned must be so labeled and meet the applicable performance criteria after being cleaned as recommended by the manufacturer.
[4] For double window glazing, only the interior glazing must meet the materials requirements specified herein; the exterior need not meet those requirements.
[5] ASTM E–662 maximum test limits for smoke emission (specified optical density) must be measured in either the flaming or non-flaming mode, depending on which mode generates the most smoke.
[6] Structural flooring assemblies must meet the performance criteria during a nominal test period determined by the railroad property. The nominal test period must be twice the maximum expected period of time, under normal circumstances, for a vehicle to come to a complete, safe stop from maximum speed, plus the time necessary to evacuate all passengers from a vehicle to a safe area. The nominal test period must not be less than 15 minutes. Only one specimen need be tested. A proportional reduction may be made in the dimensions of the specimen provided that it represents a true test of its ability to perform as a barrier against under-car fires. Penetrations (ducts, etc.) must be designed against acting as passageways for fire and smoke.
[7] Flooring covering must be tested in accordance with ASTM E–648 with its padding, if the padding is used in actual installation.
[8] Arm rests, if foamed plastic, are tested as cushions and, if hard material, are tested as a seat back shroud.
[9] Testing is performed without upholstery.
[10] Carpeting on walls and ceilings is to be considered wall and ceiling panel materials, respectively.

(c) *The sources of test procedures specified in the table are as follows:*

(1) Leaching Resistance of Cloth, FED–STD–191A–Textile Test Method 5830. (Available from: General Services Administration Specifications Division, Building 197 Washington Navy Yard, Washington, D.C. 20407.)

(2) Federal Aviation Administration Vertical Burn Test, FAR–25.853.

(3) American Society for Testing Materials (ASTM):

(i) Specification for Gaskets, ASTM C–542.

(ii) Surface Flammability of Flexible Cellular Materials Using a Radiant Heat Energy Source, ASTM D–3675.

(iii) Fire Tests of Building Construction and Materials, ASTM E–119.

(iv) Surface Flammability of Materials Using a Radiant Heat Energy Source, ASTM E–162.

(v) Bonded and Laminated Apparel Fabrics, ASTM D–2724.

(vi) Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source, ASTM E–648.

(vii) Specific Optical Density of Smoke Generated by Solid Materials, ASTM E–662. (Available from: American Society for Testing Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.)

Appendix C to Part 243—Railroad Safety—Critical Operating Rules [Reserved]

Issued in Washington, D.C. this 24th day of November, 1997.

Jolene M. Molitoris,

Federal Railroad Administrator.

[FR Doc. 97–31457 Filed 12–11–97; 8:45 am]

BILLING CODE 4910–06–P