

**DEPARTMENT OF TRANSPORTATION****Federal Railroad Administration****49 CFR Part 228**

[Docket No. FRA-2009-0043, Notice No. 2]

RIN 2130-AC15

**Hours of Service of Railroad Employees; Substantive Regulations for Train Employees Providing Commuter and Intercity Rail Passenger Transportation; Conforming Amendments to Recordkeeping Requirements**

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

**ACTION:** Final rule.

**SUMMARY:** FRA is amending its hours of service recordkeeping regulations, to add substantive hours of service regulations, including maximum on-duty periods, minimum off-duty periods, and other limitations, for train employees (e.g., locomotive engineers and conductors) providing commuter and intercity rail passenger transportation. The new substantive regulations require that railroads employing such train employees analyze and mitigate the risks for fatigue in the schedules worked by these train employees, and that the railroads submit to FRA for its approval the relevant schedules and fatigue mitigation plans. This final rule also makes corresponding changes to FRA's hours of service recordkeeping regulation, to require railroads to keep hours of service records and report excess service to FRA in a manner consistent with the new substantive requirements. This regulation is authorized by the Rail Safety Improvement Act of 2008.

**DATES:** *Effective Date:* This final rule is effective October 15, 2011. Petitions for reconsideration must be received on or before October 5, 2011.

**ADDRESSES:** *Petitions for reconsideration:* Any petitions for reconsideration related to Docket No. FRA-2009-0043, Notice No. 2, may be submitted by any of the following methods:

- *Web site:* The Federal eRulemaking Portal, <http://www.regulations.gov>. Follow the Web site's online instructions for submitting comments.
- *Fax:* 202-493-2251.
- *Mail:* Docket Management Facility, U.S. Department of Transportation, 1200 New Jersey Avenue, SE., W12-140, Washington, DC 20590.

- *Hand Delivery:* Room W12-140 on the Ground level of the West Building, 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m. Monday through Friday, except Federal holidays.

*Instructions:* All submissions must include the agency name and docket number or Regulatory Identification Number (RIN) for this rulemaking. Note that all petitions received will be posted without change to <http://www.regulations.gov> including any personal information. Please see the Privacy Act heading in the SUPPLEMENTARY INFORMATION section of this document for Privacy Act information related to any submitted petitions, comments, or materials.

*Docket:* For access to the docket to read background documents or comments received, go to <http://www.regulations.gov> or to Room W12-140 on the Ground level of the West Building, 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m. Monday through Friday, except Federal holidays.

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**I. Executive Summary**

Having considered public comments in response to FRA's March 22, 2011 proposed rule in this rulemaking (76 FR 16200), FRA issues this final rule establishing substantive hours of service regulations for train employees who provide commuter or intercity rail passenger transportation (passenger train employees).

Federal laws governing railroad employees' hours of service date back to 1907 with the enactment of the Hours of Service Act (Pub. L. 59-274, 34 Stat. 1415), and FRA, under delegations from the Secretary of Transportation (Secretary), has long administered statutory hours of service requirements for the three groups of employees now covered under the statute, namely employees performing the functions of train employees, signal employees, and dispatching service employees, as those terms are defined at 49 U.S.C. 21101. See 49 CFR 1.49; 49 U.S.C. 21101-21109, 21303.

These requirements have been amended several times over the years, most recently in the Rail Safety Improvement Act of 2008 (Pub. L. 110-432, Div. A) (RSIA). The RSIA substantially amended the requirements of 49 U.S.C. 21103, applicable to train employees, defined as "individual[s] engaged in or connected with the movement of a train, including a hostler." 49 U.S.C. 21101(5). However, the RSIA also granted the Secretary

authority to prescribe regulations governing the hours of service of passenger train employees. 49 U.S.C. 21109(b)–(c). As will be discussed below, FRA interprets commuter or intercity rail passenger transportation to include rail passenger transportation by tourist, scenic, excursion, and historic railroads. The RSIA provided that this particular subset of train employees (*i.e.*, passenger train employees) would continue to be governed by 49 U.S.C. 21103 as it existed prior to the enactment of the RSIA (old Section 21103), until the earlier of, the effective date of final regulations prescribed by the Secretary, or the date that is three

years from the date of enactment of the RSIA. 49 U.S.C. 21102(c). In the absence of a final rule in effect governing this group of train employees, the requirements of the RSIA currently in effect for other train employees (new Section 21103) would go into effect for passenger train employees on October 16, 2011. 49 U.S.C. 21102(c).

As will be discussed further below, FRA reviewed the applicable fatigue science, and sought input from FRA’s Railroad Safety Advisory Committee (RSAC). Based on FRA’s understanding of current fatigue science, and information received through RSAC, FRA determined that the requirements imposed on train employees by the

RSIA were not appropriate for passenger train employees. The chart below compares and contrasts (1) the hours of service requirements in 49 U.S.C. 21103 as amended by the RSIA, (2) the statutory hours of service requirements applicable to all train employees immediately prior to the RSIA, which are currently still applicable to passenger train employees until the effective date of this final rule, and (3) the requirements of this final rule that applies to passenger train employees from the effective date of the rule, with the compliance date of some provisions delayed for a period of 180 or 545 days from the effective date.

	Freight train employee statute	Train employee statutory provisions immediately prior to the RSIA and currently applicable only to passenger train employees	FRA passenger train employee final rule
Citation .....	49 U.S.C. 21103 (as amended by the RSIA effective July 16, 2009) (new section 21103) (Applies to train employees on freight railroads. Will apply to train employees on commuter and intercity passenger railroads if no regulations are in effect by October 16, 2011).	49 U.S.C. 21103 as it existed prior to the October 16, 2008, enactment of the RSIA (old section 21103) (Train employees providing commuter and intercity rail passenger transportation are currently covered by these provisions pursuant to 49 U.S.C. 21102(c).).	49 CFR part 228, subpart F.
Use of Fatigue Science .....	None .....	None .....	This final rule requires passenger train employees’ work schedules to be analyzed under an FRA-approved validated bi-mathematical fatigue model such as the specified version of the Fatigue Avoidance Scheduling Tool™ or Fatigue Audit InterDyne™, with the exception of certain schedules (completely within the hours of 4 a.m. and 8 p.m., or nested within other schedules that have been previously modeled and shown to present an acceptable level of risk for fatigue, and otherwise in compliance with the limitations in the regulation) deemed as categorically presenting an acceptable level of risk for fatigue that does not violate the defined fatigue threshold. Analysis must be complete 180 days from the effective date of the final rule, except that tourist, scenic, historic and excursion railroads have 545 days from the effective date of the final rule to complete their analysis.
Limitations on Time on Duty in a Single Tour.	12 consecutive hours of time on duty or 12 nonconsecutive hours on duty if broken by an interim release of at least 4 consecutive hours uninterrupted by communication from the railroad likely to disturb rest, in a 24-hour period that begins at the beginning of the duty tour.	12 consecutive hours of time on duty or 12 nonconsecutive hours on duty if broken by an interim release of at least 4 consecutive hours, in a 24-hour period that begins at the beginning of the duty tour.	12 consecutive hours of time on duty or 12 nonconsecutive hours on duty if broken by an interim release of at least 4 consecutive hours, in a 24-hour period that begins at the beginning of the duty tour. This is effective on the effective date of the final rule.

	Freight train employee statute	Train employee statutory provisions immediately prior to the RSIA and currently applicable only to passenger train employees	FRA passenger train employee final rule
Limitations on Consecutive Duty Tours or Total Duty Tours in Set Period.	May not be on duty as a train employee after initiating an on-duty period on six consecutive days without receiving 48 consecutive hours off duty free from any service for any railroad carrier at the employee's home terminal. Employees are permitted to initiate a seventh consecutive day when the employee ends the sixth consecutive day at the away-from-home terminal, as part of a pilot project, or as part of a grandfathered collectively bargained arrangement. Employees performing service on this additional day must receive 72 consecutive hours free from any service for any railroad carrier at their home terminal before going on duty again as a train employee.	None .....	If employee initiates an on-duty period each day for six consecutive calendar days including at least one "Type 2" assignment (generally, those including time on duty between 8 p.m. and 4 a.m.) employee must have 24 consecutive hours off duty at the employee's home terminal. If an employee initiates an on-duty period on 13 or more calendar days of a period of 14 consecutive days then must have 2 consecutive calendar days without initiating an on-duty period at the employee's home terminal. Employees may be permitted to perform service on an additional day to facilitate their return to their home terminal. These limitations are effective 180 days from the effective date of the final rule, except that they become effective for tourist, scenic, historic and excursion railroads 545 days from the effective date of the final rule.
Cumulative Limits on Time on Duty	Limited to 276 hours of time on duty, in deadhead transportation to a point of final release, or any other mandatory activity for the railroad carrier.  Limited to 30 hours of time spent on duty and waiting for or in deadhead transportation to a point of final release after reaching 12 hours of time on duty and waiting for or in deadhead transportation to a point of final release.	None .....	None.
Mandatory Off-Duty Periods .....	10 consecutive hours of time off duty free from any communication from the railroad likely to disturb rest, with additional time off duty if on-duty time plus time in or awaiting deadhead transportation to final release exceeds 12 hours.  48 consecutive hours off duty, free from any service for any railroad carrier, after initiating an on-duty period for 6 consecutive days. If 7 consecutive days are permitted, mandatory off-duty period extended to 72 consecutive hours.	8 consecutive hours (10 consecutive hours if time on duty reaches 12 consecutive hours).	8 consecutive hours (10 consecutive hours if time on duty reaches 12 consecutive hours). This is effective on the effective date of the final rule.

	Freight train employee statute	Train employee statutory provisions immediately prior to the RSIA and currently applicable only to passenger train employees	FRA passenger train employee final rule
Specific Rules for Nighttime Operations.	None .....	None .....	Schedules that include any time on duty between 8 p.m. and 4 a.m. must be analyzed using a validated biomathematical model of human performance and fatigue approved by FRA. Schedules with excess risk of fatigue must be mitigated or supported by a determination that mitigation is not possible and the schedule is operationally necessary and approved by FRA. Analysis must be complete and required submissions must be made 180 days from the effective date of the final rule, except that tourist, scenic, historic and excursion railroads have 545 days from the effective date of the final rule to complete their analysis and any required submission.
Specific Rules for Unscheduled Assignments.	None .....	None .....	The potential for fatigue presented by unscheduled work assignments must be mitigated as part of a railroad's FRA-approved fatigue mitigation plan. Plans must be submitted for FRA review and approval along with the associated schedules requiring mitigation, 180 days from the effective date of the final rule, except that tourist, scenic, historic and excursion railroads have 545 days from the effective date of the final rule to complete their analysis and any required submission.
Recordkeeping requirements .....	Record for each duty tour must contain 15 elements specified in 49 CFR 228.11(b).	Record for each duty tour must contain the first 12 elements specified in 49 CFR 228.11(b), as items 13 through 16 relate to RSIA requirements not applicable to train employees providing commuter or intercity rail passenger transportation.	Record for each duty tour must contain the first 12 elements specified in 49 CFR 228.11(b). Record must also indicate the date on which the series of at most 14 consecutive calendar days begins, as well as the date of any calendar day on which the employee did not initiate an on-duty period during the series. These recordkeeping requirements go into effect at the same time as the substantive provisions being tracked by them, which is 180 days from the effective date of the final rule, except that those provisions go into effect for tourist, scenic, historic and excursion railroads 545 days from the effective date of the final rule, as would the associated recordkeeping requirements.

	Freight train employee statute	Train employee statutory provisions immediately prior to the RSIA and currently applicable only to passenger train employees	FRA passenger train employee final rule
Excess Service Reporting Requirements.	Requires reporting of any of 10 different ways in which hours of service limitations may be exceeded.	Requires reporting of any of 4 different ways in which hours of service limitations may be exceeded.	Requires reporting of any of 8 different ways in which hours of service limitations may be exceeded (reflecting various ways of violating new consecutive-days requirements). These recordkeeping requirements go into effect at the same time as the substantive provisions being tracked by them, which is 180 days from the effective date of the final rule, except that those provisions go into effect for tourist, scenic, historic and excursion railroads 545 days from the effective date of the final rule, as would the associated recordkeeping requirements.

This rule mirrors the existing limitations set by old section 21103 on the maximum number of hours in a duty tour and minimum number of hours in a statutory off-duty period. Additional limitations are added on the number of consecutive days or total days within a prescribed period that a passenger train employee may work, depending on the time of day of the assignment. This differentiation takes into account the fact that work during nighttime hours may present a greater risk for fatigue. (For ease of reference, these provisions of this regulation are collectively referred to as “consecutive-days limitations”). Conforming changes are also made to the recordkeeping and reporting requirements to accommodate the consecutive-days limitations.

The limitations on maximum hours worked, minimum hours of rest, and consecutive days or total days within a prescribed period provide a “floor,” a minimum set of limitations, within which the rule requires railroads subject to this rule to analyze the work schedules of their passenger train employees using a validated and calibrated biomathematical model of human performance and fatigue, and to mitigate any fatigue identified that violates the fatigue threshold for the model.<sup>1</sup> The fatigue threshold is a level of fatigue at which safety may be

<sup>1</sup> In the NPRM, FRA referred to “exceeding” the fatigue threshold. The two currently approved models differ in how their thresholds are expressed, with FAST requiring an effectiveness score greater than or equal to its threshold, and FAID requiring a score less than or equal to its threshold, so FRA realized there could be confusion as to what it meant to “exceed” the threshold depending which model is being used, while it is equally applicable to say the threshold is violated, however that threshold is expressed.

compromised. As will be discussed below, especially under Section III.A, there are two models that currently have been validated and calibrated using data from freight railroads, that have been approved by FRA to be used for the analysis required by this rule. The rule also allows for the development of new models. It discusses procedures for validating and calibrating a model, and provides that evidence of a new model’s validation and calibration may be submitted to FRA for approval.

The rule defines as a “Type 1 assignment” any assignment that requires an employee to report for duty no earlier than 4 a.m. and be released from duty no later than 8 p.m. Based on analysis conducted during the formulation of this rule, such assignments are subjected to a less restrictive consecutive-days limitation, and such schedules are deemed to present an acceptable level of fatigue when otherwise in compliance with the limitations established in this rule. Thus, these schedules are not required to be submitted to FRA for approval, nor is the application of fatigue mitigation tools to these schedules required.

A “Type 2 assignment” is any assignment having any period of time during a calendar day before 4 a.m. or after 8 p.m. Within 180 days of the effective date of this regulation, railroads are required to analyze the fatigue risk of assignments that they make to their passenger train employees using an FRA-approved fatigue model. If the analysis shows that a schedule does not violate the fatigue threshold, and the schedule is otherwise in compliance with the limitations of the rule and does not require the employee to be on duty for any period of time between midnight

and 4 a.m., the rule allows that schedule to be treated as a Type 1 assignment for the purposes of the consecutive-days limitation, and there is no requirement to submit the schedule to FRA or to mitigate fatigue in that schedule. However, for those schedules that the analysis indicates have a level of risk for fatigue violating the fatigue threshold, the railroad is required to mitigate the fatigue. Railroads are also required to complete their analysis and submit any schedules with a risk violating the fatigue threshold, and the mitigation tools the railroad applied to mitigate the fatigue risk in those schedules to FRA for approval. In addition, any schedule, the fatigue risk of which could not be sufficiently mitigated so that it no longer violates the fatigue threshold, but which the railroad deems operationally necessary, must also be submitted for FRA approval, along with a declaration of operational necessity for FRA approval.

The rule also requires railroads to submit any schedule changes that result in a schedule that would have been required to be submitted if it were an original schedule, unless the new schedule is the same as another schedule that has previously been analyzed and approved.

Within 120 days of any railroad submission, FRA will notify the railroad of any exceptions taken to its submission and the time frame within which the railroad must correct the exceptions. While the rule requires FRA approval of the schedules and fatigue mitigation tools, FRA expects that it will work with a railroad to make necessary modifications to schedules or mitigation tools to minimize fatigue to the greatest extent possible.

Railroads are required to consult with affected employees and applicable labor organizations regarding the analysis of work schedules, fatigue mitigation tools, and submissions to FRA. Should the employees or labor organizations disagree with the railroad, they have the opportunity to file a statement for FRA's consideration in reviewing the submission and determining whether to approve it.

Finally, the rule requires initial fatigue training, addressing a list of subjects, and refresher training every three years. This training may be combined with other training that the

railroads are providing to their employees.

FRA analyzed the economic impacts of this rule against two baselines. One is a "status quo" baseline that reflects present conditions (*i.e.*, primarily, the statutory hours of service provisions (specifically, old section 21103) and, secondarily, the hours of service recordkeeping and reporting regulations) that have applied, and will continue to apply to passenger railroads, with respect to their train employees, until this final rule becomes effective. The other baseline is a "no regulatory action" baseline that reflects what

would have happened in the absence of this rulemaking (*i.e.*, the freight hours of service laws would have been applied to passenger railroads with respect to their train employees).

With respect to the "no regulatory action" baseline, this rule represents a substantially more cost-effective alternative for achieving the goal of identifying and mitigating unacceptable fatigue risk levels and thus ensuring the safety of passenger train operations. The following table presents the costs of the final rule compared to the "no regulatory action" alternative.

Cost description	No regulatory action alternative—freight HSL			Final rule		
	Undiscounted	PV@7%	PV@3%	Undiscounted	PV@7%	PV@3%
New Engineer Training, Initial (20% New Hires).	\$31,237,549	\$26,299,825	\$28,705,081	0	0	0.
New Engineer Training, Refresher (20% New Hires).	\$4,599,050	\$2,278,431	\$3,327,802	0	0	0.
New Conductor Training, Initial (20% New Hires).	\$30,847,974	\$25,942,971	\$28,330,908	0	0	0.
New Conductor Training, Refresher (20% New Hires).	\$8,636,745	\$4,278,146	\$6,249,071	0	0	0.
Work Schedule Analysis (No-Reg Action)/Initial Analysis of Work Schedules + Follow-up Analysis and Fatigue Mitigation Plan Review (FRA rule).	\$189,723	\$177,312	\$184,198	(\$126,482 + \$240,316) = \$366,799.	(\$118,208 + \$122,175) = \$240,382.	(\$122,798 + \$175,894) = \$298,692.
Indirect Determination that Type 2 Schedules are Acceptable ("Nested" Schedules Reduction).				-\$91,700	-\$60,096	-\$74,673.
Biomathematical Model of Fatigue Software (Training on model use).	0	0	0	\$417,500 (includes \$192,500 for training on model use).	\$268,723 (includes \$119,175 for training on model use).	\$337,240 (includes \$152,843 for training on model use).
Use of Rest Facilities	0	0	0	\$30,988	\$28,961	\$30,086.
Fatigue Training	0	0	0	\$1,312,920	\$782,634	\$1,025,158.
Fatigue Training (Tourist & Excursion)	0	0	0	\$20,000	\$12,000	\$16,000.
<b>Total (rounded)</b>	<b>\$75,511,041</b>	<b>\$58,976,685</b>	<b>\$66,797,059</b>	<b>\$2,056,507</b>	<b>\$1,272,605</b>	<b>\$1,632,502.</b>

FRA estimates that the recordkeeping and reporting costs per employee record under the no-regulatory action alternative and this rule will be practically the same.

The estimated accident reduction benefits of the rule relative to the statutory hours of service requirements currently in place include prevented accident damages, injuries, and fatalities. The table below presents the

estimates for the 20-year period of analysis for the benefits of this rule, which FRA estimates to be the same as the benefits of the no-regulatory action alternative.

INTERCITY PASSENGER, COMMUTER, TOURIST AND EXCURSION RAILROADS

[All track types]

Accident reduction benefits	VSL = \$6 M undiscounted benefits	VSL = \$6 M discounted PV@7%	VSL = \$6 M discounted PV@3%
Property Damage	\$685,915	\$348,713	\$502,039
Injuries	94,861	48,227	69,431
Fatalities	407,634	207,237	298,358
<b>Total (rounded)</b>	<b>1,188,410</b>	<b>604,177</b>	<b>869,828</b>

FRA does not expect that the overall number of casualties and property damages attributable to the rule will differ from those that would be prevented under the statutory freight hours of service requirements. However, as noted above, there are significant

additional potential safety enhancement benefits that may result from the FRA approach. FRA believes that the safety of passenger train operations will be enhanced under this rule as a result of subjecting every crew assignment to a biomathematical analysis either via the

analyses conducted while developing the RSAC recommendation or the analyses that will be performed by railroads in the years ahead. The information that railroads will have as a result of this rule regarding fatigue, its causes and symptoms, and its impact on

safety, will allow them to make crew assignments that take this into consideration and minimize fatigue beyond the requirements of this rule. Based on its literature review, FRA is confident that, overall, fatigue awareness training will positively contribute to a stronger safety culture that will extend beyond railroad operations, which is a benefit that extends beyond what would result under the freight hours of service law. For instance, safety and health benefits may accrue from the transfer of knowledge to employees, their families, friends, and others with whom they may share the fatigue knowledge that they acquire from the required fatigue awareness training programs. This fatigue awareness may result in more optimal decisions regarding rest and sleep, leading to less fatigue and improved safety outside of passenger train operations during the course of daily activities that may also include the operation of motor vehicles or other heavy machinery. This fatigue awareness may also result in proper identification and treatment, if necessary, of fatigue symptoms. Although FRA has not identified research on the effectiveness of the specific types of fatigue training programs required under this rule, many studies have indicated health training programs in general produce meaningful behavioral performance improvements.

With respect to the “status-quo” baseline, this rule imposes costs that are higher than the safety benefits FRA was able to quantify. Costs compared to the “status quo” baseline total \$2.1 million (undiscounted), \$1.3 million (PV, 7 percent), and \$1.6 million (PV, 3 percent). Quantified benefits compared to the “status quo” baseline total \$1.2 million (undiscounted), \$0.6 million (PV, 7 percent), and \$0.9 million (PV, 3 percent). However, there are additional benefits that have not been quantified, but should be considered when comparing the overall costs and benefits. As when compared to the “no-regulatory action” baseline, FRA believes that the safety of passenger train operations will be enhanced under this rule as a result of a stronger safety culture that may extend beyond railroad operations, which would be a benefit that extends beyond what would result under the freight hours of service law. Separately, accident avoidance will result in fewer unplanned delays to passengers and freight commodities impacted by passenger train accidents and incidents that result in blocking one or more tracks for prolonged periods. These costs can be very substantial

given the need to investigate accidents and often clear wreckage. It is not unreasonable to expect that the unquantified benefits will raise the benefits to a level quite comparable to the costs. FRA also believes that the unquantified benefits coupled with the quantified safety benefits are comparable to the costs associated with meeting the intent of the statutory mandate.

After careful consideration of comments received in response to the NPRM, FRA has made modifications to its proposal in the final rule that reduce the overall burden by approximately \$100,000 due in equal part to flexibilities added by extending the deadline for fatigue awareness training and the expanded ability to rely on the findings of analyses conducted for other assignments.

## II. Statutory Background and History

Federal laws governing railroad employees' hours of service date back to 1907 with the enactment of the Hours of Service Act. These laws, codified as amended primarily at 49 U.S.C. 21101–21109, are intended to promote safe railroad operations by limiting the hours of service of certain railroad employees and ensuring that they receive adequate opportunities for rest in the course of performing their duties. Public Law 103–272 (1994). The Secretary is charged with the administration of those laws, collectively referred to in this document as the hours of service laws (HSL). This function has been delegated to the FRA Administrator. 49 U.S.C. 103(c); 49 CFR 1.49(d).

Congress substantially amended the HSL on three occasions. The first significant amendments occurred in 1969. Public Law 91–169, 83 Stat. 463. The 1969 amendments reduced the maximum time on duty for train employees<sup>2</sup> from 16 hours to 14 hours effective immediately, with a further

<sup>2</sup> A “train employee” is defined at 49 U.S.C. 21101(5) and 49 CFR 228.5 as an individual engaged in or connected with the movement of a train, including a hostler. FRA also interpreted this statutory term in published interpretations in 49 CFR part 228, appendix A, providing: “Train or engine service refers to the actual assembling or operation of trains. Employees who perform this type of service commonly include locomotive engineers, firemen, conductors, trainmen, switchmen, switchtenders (unless their duties come under the provisions of section 3 [49 U.S.C. 21105]) and hostlers.” Other employees, such as food service providers or sleeping car attendants, who may work on passenger trains, but have no responsibility for assembling or operating the train, are not within the definition of a train employee, and are, as such, not generally covered by this rule, or any other hours of service limitations, but they would be covered if they performed functions related to assembling or operating the train, regardless of the employee’s job title.

reduction to 12 hours automatically taking effect two years later. Congress also established provisions for determining, in the case of a train employee, whether a period of time is to be counted as time on duty. 49 U.S.C. 21103(b). In so doing, Congress also addressed the issue of deadhead transportation<sup>3</sup> time, providing that “[t]ime spent in deadhead transportation to a duty assignment” is counted as time on duty. Although time spent in deadhead transportation from a duty assignment to the point of final release is not included within any of the categories of time on duty, Congress further provided that it shall be counted as neither time on duty nor time off duty. 49 U.S.C. 21103(b)(4). This provision effectively created a third category of time, known commonly as “limbo time.”

In 1976, Congress again amended the HSL in several important respects. Most significantly, Congress expanded the coverage of the laws, by including hostlers within the definition of employees now termed “train employees,” and adding the section providing hours of service requirements for “signal employees,” now codified at 49 U.S.C. 21104. Congress also added a provision that prohibited a railroad from providing sleeping quarters that are not free from interruptions of rest caused by noise under the control of the railroad, and that are not clean, safe, and sanitary, and prohibited beginning construction or reconstruction of sleeping quarters in an area or in the immediate vicinity of an area in which humping or switching operations are performed after July 7, 1996. See Public Law 94–348, 90 Stat. 818 (1976).

Section 108 of the RSIA also amended the HSL in a number of significant ways, most of which became effective July 16, 2009. See Section 108 of Public Law 110–432, Div. A, and FRA Interim Statement of Agency Policy and Interpretation at 74 FR 30665 (June 26, 2009). The RSIA established a limit of 276 hours per calendar month for train employees on service performed for a railroad and on time spent in or waiting for deadhead transportation to a point of final release, increased the quantity of the statutory minimum off-duty period after being on duty for 12 hours in broken service from 8 hours of rest to 10 hours of rest, prohibited communication with train or signal employees during certain minimum statutory rest periods, and established mandatory time off duty

<sup>3</sup> “Deadheading” is defined at 49 CFR 228.5 as the physical relocation of a train employee from one point to another as a result of a railroad-issued verbal or written directive.

for train employees of 48 hours after initiating an on-duty period on six consecutive days, or 72 hours after initiating an on-duty period on seven consecutive days. 49 U.S.C. 21103–21104. The RSIA also revised the definition of “signal employee” to include contractors who perform the work of a signal employee within the scope of the statute. 49 U.S.C. 21101(4).

However, Section 108(d) of the RSIA, which became effective on October 16, 2008, provided that the requirements described above for train employees would not go into effect on July 16, 2009, for train employees when providing commuter or intercity rail passenger transportation. 49 U.S.C. 21102(c). Section 108(d) further provided that these train employees, who provide commuter or intercity passenger rail service, would continue to be governed by the old HSL (as they existed immediately prior to the enactment of the RSIA, at 49 U.S.C. 21103 prior to its 2008 amendment), until the effective date of regulations promulgated by the Secretary. 49 U.S.C. 21102(c). However, if no new regulations are in effect before October 16, 2011, the provisions of Section 108(b), which applied to train employees, would be extended to these employees at that time. *Id.*

Section 108(e) of the RSIA specifically provides the Secretary with the authority to issue hours of service rules and orders applicable to train employees engaged in commuter rail passenger transportation and intercity rail passenger transportation (as defined in 49 U.S.C. 24102), that may be different from the statute applied to other train employees. 49 U.S.C. 21109(b). Section 108(e) of the RSIA further provides that such regulations and orders may address railroad operating and scheduling practices, including unscheduled duty calls, communications during time off duty, and time spent waiting for deadhead transportation or in deadhead transportation from a duty assignment to the place of final release, that could affect employee fatigue and railroad safety. *Id.*

Section 108(e) of the RSIA also provides—

[i]n issuing regulations under subsection (a) the Secretary shall consider scientific and medical research related to fatigue and fatigue abatement, railroad scheduling and operating practices that improve safety or reduce employee fatigue, a railroad’s use of new or novel technology intended to reduce or eliminate human error, the variations in freight and passenger railroad scheduling practices and operating conditions, the variations in duties and operating conditions

for employees subject to this chapter, a railroad’s required or voluntary use of fatigue management plans covering employees subject to this chapter, and any other relevant factors.

49 U.S.C. 21109(c). Section 21109(a) of title 49 of the U.S. Code refers to other regulatory authority granted to FRA, as the Secretary’s delegate related to the HSL, which is not relevant to this rule. One of the goals of the present rulemaking is to identify and reduce unacceptable fatigue for the employees who will be covered by the final rule. Therefore, as will be described below, FRA has based these regulations on scientific research related to fatigue and fatigue abatement, as applied to railroad scheduling practices and operating conditions for train employees providing commuter and intercity rail passenger transportation. Section III below will describe the primary scientific foundation and support for the requirements contained in this rule. In addition, scientific considerations will also be addressed in discussion of various elements of the rule, including in the discussion of specific provisions in Section VI, Section-by-Section Analysis, below.

### III. Scientific Background

Most mammals, including human beings, have an approximately 24-hour sleep-wake cycle known as a “circadian rhythm.” Rapid changes in the circadian pattern of sleep and wakefulness disrupt many physiological functions such as hormone releases, digestion, and temperature regulation. Physiological functions can be affected, performance may be impaired, and a general feeling of fatigue and debility may occur until realignment is achieved. Jet lag, a commonly experienced syndrome when flying across several time zones, especially when flying east, is similar to the experience of individuals working schedules with abrupt changes in the timing of work and subsequent sleep.

Fatigue risk in an industry that operates 24 hours a day and 7 days a week is not just dependent on how many hours per day a person is permitted to work, or the amount of time that a person is required to be off duty between periods of work. Other significant factors in the level of fatigue risk include the time of day that an employee works, the number of consecutive hours worked, direction and rate of schedule rotation, and the number of consecutive days that an employee works. In addition, the quantity and quality of sleep vary with the time of day and environmental conditions in which sleep occurs. Furthermore, there are significant

individual factors such as sleep disorders, age and time of day (*e.g.*, morning or evening that may affect one’s fatigue and alertness. Because of natural circadian rhythms and environmental and social factors, most people are able to achieve the best quality and most restful sleep at night.

The railroad industry by necessity is a continuous operation, 24 hours a day, seven days a week, 365 days a year, including both day and night work. Consequently, fatigue risk mitigation is a very important strategy of a railroad safety management system. In fact, the design and operation of the work schedule system are perhaps the most essential elements of that fatigue risk management strategy. While the purpose of any work schedule system is to provide the organization with a methodical means of organizing the timing and structure of work to maximize efficiency and productivity, seldom are these schedules designed to minimize the safety risks associated with work schedules that are incompatible with human biological limitations, such as our circadian system. Because the railroad industry is a continuous service industry, and because both employees and the general public are exposed to the safety risks associated with railroad operations, researchers have long called for validated fatigue models to better identify and mitigate fatigue-related risks associated with work scheduling.<sup>4</sup>

The general purpose for a regulation requiring an industry to use a valid fatigue model is to impose a minimum standard for identifying and mitigating fatigue risk that otherwise might not occur without such a standard. These models take into account the complex interaction between human physiology and work times, something that would be very difficult to specify through other means. Use of fatigue modeling tools to evaluate work schedules, however, is just one aspect of mitigating fatigue risk in a larger system. While FRA intends to enforce the minimum standards in the regulatory text, including those related to fatigue models, it also hopes that the industry will go beyond compliance with this standard by using the models and other tools to assess and address fatigue risk across the system.<sup>5</sup>

For example, if a fatigue model were to identify a particular type of work

<sup>4</sup> See Pilcher and Copen, *Ergonomics*, 2000, Vol. 43, No. 5, 573–588.

<sup>5</sup> FRA notes that other provisions of the RSIA mandate issuance of regulations requiring certain railroads to implement railroad safety risk reduction programs and plans; one component of each plan is a fatigue management plan. See 49 U.S.C. 20156.



schedule that violates the model's fatigue threshold, and thus requires fatigue mitigation, the carrier may discover underlying systems issues and factors (e.g., inadequate rest facilities, etc.) that contribute to fatigue-related risks on not only that work schedule, but also on other less fatiguing schedules that do not violate the fatigue threshold. The use of fatigue modeling in this way, then, provides the organization with a method for systematically identifying and addressing the underlying system risks, as opposed to those risks only for a given work schedule. In going beyond compliance with the minimum standard, the organization also builds its organizational capacity for mitigating fatigue as a major safety risk factor across the system.

As previously mentioned, the statutory hours of service requirements currently in effect for train employees providing commuter and intercity rail passenger transportation establish a maximum on-duty time of 12 hours in a 24-hour period, and a minimum off-duty time of 8 hours in a 24-hour period, or 10 hours after a period of 12 consecutive hours on duty. Statutory requirements applicable to train employees on freight railroads, as revised by the RSIA, include a limitation on the number of consecutive days on which a train employee may initiate an on-duty period. However, the HSL for the railroad industry have never, up to the present day, differentiated in their requirements based on the time of day in which service is performed, or the time of day that a period is available for rest.

As will be discussed further below, FRA conducted two work/rest diary studies with train employees in freight and passenger operations. Data from these studies indicate that train employees get more sleep than the average U.S. adult. While 46 percent of U.S. adults get less than seven hours of sleep, only 35 percent of freight train employees and 41 percent of passenger train employees get less than seven hours of sleep. This amount of sleep results in a level of fatigue that increases accident risk by 21 to 39 percent.<sup>6</sup> Moreover, certain operational characteristics of commuter and intercity passenger service mitigate the fatigue associated with this amount of sleep loss relative to freight service. For example, many train employees on commuter and intercity passenger railroads work scheduled assignments, in which they begin and end their work day at approximately the same time

each day. These employees also usually begin and end their duty tour at the same location, meaning that they can go home at the end of their work day and sleep in their own beds. In addition, very few scheduled assignments on most railroads operate during late night hours, and many of them result in duty tours significantly shorter than the maximum hours that the employee would be allowed to remain or go on duty under the existing law or this regulation. Because these characteristics are more likely to allow for periods of rest that are consistent with normal circadian rhythms, they will provide better opportunities for rest, and less risk for fatigue. In addition, as will be discussed further below, two FRA work/rest diary studies demonstrate that levels of fatigue are not equivalent in freight and passenger operations (Work Schedules and Sleep Patterns of Railroad Train and Engine Service Workers <http://www.fra.dot.gov/downloads/Research/ord0922.pdf>) (which included data from a small number of train employees in passenger operations); Work Schedules and Sleep Patterns of Railroad Train and Engine Employees in Passenger Operations [http://www.fra.dot.gov/rpd/downloads/TR\\_Work\\_Schedules\\_and\\_Sleep\\_Patterns\\_final.pdf](http://www.fra.dot.gov/rpd/downloads/TR_Work_Schedules_and_Sleep_Patterns_final.pdf) (the diary study conducted to support this rulemaking).

For all of these reasons, FRA has determined that some of the specific limitations that Congress applied to train employees on freight railroads in the RSIA are not appropriate for train employees on commuter and intercity passenger railroads.

However, FRA also recognizes that some train employees covered by this rule experience a level of fatigue at which safety may be compromised. This is particularly true of those employees who do not work scheduled assignments and may not return home at the end of each duty tour, or who are required to perform service during late night hours, or to work duty tours of the maximum length allowed by existing requirements, with only the minimum required rest between duty tours. FRA has attempted, in this regulation, to specifically address those employees who are most at risk for fatigue, even when in compliance with specific hours of service limitations. As will be discussed below, research that resulted in the validation of fatigue models using data from freight railroads demonstrated that fatigue increases the risk of a human factors accident. In addition, as will be discussed below, diary data show the risk of fatigue in passenger operations. The risk must be measured

in order to be managed, and fatigue models allow for that measurement.

An effective proactive fatigue risk management program needs to balance the amount of work performed against when the work is performed, how long a work schedule is in effect in terms of hours in a day, consecutive days, and other variables. This regulation addresses fatigue risk by going beyond establishing limitations on the amount of time that an employee may work, and the minimum amount of time that an employee must be off duty between duty tours. It additionally requires the analysis of the fatigue risk in employee work schedules using a biomathematical model of performance and fatigue, identification of those schedules that present an unacceptable level of fatigue risk, and mitigation of the identified fatigue risk. In addition, the regulation establishes different requirements for schedules of employees who operate trains during the late night hours in which the fatigue risk is greatest. Thus, the rule will specifically address those schedules the characteristics of which present a risk for fatigue, even when otherwise in compliance with required maximum on-duty and minimum off-duty periods and other limitations. These risks would not be addressed by a regulation that simply established maximum on-duty and minimum off-duty periods, just as they are not addressed by the existing statutory requirements.

#### A. Validated and Calibrated Fatigue Models<sup>7</sup>

A biomathematical model of performance and fatigue that has been properly validated and calibrated predicts accident risk based on analysis of identified periods of wakefulness and periods available for sleep.

"Validation" of a biomathematical model of human performance and fatigue means determining that the output of the model actually measures human performance and fatigue. There are two dimensions to this validation. The first is that the model must be demonstrated to be consistent with currently established science in the area of human performance, sleep, and fatigue. The second part of the validation process involves determining that the model output has a statistically reliable relationship with the risk of a human factors accident caused by fatigue, and that the model output does

<sup>7</sup> For a discussion of existing models and their application, see Dean II, D.A., Fletcher, A., Hursh, S.R. and Klerman, E.B., *Developing Models of Neurobehavioral Performance for the "Real World,"* J. Biol. Rhythms 2007; 22; 246.

<sup>6</sup> See Hursh, et al. *infra* at footnote 7.

not have such a relationship with nonhuman factors accident risk.

In general, and for the purpose of compliance with this rule, a model will be validated if statistical analyses demonstrate the existence of a statistically significant relationship between the output of the model and the human factors accident risk ratio, and the absence of such a relationship between the output of the model and the non-human factors accident risk ratio. The presence of a statistically significant relationship is evaluated by way of the correlation coefficient ( $r$ ) with statistical significance requiring a  $p$ -value of less than 0.05. The first step is the selection of bin<sup>8</sup> edges that correspond to varying levels of fatigue, (e.g., the “not fatigued” bin and the “severely fatigued” bin). The “not fatigued” bin is determined by the output of the model when sleep occurs or can occur for 8 or more hours, without abrupt phase changes, between 10 p.m. and 10 a.m. This is similar to the amount of fatigue produced by the standard 9 a.m. to 5 p.m., Monday through Friday work week. The performance bin “severely fatigued” is determined by the output of the model when there is total sleep deprivation for 42.5 hours after waking at 7 a.m. This is similar to the amount of fatigue produced by a permanent night shift schedule with six consecutive 12-hour work periods followed by 1 day off. These two bins are the “anchor” bins for the validation procedure. Four additional bins, equally spaced between the anchor bins, accommodate the intermediate fatigue scores.

Calibration is, in general, the assignment of numerical values to represent aspects of empirical observations. In the case of human fatigue and performance, the calibration of a fatigue scale would start with the assignment of values to “not fatigued,” and the most fatigued condition might be described as “severely fatigued.” The calibration process starts during the validation process with the assignment of model output values to anchor bins for “not fatigued” and “severely fatigued.” The next step consists of determining the fatigue threshold. Given a scale for human fatigue and performance and a relationship between that scale and human factors accident risk, a final calibration point would be to determine the fatigue value at which fatigue becomes unacceptable because the increase in accident risk at that level

compromises safety. This is the fatigue threshold.<sup>9</sup>

The procedure for determining the fatigue threshold consists of several computations. First, the cumulative risk for the six fatigue score bins is determined for human factor and non-human factor accidents. Next, a 95-percent confidence interval is calculated for the cumulative risk in each bin. Finally, the fatigue score bin in which human factor cumulative risk exceeds both human factors Accident Risk Ratio = 1 and the mean non-human factors risk is determined. This is the fatigue threshold for the model.<sup>10</sup>

The accident risk is defined as an odds ratio, expressed as a percentage of accidents occurring when employees involved in the accident are within a given range of fatigue, divided by the percentage of time spent by the individual working in that given range of predicted fatigue. For example, if 20 percent of accidents occur when an employee is within a particular range of predicted fatigue, and 10 percent of an employee’s time in a given duty tour is spent within that range of predicted fatigue, then that specific range of predicted fatigue has doubled the accident risk.<sup>11</sup>

#### 1. Fatigue Avoidance Scheduling Tool™ Model

FRA-sponsored research resulted in the development of a Sleep, Activity, Fatigue, and Task Effectiveness (SAFTE) model and Fatigue Avoidance Scheduling Tool™ (FAST) that have been validated and calibrated using data from freight railroads. FAST is a biomathematical model of performance and fatigue that can be used to assess the risk of fatigue in work schedules and to plan schedules that ameliorate fatigue. The model takes into account the time of day when work occurs (circadian rhythm) and opportunities for sleep based on work schedules.<sup>12</sup>

<sup>9</sup> For the purposes of this regulation, the fatigue threshold is referred to as a level of fatigue at which safety may be compromised, in recognition of the fact that while it is possible to determine the level of fatigue expected to be produced by working a certain schedule, that is not necessarily the exact level of fatigue experienced by each individual employee working that schedule.

<sup>10</sup> A model may also be calibrated by reference to a model that has been previously validated and calibrated, as discussed in Section III.A.2, below.

<sup>11</sup> For more information on the proper procedures for validation and calibration of a biomathematical model of performance and fatigue, see Raslear, T.G., *Criteria and Procedures for Validating Biomathematical Models of Human Performance and Fatigue; Procedures for Analysis of Work Schedules*. (A copy of this document has been placed in the docket for this rulemaking.)

<sup>12</sup> For a description of the FAST model, see Hursh, S. R., Redmond, D. P., Johnson, M. L., Thorne, D. R., Belenky, G., Balkin, T. J., Storm, W.

The model validation used work histories from 400 human factors accidents and 1,000 non-human factors accidents on freight railroads. The model has not specifically been validated using passenger railroad accidents, because there were not enough such accidents in the relevant time period to obtain statistically significant results, and had the period of analysis been extended sufficiently to capture enough passenger railroad accidents, much of the needed work schedule data for the employees involved in those accidents would no longer be available. However, FAST measures fatigue and effectiveness, based on laboratory analysis of cognitive and sensory motor functions during sleep deprivation, which are not job specific. Furthermore, the tasks associated with freight and passenger train operations are actually highly similar. In addition, there was no statistically significant difference between the proportion of accidents in categories associated with fatigue, between freight and passenger railroads. For all of these reasons, FRA has determined that the model is valid for use in evaluating fatigue levels in passenger railroad schedules for the purposes of this rule. Indeed, the FAST model has been used by other entities, including the military and the airline industry.

FAST was used to calculate cognitive effectiveness (the inverse of fatigue) on a scale from 0 (worst) to 100 (best) using the 30-day work histories of locomotive engineers prior to the accidents and at the time of the accidents.<sup>13</sup> Cognitive effectiveness is a metric that tracks speed of performance on a simple reaction time test and is strongly related to overall response speed, vigilance, and the probability of lapses.

The analysis revealed a significant high correlation between reduced predicted crew effectiveness (as a result of increased fatigue) and the risk of a human factor accident for freight railroads. As was discussed above,

F., Miller, J. C., and Eddy, D. R. (2004). *Fatigue models for applied research in warfighting*. *Aviation, Space, and Environmental Medicine*, 75, A44–53.

<sup>13</sup> Hursh, S. R., Raslear, T. G., Kaye, A. S., and Fanzone, J. F. (2006). *Validation and calibration of a fatigue assessment tool for railroad work schedules, summary report* (Report No. DOT/FRA/ORD–06/21). Washington, DC: U.S. Department of Transportation.

<http://www.fra.dot.gov/downloads/Research/ord0621.pdf>; Hursh, S. R., Raslear, T. G., Kaye, A. S., and Fanzone, J. F. (2008). *Validation and calibration of a fatigue assessment tool for railroad work schedules, final report* (Report No. DOT/FRA/ORD–08/04). Washington, DC: U.S. Department of Transportation. <http://www.fra.dot.gov/downloads/Research/ord0804.pdf>.

<sup>8</sup> In statistics, a “bin” is a discrete, non-overlapping interval of a variable. Here, the variable is the level of fatigue.

although FAST was validated using freight railroad accidents, the cognitive and sensory motor functions it measures are not job specific, so the resulting determinations of effectiveness and accident risk are equally applicable to passenger railroads. There was no significant relationship between increased fatigue and non-human factor accidents. In addition, the data showed that there is a reliable relationship between the time of day of human factor accidents and the expected, normal circadian rhythm. The circadian pattern was not reliably present for non-human factor accidents. The risk of a human factor accident is increased by 20 percent by working during the hours from midnight to 3 a.m. *Id.*

The study showed that there is an elevated risk of human factors accidents at any effectiveness score below 90, and accident risk increased as effectiveness decreased. The risk of a human factors accident is increased by 21 percent at effectiveness scores at or below 70, which is a level of risk elevated beyond chance level, and greater than the mean risk of non-human factor accidents. Twenty-three percent of the freight accidents examined occurred when an employee involved was at or below an effectiveness score of 70. The study also found that cause codes associated with accidents that occurred at or below an effectiveness score of 70 showed an over-representation of the type of human factors accident that might be expected of a fatigued crew, such as passing a signal indicating stop, or exceeding the maximum authorized speed, which confirmed that the detected relationship between accident risk and predicted effectiveness is meaningful.

Other research, comparing the effects of alcohol and sleep deprivation on performance on a driving simulator, has also indicated that an effectiveness score of 70 is the rough equivalent of a 0.08 blood alcohol level, or the equivalent of being awake for 21 hours following an 8-hour sleep period the previous night.<sup>14</sup> However, direct comparisons between the performance effects of alcohol and fatigue must be made with caution. Some aspects of a complex task, such as driving an automobile simulator, show a high degree of congruence between the effects of alcohol and fatigue, while the

effects of alcohol and fatigue on other aspects of the same task are highly dissimilar. For instance, Arnedt *et al.* (2001) found that tracking, tracking variability, and speed variability were all similarly affected by alcohol and fatigue in a driving simulator. However, Arnedt *et al.* found that, while subjects drove faster after consuming alcohol, fatigue did not affect driving speed. In addition, alcohol produced a more rapid deterioration in performance in off-road events (incidents in which the simulated vehicle was driven off the road) than did fatigue. Thus, while it is clear that alcohol and fatigue can both cause deterioration in task performance, the effect of alcohol is often more severe and extensive.<sup>15</sup>

As a result of this analysis, a fatigue threshold (the fatigue level at which there is an unacceptable accident risk due to fatigue) of 70 was established for FAST.<sup>16</sup> Accordingly, an effectiveness score less than or equal to 70 violates that threshold for the purposes of this regulation.<sup>17</sup>

## 2. Fatigue Audit InterDyne™ Model<sup>18</sup>

Another biomathematical model of performance and fatigue that has recently been validated and calibrated is the Fatigue Audit InterDyne™ (FAID). FAID was validated and calibrated using the same accident data from freight railroads as FAST used.<sup>19</sup> For the same reasons described above with regard to FAST, FRA has determined that FAID is valid for use in evaluating fatigue levels in passenger railroad schedules for the purposes of this rule.

Analysis of the FAID scores resulted in a statistically significant correlation for human factor accidents and no statistically significant correlation for non-human factor accidents, which meant that FAID could be validated for freight railroads, and, as explained

above, FRA has determined that it is equally applicable to passenger railroads. The FAID model was validated with scores of 40 and 120, corresponding to “not fatigued” and “extremely fatigued.” FAID scores showed a statistically reliable relationship (*p*-value below .05) with the risk of a human factors accident but did not show such a relationship with other accident risk.<sup>20</sup>

However, in analyzing the FAID data for the purpose of calibration, none of the confidence intervals demonstrated a statistically significant increase in cumulative risk. This was true for both human factors and non-human factors accidents. An alternative procedure, using FAST, which was already a validated and calibrated model, allowed for calibration of FAID. The alternative procedure required correlating FAST and FAID scores. The calibration of FAST is the equivalent of fundamental measurement in physics, while the calibration of FAID by reference to FAST is the equivalent of derived measurement, both of which are valid measurement methods.<sup>21</sup>

Correlation of individual FAST and FAID scores found a high level of variation in the individual FAST scores within a FAID bin, so linking fatigue scores on an individual level was not feasible. An alternative method is to calculate confidence intervals for the population, or mean, score. Since biomathematical models are known to be more accurate at predicting population behavior rather than individual behavior, the confidence intervals of the bin means were compared. When analyzed at the population level, the regression line for FAID scores as a function of FAST scores, or FAST scores as a function of FAID scores, has an *r* of 0.909.

The calibration of FAID indicated that FAID scores above 80 indicate a severe level of fatigue, and that FAID scores between 70 and 80 indicate extreme fatigue. A fatigue threshold (as with FAST, the fatigue level at which there is an unacceptable accident risk due to fatigue) of 60 was established for FAID in its validation report, and an effectiveness score greater than or equal to 60 would violate that threshold.<sup>22</sup>

In the NPRM, FRA proposed to use the threshold of 60 to trigger the requirements to mitigate fatigue in work

<sup>14</sup> See Arnedt, J.T., Wilde, G.J., Munt, P.W., and MacLean, A.W. (2001). How do prolonged wakefulness and alcohol compare in the decrements they produce on a simulated driving task? *Accident Analysis and Prevention*, 33, 3, 337–44; Dawson, D., and Reid, K. (1997). “Fatigue, alcohol and performance impairment.” *Nature* 388, 23.

<sup>15</sup> See also Williamson, A., Feyer, A.M., Friswell, R., and Finlay-Brown, S. (2000). *Development of Measures of Fatigue: Using an Alcohol Comparison to Validate the Effects of Fatigue on Performance* (Road Safety Research Report CR 189). Canberra, Australia: Australian Transport Safety Bureau.

<sup>16</sup> See Hursh, *et al.*, *supra* note 7.

<sup>17</sup> A 21-day free trial of the FAST Model can be downloaded at <http://fatiguescience.com/products/fast>.

<sup>18</sup> For a description of FAID, see Roach, G. D., Fletcher, A., and Dawson, D. (2004). A model to predict work-related fatigue based on hours of work. *Aviation, Space, and Environmental Medicine*, 75, A61–9.

<sup>19</sup> For details see Tabak, B., and Raslear, T. G. (2010). *Procedures for Validation and Calibration of Human Fatigue Models: The Fatigue Audit InterDyne (FAID) Tool* (Report No. DOT/FRA/ORD–10/14). Washington, DC: U.S. Department of Transportation. ([http://www.fra.dot.gov/rpd/downloads/TR\\_Procedures\\_or\\_Validation\\_and\\_Calibration\\_final.pdf](http://www.fra.dot.gov/rpd/downloads/TR_Procedures_or_Validation_and_Calibration_final.pdf)) (“FAID validation report”).

<sup>20</sup> *Id.* at 9.

<sup>21</sup> Kranz, D.H., Luce, R.D., Suppes, P., and Tversky, A. (1971). *Foundations of measurement*. Volume 1. Additive and polynomial representations. New York: Academic Press.

<sup>22</sup> A free trial of the FAID Model can be downloaded at <http://www.faisafe.com/products-main.htm#faid330>.

schedules analyzed using FAID. However, following publication of the NPRM, further schedule analysis revealed that some schedules that had an acceptable level of risk for fatigue when analyzed using FAST, violated the proposed FAID threshold when analyzed using FAID, including schedules, to be discussed in detail below, that included work entirely between the hours of 4 a.m. and 8 p.m. 10.6 percent of these schedules violated the proposed FAID threshold rather than the 2.5 percent expected. Schedules wholly within these hours are defined as "Type 1 assignments," that are deemed not to violate the fatigue threshold, are not required to be analyzed, mitigated or submitted to FRA for approval, and are subjected to a less restrictive consecutive-days limitation. Representatives of the Association of American Railroads (AAR) and the American Public Transportation Association (APTA) who actively participated in the development of this rulemaking, submitted to FRA data illustrating this issue, and suggestions for addressing it. These documents have been added to the docket for this rulemaking.

The calibration of FAID, as indicated in its validation report,<sup>23</sup> and described above, was not successful as a direct process using the fatigue accident validation database. Instead, an indirect process in which values for FAID were related to values for FAST was used. This process is similar to calibrating a measurement instrument by reference to a known standard. In this case, FAST is the known standard because it was directly calibrated using the fatigue accident validation database. There is inherent variability in both FAST and FAID values, so FRA used regression analysis, a statistical method, to determine the estimated mean values of FAID that correspond to mean values of FAST. Table 8 in the FAID validation report shows the corresponding approximate values for FAID and FAST using this procedure. The exact threshold for FAID, as noted in its validation report, is 63.18,<sup>24</sup> as calculated from the regression equation:  $FAID\ score = 149 - 1.227 \times (FAST\ score)$ . Taking into account the variability associated with predicting mean FAID scores from mean FAST scores, a range of FAID scores that is highly likely to include the true mean FAID score can be calculated. The upper 99-percent confidence limit<sup>25</sup> for

estimating FAID at FAST = 70 is 72.16. This means that we can expect the true mean FAID score to be as high as 72.16.

Allowing the FAID threshold for fatigue to be as high as 72 reduces the percentage of schedules that violate the FAID threshold from 10.6 percent to 2.11 percent in the data presented by AAR and APTA. The passenger train and engine diary study (Work Schedules and Sleep Patterns of Railroad Train and Engine Service Employees in Passenger Operations, DOT/FRA/ORD-11/05), which will be discussed in detail in Section III.B below, indicates that none of the employees subject to this regulation work more than 2.5 percent of the time at a FAST score of  $\leq 70$ . Therefore, FRA concludes that allowing the FAID threshold to be placed at the upper 99 percent confidence limit of 72 is a reasonable solution to this issue. FRA expects that the percentage of schedules that violate a FAID threshold of 72 would be approximately 2.5 percent, which will allow the railroads to focus mitigation efforts on those schedules that are at greater risk for producing an unacceptable level of fatigue and thereby reduce fatigue-related accidents and injuries.

FRA believes that the prediction of the effectiveness of an employee's performance may be used to improve work schedules, to alter to the extent possible the timing of safety-critical tasks to coincide with periods of optimal performance, and to apply countermeasures to reduce the fatigue risk, and the corresponding risk of accidents or other errors associated with that fatigue. It is for this reason that FRA has concluded that it is appropriate to require analysis of employee work schedules using a validated and calibrated biomathematical model of performance and fatigue, as an essential component of these hours of service regulations.

As will be discussed in detail below, this rule requires railroads to mitigate the fatigue resulting from following a certain work schedule, and submit the schedules and fatigue mitigations to FRA for approval. These requirements will be triggered when analysis reveals that an employee working a given schedule will experience 20 percent or more of his or her working time during the schedule at an effectiveness score violating the fatigue threshold under the model used for analysis; that is to say, at an effectiveness score of 70 or less determined by FAST, or at an

effectiveness score of 72 or greater as determined by FAID. The applicable effectiveness score could be different if a railroad were using another model that had been properly validated and calibrated. FRA encourages the development, validation, and calibration of alternative models, and their submission to FRA for approval under § 228.407(c), by any railroad desiring to use an alternative model for the analyses required by this rule.<sup>26</sup> FRA expects fatigue science to continue to develop, and also anticipates the implementation of the rule will assist the agency in better assessing the role of fatigue in accidents that may occur in the future. As a result, FRA will consider such developments and new evidence in its regularly-scheduled retrospective review of the rule, and will expedite that review of the rule should evidence suggest such review is appropriate.

#### *B. Diary Study of Train Employees on Commuter and Intercity Passenger Railroads*

To further support this rule, FRA conducted primary research specifically directed to train employees of commuter and intercity passenger railroads (Office of Management and Budget (OMB) Control Number 2130-0588).<sup>27</sup> The results of the study provided valuable evidence of the actual levels of fatigue experienced by train employees on commuter and intercity passenger railroads, because the study allowed analysis of the actual periods of time that an employee reports having worked, slept, or spent in other activities during the period analyzed, which may be different from the assigned schedule and presumed periods available for sleep.

FRA had previously conducted similar surveys for signal employees (OMB Control Number 2130-0558), maintenance of way employees (OMB Control Number 2130-0561), dispatching service employees (OMB Control Number 2130-0570), and train employees generally (OMB Control Number 2130-0577). The purpose of these studies was to characterize, using a consistent statistical survey methodology, the work schedules and sleep patterns of each unique group of railroad workers. Because each of these studies used a random sample of each worker population, they provide defensible and definitive data on work/rest cycle parameters and fatigue for the

<sup>23</sup> Tabak and Raslear, *infra* note 19.

<sup>24</sup> *Id.* at 24.

<sup>25</sup> The upper 99-percent confidence limit represents the highest value of a variable within a

99-percent confidence interval. The 99-percent confidence interval is a range of values with a 99 percent probability of including the true population value of a variable.

<sup>26</sup> See Raslear, *supra* note 11 for information on procedures for validating and calibrating a model.

<sup>27</sup> [http://www.fra.dot.gov/rpd/downloads/TR\\_Work\\_Schedules\\_and\\_Sleep\\_Patterns\\_final.pdf](http://www.fra.dot.gov/rpd/downloads/TR_Work_Schedules_and_Sleep_Patterns_final.pdf).

respective group. The small number of train employees on commuter and intercity passenger railroads represented in the previous study of train employees generally did not allow for meaningful conclusions with regard to this subpopulation of train employees. As a result, the present study, specifically focused on this population, was necessary. The present study of train employees on commuter and intercity passenger railroads used the same methodology as the previous studies.

The primary objectives of this study were to design and conduct a survey to collect work schedule and sleep data from train and engine service (T&E) employees, and to analyze the data to characterize the work/sleep patterns and to identify work schedule-related fatigue issues. The goal was to characterize train employees on commuter and intercity passenger railroads as a group, not to characterize such employees on a specific railroad.

The research described in this report had three phases: preparation; field data collection; and data analysis. Since no existing source would provide answers to the study's research questions, a survey of train employees was the only means to obtain the necessary data. The preparation phase included securing approval from the OMB for the proposed data collection.

Representatives from the Brotherhood of Locomotive Engineers and Trainmen (BLET) and the United Transportation Union (UTU) worked closely with the researchers throughout the study.

The study used two survey instruments—a background survey and a daily log. Survey participants used the background survey to provide demographic information, descriptive data for their type of work, type of position, work schedule, and a self-assessment of overall health. The daily log provided the means for survey participants to record their daily activities in terms of sleep, personal time, time spent commuting to and from work, work time, limbo time, and periods of interim release. Study participants also provided self-assessments of the quality of their sleep and their level of alertness at the start and end of each work period. This study used a 14-day data-collection period to accommodate those train employees who did not work a regular schedule.

Researchers drew a random sample of 1275 train employees on commuter and intercity passenger railroads. The size of the sample from each of the two unions was proportional to that organization's representation in the total number of eligible participants. Retirees, full-time union officials, and anyone currently

holding a railroad management position were not eligible for the study. Determination of the sample size assumed a 95-percent confidence interval on the estimates for mean sleep time, an error tolerance of 15 percent, and a 33-percent response rate.

Mailing of the survey materials occurred on December 31, 2009. Ten days later, every potential survey participant received a postcard, signed by his or her union president, to encourage the employee to participate in the survey. Three weeks after distribution of the materials, a second postcard thanked those who had decided to participate and encouraged those who had not yet done so to participate.

The overall response rate for the survey was 21 percent. Of the 269 complete responses, 13 could not be part of the analysis because either there were problems with the respondents' log books, or the respondents were not in crafts covered by the survey. (It was not possible to identify these individuals from the information contained in union membership databases.) The nonresponse-bias study based on age found no difference between survey respondents and nonrespondents.

The results of the study support the approach that FRA has taken in this rule. For instance, the results are consistent with the separate analysis during the development of this rule of schedules provided by commuter and intercity passenger railroads, indicating that a fairly small percentage of employee work time (about 1.8 percent) violates the fatigue threshold. The rule focuses additional attention and effort specifically on those schedules presenting this fatigue risk by requiring the mitigation of that risk, while schedules not at risk for fatigue would not be subject to these additional requirements.

In addition, when compared to the results of the previous study that primarily considered train employees on freight railroads, the results of the study of train employees on commuter and intercity passenger railroads support a significantly different approach. Train employees on freight railroads were found to experience some level of fatigue (equivalent to an effectiveness score <90 using the FAST model) during 73 percent of their work time, while train employees on commuter and intercity passenger railroads experienced this level of fatigue during only 14 percent of their work time. The substantive limitations imposed on train employees on freight railroads in the RSIA would largely be

unnecessary for the commuter and intercity passenger railroad industry, as well as ineffective to target the specific areas where there is a fatigue risk.

#### IV. Railroad Safety Advisory Committee (RSAC) Process

##### A. Overview of the RSAC

In March 1996, FRA established RSAC,<sup>28</sup> which provides a forum for developing consensus recommendations to FRA's Administrator on rulemakings and other safety program issues. The Committee includes representation from all of the agency's major stakeholder groups, including railroads, labor organizations, suppliers, and manufacturers, and other interested parties. A list of member groups follows:

- American Association of Private Railroad Car Owners (AARPCO);
- American Association of State Highway and Transportation Officials (AASHTO);
- American Chemistry Council;
- American Petroleum Institute;
- APTA;
- American Short Line and Regional Railroad Association (ASLRRA);
- American Train Dispatchers' Association (ATDA);
- AAR;
- Association of Railway Museums;
- Association of State Rail Safety Managers (ASRSM);
- BLET;
- Brotherhood of Maintenance of Way Employees Division (BMWED);
- Brotherhood of Railroad Signalmen (BRS);
- The Chlorine Institute;
- FRA;
- Federal Transit Administration (FTA);\*
- Fertilizer Institute;
- High Speed Ground Transportation Association (HSGTA);
- Institute of Makers of Explosives;
- International Association of Machinists and Aerospace Workers;
- International Brotherhood of Electrical Workers (IBEW);
- Labor Council for Latin American Advancement;\*
- League of Railway Industry Women;\*
- National Association of Railroad Passengers (NARP);
- National Association of Railway Business Women;\*
- National Conference of Firemen & Oilers;
- National Railroad Construction and Maintenance Association (NRC);

<sup>28</sup> For more information about RSAC activities, see <http://rsac.fra.dot.gov/>. Meetings of the full RSAC are also announced by publication in the **Federal Register**.

- National Railroad Passenger Corporation (Amtrak);
- National Transportation Safety Board (NTSB);\*
- Railway Supply Institute (RSI);
- Safe Travel America (STA);
- Secretaria de Comunicaciones y Transporte;\*
- Sheet Metal Workers International Association (SMWIA);
- Tourist Railway Association, Inc.;
- Transport Canada;\*
- Transport Workers Union of America (TWU);
- Transportation Communications International Union/BRC (TCIU/BRC);
- Transportation Security Administration (TSA);\* and
- UTU.

\*Indicates associate, non-voting membership.

When appropriate, FRA assigns a task to RSAC, and after consideration and debate, RSAC may accept or reject the task. If the task is accepted, RSAC establishes a working group that possesses the appropriate expertise and representation of interests to develop recommendations to FRA for action on the task. These recommendations are developed by consensus. A working group may establish one or more task forces to develop facts and options on a particular aspect of a given task. The individual task force then provides that information to the working group for consideration. When a working group comes to unanimous consensus on recommendations for action, the package is presented to the full RSAC for a vote. If the proposal is accepted by a simple majority of RSAC, the proposal is formally recommended to FRA. FRA then determines what action to take on the recommendation. Because FRA staff plays an active role at the working group level in discussing the issues and options and in drafting the language of the consensus proposal, FRA is often favorably inclined toward RSAC recommendations. However, FRA is in no way bound to follow the recommendation, and the agency exercises its independent judgment on whether the recommended rule achieves the agency's regulatory goal, is soundly supported, and is in accordance with policy and legal requirements. Often, FRA varies in some respects from the RSAC recommendation in developing the actual regulatory proposal or final rule. Any such variations would be noted and explained in the rulemaking document issued by FRA. However, to the maximum extent practicable, FRA utilizes RSAC to provide consensus recommendations with respect to both proposed and final agency action. If

RSAC is unable to reach consensus on a recommendation for action, the task is withdrawn and FRA determines the best course of action. If the working group or RSAC is unable to reach consensus on a recommendation for action, FRA moves ahead to resolve the issue through traditional rulemaking proceedings.

#### *B. RSAC Proceedings in This Rulemaking*

FRA proposed Task No. 08–06 to the RSAC on April 2, 2009. The RSAC accepted the task, and formed the Passenger Hours of Service Working Group (Working Group) for the purpose of developing implementing regulations for the hours of service of train employees of commuter and intercity passenger railroads under the RSIA.

The Working Group is comprised of members from the following organizations:

- AASHTO;
- Amtrak;
- APTA;
- ASLRRRA;
- ATDA;
- AAR, including members from BNSF Railway Company (BNSF), Canadian National Railway Company (CN), Canadian Pacific Railway, Limited (CP), CSX Transportation, Inc. (CSXT), Iowa Interstate Railroad, Ltd. (IAIS), Kansas City Southern (KCS) railroads, Metra Electric District, Norfolk Southern Corporation (NS) railroads, and Union Pacific Railroad Company (UP);
- BLET;
- BRS;
- FRA;
- FTA;
- IBEW;
- Long Island Rail Road (LIRR);
- Metro-North Commuter Railroad Company (Metro-North);
- National Association of Railroad Passengers (NARP);
- National Railroad Construction and Maintenance Association;
- National Transportation Safety Board (NTSB);
- Southeastern Pennsylvania Transportation Authority (SEPTA);
- Tourist Railway Association; and
- UTU.

The Working Group completed its work after six meetings and several conference calls. The first meeting of the Working Group took place on June 24, 2009, in Washington, DC. At that meeting the group heard several presentations on fatigue science, including a report on the diary study that was to be conducted as described above. The group discussed the general approach for the rulemaking, and it was agreed that analysis of the railroads'

work schedules would support the rulemaking. Subsequent meetings were held on February 3, 2010; March 4, 2010; April 6, 2010; May 20, 2010; and June 29, 2010. In addition, a Task Force was formed that met on January 14–15, 2010, March 30–31, 2010, and April 28–29, 2010.

At the conclusion of the June 29, 2010 meeting, the Working Group voted to approve a draft of the proposed rule text, with the exception of two sections, to which the group had suggested numerous edits. It was agreed that FRA would address the remaining issues in those sections and circulate a revised draft, on which the group would vote electronically. After the revised draft was produced, the Task Force had several conference calls to discuss the revised provisions, and FRA also participated in several calls with task force members. Ultimately, on September 22, 2010, the Working Group voted unanimously to agree to the rule text presented in the proposed rule. The group's recommendation was presented to the full RSAC on September 23, 2010. The full RSAC agreed to vote electronically on the proposed rule text recommended by the Working Group, and ultimately accepted its recommendation. Although only a majority was required, the vote was unanimous.<sup>29</sup>

Following the vote of the Working Group and the full RSAC, FRA recognized the need to make two changes to the recordkeeping and reporting requirements in 49 CFR 228.11 and 228.19, to accommodate a new substantive limitation contained in the proposed rule as approved by the RSAC. While the RSAC voted in favor of the proposed substantive requirements in question, and all other elements of the proposed rule, the corresponding amendments to the recordkeeping and reporting provisions were not presented to them. After publication of the proposed rule on March 22, 2011, and consideration of public comments, FRA has made additional changes, as discussed in Section V of the preamble, below.

Earlier, at the February 3, 2010, meeting, FRA presented an initial draft of the rule text, identifying the basic concepts and direction of the rulemaking. Based on discussions at that meeting, a more complete draft was presented at the March 4, 2010 meeting, and the text was refined and supplemented at subsequent meetings. In addition, during the course of the

<sup>29</sup>The rule text voted on by the full RSAC and recommended to FRA is available on the RSAC Web site.

Working Group and Task Force meetings, a number of significant issues were discussed that resulted in changes in the rule text or common understanding of the intent of specific provisions that should be explained. Some such issues will be explained in this section, while other subjects of discussion by the Working Group and the Task Force will be discussed in the Section-by-Section Analysis at Section VI of the preamble.

In addition, as discussed below in the Regulatory Impact and Notices section of the preamble, Section VII, FRA has considered the costs and benefits of this rule. Implementation costs would be associated with analyzing work schedules, training, and rest facilities. However, relative to the “no regulatory action” alternative in which passenger railroad train employees would become subject to the new HSL in effect for freight train employees, the rule would result in a cost savings of \$57.7 million (discounted at 7 percent) and \$65.2 million (discounted at 3 percent) over a 20-year period. The quantified accident reduction benefits achieved under both the “no regulatory action” baseline and the rule total \$1.2 million (undiscounted), \$0.6 million (PV, 7 percent), and \$0.9 million (PV, 3 percent). FRA does not expect that the overall number of casualties and property damages prevented will differ under either scenario. Implementation of the final rule will yield these benefits at lower cost. While the rule has lower monetized benefits than costs, when compared to the current HSL, FRA believes that there are unquantified benefits that could close the gap.

### *C. Significant Task Force Contributions to the Development of the NPRM*

As was noted above, the Working Group created the Task Force, comprised of representatives from BLET, UTU, APTA, AAR, and FRA. The Task Force met between Working Group meetings to provide additional input and advice to the Working Group on the approach to the rule, specific concerns as to the rule text, and implementation of the regulatory requirements. Although the Task Force was extremely helpful throughout the development of the proposed rule in offering suggestions as to the rule text, its primary contributions were in the areas of schedule analysis and the creation of a fatigue mitigation tool box.

#### 1. Schedule Analysis

The diary study discussed in Section III.B of the preamble provided valuable evidence of the actual levels of fatigue experienced by train employees on

commuter and intercity passenger railroads. However, since many of these employees work scheduled assignments, it was also valuable to evaluate the schedules themselves, to get a sense of the parameters of those assignments that would result in fatigue violating the threshold, which informed some of the provisions of this rule. The Task Force assisted the Working Group by evaluating the schedules and presenting their results to the Working Group.

APTA hired a consultant to analyze the schedules provided by the railroads that were worked by their train employees. The railroads provided all of their schedules for the month of July 2009. The schedules were analyzed using the FAST model, including conservative assumptions about the sleep that would be obtained by an employee working that schedule. For example, the analyses assumed that employees did not sleep during periods of interim release.

The analyses that the Task Force presented to the Working Group demonstrated that most schedules did not result in an employee’s violating the fatigue threshold. This was true even for schedules in which the employee reported for duty at 4 a.m. and was relieved from duty at 8 p.m., for a 16-hour duty tour that included a total of 12 hours on duty and a 4-hour interim release. Most of the problematic schedules identified through the analysis presented by the Task Force involved duty tours in which some time was spent working during late night hours. These analyses formed the parameters for FRA’s definitions of “Type 1 assignment” and “Type 2 assignment” for which different requirements would apply in this rule.

#### 2. Fatigue Mitigation Tool Box

Because a major aspect of this rule requires mitigation of the fatigue risks identified in those schedules that resulted in an employee’s violating the applicable fatigue threshold, and experiencing a level of fatigue at which safety may be compromised, the Task Force assisted the Working Group by developing a fatigue mitigation tool box, a document that would illustrate the variety of ways in which a railroad might seek to address the fatigue risks in its schedules. (A copy of this document has been placed in the docket for this rulemaking.) The tool box itself is not intended to become a part of the regulatory text. Instead, it is intended to provide the variety of methods from which a railroad may propose, in its plans submitted to FRA for approval, to mitigate identified fatigue risks in its work schedules, to bring them into

compliance with the regulation. It is expected that not every tool will be appropriate for each railroad, or for individual locations or schedules on a given railroad, and that the railroads, in consultation with their labor organizations, will choose the mitigation tools most appropriate to each circumstance, subject to FRA review and approval. In addition, the tool box is expected to be a living document, as the available fatigue mitigation tools will change over time as fatigue science continues to develop, or as railroad operations change, either generally or as related to specific properties or schedules. The tool box as a whole will not be approved by FRA, nor will it be maintained by FRA as it evolves. FRA will evaluate the appropriateness of specific fatigue mitigation tools as they are submitted to FRA as part of a railroad’s plan to mitigate fatigue risks associated with particular schedules.

This section will describe a representative sample of the variety of the tools included in the tool box developed by the Task Force, which may be applied to mitigate fatigue risk. This discussion is not intended to provide an all-inclusive list of the possible fatigue mitigation tools. A railroad is free to use any fatigue mitigation tool that it believes is effective in reducing the fatigue risk found in its schedules, subject to FRA’s review and approval when the tools are applied to mitigate fatigue in a particular work schedule.

Perhaps the easiest mitigation tool to understand that was identified by the Task Force is the adoption and implementation of a napping policy, and the provision of facilities for employees to take a nap during interim releases or other periods between assignments that may be available for rest during a duty tour. The addition of a period of sleep to the employee’s schedule would have a clear impact on the employee’s level of fatigue when working that schedule, and the level of fatigue that the employee would be expected to experience throughout the remainder of the duty tour after a nap, which might reduce the risk of fatigue sufficiently to bring the schedule and the employee’s effectiveness score within the fatigue threshold.

To use this tool to mitigate fatigue, a railroad would be required to identify, in consultation with its labor organizations or employees, the facilities that would be available for the purpose of rest during the duty tour, that are appropriate to the schedule and location at issue. This would not always require a bunk or a quiet room, though



this might be available at some locations and in certain situations. However, the period available for rest would have to be at least 90 minutes for this mitigation tool to be applied, as this amount of time would provide sufficient opportunity for an employee to get to his or her napping location and fall asleep, having enough time for a nap of sufficient duration to be beneficial to the employee's level of fatigue, and then also allowing the employee time to become fully awake and ready to resume the duty tour.

Another mitigation tool, applicable to railroads and locations using employees from an extra board, would be the use of multiple extra boards that are temporally separated, so that employees would be scheduled to work morning assignments or evening assignments, rather than being subject to calls for assignments at all times of day. For example, employees assigned to a morning extra board might be subject to being called only for assignments requiring them to report for duty between 4 a.m. and 10 a.m., while employees assigned to an evening extra board might be subject to being called only for assignments requiring them to report for duty between 4 p.m. and 10 p.m. Employees on either extra board would know that they would not be called for an assignment requiring them to report for duty outside the times established for the employee's particular assigned extra board. This would lead to greater predictability of schedule and ability to plan rest, while also avoiding (1) circadian shifts between duty tours resulting from changes in the time of day that the employee is awake and (2) difficulties in adjusting to changing periods available for sleep.

Call windows (*i.e.*, limited periods of time during which an employee is subject to receiving calls from the railroad to report for duty) are another mitigation tool in the tool box, which may be combined with a temporally separated extra board, but could also be used even if the extra board were not so divided. For example, a railroad might decide to establish a call window that would reduce or eliminate calls to the employee during the time from 11 p.m. and 5 a.m. Open assignments that would need to be filled from an extra board of employees who would otherwise be called for the assignment during that time would instead be filled before 11 p.m., which would give the employees greater predictability and ability to plan rest, as well as allowing them more rest during the late night hours.

Another possible tool would be to allow employees a period of

uninterrupted rest, similar to the requirement that applies to train employees on freight railroads, which is found at 49 U.S.C. 21103(e). The uninterrupted rest could be applied to an employee's statutory off-duty period before or after the employee is to work a schedule violating the fatigue threshold. It could also be applied to periods of interim release within the duty tour.

Education could also be part of the tools that a railroad will use to mitigate fatigue in certain circumstances, and is also a key component of the other mitigation tools. The mitigation tools will not be beneficial if the employees working the schedules to which they are applied do not understand the available tools, and how to properly use them to reduce their fatigue and increase their effectiveness. If employees do not take advantage of the mitigation tools, and use them properly to increase their rest, even those mitigation tools most likely to have the greatest and most tangible impact on reducing fatigue will not have the desired effect. FRA has also recognized the importance of education as a component of fatigue management by specifically requiring in this rule that employees and supervisors receive training on fatigue and strategies for reducing it.

Finally, one additional mitigation tool was discussed by the Task Force that was extremely well-received and supported by the Working Group, including FRA representatives. That suggestion was to develop software that would link the railroad's crew management resources to both the employee's electronic hours of service records (created and maintained in compliance with subpart D of 49 CFR part 228), and a valid biomathematical model of performance and fatigue.

The idea is that the fatigue model would be able to look back at previous duty tours and rest periods to determine which schedules might have sufficiently rested employees available to report for the assignment, not only under the limitations on time on duty and consecutive days and the requirement for minimum time off duty established by this rule, but also in terms of the fatigue threshold. The model would have the benefit of the data from the previous duty tours to take into account in determining whether these schedules would violate the fatigue threshold during the duty tour, as well as at the report-for-duty time. If the analysis revealed that the employees on these schedules would be too fatigued to report for the assignment, or would violate the fatigue threshold during the duty tour, crew management would be

alerted that these employees could be at risk if they work this particular assignment. Employees would have to affirm their fitness for duty if asked to work such assignments and be empowered to reject the assignments, because the model is being used to predict group (average) fatigue from work schedules that could be worked by several individuals. Any individual could be more or less fatigued than the average or group. Employees have a responsibility to indicate if they feel fit to work or not, regardless of the effectiveness score that a model would predict. The employer's responsibility is to arrange schedules that minimize fatigue.

While all of the parties to the Working Group agreed that this idea showed great promise as an effective fatigue mitigation tool for the future, it is not something that the railroads will be able to apply immediately, for technological reasons. Most railroads subject to this rule do not yet create and maintain their hours of service records electronically in compliance with subpart D, although there is interest among those railroads in developing hours of service electronic recordkeeping programs. In addition, software would need to be developed that would allow the fatigue model to retrieve data from the electronic recordkeeping system, without any possibility of altering or otherwise affecting the integrity of the records maintained in the system. Likewise, software would be needed to connect the fatigue model to the crew management system, so that it could appropriately alert that system and prevent an employee being placed on an assignment for which he or she would be too fatigued. If the necessary systems and software can be developed, compliance with the fatigue threshold would become much easier, and there would be much less excessive fatigue to be mitigated.

#### *D. Areas of Working Group and Task Force Concern During Development of the NPRM*

During the course of the Task Force and Working Group meetings, a few issues resulted in significant discussion. Some issues were related to specific provisions in the rule text, while other concerns were about the broader implications of the rule, as well as its effects on aspects of railroad operations or existing collective bargaining agreements.

##### 1. Proposed Definitions of "Type 1 Assignment" and "Type 2 Assignment"

Some members of the Working Group suggested that there should be a way to



determine a template for schedules that would be deemed not to violate the fatigue threshold. As was discussed above, the Task Force presented schedule analyses showing that a schedule in which an employee began work at 4 a.m. and was relieved at 8 p.m., resulting in a duty tour with a total time on duty of 12 hours, with a 4-hour period of interim release, did not violate the fatigue threshold.

Based on this analysis, FRA initially defined any assignment beginning no earlier than 4 a.m. and ending no later than 8 p.m., assuming at least a 4-hour period of interim release, as a Type 1 assignment, which would be deemed not to violate the fatigue threshold. Assignments that included any period of time outside the defined time parameters of a Type 1 assignment would be considered a Type 2 assignment, which would be subject to more stringent requirements, including analysis of the schedule using a scientifically valid biomathematical model, and a more restrictive limit on the number of consecutive days on which an employee working such an assignment would be allowed to initiate an on-duty period.

However, some Task Force members pointed out that there could be assignments that include time outside the time parameters of a Type 1 assignment that would not violate the fatigue threshold. In some cases these schedules would only have a small amount of their overall time outside of the Type 1 parameters. For example, an assignment might begin at 4:30 a.m. and end at 8:30 p.m. In addition, some assignments might not violate the threshold because of the short duration of the duty tour involved, such as, perhaps, an assignment from 5 p.m. until 9:30 p.m.

Based on these considerations, FRA amended the definition of "Type 2 assignment" to indicate that if an assignment does not include any time between midnight and 4 a.m., then the particular time of day or night that an assignment is to be performed is not the only determinant of whether an assignment is considered a Type 2 assignment. In particular, a Type 2 assignment that is analyzed using a scientifically valid biomathematical model and is determined not to violate the fatigue threshold, and that includes no period of time between midnight and 4 a.m., would be considered a Type 1 assignment.

FRA also added language to the definitions of both "Type 1 assignment" and "Type 2 assignment" to require compliance with the substantive limitations contained in § 228.405. FRA

expects that railroads would not be operating schedules that violate these limitations; most schedules have long been in effect for the railroads subject to this rule, and this was an implicit assumption of the Working Group. For example, a schedule that requires an employee to report for duty at 4 a.m. and to be released from duty at 8 p.m. would have to include a period of interim release of at least 4 hours that is not time on duty, as defined by § 228.405(b). However, this language was added to the definitions to make clear that the schedule analysis and fatigue mitigation requirements of this rule supplement, but do not replace, the specific limitations, and any schedule that violated other provisions of this rule (for example, exceeded 12 hours total time on duty, or did not allow for at least 8 hours off duty, or 10 hours off duty after 12 consecutive hours) could not be deemed "approved" by FRA and subject to the less stringent requirements applicable to Type 1 assignments.

## 2. Proposed Limitations on Number of Consecutive Days

In the Working Group, both the railroads and labor contended that FAST and/or FAID analysis would suggest that an employee could work beyond the limitations in what became the proposed rule and this final rule without adversely affecting safety. One potential requirement about which this was specifically argued was the limitation on the number of consecutive days or days within a prescribed period that an employee would be permitted to initiate an on-duty period before the employee was required to have a 24-hour or two-consecutive calendar days off-duty period at the employee's home terminal under this regulation, which would differ depending on the time of day that the employee works. See § 228.405(a)(3) and (a)(4) of the proposed rule, and § 228.405(a)(3) of this final rule. In the Working Group, the railroads and labor unions presented fatigue analyses for theoretical schedules that would have an employee initiating on-duty periods for numbers of days that exceeded those permitted by the contemplated rule. The railroads and labor also indicated that the current agreements or practices on their properties allow for such schedules.

Research shows that work on successive days without a full day off exponentially increases the accident risk as the number of days worked increases. For instance, after working four consecutive day shifts, there is a 17-percent increase in risk, and after working four consecutive night shifts,

there is a 36-percent increase in risk.<sup>30</sup> FRA research on train crew work schedules and sleep patterns<sup>31</sup> has shown that train crews average a 10.25-hour day (work period, limbo time, and commute time) and get 6.88 hours of primary sleep per day. A follow-up study on passenger train crews found that workers on split shift assignments average a 13.75-hour day (work period, interim release, and commute time) and get 6.18 hours of primary sleep. Laboratory studies of restricted sleep<sup>32</sup> show a 5-percent decrease in performance after 7 days with 7 hours of sleep per day and a 15-percent decrease after 7 days with 5 hours of sleep per day. These studies are consistent with the previously noted increase in accident risk with the number of days worked.

Therefore, FRA reasoned that, even if an employee were working a schedule for which the employee's effectiveness score did not violate the fatigue threshold, even when the schedule was worked for more consecutive days or days in a 14-day period than the regulation would permit, at some point the employee would have to use some of the time between duty tours (time that a model would otherwise view as available for rest) to attend to other personal activities. This time spent in activities other than rest would decrease the time actually available to the employee for rest, and, therefore, the employee's actual effectiveness score. This circumstance would be particularly problematic for schedules featuring long duty tours, such as the maximum 12 hours on duty, including an interim release, for a total time of 16 hours in the duty tour, followed by the minimum of 8 consecutive hours off duty before reporting for the next duty tour. From this perspective, FRA believes that, although the available research does not identify the exact number of consecutive days or days in a prescribed period allowed under this rule as the maximum that can be safely worked, the limitations that FRA has established are reasonable.

FRA remains aware that the requirements of the final rule may have

<sup>30</sup> Folkard, S. and Akerstedt, T., *Trends in the Risk of Accidents and Injuries and Their Implications for Models of Fatigue and Performance*, Aviat. Space Environ. Med. (2004).

<sup>31</sup> Gertler, J., and DiFiore, A. (2009). *Work schedules and sleep patterns of railroad train and engine service workers* (Report No. DOT/FRA/ORD-09/22). Washington, DC: U.S. Department of Transportation.

<sup>32</sup> Balkin, T., Thorne, D., Sing, H. (2000). *Effects of sleep schedules on commercial driver performance* (Report No. DOT-MC-00-133). Washington, DC: U.S. Department of Transportation.

an impact on the collective bargaining agreements affecting the railroads and employees covered by subpart F. For example, there may be some agreements that would allow employees to work a greater number of consecutive days or days in a 14-day period than would be allowed by this regulation. FRA also remains mindful that the law provides an option that enables the regulated community to seek waivers to implement pilot projects in accordance with the requirements of 49 U.S.C. 21108(a) and encourages members of the regulated community to consider this option. Pursuant to 49 CFR part 211, subpart C, the Railroad Safety Board will consider whether or not granting such waivers would be in the public interest and consistent with railroad safety. Where warranted, and upon the necessary showing, FRA may grant waivers of the requirements of this rule, including requirements concerning the maximum number of consecutive days or days in a 14-day period that an employee may work, to allow for the establishment of pilot projects to demonstrate the possible benefits of implementing alternatives to the strict application of the requirements contained in this rule.

### 3. Precision of Fatigue Models and Threshold

There was considerable discussion in the Working Group of the precision embodied in the FAST model or the FAID model, and the appropriateness of requiring compliance with a specific fatigue threshold. The railroads argued that models such as the FAST model and the FAID model are not scientifically precise enough to warrant the adoption of a specific threshold, and that different types of operations could safely function at different levels of fatigue. For example, the railroads contended that yard switching activities could safely operate at a different level of fatigue than passenger operations or through-freight activities.

The railroads conceded, however, that the regulatory structure contained in the proposed regulation, and in provisions of the final rule that mirror the proposal would not be problematic for passenger operations. The railroads' concern was that, in the future, someone might argue for adoption of the same regulatory structure for freight operations and, were that to occur, schedules might be prohibited from use that should, in fact, be acceptable from a fatigue perspective.

In FRA's view, a specific threshold is desirable because it provides regulatory certainty as to what railroads must do to be considered in compliance with the regulations. FRA has based its

regulation on the best available fatigue science, including the FAST model and the FAID model, which are the only currently validated models, and the appropriate fatigue thresholds for the purpose of compliance with this regulation. As was discussed in Section III above, FRA has adjusted the FAID threshold from the level stated in the preamble of the proposed rule, to achieve a closer correlation between the FAST and FAID thresholds for the purposes of the analyses required by this regulation. FRA has also left open the possibility that other models may be validated, and other thresholds established in the future, which could be used for the purpose of compliance with this regulation.<sup>33</sup> In addition, as new scientific evidence comes to light, FRA will review this rule as discussed in Section III, above.

As FRA has determined that use of these models and their established thresholds adequately protects safety, that this rule does not present significant implementation problems for passenger service, and that a specific threshold provides the desired regulatory certainty, FRA believes that it is appropriate to include in the regulations a requirement for a specific threshold. FRA based this belief on the understanding that the regulatory requirements will be satisfied based on a "70/20 threshold" using the FAST model (meaning that the fatigue threshold is violated if an employee's effectiveness score is less than 70 for 20 percent or more of the employee's time on duty,) or a "72/20 threshold" using FAID (meaning that the fatigue threshold is violated if an employee's effectiveness score is more than 72 for 20 percent or more of the employee's time on duty.)<sup>34</sup>

In establishing a substantive hours of service regulation with a specific threshold for train employees in passenger service, FRA is not drawing any conclusion about the suitability of such a regulatory scheme for freight operations. There may be substantial differences between freight railroad operating and crew schedules and passenger operating and crew schedules. Passenger railroads have analyzed the results of applying the regulations to their work schedules and concluded that this regulation is feasible. Freight railroads have not undertaken such analysis, nor would they be required to under the regulations, except to the extent that

employees of freight railroads may work in passenger service.

### 4. Freight Railroad Employees Acting as Pilots for Commuter or Intercity Passenger Trains

The Working Group also discussed the application of requirements of proposed subpart F, which have now been adopted, to train employees of freight railroads who occasionally provide pilot service to a commuter railroad or intercity passenger railroad. FRA's locomotive engineer certification regulations require a pilot to assist an engineer who may not be sufficiently familiar with the territory over which he or she is called to operate. See 49 CFR 240.231(b). The railroads indicated that a request for a pilot may come without advance notice, so that it would be difficult to comply with the substantive hours of service limitations and recordkeeping requirements of this regulation, and even more difficult to adhere to the schedule analysis requirements, for an employee who did not otherwise regularly engage in commuter or intercity rail passenger transportation.

The Working Group also cited the safety benefits of having a pilot available on a route when necessary, and the potential risk if commuter or intercity passenger railroads were to become less likely to request a pilot, or freight railroads less likely to be able to make a pilot available when requested, because of concerns about the requirements of this regulation, which has been adopted. FRA acknowledges these benefits. Therefore, although a pilot is performing covered service under the HSL on the assignment on which the pilot service is provided, FRA will not consider a train employee employed by a freight railroad who serves as a pilot on a train operated by a commuter railroad or intercity passenger railroad to be a train employee who is engaged in commuter or intercity rail passenger transportation.

### V. Response to Public Comments on the NPRM

FRA received 10 sets of comments on the proposed rule. Comments were received from the National Institute for Occupational Safety and Health (NIOSH); the American Academy of Sleep Medicine (AASM); Port Authority Trans-Hudson (PATH); Metropolitan Transportation Authority (MTA); SEPTA; Strasburg Rail Road Company (Strasburg); Transportation Trades Department (TTD), AFL-CIO (American Federation of Labor and Congress of Industrial Organizations); BLET and

<sup>33</sup> See Raslear, *supra* note 11.

<sup>34</sup> See Hursh, *et al.*, *supra* note 13, and Tabak and Raslear, *supra* note 19.

UTU, which filed joint comments; AAR and APTA. Issues raised in the comments will be addressed in this section. Some issues arising out of the comments were also discussed in Section III, Scientific Background, and some will be further discussed in Section VI, Section-by-Section Analysis, below.

#### *Comments Related to the FAST and FAID Fatigue Models*

AAR and APTA indicate in their comments that their analysis shows that passenger train employees' work schedules that are acceptable when analyzed using FAST with a proposed fatigue threshold of 70, violate a proposed FAID fatigue threshold of 60. Consequently, MTA, SEPTA, AAR and APTA, each recommend using a FAID threshold of 90, rather than the threshold of 60 proposed in the NPRM. AAR and APTA each attach to their comments, an analysis performed by the same consultant who performed work schedule analysis for APTA during the development of the proposed rule, in support of their request. MTA, SEPTA, AAR and APTA also contend that FRA agreed with a threshold of 90 for FAID during the Working Group, prior to FAID's validation. FRA disagrees both with a FAID threshold of 90 and with the analysis submitted in support of it.

FRA did not agree during the Working Group process that 90 was the appropriate threshold for FAID, and indeed recalls little, if any, discussion of a FAID threshold, as FAID had not been validated or calibrated at that time. It is possible that the railroads internally discussed a threshold of 90, as some railroads had been using FAID for the purposes of their own analysis even before the commencement of this rulemaking.

The analysis attached to the AAR and APTA comments looked at 101 work schedules from "some of the largest railroads" involved in passenger service. It is not clear why that number of schedules was chosen, nor why the specific schedules were chosen for analysis. This suggests that the 101 work schedules are a convenience sample, rather than a random sample of work schedules, which means that these schedules may not be representative of the rail passenger service industry. In addition, the analysis looked at work schedules alone, rather than both work schedules and on-duty accidents in which those working the schedules were involved, as had the FAST and FAID validation studies. The threshold that FRA is seeking is the point at which the risk of a human factors accident involving the person working the

schedule increases. That is the point, for the purpose of this regulation, at which "safety may be compromised" and the rule requires action to be taken to mitigate fatigue. See § 228.407(a). Looking at work schedule data only, the analysis provided by AAR and APTA has not identified that point. The analysis that they provided uses statistics, rather than fatigue science, to equate a FAST score of 70 with a FAID score of 90, based on where the effectiveness scores produced in the analyzed schedules were clustered. In validating and calibrating FAID, FRA used bins to analyze the data in light of the variation among FAID scores. Biomathematical models such as FAID are more accurate when used to predict population behavior rather than individual behavior, and the goal is establishing a fatigue threshold rather than establishing links between all FAST scores and FAID scores at an individual level. Accordingly, FRA does not believe that the statistical comparison of individual scores is an appropriate basis for establishing a FAID threshold for the purposes of this rulemaking.

FRA recognizes the concern with schedules that are acceptable using one model violating the threshold using another. In Section III, Scientific Background, FRA explained its basis for modifying the FAID threshold, not to 90, as urged by the railroads, but to 72. This change is achieved by basing the FAID threshold on the upper limit of the 99-percent confidence interval rather than the mean. A 99-percent confidence interval for a FAID threshold of 72 means that there is only a one-percent chance of a false positive (*i.e.*, a schedule that will violate the FAID threshold of 72 while not actually posing a risk for the level of fatigue indicated by the threshold). A confidence interval for the FAID threshold is appropriate, since it is calibrated in relation to FAST.

Finally, APTA suggests that FRA commit to further analysis, including analysis specifically of passenger data, which could form the basis for establishing a FAID threshold other than 90. As noted above, FRA does not believe that 90 is a scientifically valid fatigue threshold for FAID. In terms of APTA's recommendation that FRA agree to do further analysis, FRA is certainly willing to acknowledge that the area of fatigue science is still developing and that future developments or analyses may make it appropriate to revisit the models, their thresholds, or other aspects of this rulemaking, as discussed in Section III.

#### *Comments Related to Costs of Compliance With the Proposed Rule*

NIOSH questions whether the training costs included in the NPRM included costs to train staff on the use of the models. In the proposed rule, the cost of training staff to use the models was included in the cost of the biomathematical model, which also includes programming (for product enhancement) and technical support, and remains included in the model cost of the final rule. For purposes of clarification, FRA is presenting training related to the models separately.

APTA indicates that the licensing cost for FAST is approximately \$500,000 for a single railroad, which is far in excess of the cost estimated by FRA at the NPRM stage, and that the licensing cost for FAID is about five percent of the cost of FAST, or \$25,000. FRA clarifies that its cost estimate was used for conduct of the regulatory analysis and as such includes only the cost to "society," which does not include distributional effects that may arise through transfer payments including the revenue collected through a fee, surcharge in excess of the cost of services provided. "Transfer payments are monetary payments from one group to another that do not affect total resources available to society." OMB Circular A-4, p. 38.<sup>35</sup> Thus, the FRA cost estimate included some programming costs for the development of certain enhancements tailored to the passenger rail industry that included the license cost, training on use of the model, and system support. FRA did not include costs associated with the original model development or economic rent from the sale of licenses to passenger railroads. Administrative costs associated with using the model to analyze assignments for purposes of complying with this rule are included in the FRA cost estimate separately. The development costs of the models themselves are considered "sunk costs" incurred prior to the rulemaking and not attributable to this rule.

In addition, FRA assumed that railroads would select the lowest cost alternative for achieving compliance. FRA recognizes other factors may contribute to model selection. While FRA did not and does not endorse any particular model or method for use in complying with this rule, and railroads are certainly permitted to use more costly alternatives, for purposes of conducting regulatory analysis, only the

<sup>35</sup> OMB Circular A-4 is available at: <http://www.whitehouse.gov/sites/default/files/omb/assets/omb/circulars/a004/a-4.pdf>.

“opportunity cost”<sup>36</sup> is included. Any additional expense, however, would not be a cost attributable to this rule. APTA did not provide a basis for its cost estimate of \$500,000 per railroad for the FAST model, and based on information available to FRA, a cost of \$500,000 does not reflect the opportunity cost to society.

In this case the opportunity cost includes the programming and licensing cost estimated at \$75,000, the training cost estimated at \$50,000, and product support associated with analyzing assignments for purposes of complying with this rule estimated at \$7,500 annually. As noted at the NPRM stage, FRA believes that a significantly lower-cost viable alternative for compliance would be for the railroads to enter into a cost sharing agreement via a trade organization, such as APTA and the Association of Railway Museums (ARM), to facilitate so that one or few licenses are purchased for the use of all member railroads.

On a related note, MTA points out that early in the Working Group process, as the NPRM was being developed, FRA indicated a willingness to explore funding access to the models.

Unfortunately, FRA is not in a position to fund access to the models, but, as discussed above, FRA encourages relevant organizations to work together, as there may be ways to provide the model for a group of members that are more cost effective than for each member railroad to secure access individually.

APTA also contends that the cost of fatigue training will exceed \$1.8 million for a sample of 5 commuter railroads subject to this regulation. APTA does not provide any background or details related to this stated cost, and it is not consistent with information provided to FRA during the development of the proposed rule. However, it is possible that these costs are based on providing formal, classroom training to all of the employees to be covered by this regulation. As was explained in the NPRM, FRA incorporated significant flexibility into the training requirement, so that each railroad would be allowed to tailor the level of complexity and formality to the needs of its employees. There are likely railroads, or locations on a particular railroad, where the nature of the operations and assignments do not warrant formal classroom training and such training would not be practical or cost-effective.

In many cases, there will be lower cost alternatives that will be more appropriate and sufficient to comply with the training requirement.

APTA and MTA both claim costs related to the hiring of additional personnel. MTA says that it would have compliance costs of at least \$5 million per year, including the cost of hiring additional train and engine employees. APTA contends that the cost of additional personnel will exceed \$15 million for five sample commuter railroads, and \$12 million for Amtrak. Neither MTA nor APTA provides any specific information regarding these costs, and FRA does not believe that additional personnel will be required by the regulation. The rule provides substantial flexibility in how railroads may mitigate fatigue in their schedules. Many of the available fatigue mitigation tools, such as allowing employees to take a nap during available periods within a schedule, would significantly reduce fatigue without requiring the railroad to hire additional employees. In addition, should a railroad be unable to sufficiently mitigate the risk of fatigue in one of its schedules, it would also have the option of submitting a declaration of operational necessity to FRA for approval. See § 228.407(b)(1)(ii). Although there may be some circumstances in which a railroad would choose to hire additional employees, the regulation does not require extra hiring, especially not to the extent of the costs alleged by MTA and APTA. Finally, addition of new train crews to perform the same train operations would result in a decrease in the hours of service performed by existing train crews, which in turn would result in a savings that would in large part offset the expense associated with the hours of service performed by new employees and must be taken into account. In other words, it would basically take the same number of total employee hours to operate trains if the train schedules are unchanged regardless of how many train crews participate in the operation, leaving the total wage expense largely unchanged and only impacting the fixed overhead costs resulting from a larger employee pool. The Regulatory Impact Analysis contains a more detailed discussion of such impacts.

Some of the personnel costs described by MTA and APTA may be a result of concerns about the FAID threshold, proposed as 60 in the NPRM, which resulted in a greater number of schedules than expected violating the fatigue threshold. FRA responded to comments about the fatigue models above, and also addressed the issue in

Section III of this preamble, Scientific Background. In light of the modifications made by FRA, the impact of this issue will be significantly reduced. In addition, as noted above, schedules violating the threshold do not require the hiring of additional personnel, as there are a variety of ways to mitigate the fatigue that would not require the expense of additional hiring.

PATH also indicates that it would need to hire additional engineers and conductors “to mitigate the effects of a mandatory 48 to 72 consecutive-hour rest period” the cost of which it estimates at \$4 million annually. This comment appears to refer to the statutory requirements at 49 U.S.C. 21103(a)(4), which do not apply to train employees subject to this regulation. The requirements of this regulation are imposed instead of, rather than in addition to, the requirements for train employees in freight service. If, as PATH contends, its schedules will pass any fatigue analysis, its costs resulting from this regulation should be minimal.

Finally, AAR objects to the cost of having some employees subject to two different sets of hours of service requirements, referring specifically to those employees working from an extra board that includes both freight and passenger assignments. For this reason, AAR suggests that train employees employed by freight railroads should be governed only by the freight hours of service provisions in 49 U.S.C. 21103. This comment will be more fully discussed below, with comments related to the scope of the rulemaking. From a cost perspective, however, the cost of compliance with two separate hours of service schemes is not a new cost, as freight railroads have already had to track their train employees who perform both freight and passenger service under the different statutory provisions currently applicable to both, as freight and passenger train employees have had different requirements since the effective date of the RSIA. In addition, AAR admits that very few employees would be affected by being subject to both freight and passenger requirements, so any cost would likely be minimal.

#### *Comments on the Scope of the Proposed Rule (§ 228.401 and § 228.403)*

AASM suggests that FRA should develop an additional subpart to establish comparable language for train employees engaged in transportation services outside of commuter or intercity rail passenger transportation. As was described in the Section II, Statutory Background and History, prior to the RSIA, the Secretary had no

<sup>36</sup> “The opportunity cost is equal to the net benefit the resource would have provided in absence of the requirement.” OMB Circular A-4, p. 19.

authority to issue regulations governing the hours of service of train employees. In the RSIA, Congress amended the then-existing statutory hours of service requirements for train employees, but specifically excluded train employees providing commuter or intercity rail passenger transportation from the application of those provisions for a period of three years, during which FRA, as the Secretary's delegate, was granted authority to promulgate hours of service regulations for these train employees. Other train employees remain subject to the hours of service statutory provisions as amended by the RSIA.

AAR and APTA both suggest that train employees on freight service extra boards who occasionally are called to operate passenger trains should be subject exclusively to the freight hours of service statutory requirements, rather than this final rule, and they suggest amending § 228.403 to exclude such employees from the requirements of this rule. FRA does not believe this exception would be consistent with the Congressional authorization, which is to establish hours of service regulations for train employees providing commuter or intercity rail passenger transportation. Congress recognized that the transportation of passengers has different characteristics that make the requirements established for freight operations inappropriate, and that regulations based on fatigue science would be more appropriate to passenger operations, regardless of the entity that employs the train employee providing this service. In addition, the railroads would have to track freight and passenger service separately for business purposes, to bill the commuter operator for the employee's time, even if the employees were just under the freight provisions. Finally, if the fact that an employee could be called on to perform freight service on an as-needed basis is enough to exclude them from the coverage of this rule, this could result in excluding employees who perform predominantly passenger service just for the possibility of their performing occasional freight service.

AAR also suggests that train employees of freight railroads who operate non-scheduled passenger service such as "Santa trains" or steam trains should not be subject to this regulation. AAR contends that these employees are "akin to employees operating work trains" who were specifically proposed for exclusion from the application of the proposed rule and who are specifically excluded from the application of this final rule by a definition in § 228.403(c). FRA disagrees

with this analogy, as train employees operating "Santa trains" or steam trains are transporting passengers, while train employees operating work trains are not. In the NPRM, FRA stated its belief that Congress intended that these regulations apply to all railroads providing rail passenger transportation, and therefore included tourist, scenic, excursion and historic railroads within the scope of this regulation. FRA likewise believes it was the intent of Congress to cover operations such as those described by AAR that also involve rail passenger transportation.

AAR also suggests that FRA remove the limit on the number of times a month that train employees employed by a freight railroad who may provide pilot service for a locomotive engineer of a passenger railroad without being subject to the schedule analysis and other requirements of this regulation. AAR acknowledges that it would be unlikely that an employee would provide pilot service more than four times in a month, but says it should be permitted if necessary. FRA agrees with this suggestion for the reasons discussed above in Section IV.D.4, and has eliminated the cap on the provision of pilot service. FRA has also added the exclusion of freight train employees providing pilot service from the coverage of this rule to the rule text, in § 228.403(c), rather than just including it in the preamble, as was done in the NPRM.

APTA recommends that mechanical breakdowns, signal failures, switch failures and similar conditions should come within the non-application provision of § 228.403. FRA does not believe this is appropriate, as these common operational issues do not justify a complete exemption from the provisions of this regulation. This position is consistent with FRA's longstanding interpretation of the comparable statutory nonapplication provision at 49 U.S.C. 21102. See 49 CFR part 228, Appendix A. However, as will be discussed below, to the extent that such issues delay schedules the fatigue implications of which a railroad had previously analyzed and mitigated as appropriate, FRA will allow flexibility as to the schedule analysis requirements and consecutive-days limitations of this rule, if the schedule as delayed does not extend past midnight.

Strasburg suggests that Class III tourist, scenic, historic, and excursion railroad operations should be excluded from the schedule-analysis requirements of this rule, and specifically excluded from the definition of "Type 2 assignment," because of the nature of

these operations. Strasburg contends that, even in their busiest periods, these operations generally operate shorter assignments than the duration permitted for a Type 1 assignment under this rule. In addition, employees rarely work more than five days in a row, and schedules begin and end at the same time and location each day. FRA acknowledges that the nature of these operations reduces the risk of cumulative fatigue experienced by employees of such railroads.

While FRA does not believe these operations should be categorically excluded from the requirements of this regulation, FRA will delay the compliance date for tourist, scenic, historic and excursion railroads until 18 months from the effective date of the final rule, or a year longer than other railroads will have to complete their work schedule analysis and make any required submission of schedules and fatigue mitigation tools to FRA.

This extra year to prepare to comply would allow additional time for such operations to obtain necessary resources, but may also allow many such operations to avoid the necessity of obtaining access to an approved biomathematical model and analyzing schedules, if their only Type 2 assignments had already been approved by FRA on the submission of another railroad, or had been modeled by another railroad and showed that they could be treated as Type 1. This deferral of the compliance date is also consistent with a suggestion in APTA's comments that FRA should allow a schedule approved for one railroad to be used by others without also having to analyze the same schedule. FRA will create a public docket of schedules that it has approved, but if such a listing is to be complete, railroads would have to submit to the docket established for that purpose those Type 2 schedules that they analyze and determine do not violate the fatigue threshold and do not need to be mitigated or submitted to FRA for approval and can be treated as Type 1.

*Comments on Consecutive-Days Provisions (§ 228.405(a)(3) and (a)(4))*

BLET/UTU and TTD contend that FRA has not made a sufficient case for imposing the limitation on employees working only Type 1 assignments included in the proposed rule, which would require that if an employee had not had at least two calendar days in which he or she had not initiated an on-duty period in a period of 14 consecutive calendar days, that employee must have two consecutive calendar days off duty at his or her

home terminal (unless the fourteenth day ended at his or her away-from-home terminal, in which case the employee would be permitted to work a fifteenth day to return to his or her home terminal and then would be required to have two consecutive calendar days off duty at his or her home terminal). BLET and UTU note that schedule analysis conducted during the RSAC process did not support a limitation on Type 1 assignments, and they argue that the proposed limitation was therefore not based on science but was a subjective requirement. FRA does not dispute the assertion that the work schedule analysis did not suggest the specific limitation proposed and adopted in the final rule. However, as FRA stated in the NPRM, even a Type 1 schedule that allowed the minimum rest required by this regulation would eventually result in an employee using time for other life activities (such as commuting, eating, grooming, personal errands, *etc.*) that the approved models assume to be available for sleep, if the employee is not at some point required to have a day off. FRA also notes that fatigue science indicates that individuals may require more than one recovery day to recover from sleep restriction.<sup>37</sup>

In contrast to the position of BLET/UTU, NIOSH says it may be premature to say that an employee working even Type 1 schedules will get sufficient rest, noting that if an employee has only the required minimum 8 hours off duty between duty tours, this will not allow the employee to get 8 hours of rest. Likewise, AASM suggests that the required minimum off-duty period under the regulation should be sufficient to allow for an 8-hour sleep period. FRA is comfortable with the limitations included in the rule, because of the nature of the operations in question, and the fact that the diary study of passenger train employees indicated that these employees are usually getting appropriate amounts of sleep, and most are not subjected to fatigue that would violate a threshold established in this regulation. However, FRA believes that the support of the scientific community for even more stringent limitations indicates that the limitations included in this regulation are quite reasonable.

Many comments asked for further clarification and examples to aid in the

discussion of the limitation on Type 1 assignments, and these clarifications have been made throughout the final rule in the many references to this provision, and rule text has been added to clarify the application of these limitations. See § 228.405(a)(3) and the discussion of the provision in Section V, Section-by-Section Analysis.

For example, in the NPRM, FRA stated that if an employee worked only Type 1 assignments for a period of more than 6 consecutive calendar days but less than 14 consecutive calendar days, and then initiated an on-duty period involving a Type 2 assignment, the employee would be required to have the Type 2 assignment's rest period of 24 consecutive hours at the employee's home terminal, and then start the count over with regard to consecutive days or total days worked in a 14-day period. In response, MTA asks in its comment what would happen if an employee worked Type 1 assignments on 13 consecutive days, and then a Type 2 assignment on day 14. If the assignment on the 14th consecutive day had been a Type 1 assignment, the employee would have to have two consecutive calendar days off. It does not make sense to require only 24 consecutive hours off after a more fatiguing Type 2 assignment at that point. FRA has revised the rule text in § 228.405(a)(3) to clarify this issue, and other questions related to the application of these provisions.

*Comments on Definitions of "Type 1 Assignment" and "Type 2 Assignment" (§ 228.5)*

SEPTA, AAR and APTA each argue that the definition of "Type 2 assignment" should be modified to cover any assignment with time between midnight and 3 a.m., rather than 4 a.m., and that Type 1 assignments should be allowed to begin at 3 a.m. They point to a citation in the NPRM to the FAST validation study, which indicated a 20-percent increase in the risk of a human factors accident by working between the hours of midnight and 3 a.m. This causes AAR to conclude that 4 a.m. is an arbitrary threshold. However, 3 a.m. is actually the absolute low point for circadian rhythm, so it is actually the worst possible time to begin a shift, especially since to do so would require being awake in the period before that, in order to report for duty at 3 a.m. Indeed, NIOSH points out that even the 4 a.m. start time can have the same effect as an overnight shift because the employee must wake up earlier to report for duty at 4 a.m. Therefore, FRA has not modified the definitions as requested.

SEPTA and MTA suggest that Type 1 assignments that are delayed such that they extend past the Type 1 hours, or Type 2 assignments that model as Type 1 and are delayed, should still be treated as Type 1 assignments. This seems reasonable to FRA, as it does not seem appropriate for a schedule to have to be modeled every day if it runs a few minutes late. However, if the delay results in the employee's working in the midnight-to-4-am time period that is always to be considered a Type 2 assignment, the assignment must be considered Type 2 for that day, and the employee who worked it will have worked a Type 2 assignment for the purposes of the consecutive-days limitation. FRA has added rule text to clarify this issue. See § 228.5.

*Comments About Nap Policies and Sleep Facilities (§ 228.409)*

MTA suggests reducing the minimum nap period to be eligible for fatigue mitigation to 60 minutes instead of 90 minutes. The FRA-proposed 90-minute minimum nap period was the subject of significant Working Group discussion, and FRA does not see a significant reason to change it at this time. FRA notes that the *Commercial Transportation Operator Fatigue Management Reference* indicates that naps should not exceed 45 minutes and that 15–30 minutes should be allowed to fully wake up. If 15 minutes are added to allow time to fall asleep, the total is 75 minutes to 90 minutes.

MTA also suggests allowing railroads to decide on nap policies and sleep facilities unilaterally. FRA believes that the collaboration of labor and management on fatigue mitigation efforts is important to ensure successful fatigue mitigation, and FRA therefore declines to modify these provisions.

*Comments About Training (§ 228.411)*

Comments about training were centered on the timing of both initial training of existing employees subject to the subpart and immediate supervisors of those employees, and initial training of new employees. The NPRM proposed initial training of such existing employees and supervisors "as soon as practicable." This description of the deadline was deemed too uncertain. NIOSH suggested initial training should be provided to existing employees and supervisors within 90 days of the effective date of the final rule, while SEPTA recommended delaying the deadline for compliance with the initial training requirement for existing employees and supervisors until December 2012, so that it could be aligned with other railroad training

<sup>37</sup> See, e.g., Balkin, T.J. *et al.* "Effects of Sleep Schedules on Commercial Motor Vehicle Driver Performance," FMCSA Technical Report No. DOT-MC-00-133, U.S. Department of Transportation, (2000); Belenky *et al.*, "Patterns of performance degradation and restoration during sleep restriction and subsequent recovery: A sleep dose-response study," *Journal of Sleep Research*, 12, 1–12, (2003).

schedules. FRA believes that SEPTA's proposal is reasonable, has the benefit of certainty, and is consistent with the period for providing training in certain other FRA rules. Consequently, FRA has amended the training provision to require initial training of existing employees and supervisors no later than December 31, 2012.

With regard to initial training of new employees, which FRA proposed to require within 90 days of an employee's working an assignment that would be subject to this rule, AAR commented that this time frame will not allow employees to be trained within the railroads' normal training schedules. FRA has revised the time period in which new employees must be trained to be consistent with the latest version of FRA's forthcoming training standards, which was discussed in the Working Group as a standard with which it was agreed that the training provision in this regulation should be consistent. Therefore, new employees will have to be trained prior to December 31, 2012 or before they begin work, whichever is later.

#### *Other Comments*

BLET/UTU and TTD request that FRA require a "10-hour call" prior to an assignment (*i.e.*, notification of the time to report 10 hours in advance of the time at which the employee is requested to report for duty). While FRA agrees that such a requirement would provide predictability as to when an employee will be called to work, adopting a 10-hour call requirement is not possible at this time, as it was not a part of the proposed rule. FRA notes, however, that a 10-hour call is one of the fatigue mitigation tools that was discussed. The regulation requires labor involvement in the determination of fatigue mitigation tools to be applied, so there may be opportunities to voluntarily make use of this scheduling practice.

SEPTA suggested that the rule should place responsibility on the employee not to violate the regulation. FRA agrees that in some circumstances the employee may bear some responsibility, but the railroad bears responsibility for scheduling, so it will also bear some responsibility for scheduling an employee for an assignment that would violate the regulation. The applicable civil penalty provision (49 CFR 228.21) includes a reference to the liability of individuals for civil penalties for violating a requirement or causing the violation of any requirement of part 228, and the penalty schedule for part 228 includes a footnote, common to the penalty schedules of many FRA regulations, providing for the possibility

of individual liability for a civil penalty for a willful violation.

Finally, NIOSH says this regulation should be part of a comprehensive fatigue management plan. FRA agrees, and notes that the fatigue mitigation plans applied to particular schedules found to violate the fatigue threshold will be part of overall fatigue management. Appendix D to this rule provides guidance on fatigue management plans. Additional requirements will likely result from other ongoing FRA rulemaking projects.

## **VI. Section-by-Section Analysis**

### **Subpart A—General**

#### *Section 228.1 Scope*

FRA is revising this section by adding paragraph (c), which indicates that the regulation prescribes substantive hours of service requirements for train employees engaged in commuter or intercity rail passenger transportation.

#### *Section 228.3 Application*

Existing paragraph (a) of this section states that part 228 applies to any railroad or contractor or subcontractor to a railroad except as provided in paragraph (b) of the section.

Paragraph (b) of this section excludes from the scope of this part railroads or a contractor or subcontractor of a railroad that operates only on track inside an installation which is not part of the general railroad system of transportation. This provision would exclude from the coverage of subpart F some tourist, scenic, excursion or historic railroads because they operate off the general system. FRA has otherwise specifically included these operations within the coverage of this regulation, as provided by § 228.401, because if they are not covered by this regulation, their train employees would be subject to the statutory freight hours of service requirements of 49 U.S.C. 21103. As is explained in more detail in the discussion below of § 228.401, FRA believes that Congress intended these operations to be subject to this regulation, rather than the statutory requirements, and FRA does not believe the statutory requirements are appropriate for these operations. Accordingly, FRA is revising paragraph (b) of this section to refer to § 228.401, which is the specific applicability provision for new subpart F.

Paragraph (b) of § 228.3 also excludes from the application of part 228 rapid transit operations in an urban area that are not connected with the general railroad system of transportation. Section 228.401 contains an exclusion for these operations.

#### *Section 228.5 Definitions*

FRA is amending this section to add definitions of "Associate Administrator" and "FRA" as used in this part. Section 101 of the RSIA refers to FRA's "Associate Administrator for Railroad Safety" and emphasizes that the Associate Administrator is the Chief Safety Officer. Thus, in this final rule "Associate Administrator" means FRA's Associate Administrator for Railroad Safety/Chief Safety Officer.

FRA is also adding definitions of the terms "Type 1 assignment" and "Type 2 assignment." As was previously discussed in Section IV, above, these definitions were the subject of significant discussion in the Task Force and the Working Group, particularly because of the implications of a particular schedule's status as a Type 1 assignment or a Type 2 assignment for determining the application of the limitations on consecutive days in § 228.405 and the requirements for analysis of schedules and submission of schedules to FRA for approval in § 228.407. FRA believes that the definitions accommodate the concerns expressed in the Working Group regarding schedules outside the time parameters for a Type 1 assignment that may still present very little risk of an effectiveness score that would violate the fatigue threshold and compromise safety. At the same time, however, the definitions recognize the increased risk of fatigue associated with working late night and very early morning hours, which justifies the application of the more stringent requirements.

FRA added language to these definitions as they appeared in the NPRM to make clear that if an assignment is delayed so that the assignment that an employee actually worked includes any period of time between midnight and 4 a.m., the assignment must be treated as a Type 2 assignment for that employee for purposes of the consecutive days limitations and corresponding rest requirements in section 228.405. As was discussed in Section V, Responses to Public Comments on the NPRM, some commenters suggest that Type 1 assignments, or assignments having some time within the definition of a Type 2 assignment but that modeled acceptably to be treated as Type 1 assignments, should continue to be treated as Type 1 assignments even if delayed.

In most circumstances, this makes sense to FRA, in that railroads should not be expected to model assignments on a daily basis if they extend a few minutes past the 8 p.m. limits of a Type



1 assignment, or past the scheduled end time of a Type 2 assignment that was acceptable to be treated as Type 1. However, if the assignment as delayed includes time between midnight and 4 a.m., such an assignment is always considered Type 2, and an employee working that assignment should have Type 2 consecutive-days limitations and corresponding rest requirements.

FRA has added these terms to this general definitions section for part 228, rather than the definitions specific to subpart F, because these terms are also used in the recordkeeping provisions of subpart B, as amended by this rule.

### **Subpart B—Records and Reporting**

#### *Section 228.11 Hours of Duty Records*

Paragraph (c) of this section indicates that paragraphs (b)(13) through (b)(16) do not apply to the records of train employees providing commuter or intercity passenger rail transportation. Paragraphs (b)(13) through (b)(16) relate to substantive provisions of the HSL for train employees, added by the RSIA. As was described above in Section II, these requirements were not extended to train employees on commuter and intercity passenger railroads. The requirements referred to in paragraphs (b)(13) through (b)(16) are not required by this rule and therefore would continue not to apply to train employees providing commuter and intercity rail passenger transportation.

Paragraph (c) of this section now also requires two additional pieces of information, relating to the provisions of § 228.405(a)(3). First, paragraph (c)(1) requires that the record must note the date that begins the series of at most 14 consecutive calendar days that includes the duty tour being recorded. Second, paragraph (c)(2) requires that the record note the date, if any, of a calendar day on which the employee did not initiate an on-duty period prior to the current duty tour in the current series of at most 14 consecutive calendar days. This information will allow the railroad and FRA to determine compliance with the limitations established by paragraph (a)(3), both with respect to calendar days on which the employee did not initiate an on-duty period and consecutive days including one or more Type 2 assignments.

FRA recognizes that most railroads and employees subject to this subpart are currently keeping their hours of service records manually, and it may be burdensome for an employee to be required to keep track of his or her series of at most 14 consecutive days and mark its starting date on the hours of service record each day, as well as

indicating whether there had been a prior day off during the series. However, the railroad will have to have some way to track this information. Therefore, if a railroad wishes to keep this information centrally for all of its employees, this will be considered sufficient to satisfy the requirements that the hours of service record include the start date of the at-most 14-day series and the date, if any, that the employee did not initiate an on-duty period during the at-most 14-day series, provided this information is made available to FRA upon request.

#### *Section 228.19 Monthly Reports of Excess Service*

FRA is revising paragraph (c) of this section to require railroads to report to FRA instances of excess service related to new substantive limitations contained in § 228.405(a)(3) of this rule. That paragraph limits the number of consecutive days or total days within a series of at most 14 consecutive calendar days that train employees engaged in commuter or intercity passenger railroad transportation may initiate an on-duty period, and requires a minimum amount of time off duty or not initiating an on-duty period after an employee has reached the maximum number of consecutive or total days within the prescribed period, before the employee may return to duty, with different requirements depending on the time of day of the employee's assignments.

Excess service under § 228.405(a)(3)(ii) occurs when an employee has initiated on-duty periods on six consecutive days, including one or more Type 2 assignments, and then initiates a new on-duty period without having had the required 24 consecutive hours off at the home terminal. Paragraph (c)(5) addresses this excess service in the situation when the employee is at his or her home terminal at the end of the duty tour that triggers the rest requirement. Paragraph (c)(6) addresses this excess service, including the exception for an additional initiation of an on-duty period when the employee is not at his or her home terminal at the end of the duty tour that triggers the rest requirement.

Excess service under § 228.405(a)(3)(iii) occurs when an employee has not had two consecutive calendar days in which the employee has not initiated an on-duty period during the series of 14 consecutive calendar days, and initiates a new on-duty period without having had the required two consecutive calendar days without initiating an on-duty period at the home terminal. Paragraph (c)(7) addresses this excess service in the

situation when the employee is at his or her home terminal at the end of the duty tour that triggers the rest requirement. Paragraph (c)(8) addresses this excess service, including the exception for an additional initiation of an on-duty period when the employee is not at his or her home terminal at the end of the duty tour that triggers the rest requirement.

In the final rule, FRA has revised this section to reflect the consolidation of the revised consecutive-day provisions into § 228.405(a)(3). These issues were discussed in detail in Section V, Responses to Public Comments on the NPRM, and are further discussed in the section-by-section analysis of these provisions in § 228.405 below.

### **Subpart F—Substantive Hours of Service Requirements for Train Employees Engaged in Commuter or Intercity Rail Passenger Transportation**

#### *Section 228.401 Applicability*

This section would establish the specific applicability of new subpart F, which differs somewhat from that of existing subparts in this part. Paragraph (a) of this section provides that the requirements of subpart F apply to railroads and their officers and agents, only with respect to their train employees engaged in commuter or intercity rail passenger transportation. Subpart F does not apply to contractors or subcontractors to railroads, unlike the rest of part 228. See § 228.3(a).

For purposes of subpart F, FRA interprets “commuter or intercity rail passenger transportation” to include rail passenger transportation by tourist, scenic, excursion, and historic railroads (referred to collectively for the purposes of this discussion as tourist railroads). FRA believes that in the RSIA Congress intended that these regulations apply to all railroads providing rail passenger transportation, and that Congress did not intend to apply the amended statutory provision at 49 U.S.C. 21103 to tourist railroads because tourist railroad operations are more similar to the other passenger service than they are to freight service. The provisions of the HSL that apply to train employees on freight railroads are not as appropriate, therefore, for train employees on tourist railroads. For fatigue purposes, the most salient difference between passenger and freight operations is that most passenger operations tend to be scheduled, whereas freight operations tend to be unscheduled. Virtually all passenger crew assignments have scheduled on-duty and off-duty times, and the vast majority of passenger crew assignments are to report in the morning



and go off duty in the late afternoon or early evening, thereby reducing the likelihood of on-duty fatigue. Like typical intercity and commuter rail operations, tourist rail operations tend to be scheduled and to occur during the daytime or early evening.

Paragraph (b) of this section provides that this subpart does not apply to urban rapid transit operations not connected with the general railroad system of transportation.

*Section 228.403 Nonapplication, Exemption, and Definitions*

This section would establish the situations in which this subpart does not apply, provide circumstances in which a railroad may seek an exemption from the provisions of this subpart, and provide key definitions specifically applicable to this subpart.

Paragraph (a) of this section would establish the situations in which this subpart does not apply, such as an act of God. This paragraph is substantively identical to the nonapplication provision of the HSL (49 U.S.C. 21102(a)), which was unchanged by the RSIA. The provisions of this rule would therefore not apply to train employees engaged in commuter or intercity passenger service in the same situations as the statutory hours of service requirements would not apply to other train employees, (or to signal employees or dispatching service employees).

Paragraph (b) of this section would provide the possibility of an exemption from the requirements of this subpart for a railroad having not more than a total of 15 train employees, signal employees, and dispatching service employees. This paragraph is substantively identical to the exemption provision of the HSL at 49 U.S.C. 21102(b), which was unchanged by the RSIA. It would provide the same opportunity for a railroad to seek an exemption from the requirements of this subpart as a railroad would have to seek an exemption from the statutory requirements applicable to its other employees.

Paragraph (c) of this section defines several key terms specifically applicable to this subpart. It defines “commuter or intercity rail passenger transportation” as the terms “commuter rail passenger transportation” and “intercity rail passenger transportation” have been defined at 49 U.S.C. 24102. This definition is consistent with FRA’s authority to issue this rule, as Section 108(e) of the RSIA defined these terms as they are defined at 49 U.S.C. 24102.

This paragraph also defines “train employee who is engaged in commuter or intercity rail passenger

transportation” to establish that the term includes any train employee performing that function, regardless of whether the train employee is employed by a commuter or intercity passenger railroad, or another type of railroad or other entity. The term also includes all train employees employed by a commuter or intercity passenger railroad. The term excludes a train employee employed by another type of railroad or entity who is engaged in work train service. In this final rule, FRA has added language to the proposed definition. As FRA discussed above in Section IV, the RSAC Working Group discussed the application of subpart F to train employees of freight railroads who provide pilot service on trains operated by commuter railroads or intercity passenger railroads, and FRA included preamble language in the NPRM excluding such pilot service from coverage under this rule, provided that an employee does not serve as a pilot more than four times in a calendar month, or engage in any other commuter or intercity rail passenger transportation. In response to comments on the scope of the rulemaking, discussed further in Section V, Responses to Public Comments on the NPRM, above, FRA has eliminated the cap on the amount of pilot service that may be performed, and has clarified the issue by specifically excluding pilot service from the definition of “train employee who is engaged in commuter or intercity rail passenger transportation.” See § 228.3.

*Section 228.405 Limitations on Duty Hours of Train Employees Engaged in Commuter or Intercity Rail Passenger Transportation*

This section provides the substantive limitations on the duty hours of train employees subject to this subpart.

Paragraphs (a)(1) and (a)(2) of this section establish the maximum time on duty in a duty tour and the required minimum time off duty in a 24-hour period. These limitations are substantively identical to the statutory requirements of 49 U.S.C. 21103(a)(1) and (a)(2) as they existed prior to July 16, 2009, the effective date of the amendments to that section made by the RSIA, which requirements currently still apply to train employees engaged in commuter or intercity rail passenger transportation, until the effective date of this regulation. As these provisions are substantively identical to their parallel provisions in old section 21103, FRA’s prior interpretations of these provisions, as established in FRA’s technical

bulletins, will continue to apply.<sup>38</sup> FRA retains these limitations as a “floor” because there is limited evidence of fatigue-related accidents in operations subject to this rule. Furthermore, an analysis sampling the schedules of train employees now subject to this rule indicates that many of the schedules are not likely to be at risk for producing a level of fatigue at which safety may be compromised. However, FRA is imposing additional requirements to address work schedules that are likely to result in fatigued employees and rest requirements that will minimize cumulative fatigue.

In order to address cumulative fatigue, new requirements are added in paragraph (a)(3) restricting the number of consecutive days or total days in a prescribed period on which an employee may initiate an on-duty period, as discussed below. The changes from the proposed rule to the final rule do not significantly change the time off duty previously proposed to be required by proposed paragraphs (a)(3) and (a)(4), but resolve issues previously identified by FRA and further discussed by a commenter. In the NPRM, paragraphs (a)(3) and (a)(4) of § 228.405 proposed limitations on the number of days that an employee may work, with paragraph (a)(3) providing the limitation for an employee who works one or more Type 2 assignments, and paragraph (a)(4) providing a less stringent, but more complex limitation for an employee who works only Type 1 assignments. Paragraph (a)(3) in the NRPM proposed that an employee who initiates an on-duty period on 6 consecutive calendar days including one or more Type 2 assignments must have at least 24 consecutive hours off duty at the employee’s home terminal. Paragraph (a)(4) in the NRPM proposed that after an employee has initiated on-duty periods in a period of 14 consecutive calendar days and has not had a total of at least two calendar days within that 14-day period in which the employee has not initiated an on-duty period, the employee must have two consecutive calendar days without initiating an on-duty period at the employee’s home terminal.

Recognizing the potential interaction between the proposed paragraphs (a)(3) and (a)(4), FRA provided an example in the NPRM of how the consecutive-days provisions would apply if an employee initiated a Type 2 assignment after

<sup>38</sup> Similarly, paragraphs (b) and (c) of the rule are substantively identical to their parallel provisions, paragraphs (b) and (c) of the old section 21103. As with paragraphs (a)(1) and (a)(2), FRA’s prior interpretations of these provisions continue to apply.

having initiated only Type 1 assignments in a period of more than 6 but less than 14 consecutive calendar days. FRA indicated that if an employee initiated only Type 1 assignments for a period of more than 6 consecutive calendar days but fewer than 14 consecutive calendar days on which the employee has initiated an on-duty period, and then initiated a Type 2 assignment—for example, a Type 2 assignment on the eighth consecutive day after having worked Type 1 assignments on the previous 7 days—the “Type 2” limitation will apply at that time, and the employee must have 24 consecutive hours off duty following the Type 2 assignment (or work or deadhead to the home terminal the next day and then have 24 hours off duty at the home terminal) and then begin a new period of consecutive days upon returning to duty.

However, as was discussed above in Section V, Response to Public Comments on the NPRM, FRA received a comment pointing out that if an employee had initiated an on-duty period in a Type 1 assignments each day for 13 consecutive days, and then initiated a Type 2 assignment on the 14th day, it would not make sense for the employee to have only 24 hours off duty, when 2 consecutive calendar days without initiating an on-duty period would have been required had the employee worked a less fatiguing Type 1 assignment on the 14th day. The consolidation of proposed paragraphs (a)(3) and (a)(4) into new paragraph (a)(3) addresses this concern by including the restriction on more than six consecutive days including a Type 2 assignment in the same at-most 14-day period applicable to Type 1 assignments, as discussed in more detail below. FRA has also rephrased the requirements into a positive statement of when additional time off duty is required, rather than negatively expressing when an employee may not work. FRA also clarified the nature of the “14-day period.” For the vast majority of circumstances considered by FRA, the rest required under the consolidated paragraph (a)(3) will not differ from the rest required under the proposed paragraphs (a)(3) and (a)(4). By including the limitation on consecutive assignments including at least one Type 2 assignment within the broader limitation of the at-most 14-day period, the consolidation provides a clearer set of rules to govern how much time off duty is required when an employee works a Type 2 assignment after having worked a series of Type 1 assignments late in the at-most 14-day

period. The revisions will also relieve railroads and employees from having to determine, on a daily basis, how many days have elapsed since the beginning of the at-most 14-day period in order to determine how much time off duty is required if a Type 2 assignment is worked on that day.

As a general rule, the application of the cumulative-fatigue provisions has not changed from the NRPM. As proposed in the NPRM and as adopted in the final rule, if an employee initiates an on-duty period each day for 14 consecutive calendar days, or 13 days out of the 14 consecutive calendar days, even if all of those assignments are Type 1 assignments, that employee must have at least 2 consecutive calendar days on which he or she does not initiate an on-duty period at his or her home terminal. As proposed in the NRPM and as adopted in the final rule, if an employee initiates an on-duty period for 6 consecutive calendar days, including one or more Type 2 assignments, that employee must have at least 24 consecutive hours off duty at his or her home terminal. Similarly, in both the proposed and the final versions of the cumulative-fatigue provisions, flexibility is provided to allow the employee to return to his or her home terminal, if necessary, before taking the required rest. The only clarifying change that the final rule makes is that both the 24-hour and 2 consecutive calendar day off-duty periods can be applicable within a series of at most 14 consecutive calendar days; when this occurs, to the extent that the rest periods overlap, they do so concurrently, rather than consecutively.

Paragraph (a)(3) of the final rule now provides a series of at most 14 consecutive calendar days as the frame of reference regardless of whether the employee initiates Type 1 assignments, Type 2 assignments, or some combination thereof. As was implied in the NRPM, the final rule’s paragraph (a)(3)(i) now makes explicit that the first series of at most 14 consecutive calendar days begins at a fixed date: the first calendar day on or after the compliance date, as specified in section 228.413, for paragraph (a)(3) that the employee initiates an on-duty period. A series of at most 14 consecutive calendar days ends either (1) after the employee has had two calendar days without initiating an on-duty period or (2) after the 14th consecutive day, whichever comes first. When a series of at most 14 consecutive calendar days ends, the next series of at most 14 consecutive calendar days begins when the employee next initiates an on-duty period. Once a new series has begun, it

is not necessary to look back at a prior series to find a day on which an on-duty period was not initiated. For instance, if an employee begins a series of at most 14 consecutive calendar days on May 1, and he or she does not initiate an on-duty period on May 4 and May 9, the series beginning on May 1 ends on May 9. If the employee next initiates an on-duty period on May 10, a new series begins on May 10, potentially extending as far as May 23. The series beginning May 10 will not end before May 23 unless the employee has two days in the period between May 10 and May 23 on which the employee does not initiate an on-duty period.

If the employee, at any point in the at-most 14-day period, works six consecutive calendar days including a Type 2 assignment, paragraph (a)(3)(ii) requires the employee to have 24 hours off duty before the employee may return to initiate another on-duty period.

If an employee reaches the end of the 14th consecutive day of the at-most 14 day period without having two calendar days on which he or she did not initiate an on-duty period, paragraph (a)(3)(iii) requires the employee to have two consecutive calendar days on which he or she does not initiate an on-duty period before the employee may return to initiate another on-duty period.

Paragraph (a)(3)(iv) establishes that this time off be at the home terminal, and that the employee not be available for any service for any railroad during the time off duty required by paragraph (a)(3). Paragraph (a)(3)(v) provides flexibility to railroads, allowing an employee to receive deadhead transportation to his or her home terminal or to work an additional assignment to the employee’s home terminal prior to receiving the required rest.

Some examples may help to illustrate the cumulative-fatigue provisions of paragraph (a)(3) of this section as applied to employees working only Type 1 assignments under paragraph (a)(3)(iii). An employee who initiates an on-duty period each day on 14 consecutive calendar days must have two consecutive calendar days on which he or she does not initiate an on-duty period. Likewise, an employee who initiates an on-duty period on any combination of calendar days during an at-most 14-day period that does not include a total of at least two calendar days when he or she did not initiate an on-duty period within the period (e.g., if the employee had no days or only one day in which he or she did not initiate an on-duty period in the at-most 14-day series), must also have two consecutive calendar days without initiating an on-

duty period. If an employee initiated an on-duty period each day on 6 consecutive calendar days, had one calendar day without initiating an on-duty period, and then initiated an on-duty period for the next 7 consecutive calendar days, finishing the last of these on-duty periods on the 14th or 15th consecutive calendar day, that employee would not have had at least two calendar days in the 14-day period in which he or she did not initiate an on-duty period, and that employee would have to have at least two consecutive calendar days in which he or she does not initiate an on-duty period, before the employee could initiate another on-duty period. However, if an employee initiated an on-duty period for 4 consecutive calendar days, had a calendar day in which he or she did not initiate an on-duty period, then initiated an on-duty period on 3 consecutive calendar days and had another calendar day without initiating an on-duty period, that employee would have had a total of 2 calendar days on which the employee did not initiate an on-duty period in the 14-day period, ending the at-most 14-day period. Because the employee has had two calendar days on which he or she has not initiated an on-duty period in the at-most 14-day period, a new period of at-most 14 days will begin for that employee when he or she next initiates an on-duty period. If that same employee, starting on the next calendar day, initiated an on-duty period for 4 more consecutive calendar days, followed by a calendar day in which the employee does not initiate an on-duty period, the employee has had only 1 calendar day without initiating an on-duty period in the current at-most 14-day period, because calendar days prior to the start of the 14-day period are not counted.

The new paragraph (a)(3)(ii) addresses the time off duty that is required when an employee works a Type 2 assignment at any point in a series of at most 14 consecutive calendar days; the employee is required to have 24 consecutive hours of time off duty at the employee's home terminal after any sequence of six consecutive calendar days each day of which the employee initiates an on-duty period including at least one Type 2 assignment, regardless of when this period of six or more consecutive days falls within the larger at-most 14-day period. This 24 hours off duty under paragraph (a)(3)(ii) must run concurrently with the two consecutive calendar days of not initiating an on-duty period required by paragraph (a)(3)(iii) if an employee also has not had two calendar days on which he or

she did not initiate an on-duty period in the fully realized series of 14 consecutive calendar days. In the example provided in the comment on the NRPM discussed above, an employee who initiated an on-duty period in Type 1 assignments each day for 13 consecutive calendar days, and then initiated a Type 2 assignment on the 14th day will be required to have 24 consecutive hours of time off duty before initiating an on-duty period again (as required by paragraph (a)(3)(ii) because the employee has initiated an on-duty period for six or more consecutive days), as well as not initiate an on-duty period for two consecutive calendar days before initiating an on-duty period again (as required by paragraph (a)(3)(iii) because the employee has not had two calendar days without initiating an on-duty period during the 14-day period). To the extent that the required rest periods overlap, they run concurrently, not consecutively.

Although many train employees engaged in commuter or intercity passenger service regularly end their duty tour at their home terminal, FRA recognizes that this will not be the case for all employees, and all railroads, subject to this subpart. The language of paragraph (a)(3)(v) allows the railroad the flexibility to get the employee back to his or her home terminal, while at the same time ensuring that the employee will observe the required rest period at the home terminal. Note that although rest periods of 24 consecutive hours and of two consecutive calendar days without initiating an on-duty period must be at the employee's home terminal, by contrast, a calendar day during the at-most 14-day period "on which the employee has not initiated an on-duty period" under paragraphs (a)(3)(i)–(a)(3)(iii) does not have to be at the home terminal.

As was discussed above in Section IV, members of the Working Group expressed concern about these requirements, because the schedule analysis done by the Task Force had indicated a number of situations in which employees who worked consecutive days beyond the limitations proposed by FRA would not exceed the fatigue threshold. However, as also stated above, FRA still believed the limitations were appropriate, based on accepted fatigue science indicating that work on successive days increases the risk of accidents as the number of successive days of work increases, and because of the likelihood that an employee working an indefinite number of consecutive days will eventually attend to other activities during time

that a fatigue model would consider available for rest.

FRA accommodated the concerns of Working Group members in revising the draft proposed definition of "Type 2 assignments" as discussed above. In addition, the cumulative-fatigue provisions of paragraph (a)(3) as they apply to employees working only Type 1 assignments allow employees to work two consecutive hold downs (allowing the employee to exercise seniority to select and work the full cycle of two separate 6-day or 7-day schedules for which the incumbent employee is on vacation or otherwise unavailable), before being required to have two consecutive days at the employee's home terminal without initiating an on-duty period. This flexibility eliminates some potential conflict with existing operations and agreements.

At the same time, an employee who does not initiate an on-duty period each day for the maximum number of consecutive days will be able to restart the series of 14 consecutive days after having accumulated two calendar days in which the employee does not initiate an on-duty period, as provided in paragraph (a)(3)(i). This language eliminates a concern that the railroad and the employee would have to look back each day during any series of 14 consecutive calendar days and find that the employee has had two calendar days without initiating an on-duty period during each of those previous 14-day periods to be in compliance.

Paragraph (b) of this section describes how various periods of time are counted for the purpose of determining total time on duty. This paragraph is substantively identical to the provisions for determining time on duty in 49 U.S.C. 21103(b), which were unchanged by the RSIA. Therefore, these provisions are currently in effect for train employees of commuter and intercity passenger railroads, as well as for other train employees. FRA recognizes that any change in these provisions would require significant changes for the industry in operations and recordkeeping. FRA does not believe that there is any reason to change these provisions at the present time.

Paragraph (c) of this section allows a train employee to work additional hours in emergency situations. This paragraph is substantively identical to the "emergency" provision of 49 U.S.C. 21103(c), which was unchanged by the RSIA.

As provided by § 228.413, paragraphs (a)(1), (a)(2), (b), and (c) are effective on and after October 15, 2011. The limitations provided by paragraph (a)(3) are generally effective beginning on the

date that is 180 days after the effective date of this final rule, to give railroads time to complete their analysis of their work schedules. See discussion under § 228.407. A further delayed compliance date of 545 days after the effective date of this final rule is provided for railroads engaged in tourist, scenic, historic, or excursion rail passenger transportation, as discussed above in Section V, Response to Public Comments on the NPRM.

*Section 228.407 Analysis of Work Schedules; Submissions; FRA Review and Approval of Submissions; Fatigue Mitigation Plans*

This section requires a railroad subject to this subpart to analyze the schedules that the railroad intends its employees subject to this subpart to work, to identify those schedules at risk for fatigue violating the fatigue threshold, and to report to FRA in certain circumstances.

Paragraph (a) requires the railroads to analyze one work cycle, of each schedule, using a valid biomathematical model of performance and fatigue, to determine whether the fatigue risk posed by the schedule violates the fatigue threshold. A work cycle is the cycle within which the schedule repeats. For example, if a schedule called for an employee to work Monday through Friday from 8 a.m. until 4 p.m., with Saturday and Sunday off, and then report again Monday at 8 a.m., the work cycle is the Monday to Sunday schedule that then repeats. Other schedules on some railroads may operate over a two-week period, with certain days off within the two-week cycle. Some schedules do not require analysis, as provided by paragraph (g), discussed below.

Based on this analysis, the railroad is required to identify those schedules at risk for resulting in a level of fatigue that would violate the fatigue threshold. To the extent possible, the railroad is required to apply fatigue mitigation tools identified in the railroad's fatigue mitigation plan (including, but not limited to, those tools described in Section IV above) to mitigate the fatigue risk in those schedules to a level that does not violate the fatigue threshold. If the railroad is unable to mitigate the risk for fatigue presented by a particular schedule to the point that it no longer violates the fatigue threshold, and the schedule cannot be modified to reduce the fatigue risk sufficiently, then the railroad must make a determination that the fatigue risk cannot be sufficiently mitigated to bring it within the fatigue threshold, but that the schedule is operationally necessary. Any schedule

that has been identified as having a risk for fatigue that violates the fatigue threshold must be reported to FRA within 180 days after the effective date of the final rule, with an extension to 545 days after the effective of the final rule for tourist, scenic, historic, and excursion railroads, as specified by § 228.413.

Paragraph (b) of this section provides further details as to the requirements and procedures for submission of schedules and other information to FRA for review by the applicable compliance date.

A railroad must submit to FRA those schedules for which it has mitigated the fatigue risk so that it no longer violates the fatigue threshold, along with the fatigue mitigation tools it applied to each particular schedule to reduce the fatigue risk.

A railroad must also submit to FRA those schedules for which it is unable to mitigate the fatigue risk to a level that does not violate the fatigue threshold, but which the railroad has determined are operationally necessary. A railroad must also submit the fatigue mitigation tools that the railroad applied to each schedule, if any, to reduce its fatigue risk even if it could not be reduced to the point that it no longer violated the fatigue threshold. Finally, a railroad must submit the basis for its determination that each schedule is operationally necessary.

If a railroad performs the required analysis of its schedules and determines that none of its schedules presents a risk for a level of fatigue that violates the fatigue threshold and requires transmittal to FRA, the railroad must submit a declaration that it has performed the required analysis and determined that none of its schedules violate the fatigue threshold, and therefore none are required to be submitted.

FRA will review the submissions, and will notify the railroad if the agency takes any exception to the submitted information within 120 days of FRA's receipt of the submission. Railroads are required to correct any deficiencies identified within the time frame specified by FRA. FRA expects that it will work with a railroad to address any concerns with the schedules, mitigation tools, or determinations of operational necessity, and does not intend to dictate how a schedule must be modified.

FRA will also audit each railroad's work schedules and mitigation tools every two years to ensure compliance with the requirements of this section.

Paragraph (c) of this section provides a railroad's options with regard to the use of a biomathematical model of

performance and fatigue. Paragraph (c)(1) provides that a railroad may submit to FRA's Associate Administrator for approval evidence of the scientific validation of any biomathematical model of performance and fatigue that it wishes to use for the analysis required by this section. Decisions of the Associate Administrator regarding the validity of a model are subject to review as provided by 49 CFR 211.55.

Paragraph (c)(2) provides that a railroad may use a model that has already been approved, and further provides that FRA has approved the use of both the FAST model and the FAID model, both of which are discussed in Section III above, for the analysis required by this section. FRA has added language to this paragraph to specify the thresholds for FAST and FAID for the purposes of compliance with this regulation. In addition, the paragraph now indicates that versions of FAST and FAID besides those specifically identified in the paragraph must be submitted to FRA for approval prior to use, under the procedures provided by paragraph (c)(1) for approval of a new model.

Paragraph (c)(3) has also been added to this section, to provide that if a new model is submitted to FRA for approval, pursuant to paragraph (c)(1) of this section, FRA will publish notice of the submission in the **Federal Register**, and will provide an opportunity for comment, before the Associate Administrator makes a final determination as to its approval or disapproval. If the Associate Administrator approves a new model as having been validated and calibrated, so that it can be used for schedule analysis in compliance with this regulation, FRA will also publish notice of this determination in the **Federal Register**.

Paragraph (d) of this section requires a railroad that changes its schedules to analyze certain of those schedules and submit them to FRA for approval.

Paragraph (d)(1)(i) requires a railroad to analyze and submit for approval any schedule that has been changed such that it would differ from the parameters of any schedule that had been previously analyzed and approved. In other words, a railroad does not have to submit a revised schedule to FRA if it is the same as any of its schedules that had been previously approved, or if it is a schedule that would not have had to be analyzed or submitted if it were an original schedule.

Specifically, if a schedule is revised so that it is now the same as another schedule that has previously been submitted to and approved by FRA, that

schedule does not have to be analyzed or submitted. A railroad also does not have to analyze or submit any schedule that, as revised, is wholly within the hours of 4 a.m. to 8 p.m. (a Type 1 schedule, which FRA considers per se to present an acceptable level of risk for fatigue that does not violate the fatigue threshold). A railroad is also not required to submit a schedule that, as revised, is now the same as another schedule that includes time outside the 4 a.m. to 8 p.m. hours, but that the railroad analyzed and found not to violate the fatigue threshold, and that does not include any time between midnight and 4 a.m. (because such a schedule would qualify for treatment as a Type 1 assignment).

However, any revised schedule that includes time outside the hours of 4 a.m. to 8 p.m. that is not either the same as a schedule previously approved, or the same as a schedule previously analyzed and found not to violate the fatigue threshold and not including any time between midnight and 4 a.m., has to be analyzed by the railroad. Further, a railroad must submit to FRA any revised schedules that, when analyzed, are found to violate the fatigue threshold, along with the fatigue mitigation tools that the railroad has applied to mitigate the fatigue risk in those schedules to a level that does not violate the fatigue threshold. In addition, if the railroad analyzes a revised schedule and finds that it cannot be mitigated so that the risk for fatigue does not violate the fatigue threshold, but is operationally necessary, the railroad must submit the schedule, along with any fatigue mitigation tools that have been applied, and the railroad's determination of the operational necessity of the schedule and the basis for that determination.

Paragraph (d)(1)(ii) of this section requires a railroad to analyze any revised schedule that has been altered to an extent that employees working the schedule may be at risk of experiencing a level of fatigue that violates the fatigue threshold. This means that the railroad must analyze a schedule that previously was not at risk of violating the fatigue threshold but that may be at risk as revised. If such a revised schedule is in fact found to violate the fatigue threshold, the fatigue risk must be mitigated or the schedule determined to be operationally necessary, just as in the initial analysis required by paragraph (a) of this section.

In addition, any schedules that were previously found to violate the fatigue threshold and either mitigated or found to be operationally necessary also have to be analyzed when those schedules are

changed, and submitted to FRA for approval if the revised schedule violates the fatigue threshold. Even though the schedule was already known to present a fatigue risk, the level of risk presented by the schedule as revised could increase or decrease, and different mitigations may be warranted, or the determination of operational necessity could be different, depending on the level of fatigue risk, as that determination is based on balancing the necessity with the risk. Therefore, FRA review of these revised schedules, along with the relevant fatigue mitigation tools or determinations of operational necessity, is required.

Paragraph (d)(2) of this section requires that revised schedules and supporting documentation that are required to be submitted to FRA must be submitted as provided by paragraph (b) of this section, as soon as practicable prior to the use of the new schedule. Some railroads expressed the concern that work schedule changes are sometimes not finalized until shortly before the schedules are to begin operation, and the FRA approval process could delay work schedule implementation and published timetable changes. However, the regulatory language does not require FRA approval before a new schedule may begin operation, just that it be submitted as soon as practicable prior to use. In addition, given the limited nature of the schedules that require FRA review, FRA would expect some degree of advance planning for those kinds of schedules, so that the fatigue implications of the revised schedules can be fully understood by the railroad, as well as by FRA. FRA has added paragraph (d)(3) to provide that FRA will respond to any submissions of revised schedules as soon as practicable, depending on the number and complexity of the revisions submitted, and that railroads are required to correct any deficiencies identified by FRA within the time frame specified by FRA in its response. FRA expects to work with the railroad to resolve any concerns about schedules, mitigation tools and determinations of operational necessity, and does not intend to dictate how a schedule must be modified.

In addition, some APTA members also expressed concern about compliance with the requirements of this paragraph for special trains that they are sometimes called upon to operate. Many special events require advance notification and planning. For those events of which the railroad does not have advance notice, FRA will address those situations and work with the railroad on a case-by-case basis.

Paragraph (e) of this section requires a railroad to have and comply with a written fatigue mitigation plan, to mitigate the potential for fatigue in its work schedules, identified through the analysis required by paragraphs (a) and (d) of this section. The railroad is required to review the plan every two years and update it as necessary.

Paragraph (f) of this section requires a railroad to consult in good faith with its directly affected employees and any labor organization representing them, on the analysis of work schedules, selection of mitigation tools, and any submissions to FRA required by this section. If the railroad and its affected employees or their labor organization cannot reach consensus on any of those items, the employees or labor organizations may file a statement with FRA's Associate Administrator, explaining their views on any issue on which consensus was not reached. Any such statements will be considered by FRA during the review and approval of any submissions required by this section.

Paragraph (g) of this section allows a railroad not to analyze certain schedules that categorically do not present an unacceptable level of risk for fatigue that violates the fatigue threshold. FRA considers a Type 1 assignment to present an acceptable level of risk for fatigue that does not violate the fatigue threshold. Therefore, such schedules do not have to be analyzed according to paragraph (g)(1). In addition, FRA also considers it acceptable for railroads to make an indirect determination that a Type 2 assignment presents an acceptable level of risk for fatigue that does not violate the fatigue threshold if it is no longer in duration than, and fully contained within, the schedule of another Type 2 assignment that has already been analyzed and determined to present an acceptable level of risk for fatigue that does not violate the fatigue threshold. As a result, these schedules would not require further analysis. The daily schedule of such an indirectly analyzed assignment must be fully contained or "nested" within the same daily schedule of the previously analyzed assignment. If any mitigations were applied to the previously analyzed schedule to make this determination, the same or more effective mitigations must also be applied to the indirectly analyzed schedule to ensure that it is at least as safe. In other words, FRA will accept the results of an analysis performed of a schedule with identical or greater risk for fatigue that does not violate the fatigue threshold. For instance, if a tourist railroad operated a train from 11 a.m. to 8:30 p.m. with an

hour and a half break, and that schedule did not pose an unacceptable level of risk for fatigue and does not violate the fatigue threshold, a similar schedule operating from 1 p.m. to 8:30 p.m. would also be deemed to present an acceptable level of risk for fatigue that does not violate the fatigue threshold, provided that if any mitigations were applied to the first schedule to make this determination, the same or more effective mitigations were applied to the second. FRA believes that this added flexibility will allow railroads to make determinations of whether schedules are acceptable in a more timely and cost-effective manner.

*Section 228.409 Requirements for Railroad-Provided Employee Sleeping Quarters During Interim Releases and Other Periods Available for Rest Within a Duty Tour*

This section provides that any rest facilities provided by a railroad for the use of its employees during periods of interim release or other periods during a duty tour must be “clean, safe, and sanitary,” and give the employee “an opportunity for rest free from the interruptions caused by noise under the control of the” railroad. This section is consistent with statutory language for sleeping quarters at 49 U.S.C. 21106, including sleeping quarters provided for the use of employees during the required minimum off-duty period.

Paragraph (b) of this section provides that if the facilities are proposed as a fatigue mitigation tool, for the purpose of mitigating fatigue identified by the schedule analysis required by § 228.407, then those facilities are subject to the requirement in § 228.407(f), that the railroad consult with affected employees and labor organizations.

*Section 228.411 Training*

This section establishes training requirements for this rule. FRA believes this provision is especially important because the schedule analysis and fatigue mitigation required by other sections of this rule have little meaning if employees are not aware of the level of fatigue predicted to occur as a result of their work schedule, and the mitigation tools available to the employee to reduce the fatigue risk. For example, suppose that a railroad submits a schedule to FRA for approval that violates the fatigue threshold, but as a mitigation tool, the railroad indicates that it will provide facilities and allow employees working that schedule to take a nap during a two-hour break between scheduled trains, and that the insertion of a nap at that point decreases the fatigue level so that the threshold is

no longer violated. If the employee working that schedule does not realize that his or her work schedule violates the fatigue threshold (which is a level of fatigue at which, according to the model, safety may be compromised), or is unaware of facilities and policies allowing the employee to take a nap, or is unaware of the beneficial effect of the nap on the predicted fatigue level, then the employee will not take advantage of the mitigation tool purported to reduce the fatigue risk in that schedule, and the risk will not actually be reduced. Employees who are not currently working assignments that violate the fatigue threshold will also benefit from the training required by this section, as it may raise awareness of, and provide strategies for addressing, other circumstances in their lives that contribute to their actual level of fatigue that are not accounted for in work schedule analysis. The training requirements in this rule were the subject of extensive discussion within the Working Group, and members of the Working Group recommended the content of training, as well as the training interval.

Paragraph (a) of this section requires, as a general rule, that railroads subject to this subpart provide training to employees subject to this subpart and their immediate supervisors. Paragraph (b) of this section lists the minimum subjects that must be covered in training, based on the most current available scientific and medical research and literature. Although the subjects to be covered are quite broad, the specific information to be covered may change over time based on scientific developments or changes in a railroad's operations that may make additional topics appropriate. The format of the required training is not prescribed, as FRA specifically intends to allow each railroad the flexibility to provide training at a level of formality and complexity that is appropriate to its operations and the needs of its employees. Options include, but are not limited to, classroom training, computer-based training, review of written materials, and oral job briefings. Railroads may also combine this training with other training provided to their employees.

Paragraph (c) of this section requires that training be provided to existing affected employees no later than December 31, 2012. Based on comments received, this is a change from the NPRM, which had proposed to require training as soon as practicable. The revised deadline for initial training provides greater certainty, and allows railroads to schedule the training in

their normal cycle. Training is required to be provided to new employees hired after December 31, 2012, before they first work a schedule for the railroad that is subject to analysis under this subpart. Although the NPRM had proposed to require that new employees receive training within 90 days after they work a schedule subject to analysis, the provision has been revised in the final rule to be consistent with the latest version of FRA's forthcoming training standards (a separate rulemaking), as members of the Working Group requested that the interval in this rule be consistent with the training standards.

Paragraph (d) of this section requires refresher training at least every three years, and when significant changes are made to the railroad's fatigue mitigation plan or to the available fatigue mitigation tools applied to an employee's assignment or to assignments at the location where the employee works. Railroads also have the flexibility to select an appropriate method of providing refresher training, which will likely be less detailed, and could also be less formal, than the initial training provided to an employee, depending on the extent of any new information to be presented.

Paragraph (e) of this section requires a railroad to keep records of each employee provided training and to retain these records for three years.

Paragraph (f) of this section provides an opportunity for tourist, scenic, historic, and excursion railroads to be excluded from the duty to comply with this section. The exclusion is available to such a railroad if its train employees subject to this rule are assigned to work only schedules that are wholly between the hours of 4 a.m. and 8 p.m. on the same calendar day, and that comply with the provisions of § 228.405, if the railroad provides written notice to FRA. Such a notice is required to help FRA ensure that the exclusion is exercised only by those railroads eligible for it in fact and not by inadvertence. FRA expects that most tourist, scenic, historic and excursion railroads will have schedules that do not violate the fatigue threshold and do not have to be mitigated, and that these railroads will submit a declaration of such to FRA pursuant to § 228.407(b)(2). Unfortunately, that declaration does not serve the same purpose as a declaration under this paragraph, because the former could include schedules having time outside the hours of 4 a.m. and 8 p.m. that have been analyzed and do not violate the fatigue threshold. Railroads operating schedules outside those hours

are not eligible for the conditional exclusion provided by this paragraph.

*Section 228.413 Compliance Date for Regulations; Exemption From Compliance With Statute.*

This section provides, that, in general, the railroads subject to this subpart must comply with this subpart and associated recordkeeping requirements, with respect to their train employees who are engaged in commuter or intercity rail passenger transportation, beginning April 12, 2012. However, some provisions governing the hours of service of these employees go into effect for all railroads subject to this subpart on October 15, 2011, specifically §§ 228.401, 228.403, 228.405(a)(1)–(2), (b), and (c), and 228.409 (a).

As an exception to this general principle, all railroads providing tourist, scenic, historic, or excursion rail passenger transportation subject to this subpart are not required to comply with the provisions of the subpart with which they would otherwise be required to comply on and after April 12, 2012 until April 13, 2013. As was discussed in Section V, Response to Public Comments on the NRPM, FRA has added this approximately one-year delay of the compliance date to address the concerns of a commenter.

This section also provides that railroads subject to this subpart are exempt from complying with the statutory hours of service requirements currently in effect for them, which are the requirements of 49 U.S.C. 21103 as it was in effect the day before the enactment of the RSIA, and are also exempt from complying with new section 21103, which is 49 U.S.C. 21103 as it was amended by the RSIA effective July 16, 2009. See 49 U.S.C. 21102(c).

## VII. Regulatory Impact and Notices

### A. Executive Orders 12866 and 13563 and DOT Regulatory Policies and Procedures

This rule has been evaluated in accordance with existing policies and procedures under Executive Orders 12866 and 13563 as well as DOT policies and procedures. The economic impacts of the rule are well under \$100 million. FRA has prepared and placed in the docket a regulatory impact analysis (RIA) addressing the economic impact of this rule over a 20-year period. This section summarizes the impacts of the rule.

This regulation is intended to promote safe railroad operations by limiting the hours of service for passenger railroad train employees, and ensuring that they receive adequate

opportunities for rest in the course of performing their duties. The main goal of this rulemaking is to identify and reduce fatigue for passenger train employees.

FRA is establishing substantive hours of service regulations, including maximum on-duty periods, minimum off-duty periods, and other requirements, for train employees of passenger railroads. The regulations require that passenger railroads analyze and mitigate the risks for fatigue in the schedules worked by their train employees, and that the railroads submit to FRA the relevant schedules and fatigue mitigation plans for approval. The RSIA established a limit of 276 hours each calendar month for train employees on service performed for a railroad, and a limit of 30 hours on time spent in or waiting for deadhead transportation to a point of final release; increased the quantity of the statutory minimum off-duty period after being on duty for 12 hours in broken service from 8 hours of rest to 10 hours of rest; prohibited communication with train or signal employees during certain minimum statutory rest periods; and established mandatory time off duty for train employees of 48 hours after initiating an on-duty period on 6 consecutive days, or 72 hours after initiating an on-duty period on 7 consecutive days. In absence of a final rule effective before October 16, 2011, passenger railroad train employees would be subject to the more stringent freight hours of service laws described above. Until then, passenger railroads will continue to operate under the hours of service laws in effect prior to the enactment of the RSIA. Thus, issuance of this regulation relieves railroads covered by this rule from becoming covered by the stricter statutory hours of service laws governing freight railroads and their train crews.

The RSIA mandated that in issuing regulations FRA “consider scientific and medical research related to fatigue and fatigue abatement, railroad scheduling and operating practices that improve safety and reduce employee fatigue, a railroad’s use of new or novel technology intended to reduce or eliminate human error, the variations in freight and passenger railroad scheduling practices and operating conditions, the variations in duties and operating conditions for employees, a railroad’s required or voluntary use of fatigue management plans \* \* \*, and any other relevant factors.” 49 U.S.C. 21109(c). FRA adhered to this mandate. In addition, FRA relied on its RSAC to make recommendations with respect to

this rulemaking and this rule reflects the recommendations of this committee.

FRA has analyzed the economic impacts of this rule against a “no regulatory action” baseline that reflects what would happen in absence of this rulemaking (*i.e.*, the freight hours of service laws are applied to passenger railroads) as well as a “status quo” baseline that reflects present conditions (*i.e.*, primarily, the statutory hours of service provisions (specifically, old section 21103 and, secondarily, the applicable hours of service recordkeeping and reporting regulations) that have and will continue to apply to passenger railroads until they become subject to either the freight hours of service laws on October 16, 2011 or this rule prior to that). With respect to the “no regulatory action” baseline, this rule represents a substantially more cost-effective alternative for achieving the goal of identifying and mitigating unacceptable fatigue risk levels and thus ensuring the safety of passenger train operations. Over the 20-year period analyzed, the undiscounted costs associated with the “no regulatory action” alternative total \$75.5 million compared to \$2.1 million for the FRA proposal. Similarly, when discounted at 7 percent, the costs associated with the “no regulatory action” alternative total \$59.0 million compared to \$1.3 million for this rule and when discounted at 3 percent, the costs associated with the “no regulatory action” alternative total \$66.8 million compared to \$1.6 million for this rule. The quantified accident reduction benefits achieved under both the “no regulatory action” baseline and this rule total \$1.2 million (undiscounted), \$0.6 million (PV, 7 percent), and \$0.9 million (PV, 3 percent). FRA does not expect that the overall number of casualties and property damages prevented will differ under either scenario. Implementation of this rule would yield these benefits at lower cost. However, there are significant additional potential safety enhancement benefits that may result from the FRA approach. FRA believes that the safety of passenger train operations will be enhanced under this rule as a result of subjecting every crew assignment to a biomathematical analysis either via the analyses conducted while developing the RSAC recommendation or the analyses that will be performed by railroads in the years ahead. The information that railroads will have as a result of this rule regarding fatigue, its causes and symptoms, and its impact on safety will allow them to make crew assignments that take this into consideration and



minimize fatigue beyond the requirements of this rule. FRA is confident that, overall, fatigue awareness training will result in a stronger safety culture that will extend beyond railroad operations, which is a benefit that extends beyond what would result under the freight hours of service law. For instance, safety and health benefits will accrue from the transfer of knowledge to employees, their families, friends and others with whom they may share the fatigue knowledge that they acquire from the required fatigue awareness training programs. This fatigue awareness will result in more optimal decisions regarding rest and sleep, leading to less fatigue and improved safety outside of passenger train operations during the course of daily activities that may include the operation of motor vehicles or other heavy machinery. This fatigue awareness will also result in proper identification and treatment, if necessary, of fatigue symptoms.

With respect to the “status-quo” baseline, this rule would impose costs that are higher than the safety benefits that were quantified. Costs compared to the “status quo” baseline total \$2.1 million (undiscounted), \$1.3 million (PV, 7 percent), and \$1.6 million (PV, 3 percent). Quantified benefits compared to the “status quo” baseline total \$1.2 million (undiscounted), \$0.6 million (PV, 7 percent), and \$0.9 million (PV, 3 percent). However, there are additional

benefits that have not been quantified, but should be considered when comparing the overall costs and benefits. For instance, as noted above, FRA believes that the safety of passenger train operations will be enhanced under this rule as a result of subjecting every crew assignment to a biomathematical analysis either via the analyses conducted while developing the RSAC recommendation or the analyses that will be performed by railroads in the years ahead. The information that railroads will have as a result of this rule regarding fatigue, its causes and symptoms, and its impact on safety will allow them to make crew assignments that take this into consideration and minimize fatigue beyond the requirements of this rule. FRA is confident that, overall, fatigue awareness training will result in a stronger safety culture that will extend beyond railroad operations from the transfer of knowledge to employees, their families, friends and others with whom they may share the fatigue knowledge that they acquire from the required fatigue awareness training programs. This fatigue awareness will result in more optimal decisions regarding rest and sleep, leading to less fatigue and improved safety outside of passenger train operations during the course of daily activities that may include the operation of motor vehicles or other heavy machinery. This fatigue

awareness will also result in proper identification and treatment, if necessary, of fatigue symptoms. Separately, accident avoidance will result in fewer unplanned delays to passengers and freight commodities impacted by passenger train accident and incidents that result in blocking one or more tracks for prolonged periods. These costs can be very substantial given the need to investigate accidents and often clear wreckage. Finally, there is the non-quantified benefit of ensuring that passenger railroads do not unknowingly require train employees to work schedules with unacceptable high-fatigue risk levels. It is not unreasonable to expect that the unquantified benefits will raise the benefits to a level quite comparable to the costs.

FRA notes that, in addition to the quantified safety benefits that would result from the rule, there are additional unquantified benefits which may result from the implementation of the rule, as discussed above. FRA expects these unquantified benefits to prevent several serious injuries, which may or may not be related to the operation of trains, over the next twenty years; when these benefits are combined with the quantified safety benefits, the benefits are comparable to the quantified costs of the rule.

The table below presents the costs associated with both the “no regulatory action” alternative and this regulation.

Cost description	No regulatory action alternative			FRA final rule		
	Undiscounted	PV@7%	PV@3%	Undiscounted	PV@7%	PV@3%
New Engineer Training, Initial (20% New Hires).	\$31,237,549	\$26,299,825	\$28,705,081	0	0	0.
New Engineer Training, Refresher (20% New Hires).	\$4,599,050	\$2,278,431	\$3,327,802	0	0	0.
New Conductor Training, Initial (20% New Hires).	\$30,847,974	\$25,942,971	\$28,330,908	0	0	0.
New Conductor Training, Refresher (20% New Hires).	\$8,636,745	\$4,278,146	\$6,249,071.15	0	0	0.
Work Schedule Analysis (No-Reg Action)/Initial Analysis of Work Schedules + Follow-up Analysis and Fatigue Mitigation Plan Review.	\$189,723	\$177,312	\$184,198	(\$126,482 + \$240,316) = \$366,799.	(\$118,208 + \$122,175) = \$240,382.	(\$122,798 + \$175,894) = \$298,692.
Indirect Determination that Type 2 Schedules are Acceptable (“Nested” Schedules Reduction).	.....	.....	.....	-\$91,700	-\$60,096	-\$74,673.
Biomathematical Model of Fatigue Software.	0	0	0	\$417,500	\$268,723	\$337,240.
Use of Rest Facilities	0	0	0	\$30,988	\$28,961	\$30,086.
Fatigue Training	0	0	0	\$1,312,920	\$782,634	\$1,025,158.
Fatigue Training (Tourist & Excursion)	0	0	0	\$20,000	\$12,000	\$16,000.
<b>Total (rounded)</b>	<b>\$75,511,041</b>	<b>\$58,976,685</b>	<b>\$66,797,059</b>	<b>\$2,056,507</b>	<b>\$1,272,605</b>	<b>\$1,632,502.</b>

FRA estimates that the recordkeeping and reporting costs per employee record under the no-action alternative and this rule will be practically the same. Under the “no regulatory action” alternative, costs for recordkeeping and reporting employee hours of service are reflected

in the New Engineer and New Conductor training requirements and the Work Schedule Analysis burden. Under this rule, the costs associated with the recordkeeping and reporting requirements for the substantive hours of service changes are reflected in

Fatigue Training as well as the Initial and Follow-up Analysis and Fatigue Mitigation Plan Review.

The estimated benefits of the rule relative to the “status quo” baseline, based on the above calculations of potentially prevented accident damages,



injuries, and fatalities, over a 20-year period of analysis are presented below.

INTERCITY PASSENGER, COMMUTER, TOURIST AND EXCURSION RAILROADS  
[All track types]

Accident reduction benefits	VSL = \$6 M undiscounted benefits	VSL = \$6 M discounted PV@ 7%	VSL = \$6 M discounted PV@ 3%
Property Damage .....	\$685,915	\$348,713	\$502,039
Injuries .....	94,861	48,227	69,431
Fatalities .....	407,634	207,237	298,358
<b>Total (rounded) .....</b>	<b>1,188,410</b>	<b>604,177</b>	<b>869,828</b>

FRA does not expect that the overall number of casualties prevented will differ under this rule or the “no regulatory action” baseline in which the freight hours of service law would apply to passenger train crews.

After careful consideration of comments received in response to the NPRM, FRA has made modifications to its proposal in the final rule that reduce the overall burden by approximately \$100,000 due in equal part to flexibilities added by extending the deadline for fatigue awareness training and the expanded ability to rely on the findings of analyses conducted for other assignments. Nevertheless, since this would not greatly impact the overall conclusions, FRA has not adjusted its quantified cost and benefit estimates for use in this final rule.

#### B. Executive Order 13132

Executive Order 13132, “Federalism” (64 FR 43255 (Aug. 10, 1999)), requires FRA to develop an accountable process to ensure “meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications.” “Policies that have federalism implications” are defined in the Executive Order to include regulations that have “substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.” Under Executive Order 13132, the agency may not issue a regulation with federalism implications that imposes substantial direct compliance costs and that is not required by statute, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by State and local governments, the agency consults with State and local governments, or the agency consults with State and local government officials early in the process of developing the regulation. Where a

regulation has federalism implications and preempts State law, the agency seeks to consult with State and local officials in the process of developing the regulation.

This rule has been analyzed in accordance with the principles and criteria contained in Executive Order 13132. This rule would not have substantial effect on the States or their political subdivisions; it would not impose any compliance costs; and it would not affect the relationships between the Federal government and the States or their political subdivisions, or the distribution of power and responsibilities among the various levels of government. Therefore, the consultation and funding requirements of Executive Order 13132 do not apply. Nevertheless, State and local officials were involved in developing this rule. The RSAC, which was used to assist in the development of this rule, has as permanent members, the AASHTO and the ASRSM.

However, this rule could have preemptive effect by operation of law under a provision of the former Federal Railroad Safety Act of 1970 (FRSA) (49 U.S.C. 20106 (Section 20106)) and the HSL. See Public Law 103–272 (1994) repealing the Federal Railroad Safety Act of 1970 and the HSL and revising and enacting their provisions as positive law in title 49 U.S. Code. The FRSA provides that States may not adopt or continue in effect any law, regulation, or order related to railroad safety or security that covers the subject matter of a regulation prescribed or order issued by the Secretary of Transportation (with respect to railroad safety matters) or the Secretary of Homeland Security (with respect to railroad security matters), except when the State law, regulation, or order qualifies under the “essentially local safety or security hazard” exception to Section 20106. Moreover, the HSL have been interpreted by the Supreme Court as totally preempting the field of the hours of labor of railroad

employees. *Erie RR. Co. v. New York*, 233 U.S. 671 (1914).

#### C. Executive Order 13175

FRA analyzed this rule in accordance with the principles and criteria contained in Executive Order 13175 (“Consultation and Coordination with Indian Tribal Governments”). Because this rule does not significantly or uniquely affect tribes and does not impose substantial and direct compliance costs on Indian tribal governments, the funding and consultation requirements of Executive Order 13175 do not apply, and a tribal summary impact statement is not required.

#### D. Regulatory Flexibility Act and Executive Order 13272

To ensure that the potential impact of this rulemaking on small entities is properly considered, FRA developed this rule in accordance with Executive Order 13272 (“Proper Consideration of Small Entities in Agency Rulemaking”) and DOT’s policies and procedures to promote compliance with the Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*).

The Regulatory Flexibility Act requires an agency to review regulations to assess their impact on small entities. An agency must conduct a regulatory flexibility analysis unless it determines and certifies that a rule is not expected to have a significant economic impact on a substantial number of small entities.

As discussed in earlier sections of this preamble, FRA is establishing hours of service regulations, including maximum on-duty periods, minimum off-duty periods, and other requirements, for train employees providing commuter and intercity rail passenger transportation. The regulations require that commuter and intercity passenger railroads analyze and mitigate the risks for fatigue in the schedules worked by their train employees, and that the railroads submit to FRA for its approval

the relevant schedules and fatigue mitigation plans. This rule also applies to train employees of tourist, scenic, excursion, and historic railroads (tourist and excursion railroads) as well. Issuance of these regulations relieves railroads covered by this rule from being covered by the more strict hours of service laws governing freight train crews.

This regulation is authorized by Section 108(e) of the RSIA (49 U.S.C. 21109(b)) and is intended to promote safe railroad operations by limiting the hours of service for passenger railroad train employees and ensuring that they receive adequate opportunities for rest in the course of performing their duties. The main goal of this rulemaking is to identify and reduce fatigue for the employees covered by the final rule. As described in Section II of this preamble, FRA has based the regulation on scientific research related to fatigue and fatigue abatement, as applied to railroad scheduling practices and operating conditions for train employees of commuter and intercity passenger railroads. FRA is also making conforming changes to existing hours of service recordkeeping requirements.

Federal laws governing railroad employees' hours of service date back to 1907 with the enactment of the Hours of Service Act. Railroads have been subject to the provisions of this Act or successor Federal hours of service laws since it was first enacted. Currently, railroads are subject to the version of 49 U.S.C. 21103 that was in effect the day before the enactment of the RSIA, with respect to their train employees who are engaged in intercity or commuter rail transportation, including tourist and excursion rail operations.

In the NPRM, FRA certified that its proposal would result in "no significant economic impact on a substantial number of small entities." FRA received one response to the NPRM from a small entity directly impacted by its proposal. Strasburg expressed concern regarding a "Dinner Train" schedule operated by one of its train crews with an assignment from 11 a.m. to 8:30 p.m., including a 1.5-hour break. Strasburg notes that it "believes that the analysis required to determine the tranquil nature of these assignments is rooted in common sense and should not require yet an additional regulatory expense of human performance modeling." Strasburg further states that it therefore "believes that it should be exempt from § 228.407 work schedule analysis and that its dinner train assignments should be specifically exempted from the § 228.5 [sic] *Definitions of a Type 2 assignment.*" For purposes of assessing

the impacts of this final rule on this schedule, FRA analyzed this assignment using the FAST model and found that this Type 2 assignment could be considered a Type 1 assignment and not require any adjustment or mitigation. In fact, based on this analysis, other identical or shorter assignments ending at 8:30 p.m. could also be considered Type 1 assignments and not require any adjustment or mitigation.

To alleviate the impact on small railroads in general, FRA is also extending the effective date of the final rule for all tourist, scenic, historic, and excursion railroads by one year relative to other intercity and passenger railroads. This should allow such railroads more time to perform any necessary analysis of assignments and in some cases to take advantage of any analyses that will have already been performed by larger railroads, to the extent that these are available. This additional time will also allow small railroads to implement any assignment adjustments or other mitigating measures. In addition, FRA is providing an opportunity for tourist, scenic, historic, and excursion railroads to be excluded from the training provisions of this rule. The exclusion is available to such railroads if their train employees subject to this rule only work schedules wholly between the hours of 4 a.m. and 8 p.m. and they provide written notice to FRA. This exclusion should further reduce the burden on small railroads. FRA is certifying that this rule will result in "no significant economic impact on a substantial number of small entities." The following section explains the reasons for this certification.

#### 1. Description of Regulated Entities and Impacts

The "universe" of the entities under consideration includes only those small entities that can reasonably be expected to be directly affected by the provisions of this rule. In this case, the "universe" comprises Class III freight railroads that provide train crews for commuter operations and tourist, scenic, historic and excursion railroads.

"Small entity" is defined in 5 U.S.C. 601 (Section 601). Section 601(3) defines a "small entity" as having the same meaning as "small business concern" under Section 3 of the Small Business Act. This includes any small business concern that is independently owned and operated, and is not dominant in its field of operation. Section 601(4), likewise includes within the definition of "small entities" not-for-profit enterprises that are independently owned and operated, and are not dominant in their fields of

operation. Additionally, Section 601(5) defines as "small entities" governments of cities, counties, towns, townships, villages, school districts, or special districts with populations less than 50,000.

The U.S. Small Business Administration (SBA) stipulates "size standards" for small entities. It provides that the largest a for-profit railroad business firm may be and still classify as a "small entity" is 1,500 employees for "Line-Haul Operating" railroads, and 500 employees for "Short-Line Operating" railroads.<sup>39</sup>

Federal agencies may adopt their own size standards for small entities in consultation with SBA and in conjunction with public comment. Pursuant to the authority provided to it by SBA, FRA has published a final policy that formally establishes small entities as railroads that meet the line haulage revenue requirements of a Class III railroad.<sup>40</sup> Currently, the revenue requirement is \$20 million or less in annual operating revenue, adjusted annually for inflation (\$30.3 million for 2009). This threshold is based on the Surface Transportation Board's (STB) threshold of a Class III railroad carrier, which is adjusted by applying the railroad revenue deflator adjustment.<sup>41</sup> FRA is using the STB's threshold in its definition of "small entities" for this rule.

This regulation applies to railroads with respect to their train employees engaged in commuter or intercity rail passenger transportation as well as train employees of tourist and excursion railroads. Intercity passenger railroads include Amtrak and the Alaska Railroad, both of which employ their own train crews and neither of which is considered a small entity. Amtrak is a Class I railroad, and the Alaska Railroad is a Class II railroad. The Alaska Railroad is owned by the State of Alaska, which has a population well in excess of 50,000.

All commuter railroads in operation in the U.S. serve major metropolitan areas with populations higher than 50,000. Although some commuter railroads contract with Amtrak or other entities to operate some or all of their trains, most employ their own train crews.

Train employees of only two small entities that operate trains under

<sup>39</sup> "Table of Size Standards," U.S. Small Business Administration, January 31, 1996, 13 CFR part 121. See also NAICS Codes 482111 and 482112.

<sup>40</sup> See 68 FR 24891 (May 9, 2003); 49 CFR part 209, app. C.

<sup>41</sup> For further information on the calculation of the specific dollar limit, please see 49 CFR part 1201.

contract for commuter railroads would be covered by this rule, and they are not expected to be impacted significantly. One of these Class III freight railroads with commuter rail train crew schedules will likely modify its schedule by a few minutes each day so that all of its schedules will be considered Type 1 assignments as defined by this rule and thus be determined not to violate the fatigue threshold, thus excluding the railroad from the requirement to analyze those work schedules. Their current train crew assignments would be allowed to continue with a less than 5 minute change. The other Class III freight railroad with commuter train crew schedules would have to evaluate one or two schedules directly using a biomathematical model or indirectly by relying on the determination from another railroad that the same schedule, or a schedule within which it can nest, does not violate the fatigue threshold. Given the small size of the commuter operation, the burden of analysis and training would be small in absolute magnitude and in proportion to the size of their operation. Although this rule imposes some additional recordkeeping burden on these entities for tracking days of consecutive service, the increase would be nominal and proportionate to the extent of their passenger train service, which is quite limited. These train crews are also subject to initial and refresher training no less frequently than every three years. This training must cover the following topics: (1) Physiological and human factors that affect fatigue, as well as strategies to reduce or mitigate the effects of fatigue; (2) opportunities for identification, diagnosis, and treatment of any medical condition that may affect alertness or fatigue, including sleep disorders; (3) alertness strategies, such as policies on napping, to address acute drowsiness and fatigue while an employee is on duty; (4) opportunities to obtain restful sleep at lodging facilities, including employee sleeping quarters provided by the railroad; and (5) the effects of abrupt changes in rest cycles for employees. There is flexibility with respect to how the training is delivered (*e.g.*, computer-based training, job briefings, pamphlets, as well as in class instruction). Such training could be accomplished in about one hour initially and 15 minutes triennially per train employee. Small freight railroads operating commuter trains could recoup any costs associated with this rulemaking from the commuter authorities with which they contract.

The requirements of this rule that apply to tourist and excursion railroads

are those contained in subpart F, Substantive Hours of Service Requirements for Train Employees Engaged in Commuter or Intercity Rail Passenger Transportation, as well as the conforming changes to the recordkeeping requirements in subpart B. These railroads benefit from a delayed compliance date for the portions of this rule requiring the analysis of schedules and associated recordkeeping requirements. FRA regulates approximately 140 tourist and excursion railroads nationwide. Approximately 130 of these railroads have 15 or fewer covered employees and thus are eligible to be considered for exemption from the limitations that would be imposed under § 228.403. As noted earlier, this particular exemption is substantively identical to the exemption provision of the HSL at 49 U.S.C. 21102(b), which was unchanged by the RSIA, and § 228.403 provides the same opportunity for a railroad to seek an exemption from the requirements of this subpart as a railroad has to seek an exemption from the statutory requirements applicable to its other employees. Additionally, tourist, scenic, historic, and excursion railroads, regardless of size, may be excluded from the requirement to provide training, so long as their schedules are wholly within the hours of 4 a.m. and 8 p.m.

Tourist, scenic, historic, and excursion railroads by virtue of their train service schedules generally have only Type 1 assignments, which categorically do not violate the fatigue threshold, thus excluding the railroads from the requirement to analyze or mitigate most of their schedules. Scheduled assignments that include "Dinner Train" operations may be the only schedules impacted by the requirement for analysis or mitigation. Information available regarding train schedules for these railroads indicates that trains do not operate for more than 12 hours on any day, with virtually all train service starting at 10 a.m. or afterward. Dinner trains operate until no later than 10 p.m. and are not in operation every day of the week. They generally operate once a week and in no case more than three days a week. Thus the impact of crew assignment limitations would be minimal. Impacted railroads are likely to be able to rely on the analysis of another railroad due to the delayed compliance date for tourist, scenic, historic, and excursion railroads, as many of their schedules will either be the same as those analyzed by another railroad, or will nest within a longer schedule analyzed by another railroad. In the rare instances where new analysis

is required, the railroads may conduct the analysis in-house or contract it out for a nominal fee. Given the similarity of the assignments, the tourist, scenic, historic, and excursion railroads impacted may decide to address the assignments that include "Dinner Trains" jointly, either under the auspices of the Tourist Railway Association, Inc. or otherwise. The consecutive-day limitations will likely not impact these railroads since they already accommodate time off for their train crews. Given the very limited train service and the need to accommodate time off now, crew schedules should allow for the proposed time off allowing the consecutive days of service requirements to be met. Since "Dinner Trains" are not included in most assignments, the majority of current scheduled train crew assignments would run no later than 6:30 p.m. and thus be considered Type 1 assignments and be unaffected, assuming the consecutive-day limitations do not affect them. Although the modifications to existing recordkeeping requirements will impose some additional net burden on these entities, the increase is nominal and proportionate to the size of their passenger service, which is quite limited. Where these entities are not able to take advantage of the exclusion from the training requirements due to the operation of trains past 8 p.m., they will be required to train their employees as discussed above. The impact of the training requirements will vary in proportion to the size of each operation. Note, however, that the training cost associated with this rule is lower than that associated with complying with the training requirements for the freight hours of service laws.

The limitations on service afford significantly more flexibility to passenger train employees than those imposed by the RSIA on freight train employees. Given that, in absence of a final rule effective by October 16, 2011, passenger train employees would be subject to the more stringent freight hours of service laws (49 U.S.C. 21103), issuance of this rule creates a cost savings for small entities impacted. In addition, the more stringent requirements for schedules of employees who operate trains during the late night hours, in which the fatigue risk is greatest, probably do not affect any tourist and excursion railroads because they do not operate during late night hours.

No shippers, contractors, or small governmental jurisdictions will be directly impacted by this proposal.

2. Certification

Pursuant to the Regulatory Flexibility Act, 5 U.S.C. 605(b), the FRA Administrator certifies that this rule will not have a significant economic impact on a substantial number of small entities.

E. Paperwork Reduction Act

The information collection requirements in this final rule have been submitted for approval under the Paperwork Reduction Act of 1995, 44 U.S.C. 3501 *et seq.* The sections that contain the current information

collection requirements, which affect both passenger and freight railroads, and new information collection requirements and the estimated time to fulfill each requirement are as follows:

49 CFR section or statutory provision	Respondent universe	Total annual responses	Average time per response	Total annual burden hours
228.11—Hours of Duty Records (Current Requirement)	768 railroads/signal contractors	27,429,750 records.	2 min./5 min./10 min.	2,856,125
228.17—Dispatcher's Record of Train Movements (Current Requirement)	150 Dispatch Offices	200,750 records.	3 hours	602,250
228.19—Monthly Reports of Excess Service (Current Requirement But Now includes consecutive days on duty).	300 railroads	2,670 reports	2 hours	5,340
228.103—Construction of Employee Sleeping Quarters—Petitions to allow construction near work areas (Current Requirement).	50 railroads	1 petition	16 hours	16
228.203—Program Components (Current Requirements)—Electronic Recordkeeping—Modifications for Daylight Savings Time.	9 railroads	5 modifications	120 hours	60
—System Security/Individual User Identification/Program Logic Capabilities/Search Capabilities.	9 railroads	1 program w/ security/ <i>etc.</i>	720 Hours	720
228.205—Access to Electronic Records—(Current Requirement)—System Access Procedures for Inspectors.	768 railroads/signal contractors	100 electronic records access procedures.	30 minutes	50
228.207—Training in Use of Electronic System—(Current Requirements)—Initial Training.	768 railroads/signal contractors	47,000 tr. employees.	1 hour	47,000
—Refresher Training	768 railroads/signal contractors	2,200 tr. employees.	1 hour	2,200
49 U.S.C. 21102(b)—The Federal hours of service laws—Petitions for Exemption from Laws (Current Requirement).	10 railroads	2 petitions	10 hours	20
228.403—Exemption requests from passenger/commuter railroads—(New Requirements).	28 railroads	5 exemption requests.	8 hours	40
—Initial exemption requests from tourist/excursion railroads	140 railroads	10 exempt requests.	2 hours	20
—Renewal exemption requests from tourist/excursion railroads	140 railroads	5 renewal exemption requests.	30 minutes	3
228.407—Analysis of Work Schedules Submissions (New Requirements)	168 railroads	28 analyses	80 hours	2,240
—Reports to FRA of Work Schedules that Violate Fatigue Threshold	168 railroads	20 reports	2 hours	40
—Fatigue Mitigation Plans Submitted to FRA	168 railroads	15 plans	4 hours	60
—Submission of Work Schedules Using Validation Model Violating Threshold that can be mitigated by tools.	168 railroads	15 work schedule submissions.	4 hours	60
—Submission of Work Schedules Using Validation Model Violating Threshold that <i>cannot</i> be mitigated by tools.	168 railroads	5 work schedule submissions.	4 hours	20
—RR Determinations of necessary schedules	168 railroads	20 decisions	2 hours	40
—RR Declaration that no work schedule needs to be submitted to FRA for violating fatigue threshold.	168 railroads	148 written declarations.	1 hour	148
—Corrected work schedules, <i>etc.</i>	168 railroads	2 documents	2 hours	4
—Submission of follow-up analysis by RR due to work schedule change	168 railroads	28 analyses	4 hours	112
—Corrected work schedules, <i>etc.</i>	168 railroads	2 documents	2 hours	4
—Updated fatigue mitigation plans	168 railroads	28 plans	4 hours	112
—RR consultations w/employees	168 railroads	28 plans	4 hours	112
—Filed statements w/FRA by employees and employee organizations unable to reach consensus w/RR on work schedules or mitigation tools/RR submissions to FRA.	RR Employees/Employee Organizations.	5 statements	2 hours	10
228.411—Training Programs (New Requirements)	168 railroads	29 programs	20 hours	580
—Employee Initial Training	168 railroads	10,200 tr. employees.	1 hour	10,200
—Initial Training—New Employees	168 railroads	150 trained employees.	1 hour	150
—Triennial Refresher Training of Employees <sup>42</sup>	168 railroads	n/a	n/a	n/a
—Records of Training	168 railroads	10,350 records	5 minutes	863
—Written Declaration by Tourist Railroads for Exclusion from this Section's Requirements.	140 railroads	100 written declarations.	60 minutes	100
Appendix D: Guidance on Fatigue Management Plans—(New Option)	168 railroads	4 plans	15 hours	60

All estimates include the time for reviewing instructions; searching existing data sources; gathering or maintaining the needed data; and reviewing the information. For information or a copy of the paperwork package submitted to OMB, contact Mr. Robert Brogan at 202-493-6292 or Ms.

Kimberly Toone at 202-493-6132 or via e-mail at the following addresses: [Robert.Brogan@dot.gov](mailto:Robert.Brogan@dot.gov); [Kimberly.Toone@dot.gov](mailto:Kimberly.Toone@dot.gov).

Organizations and individuals desiring to submit comments on the

<sup>42</sup> The burden associated with this requirement occurs outside the scope of this information collection submission. This burden will occur in the fourth year following the effective date in the

collection of information requirements should direct them to the Office of Management and Budget, Office of Information and Regulatory Affairs, 725 17th St., NW., Washington, DC 20503, attn: FRA Desk Officer. Comments may also be sent via e-mail to OMB at the following address: *oira\_submission@omb.eop.gov*.

OMB is required to make a decision concerning the collection of information requirements contained in this final rule between 30 and 60 days after publication of this document in the **Federal Register**. Therefore, a comment to OMB is best assured of having its full effect if OMB receives it within 30 days of publication.

FRA is not authorized to impose a penalty on persons for violating information collection requirements that do not display a current OMB control number, if required. FRA intends to obtain current OMB control numbers for any new information collection requirements resulting from this rulemaking action prior to the effective date of this final rule. The OMB control number, when assigned, will be announced by separate notice in the **Federal Register**.

*F. Unfunded Mandates Reform Act*

Pursuant to Section 201 of the Unfunded Mandates Reform Act of 1995 (Pub. L. 104-4, 2 U.S.C. 1531), each Federal agency “shall, unless otherwise prohibited by law, assess the effects of Federal regulatory actions on State, local, and tribal governments, and the private sector (other than to the extent that such regulations incorporate requirements specifically set forth in law).” Section 202 of the Act (2 U.S.C. 1532) further requires that “before promulgating any general notice of proposed rulemaking that is likely to result in the promulgation of any rule that includes any Federal mandate that may result in expenditure by State, local, and tribal governments, in the aggregate, or by the private sector, of \$100,000,000 or more (adjusted for inflation) in any 1 year, and before promulgating any final rule for which a general notice of proposed rulemaking was published, the agency shall prepare a written statement” detailing the effect on State, local, and tribal governments and the private sector. For the year 2010, this monetary amount of \$100,000,000 has been adjusted to \$140,800,000 to account for inflation. This rule will not result in the expenditure, in the aggregate, of \$140,800,000 in any one year, and thus

rule, which will be addressed in the renewal submission for this information collection.

preparation of such a statement is not required.

*G. Environmental Assessment*

The National Environmental Policy Act, 42 U.S.C. 4321-4375, requires that Federal agencies analyze actions to determine whether the action will have a significant impact on the human environment. This rule will not have a significant impact on the human environment.

*H. Privacy Act*

Anyone is able to search the electronic form of all comments received into any agency docket by the name of the individual submitting the comment (or signing the comment, if submitted on behalf of an association, business, labor union, etc.). You may review DOT’s complete Privacy Act Statement in the **Federal Register** published on April 11, 2000 (65 FR 19477-78).

**List of Subjects in 49 CFR Part 228**

Administrative practice and procedures, Buildings and facilities, Hazardous materials transportation, Noise control, Penalties, Railroad employees, Railroad safety, Reporting and recordkeeping requirements.

**The Rule**

For the reasons set forth in the preamble, FRA amends part 228 of chapter II, subtitle B, title 49 of the Code of Federal Regulations as follows:

**PART 228—[AMENDED]**

■ 1. The authority citation for part 228 is revised to read as follows:

**Authority:** 49 U.S.C. 20103, 20107, 21101-21109; Sec. 108, Div. A, Pub. L. 110-432, 122 Stat. 4860-4866; 49 U.S.C. 21301, 21303, 21304, 21311; 28 U.S.C. 2461, note; 49 U.S.C. 103; and 49 CFR 1.49.

■ 2. Section 228.1 is amended by removing the word “and” at the end of paragraph (a), removing the period and adding a semicolon in its place at the end of paragraph (b), adding and reserving paragraph (c), and adding paragraph (d) to read as follows:

**§ 228.1 Scope.**

\* \* \* \* \*

(d) Prescribes substantive hours of service requirements for train employees engaged in commuter or intercity rail passenger transportation.

■ 3. Section 228.3 is amended by revising paragraph (b) introductory text to read as follows:

**§ 228.3 Application.**

\* \* \* \* \*

(b) Except as provided in § 228.401 of this part, this part does not apply to:

\* \* \* \* \*

■ 4. Section 228.5 is amended by adding definitions of *Associate Administrator*, *FRA*, *Type 1 assignment*, and *Type 2 assignment* in alphabetical order to read as follows:

**§ 228.5 Definitions.**

\* \* \* \* \*

*Associate Administrator* means the Associate Administrator for Railroad Safety/Chief Safety Officer, Office of Railroad Safety, Federal Railroad Administration, or any person to whom he or she has delegated authority in the matter concerned.

\* \* \* \* \*

*FRA* means the Federal Railroad Administration.

\* \* \* \* \*

*Type 1 assignment* means an assignment to be worked by a train employee who is engaged in commuter or intercity rail passenger transportation that requires the employee to report for duty no earlier than 4 a.m. on a calendar day and be released from duty no later than 8 p.m. on the same calendar day, and that complies with the provisions of § 228.405. For the purposes of this part, FRA considers a Type 1 assignment to present an acceptable level of risk for fatigue that does not violate the defined fatigue threshold under a scientifically valid, biomathematical model of human performance and fatigue specified by FRA at § 228.407(c)(1) or approved by FRA under the procedures at § 228.407(c)(2). However, a Type 1 assignment that is delayed such that the schedule actually worked includes any period of time between midnight and 4 a.m. is considered a Type 2 assignment for the purposes of compliance with § 228.405.

*Type 2 assignment.* (1) *Type 2 assignment* means an assignment to be worked by a train employee who is engaged in commuter or intercity rail passenger transportation that requires the employee to be on duty for any period of time between 8:01 p.m. on a calendar day and 3:59 a.m. on the next calendar day, or that otherwise fails to qualify as a Type 1 assignment. A Type 2 assignment is considered a Type 1 assignment if—

(i) It does not violate the defined fatigue threshold under a scientifically valid biomathematical model of human performance and fatigue specified by FRA at 228.407(c)(2) or approved by FRA under the procedures at § 228.407(c)(1);

(ii) It complies with the provisions of § 228.405; and

(iii) It does not require the employee to be on duty for any period of time between midnight and 4 a.m.

(2) If a Type 2 assignment that would normally qualify to be treated as a Type 1 assignment is delayed so that the schedule actually worked includes any period of time between midnight and 4 a.m., the assignment is considered a Type 2 assignment for the purposes of compliance with § 228.405.

■ 5. Section 228.11 is amended by revising paragraph (c) to read as follows:

**§ 228.11 Hours of duty records.**

\* \* \* \* \*

(c) *Exceptions to requirements for train employees.* Paragraphs (b)(13) through (b)(16) of this section do not apply to the hours of duty records of train employees providing commuter rail passenger transportation or intercity rail passenger transportation. In addition to the information required by paragraphs (b)(1) through (b)(12) of this section, each hours of duty record for a train employee providing commuter rail passenger transportation or intercity rail passenger transportation shall include the following information:

(1) For train employees providing commuter rail passenger transportation or intercity rail passenger transportation, the date on which the series of at most 14 consecutive calendar days began for the duty tour.

(2) For train employees providing commuter rail passenger transportation or intercity rail passenger transportation, any date prior to the duty tour and during the series of at most 14 consecutive calendar days on which the employee did not initiate an on-duty period, if any.

\* \* \* \* \*

■ 6. Section 228.19 is amended by adding paragraphs (c)(5) through (8) to read as follows:

**§ 228.19 Monthly reports of excess service.**

\* \* \* \* \*

(c) \* \* \*

(5) A train employee, after first initiating an on-duty period each day for 6 or more consecutive calendar days including one or more Type 2 assignments, the last on-duty period of which ended at the employee's home terminal, initiates an on-duty period without having had 24 consecutive hours off duty at the employee's home terminal.

(6) A train employee, after first initiating an on-duty period each day for 6 or more consecutive days including one or more Type 2 assignments, initiates two or more on-duty periods without having had 24 consecutive

hours off duty at the employee's home terminal.

(7) A train employee, after initiating on-duty periods on 13 or more calendar days during a series of at most 14 consecutive calendar days as defined in § 228.405(a)(3)(i), the last of which ended at the employee's home terminal, then initiates an on-duty period without having had at least two consecutive calendar days off duty at the employee's home terminal.

(8) A train employee, after initiating an on-duty periods on 13 or more calendar days during a series of at most 14 consecutive calendar days as defined in § 228.405(a)(3)(i), then initiates two or more on-duty periods without having had at least two consecutive calendar days off duty at the employee's home terminal.

\* \* \* \* \*

**Subpart E—[Added and reserved]**

■ 7. Subpart E to part 228 is added and reserved.

■ 8. Subpart F to part 228 is added to read as follows:

**Subpart F—Substantive Hours of Service Requirements for Train Employees Engaged in Commuter or Intercity Rail Passenger Transportation**

Sec.

228.401 Applicability.

228.403 Nonapplication, exemption, and definitions.

228.405 Limitations on duty hours of train employees engaged in commuter or intercity rail passenger transportation.

228.407 Analysis of work schedules; submissions; FRA review and approval of submissions; fatigue mitigation plans.

228.409 Requirements for railroad-provided employee sleeping quarters during interim releases and other periods available for rest within a duty tour.

228.411 Training.

228.413 Compliance date for regulations; exemption from compliance with statute.

**Subpart F—Substantive Hours of Service Requirements for Train Employees Engaged in Commuter or Intercity Rail Passenger Transportation**

**§ 228.401 Applicability.**

(a) Except as provided in paragraph (b) of this section, the requirements of this subpart apply to railroads and their officers and agents, with respect to their train employees who are engaged in commuter or intercity rail passenger transportation, including train employees who are engaged in tourist, scenic, historic, or excursion rail passenger transportation.

(b) This subpart does not apply to rapid transit operations in an urban area that are not connected with the general railroad system of transportation.

**§ 228.403 Nonapplication, exemption, and definitions.**

(a) *General.* This subpart does not apply to a situation involving any of the following:

- (1) A casualty;
- (2) An unavoidable accident;
- (3) An act of God; or

(4) A delay resulting from a cause unknown and unforeseeable to a railroad or its officer or agent in charge of the employee when the employee left a terminal.

(b) *Exemption.* The Administrator may exempt a railroad having not more than a total of 15 train employees, signal employees, and dispatching service employees from the limitations imposed by this subpart on the railroad's train employees who are engaged in commuter or intercity rail passenger transportation. The Administrator may allow the exemption from this subpart after a full hearing, for good cause shown, and on deciding that the exemption is in the public interest and will not affect safety adversely. The exemption shall be for a specific period of time and is subject to review at least annually. The exemption may not authorize a railroad to require or allow its train employees to be on duty more than a total of 16 hours in a 24-hour period.

(c) *Definitions.* In this subpart—  
*Commuter or intercity rail passenger transportation* has the meaning assigned by section 24102 of title 49, United States Code, to the terms "commuter rail passenger transportation" or "intercity rail passenger transportation."

*Train employee who is engaged in commuter or intercity rail passenger transportation* includes a train employee who is engaged in commuter or intercity rail passenger transportation regardless of the nature of the entity by whom the employee is employed and any other train employee who is employed by a commuter railroad or an intercity passenger railroad. The term excludes a train employee of another type of railroad who is engaged in work train service even though that work train service might be related to providing commuter or intercity rail passenger transportation, and a train employee of another type of railroad who serves as a pilot on a train operated by a commuter railroad or intercity passenger railroad.

**§ 228.405 Limitations on duty hours of train employees engaged in commuter or intercity rail passenger transportation.**

(a) *General.* Except as provided in paragraph (c) of this section, a railroad and its officers and agents may not require or allow a train employee

engaged in commuter or intercity rail passenger transportation to remain or go on duty—

(1) Unless that employee has had at least 8 consecutive hours off duty during the prior 24 hours; or

(2) After that employee has been on duty for 12 consecutive hours, until that employee has had at least 10 consecutive hours off duty; or

(3) In a series of at most 14 consecutive calendar days, in excess of the following limitations:

(i) That employee's first series of at most 14 consecutive calendar days begins on the first calendar day that the employee initiates an on-duty period on or after the compliance date for this paragraph (a)(3), as specified in § 228.413. A series of at most 14 consecutive calendar days either ends on the 14th consecutive day or may last for less than 14 days if an employee has accumulated a total of two calendar days on which the employee has not initiated an on-duty period before the beginning of the 14th day of the series. After the employee has accumulated a total of two calendar days on which the employee has not initiated an on-duty period, including at least 24 consecutive hours off duty as required by paragraph (a)(3)(ii) or two consecutive calendar days without initiating an on-duty period as required by paragraph (a)(3)(iii) of this section, during the employee's current series of at most 14 consecutive calendar days, a new series of at most 14 consecutive calendar days begins on the calendar day in which the employee next initiates an on-duty period. Only calendar days after the starting date of a series are counted toward the accumulation of a total of two calendar days on which the employee did not initiate an on-duty period. A calendar day on which an on-duty period was not initiated that occurred prior to the start of the new series, does not count toward refreshing the new series.

(ii) If the employee initiates an on-duty period each day on any six or more consecutive calendar days during the series of at most 14 consecutive calendar days, and at least one of the on-duty periods is defined as a Type 2 assignment, that employee must have at least 24 consecutive hours off duty prior to next initiating an on-duty period, except as provided in paragraph (a)(3)(v) of this section.

(iii) If the employee has initiated an on-duty period each day on 13 or more calendar days in the series of at most 14 consecutive calendar days, that employee must have at least two consecutive calendar days on which the employee does not initiate an on-duty

period prior to next initiating an on-duty period, except as provided in paragraph (a)(3)(v) of this section.

(iv) The minimum time off duty required by paragraph (a)(3)(ii) of this section and the at least two consecutive calendar days in which the employee does not initiate an on-duty period required by paragraph (a)(3)(iii) of this section must be at the employee's home terminal, and during such periods, the employee shall be unavailable for any service for any railroad.

(v) Paragraphs (a)(3)(ii)–(iii) of this section notwithstanding, if the employee is not at the employee's home terminal when time off duty is required by paragraph (a)(3)(ii) of this section or calendar days in which the employee does not initiate an on-duty period are required by paragraph (a)(3)(iii) of this section, the employee may either deadhead to the point of final release at the employee's home terminal or initiate an on-duty period in order to return to the employee's home terminal either on the same calendar day or the next consecutive calendar day after the completion of the duty tour triggering the requirements of paragraph (a)(3)(ii) or paragraph (a)(3)(iii) of this section.

(vi) If the employee is required to have at least 24 consecutive hours off duty under paragraph (a)(3)(ii) of this section and not to initiate an on-duty period for at least two consecutive calendar days under paragraph (a)(3)(iii) of this section, both requirements shall be observed. The required periods run concurrently, to the extent that they overlap.

(b) *Determining time on duty.* In determining under paragraph (a) of this section the time that a train employee subject to this subpart is on or off duty, the following rules apply:

(1) Time on duty begins when the employee reports for duty and ends when the employee is finally released from duty;

(2) Time the employee is engaged in or connected with the movement of a train is time on duty;

(3) Time spent performing any other service for the railroad during a 24-hour period in which the employee is engaged in or connected with the movement of a train is time on duty;

(4) Time spent in deadhead transportation to a duty assignment is time on duty, but time spent in deadhead transportation from a duty assignment to the place of final release is neither time on duty nor time off duty;

(5) An interim period available for rest at a place other than a designated terminal is time on duty;

(6) An interim period available for less than four hours rest at a designated terminal is time on duty; and

(7) An interim period available for at least four hours rest at a place with suitable facilities for food and lodging is not time on duty when the employee is prevented from getting to the employee's designated terminal by any of the following:

(i) A casualty;

(ii) A track obstruction;

(iii) An act of God; or

(iv) A derailment or major equipment failure resulting from a cause that was unknown and unforeseeable to the railroad or its officer or agent in charge of that employee when that employee left the designated terminal.

(c) *Emergencies.* A train employee subject to this subpart who is on the crew of a wreck or relief train may be allowed to remain or go on duty for not more than four additional hours in any period of 24 consecutive hours when an emergency exists and the work of the crew is related to the emergency. In this paragraph, an emergency ends when the track is cleared and the railroad line is open for traffic.

**§ 228.407 Analysis of work schedules; submissions; FRA review and approval of submissions; fatigue mitigation plans.**

(a) *Analysis of work schedules.* Each railroad subject to this subpart must perform an analysis of one cycle of the work schedules (the period within which the work schedule repeats) of its train employees engaged in commuter or intercity rail passenger transportation and identify those work schedules intended to be assigned to its train employees, that, if worked by such a train employee, put the train employee at risk for a level of fatigue at which safety may be compromised. Schedules identified in paragraph (g) of this section do not have to be analyzed. A level of fatigue at which safety may be compromised, hereafter called "the fatigue threshold," shall be determined by procedures that use a scientifically valid, biomathematical model of human performance and fatigue that has been approved by the Associate Administrator pursuant to paragraph (c)(1) of this section, or previously accepted pursuant to paragraph (c)(2) of this section. Each work schedule that violates the fatigue threshold must be—

(1) Reported to the Associate Administrator as provided in paragraph (b) of this section, no later than April 12, 2012;

(2) Either—

(i) Mitigated by action in compliance with the railroad's fatigue mitigation



plan that has been approved by the Associate Administrator as specified in paragraph (b) of this section, no later than April 12, 2012; or

(ii) Supported by a determination that the schedule is operationally necessary, and that the fatigue risk cannot be sufficiently mitigated by the use of fatigue mitigation tools to reduce the risk for fatigue to a level that does not violate the fatigue threshold, no later than April 12, 2012; or

(iii) Both, no later than April 12, 2012; and

(3) Approved by FRA for use in accordance with paragraph (b) of this section.

(b) *Submissions of certain work schedules and any fatigue mitigation plans and determinations of operational necessity or declarations; FRA review and approval.* (1) No later than April 12, 2012, the railroad shall submit for approval to the Associate Administrator the work schedules described in paragraph (b)(1)(i) and (ii) of this section. The railroad shall identify and group the work schedules as follows:

(i) Work schedules that the railroad has found, using a validated model (as specified in paragraph (c)(1) of this section or approved by FRA in accordance with paragraph (c)(2) of this section) to present a risk for a level of fatigue that violates the applicable fatigue threshold, but that the railroad has determined can be mitigated by the use of fatigue mitigation tools so as to present a risk for a level of fatigue that does not violate the applicable fatigue threshold. The fatigue mitigation tools that will be used to mitigate the fatigue risk presented by the schedule must also be submitted.

(ii) Work schedules that the railroad has found, using a validated model (as specified in paragraph (c)(1) of this section or approved by FRA in accordance with paragraph (c)(2) of this section), to present a risk for a level of fatigue that violates the applicable fatigue threshold, but that the railroad has determined cannot be mitigated so as to present a risk for a level of fatigue that does not violate the applicable fatigue threshold by the use of fatigue mitigation tools, and that the railroad has determined are operationally necessary. The basis for the determination must also be submitted.

(2) If a railroad performs the analysis of its schedules required by paragraph (a) of this section, and determines that none of them violates the applicable fatigue threshold, and therefore none of them presents a risk for fatigue that requires it to be submitted to the Associate Administrator pursuant to this paragraph, that railroad shall, no

later than April 12, 2012, submit to the Associate Administrator a written declaration, signed by an officer of the railroad, that the railroad has performed the required analysis and determined that it has no schedule that is required to be submitted.

(3) FRA will review submitted work schedules, proposed fatigue mitigation tools, and determinations of operational necessity. If FRA identifies any exceptions to the submitted information, the agency will notify the railroad within 120 days of receipt of the railroad's submission. Railroads are required to correct any deficiencies identified by FRA within the time frame specified by FRA.

(4) FRA will audit railroad work schedules and fatigue mitigation tools every two years to ensure compliance with this section.

(c) *Submission of models for FRA approval; validated models already accepted by FRA.* (1) If a railroad subject to this subpart wishes to use a model of human performance and fatigue, not previously approved by FRA, for the purpose of making part or all of the analysis required by paragraph (a) or (d) of this section, the railroad shall submit the model and evidence in support of its scientific validation, for the approval of the Associate Administrator. Decisions of the Associate Administrator regarding the validity of a model are subject to review under § 211.55 of this chapter.

(2) A railroad may use a model that is already accepted by FRA. FRA has approved the Fatigue Avoidance Scheduling Tool™ (FAST) issued on July 15, 2009, by Fatigue Science, Inc. (with a fatigue threshold for the purpose of this regulation less than or equal to 70 for 20 percent or more of the time worked in a duty tour), and Fatigue Audit InterDyne™ (FAID) version 2, issued in September 2007 by InterDynamics Pty Ltd. (Australian Company Number (ACN) 057 037 635) (with a fatigue threshold for the purpose of this regulation greater than or equal to 72 for 20 percent or more of the time worked in a duty tour) as scientifically valid, biomathematical models of human performance and fatigue for the purpose of making the analysis required by paragraph (a) or (d) of this section. Other versions of the models identified in this paragraph must be submitted to FRA for approval prior to use as provided by paragraph (c)(1) of this section.

(3) If a new model is submitted to FRA for approval, pursuant to paragraph (c)(1) of this section, FRA will publish notice of the submission in the **Federal Register**, and will provide an opportunity for comment, prior to the

Associate Administrator's making a final determination as to its disposition. If the Associate Administrator approves a new model as having been validated and calibrated, so that it can be used for schedule analysis in compliance with this regulation, FRA will also publish notice of this determination in the **Federal Register**.

(d) *Analysis of certain later changes in work schedules.* (1) Additional follow-up analysis must be performed each time that the railroad changes one of its work schedules in a manner—

(i) That would differ from the FRA-approved parameters for hours of duty of any work schedule previously analyzed pursuant to paragraph (a) of this section; or

(ii) That would alter the work schedule to the extent that train employees who work the schedule may be at risk of experiencing a level of fatigue that violates the FRA-approved fatigue threshold established by paragraph (a) of this section.

(2) Such additional follow-up analysis must be submitted for FRA approval as provided under paragraph (b) of this section, as soon as practicable, prior to the use of the new schedule for an employee subject to this subpart. FRA approval is not necessary before a new schedule may be used; however, a schedule that has been disapproved by FRA may not be used.

(3) FRA will review submitted revised work schedules, and any accompanying fatigue mitigation tools, and determinations of operational necessity. If FRA identifies any exceptions to the submitted information, the agency will notify the railroad as soon as possible. Railroads are required to correct any deficiencies identified by FRA within the time frame specified by FRA.

(e) *Fatigue mitigation plans.* A written plan must be developed and adopted by the railroad to mitigate the potential for fatigue for any work schedule identified through the analysis required by paragraph (a) or (d) of this section as at risk, including potential fatigue caused by unscheduled work assignments. Compliance with the fatigue mitigation plan is mandatory. The railroad shall review and, if necessary, update the plan at least once every two years after adopting the plan.

(f) *Consultation.* (1) Each railroad subject to this subpart shall consult with, employ good faith, and use its best efforts to reach agreement with, all of its directly affected employees, including any nonprofit employee labor organization representing a class or craft of directly affected employees of the railroad, on the following subjects:



(i) The railroad's review of work schedules found to be at risk for a level of fatigue at which safety may be compromised (as described by paragraph (a) of this section;

(ii) The railroad's selection of appropriate fatigue mitigation tools; and

(iii) All submissions by the railroad to the Associate Administrator for approval that are required by this section.

(2) For purposes of this section, the term "directly affected employee" means an employee to whom one of the work schedules applies or would apply if approved.

(3) If the railroad and its directly affected employees, including any nonprofit employee labor organization representing a class or craft of directly affected employees of the railroad, cannot reach consensus on any area described in paragraph (f)(1) of this section, then directly affected employees and any such organization may file a statement with the Associate Administrator explaining their views on any issue on which consensus was not reached. The Associate Administrator shall consider such views during review and approval of items required by this section.

(g) *Schedules not requiring analysis.* The types of schedules described in paragraphs (1) and (2) of this paragraph do not require the analysis described in paragraphs (a) or (d) of this section.

(1) Schedules consisting solely of Type 1 assignments do not have to be analyzed.

(2) Schedules containing Type 2 assignments do not have to be analyzed if—

(i) The Type 2 assignment is no longer in duration than, and fully contained within, the schedule of another Type 2 assignment that has already been determined to present an acceptable level of risk for fatigue that does not violate the fatigue threshold; and

(ii) If the longer Type 2 schedule within which another Type 2 schedule is contained requires mitigations to be applied in order to achieve an acceptable level of risk for fatigue that does not violate the fatigue threshold, the same or more effective mitigations must be applied to the shorter Type 2 schedule that is fully contained within the already acceptable Type 2 schedule.

**§ 228.409 Requirements for railroad-provided employee sleeping quarters during interim releases and other periods available for rest within a duty tour.**

(a) If a railroad subject to this subpart provides sleeping quarters for the use of a train employee subject to this subpart during interim periods of release as a

method of mitigating fatigue identified by the analysis of work schedules required by § 228.407(a) and (d), such sleeping quarters must be "clean, safe, and sanitary," and give the employee "an opportunity for rest free from the interruptions caused by noise under the control of the" railroad within the meaning of section 21106(a)(1) of title 49 of the United States Code.

(b) Any sleeping quarters provided by a railroad that are proposed as a fatigue mitigation tool pursuant to § 228.407(b)(1)(i), are subject to the requirements of § 228.407(f), Consultation.

**§ 228.411 Training.**

(a) *Individuals to be trained.* Except as provided by paragraph (f) of this section, each railroad subject to this subpart shall provide training for its employees subject to this subpart, and the immediate supervisors of its employees subject to this subpart.

(b) *Subjects to be covered.* The training shall provide, at a minimum, information on the following subjects that is based on the most current available scientific and medical research literature:

(1) Physiological and human factors that affect fatigue, as well as strategies to reduce or mitigate the effects of fatigue;

(2) Opportunities for identification, diagnosis, and treatment of any medical condition that may affect alertness or fatigue, including sleep disorders;

(3) Alertness strategies, such as policies on napping, to address acute drowsiness and fatigue while an employee is on duty;

(4) Opportunities to obtain restful sleep at lodging facilities, including employee sleeping quarters provided by the railroad; and

(5) The effects of abrupt changes in rest cycles for employees.

(c) *Timing of initial training.* Initial training shall be provided to affected current employees not later than December 31, 2012, and to new employees subject to this subpart before the employee first works a schedule subject to analysis under this subpart, or not later than December 31, 2012, whichever occurs later.

(d) *Timing of refresher training.* (1) At a minimum, refresher training shall be provided every three calendar years.

(2) Additional refresher training shall also be provided when significant changes are made to the railroad's fatigue mitigation plan or to the available fatigue mitigation tools applied to an employee's assignment or assignments at the location where he or she works.

(e) *Records of training.* A railroad shall maintain a record of each employee provided training in compliance with this section and shall retain these records for three years.

(f) *Conditional exclusion.* A railroad engaged in tourist, scenic, historic, or excursion rail passenger transportation, may be excluded from the requirements of this section, if its train employees subject to this rule are assigned to work only schedules wholly within the hours of 4 a.m. and 8 p.m. on the same calendar day that comply with the provisions of § 228.405, upon that railroad's submission to the Associate Administrator of a written declaration, signed by an officer of the railroad, indicating that the railroad meets the limitations established in this paragraph.

**§ 228.413 Compliance date for regulations; exemption from compliance with statute.**

(a) *General.* Except as provided by paragraph (d) of this section or as provided in § 228.411, on and after April 12, 2012, railroads subject to this subpart shall comply with this subpart and §§ 228.11(c)(1)–(2) and 228.19(c)(5)–(c)(8) with respect to their train employees who are engaged in commuter or intercity rail passenger transportation.

(b) *Exemption from compliance with statute.* On and after October 15, 2011, railroads subject to this subpart or any provision of this subpart shall be exempt from complying with the provisions of old section 21103 and new section 21103 for such employees.

(c) *Definitions.* In this section—

(1) The term "new section 21103" means section 21103 of title 49, United States Code, as amended by the Rail Safety Improvement Act of 2008 (RSIA) effective July 16, 2009.

(2) The term "old section 21103" means section 21103 of title 49, United States Code, as it was in effect on the day before the enactment of the RSIA.

(d) *Exceptions.* (1) On and after October 15, 2011, railroads subject to this subpart shall comply with §§ 228.401, 228.403, 228.405(a)(1), (a)(2), (b), and (c), and 228.409(a).

(2) Railroads engaged in tourist, scenic, historic, or excursion rail passenger transportation, subject to this subpart, must comply with the sections listed in paragraph (d)(1) of this section on and after October 15, 2011, but are not required to comply with the other provisions of this subpart and §§ 228.11(c)(1)–(2) and 228.19(c)(5)–(c)(8) until April 12, 2013.

■ 9. Add Appendix D to Part 228 to read as follows:

**Appendix D to Part 228—Guidance on Fatigue Management Plans**

(a) Railroads subject to subpart F of this part, Substantive Hours of Service Requirements for Train Employees Engaged in Commuter or Intercity Rail Passenger Transportation, may wish to consider adopting a written fatigue management plan that is designed to reduce the fatigue experienced by their train employees subject to that subpart and to reduce the likelihood of accidents, incidents, injuries, and fatalities caused by the fatigue of these employees. If a railroad is required to have a fatigue mitigation plan under § 228.407 (containing the fatigue mitigation tools that the railroad has determined will mitigate the risk posed by a particular work schedule for a level of fatigue at or above the fatigue threshold), then the railroad's fatigue management plan could include the railroad's written fatigue mitigation plan, designated as such to distinguish it from the part of the plan that is optional, or could be a separate document. As provided in § 228.407(a)(2) and (e), compliance with the fatigue mitigation plan itself is mandatory.

(b) A good fatigue management plan contains targeted fatigue countermeasures for the particular railroad. In other words, the plan takes into account varying

circumstances of operations by the railroad on different parts of its system, and should prescribe appropriate fatigue countermeasures to address those varying circumstances. In addition, the plan addresses each of the following items, as applicable:

(1) Employee education and training on the physiological and human factors that affect fatigue, as well as strategies to reduce or mitigate the effects of fatigue, based on the most current scientific and medical research and literature;

(2) Opportunities for identification, diagnosis, and treatment of any medical condition that may affect alertness or fatigue, including sleep disorders;

(3) Effects on employee fatigue of an employee's short-term or sustained response to emergency situations, such as derailments and natural disasters, or engagement in other intensive working conditions;

(4) Scheduling practices for employees, including innovative scheduling practices, on-duty call practices, work and rest cycles, increased consecutive days off for employees, changes in shift patterns, appropriate scheduling practices for varying types of work, and other aspects of employee scheduling that would reduce employee fatigue and cumulative sleep loss;

(5) Methods to minimize accidents and incidents that occur as a result of working at times when scientific and medical research has shown that increased fatigue disrupts employees' circadian rhythm;

(6) Alertness strategies, such as policies on napping, to address acute drowsiness and fatigue while an employee is on duty;

(7) Opportunities to obtain restful sleep at lodging facilities, including employee sleeping quarters provided by the railroad;

(8) The increase of the number of consecutive hours of off-duty rest, during which an employee receives no communication from the employing railroad or its managers, supervisors, officers, or agents; and

(9) Avoidance of abrupt changes in rest cycles for employees.

(c) Finally, if a railroad chooses to adopt a fatigue management plan, FRA suggests that the railroad review the plan and update it periodically as the railroad sees fit if changes are warranted.

**Joseph C. Szabo,**

*Administrator.*

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