



U.S. Department
of Transportation

**Federal Railroad
Administration**

1120 Vermont Ave., N.W.
Washington, D.C. 20590

OCT 11 2002

Mr. Melvin F. Clemens, Jr.
Director, Office of Compliance
and Enforcement
Surface Transportation Board
1925 K Street, N.W., Suite 780
Washington, DC 20423-0001



Dear Mr. Clemens:

The Federal Railroad Administration (FRA) is pleased to provide to the Surface Transportation Board (STB), as requested in your letter of August 9, 2002, additional clarification and comment on specific issues relative to the matter of National Railroad Passenger Corporation - Petition for Declaratory Order - Weight of Rail, STB Finance Docket No. 33697.

As a result of additional precautions put into effect following the anthrax scare of last year, delivery of mail to FRA's offices at 1120 Vermont Avenue has sometimes proven to be unreliable, and unfortunately, the STB's letter of August 9 was never received. Upon recently learning of STB's additional request for comment, FRA has moved quickly to provide this information.

If you have any questions on FRA's submission, please contact me at (202) 493-6247.

Sincerely,

Edward W. Pritchard
Director, Office of Safety
Assurance and Compliance



Memorandum

US Department
of Transportation

Research and
Special Programs
Administration

Subject: Response to STB letter dated Aug. 9, 2002 Date: October 10, 2002

From: T. R. Sussmann
A. Kish Reply to
Attn. of: DTS-76

Thru: M. Coltman, Chief, DTS-76

To: Magdy El-Sibaie, RDV-31
Chief, Track Research Division

After review of the August 9, 2002 letter from the Surface Transportation Board (STB) requesting comment on several questions pertaining to the National Railroad Passenger Rail Corporation – Petition for Declaratory Order – Weight of Rail, STB Finance Docket No. 33697 we conclude that:

- the 25 ft moving average is a suitable parameter for the calculation of vertical modulus based upon the standards for rehabilitation agreed upon in previous decisions,
- safety concerns regarding rail failure due to fatigue and fracture are appropriately covered by existing FRA Track Safety Standards which will govern operations on this line,
- rail fatigue defects have been strongly linked to the severity and frequency of high axle loads and the age and quality of rail steels, however, the link to track modulus measured at a single point has not been established,
- track class designation is independent of track modulus; inherent 'weak' vertical support locations are handled through track geometry specifications that implicitly limit variations in rail head deflection by controlling spatial rail position, and
- at the 14 locations identified as not meeting the deflection criteria based on the 25 ft moving average, either: rehabilitate the zone or limit operations to less than 59 mph (track class 3) for 25 feet on either side of the limits of the location as identified by the TPCI survey.

In the STB letter several statements are made that the line should be rehabilitated and maintained to the track modulus requirement of 2750 psi. This statement has been previously misinterpreted as a routine maintenance standard for this line rather than the subtle distinction that this refers to the maintenance accomplished during rehabilitation. Since there is not even a general consensus on the measurement of track modulus, instituting the value as a maintenance parameter creates an onerous and impractical standard for Amtrak to meet. As recommended by FRA, the direct measurement of track modulus should be viewed as a quality control parameter based on industry best practice, not a regulatory safety parameter. The FRA still views that track modulus requirement as agreed upon for the initial line rehabilitation would result in a track structure that can be maintained economically to provide "safe, consistent, and continuous" service. All maintenance of the line should be conducted using industry best practices subject to the FRA TSS and inspection requirements. These safety standards control 1) safety and ongoing

maintenance concerns relating to track geometry, and 2) specify rail inspections and remedial actions to control safety issues regarding rail failure either due to fracture or fatigue.

Track modulus is a parameter based on beam on elastic foundation (BOEF) theory quantifying the support provided to the rail. This assumes a uniformly and continuously supported foundation for the rail. The deflection basin of a moving load is on the order of 25-30 ft in length, specifically depending on the load and track modulus. Therefore the 25 ft moving average used by TTCI is appropriate for evaluating average or nominal response as specified in our previous memo (June 5, 2001).

Rail failures develop at specific locations. However, a correlation between track modulus measured at a discrete location and the formation or development of failures has not been established. The two main parameters driving rail failure that can be influenced by track modulus are 1) dynamic loading and 2) rail stress. Axle loads, track geometry deviations, and wheel flats are the main drivers of excessive dynamic loading on class 3 and 4 track (not track modulus). Therefore, FRA TSS limit the variation in loaded track geometry. As for rail stress, the link connecting track modulus to rail fatigue is not clear especially when the AREMA standards control rail base stress and fatigue defects develop in the head of the rail. The level of stress is a controlling factor for fatigue, however service loading such as wheel contact stress and impact loading from wheel flats will dominate the stress level in the railhead, where fatigue defects normally develop. Therefore, track modulus does not form an appropriate basis for evaluating potential for fatigue defects. Moreover, it should be noted that rail stresses on this line will be higher for freight traffic, since wheel loads are higher than in passenger service.

The 14 locations identified as having deflection equal to or greater than 0.27 in. based on the 25 ft average are potentially appropriate for remediation. At 9 of the locations train operations are not expected to be conducted at 79 mph, so the track modulus criteria would not apply. In 1 of these locations the static deflection data confirmed compliance with the track modulus requirement. In the remaining 4 locations FRA recommends that the speed be restricted to 59 mph for 25 ft on either side of the site as identified by the TTCI survey until the site is remediated. If the site is remediated, then further testing should be conducted to demonstrate that these 4 locations have been successfully rehabilitated. The testing should be conducted using static tests measuring deflection at approximately 10 and 33 kip wheel loads (similar to the specifications of the static tests conducted by TTCI) to calculate modulus.

The remaining 4 locations that require remediation for higher speed operations are not safety concerns, but rather the low track modulus in these locations provides quality control over the rehabilitation of the line. Locations not meeting the track modulus requirement are potentially indicative of zones where additional track maintenance may be needed in the future. As long as the track is inspected and maintained in accordance with the FRA TSS specifications, the FRA does not take exception to the institution of 79 mph operations at any time.

cc:
A. MacDowell, FRA
DTS-76/File
DTS-930

**BEFORE THE
SURFACE TRANSPORTATION BOARD**

STB Finance Docket No. 33697

**NATIONAL RAILROAD PASSENGER CORPORATION - PETITION FOR
DECLARATORY ORDER - WEIGHT OF RAIL**

**COMMENTS OF THE FEDERAL RAILROAD ADMINISTRATION
DEPARTMENT OF TRANSPORTATION**

By its decision in *National Railroad Passenger Corporation - Petition for Declaratory Order - Weight of Rail*, STB Finance Docket No. 33697 (service date May 10, 2002), the Surface Transportation Board (STB) requested that the Federal Railroad Administration (FRA) participate in this proceeding in order to determine the propriety of the testing methodology used by the Transportation Technology Center Inc. (TTCI) to measure track modulus, and the manner in which the data from the test was analyzed and reported by the TTCI technical staff.

FRA's analysis and comment were provided by technical experts in FRA's Track Research Division, as well as the Structures and Dynamics Division, Volpe National Transportation Systems Center. Their analysis and comment were contained in a report dated July 5, which was included with FRA's submission.

Subsequently, in a letter dated August 9, the STB requested additional comments from FRA on certain issues. These issues were reviewed and discussed by technical experts in FRA's Track Research Division, as well as the Structures and Dynamics Division, Volpe National Transportation Systems Center. Their analysis and comment are contained in a report dated October 10, which is included with FRA's submission. Based on this review, FRA concludes the following:

1. The 25 foot moving average is a suitable parameter for the calculation of vertical modulus based upon the standards for rehabilitation agreed upon in previous decisions;
2. Safety concerns regarding rail failure due to fatigue and fracture are appropriately covered by existing FRA Track Safety Standards which will govern operations on this line;
3. Rail fatigue defects have been strongly linked to the severity and frequency of high axle loads and the age and quality of rail steels, however, the link to track modulus measured at a single point has not been established;
4. Track class designation is independent of track modulus; inherent "weak" vertical support locations are handled through track geometry

specifications that implicitly limit variations in rail head deflection by controlling spatial rail position; and

5. At the 14 locations identified as not meeting the deflection criteria based on the 25 foot moving average, either: rehabilitate the zone or limit operations to less than 59 mph (track class 3) for 25 feet on either side of the limits of the location as identified by the TTCI survey.

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