



U.S. Department
of Transportation
**Federal Railroad
Administration**

205291



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Washington, D.C. 20590

JUL - 8 2002

Mr. Vernon A. Williams
Secretary, Office of Proceedings
Surface Transportation Board
1925 K Street, N.W.
Washington, D.C. 20423-0001

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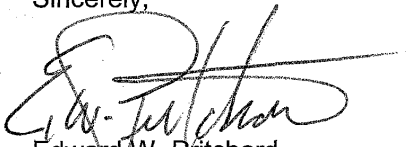
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Dear Mr. Williams:

The Federal Railroad Administration (FRA) is pleased to provide to the Surface Transportation Board (STB), as requested, analysis and comment on those issues requiring further clarification relative to the STB's October 22, 1999 decision involving the use of 115-pound rail in 79 mile per hour passenger service on the Plaistow-Portland Line. FRA's response is in connection with STB Finance Docket No. 33697.

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

Sincerely,


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

Enclosure

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

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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 conclusions provided herein are based on the analysis and comment 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 are contained in a report dated July 5, which is included with FRA's submission.

After careful review of the record in this proceeding, all available data, and the comments submitted by the parties, FRA has concluded that the testing methodology used by TTCI to measure track modulus was appropriate, and that the manner in which the data from the test was analyzed and reported by the TTCI technical staff was also appropriate.

The results from the track modulus testing support Amtrak's request for the operation of passenger train speeds up to 79 miles per hour between Plaistow and Portland with the exception of those discrete locations identified by Amtrak in their pleading. FRA has been unable to identify any safety regulatory concern with the use of 115-pound rail on the upgraded Plaistow-Portland Line provided it is maintained to FRA Class 4 standards, will be subject to twice-weekly FRA mandated visual inspections, and that it will be periodically inspected by Amtrak's track geometry car.

Memorandum

Date: July 5, 2002

Subject: STB Rail Weight/Speed Decision Clarification
STB Finance Docket No. 33697

From: Dr. Magdy El-Sibaie, RDV-31
Chief, Track Research Division

To: Al MacDowell, RRS-15
Staff Director, Track Safety Assurance & Compliance Division

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A group of technical experts and analysts at the FRA Office of R&D and the Volpe National Transportation Systems Center (M. El-Sibaie, M. Coltman, T. Sussmann and A. Kish) have reviewed various documents in reference to the April 12, 2002 National Railroad Passenger Corporation (Amtrak) motion to the Surface Transportation Board (STB) for further clarification of the board's October 22, 1999 decision on Amtrak's request to operate passenger trains on the line between Plaistow and Portland at speeds of up to 79 miles per hour. This review also included a June 7, 2002 combined reply by the Springfield Terminal Railway Company, Boston and Maine Corporation, and Portland Terminal Company (collectively referred to as Guilford) and June 27, 2002 rebuttals from Amtrak and the Northern New England Passenger Rail Authority (NNEPRA).

After review of the above mentioned documents, including the results of the track modulus testing, and after careful consideration of the issues raised by Guilford, the technical group sees no safety concerns regarding the condition of the line, agrees with the method employed by the Transportation Technology Center Inc. (TTCI) to measure its track modulus condition, and agrees with the manner by which the data from that test was analyzed and reported by the TTCI technical staff. The technical group therefore agrees with Amtrak's contention that the test results support approval of its request for Class 4 - 79 mph operation between Plaistow and Portland with the exception of the locations noted by Amtrak in their pleading. The following further clarifies the technical group's review findings.

The testing methodology employed by TTCI utilized a state of the art test vehicle, which is the only available practical method for evaluating the structural vertical support of an entire railroad line. This method produces a continuous relative dynamic measurement of vertical rail deflection under load, which is suitable for guiding further evaluation of the line through static testing and inspection, and providing a sound basis for identifying problem areas. But the relative dynamic measurements must ultimately be correlated to more definitive stationary measurements in order to produce corresponding values of track modulus. To establish such correlation, TTCI conducted further stationary tests at various sites to establish track modulus values at discrete locations. TTCI then used standard and straightforward regression techniques to establish a best-fit curve correlating the modulus values

obtained from the static measurements to the full range of dynamic measurements in order to assess the track modulus conditions throughout the entire route. To establish good correlation using this regression, it was necessary to conduct stationary static tests not only at locations where the track modulus may have fallen below 2750 lb/in/in but also at locations exhibiting high and middle range modulus values, as well as locations exhibiting extreme *variations* in modulus as potentially indicated by the TTCl proprietary Vertical Strength Index (VSI).

In its reply, Guilford repeatedly criticized Amtrak and TTCl for failing to perform static measurements at *all* locations where dynamic deflections exceeded the set threshold of 0.27 inches. For the purpose of establishing a good correlation, static testing at all such locations is not necessary, and the technical group has found that sufficient static measurements were taken to permit such a correlation. Traditionally, track data varies widely and strong regressions are difficult to develop, however TTCl was able to fit the static track modulus data to the relative deflection data with a correlation coefficient, R^2 , of 0.821, indicating a reasonable and acceptable correlation (an R^2 of 1.0 means perfect correlation). This analysis allowed TTCl to state the mean (average) track modulus of the line to be about 5350 lb/in/in. In addition, TTCl found that 99.95% of the line meets or exceeds the 2750 lb/in/in modulus required.

The testing conducted by TTCl substantially reflected the approach initially proposed. The actual 40,000 pounds wheel load used in the testing better approximates the load induced by a locomotive (heaviest load) and is still a suitable load for this type of test. As a result of this choice of test load, the deflection criteria was appropriately changed from 0.25 in. (0.16 in. contact plus 0.09 in. slack) to 0.28 in. (0.19 in. contact plus 0.09 in. slack) to reflect the increase in wheel load, holding the track modulus constant at the required 2750 lb/in/in limit. None of these changes constitute any significant departure from the agreed-to test procedures and could not have impacted any of the reported conclusions by TTCl.

The data interpretation was based on a 25 ft average of the data as described in the proposal by TTCl to Amtrak for conduct of the testing on the Plaistow to Portland line (Page 2 of the September 25, 2000 proposed Statement of Work) as referenced by FRA and STB in the documents pertaining to the June 28, 2001 decision. This 25 ft average was proposed based on TTCl's significant expertise in evaluating data collected using the TLV. In addition, this 25 ft average tends to approximate the value that would be obtained if the deflection basin of an entire car were considered, as in the analysis documented in Hay (1982, p. 262). Hay (1982), as referred to by the AREMA manual, served as the main reference for initially developing the 2750 lb/in/in modulus requirement. The recommended testing methodology, analysis, and recommendations are all required elements to ensure adequate compliance with the requirement.

TTCl based their evaluation of the data on the 25 ft average of the relative deflection data. Locations with deflection exceeding 0.27 in. (slightly less than the 0.28 in. value to conservatively account for decimal round off and measurement resolution) were tabulated by TTCl, indicating that 166 ft exceeded the deflection criteria (0.05%). All non-compliant track segments were either tested statically for track modulus compliance or inspected and evaluated by Amtrak according to the inspections required by the June 28, 2001 STB Decision (page 3, footnote 6). The inspection found that several locations were not a concern because the speed is not planned to increase to 79 mph in the area, a speed restriction was required for the Kennebunk area and a stabilization program is underway, and several locations were only noted as non-systemic problems. The evaluation of the line according to the TTCl methodology followed by the thorough inspection of the line by Amtrak's staff and consultant, both experienced track engineers, provides evidence that any poor track support problems have been evaluated and Amtrak is aware of any potential areas of concern.

Supplemental testing was completed for Guilford by Zeta-Tech using a method outlined in the AREMA manual for conducting static track modulus tests, referred to in the AREMA manual as a "simple" technique. This technique can provide useful data, but is not suitable for evaluating an entire line, since conducting repeated static tests over an entire line is not practical. It should be also stated that it is not realistic to expect consistently good agreement between modulus values computed from the regression analysis of dynamic deflection data and each and every static measurement of track modulus. This is due to what has been already described of the regression method as representing a best-fit curve, as well as the potential difference of track response to moving car loads (TLV) versus its response to a single statically applied load. Further, the value obtained from track modulus testing depends on the testing technique and analysis procedures. Depending on the measurement technique, track modulus values could vary by as much as 50 % and the industry has not reached a consensus on a preferred measurement technique. The TTCI data, as previously stated, approximates the measurement technique described by Hay (1982), the reference that served as a significant part of the basis for the previous decisions and the 2750 lb/in/in modulus requirement. The data collected by Zeta-Tech will be useful for both Guilford and Amtrak to better understand the condition of the track, however the two data sets should not be compared since two distinct testing methodologies were employed which correctly yield differing values.

Finally, it may be of interest to clarify FRA's position (as stated in previous opinions to the STB on this matter) on the use of track modulus as a safety criterion. Although an exceptionally low track modulus can indicate weak spots that require maintenance, by itself track modulus is not a safety indicator and therefore there are no explicit requirements on track modulus in the current FRA Track Safety Standards. FRA however is concerned with extreme *variations* in track modulus, and therefore, the Track Safety Standards (Subpart C on Track Geometry, especially 213.63 on Surface) do place strict controls over the allowable track geometry deviations. Further, the mandated twice-weekly visual track inspections should uncover safety problems resulting from weak vertical support conditions (Subpart D on Track Structure, Section 213.103).

In this vein, if the line is maintained to FRA Class 4 standards, is subject to routine FRA-mandated track safety inspections, and is periodically inspected by Amtrak's track geometry car, no regulatory safety concern exists. FRA does recognize, however, the importance of substructure safety research by promoting research efforts addressing track vertical stability and degradation, and diagnostics to evaluate track support issues (see FRA's 5 Year Plan). The goal of this research is to support and enhance the continued development and refinement of the Track Safety Standards, and the development of best industry maintenance, inspection, and operating practices to reduce the number of track failure caused accidents.

cc:

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Mike Coltman (Volpe)
Ted Sussmann (Volpe)
Andy Kish (Volpe)