

200-watt and 350-watt lamps were believed to be capable of producing 200,000 candela. Consequently, when FRA incorporated the 200,000-candela requirement into the auxiliary light provisions, it is clear that FRA was merely attempting to describe the locomotive lamps being used by the industry at that time.

As part of the auxiliary light rulemaking, FRA's Office of Research and Development, through the Volpe National Transportation Systems Center (Volpe), studied the impact of auxiliary lights as alerting devices to improve locomotive conspicuity. The final report on this study was issued in July of 1995 under Report Number DOT/FRA/ORD-95-13 (Volpe report). The report is part of FRA Docket Number RSGC-2 and is available online at: www.fra.dot.gov/rdv30/reports/index.htm. As part of this study, FRA evaluated various lighting systems. Four alerting light systems were evaluated for compliance with FRA's interim advisory standards, for costs, and for reliability. Field tests were also conducted on these lighting systems to determine their ability to increase an approaching train's visibility. These four alerting light systems included: standard locomotive headlights, crossing, ditch, and strobe lights. FRA utilized the data developed in this study as the basis for the auxiliary light provisions currently contained in § 229.125(d) through (h). See 60 FR 44457; and 61 FR 8881.

Based on FRA's review of the Volpe Report and its supporting data and in light of data subsequently provided by General Electric Company (GE), FRA believes that use of either a 350-watt lamp or a 200-watt lamp in locomotive auxiliary lights meets FRA's intent when issuing the regulations pertaining to such fixtures. A review of the Volpe Report establishes that the lamps tested in the headlight, ditch light, and crossing light systems were all PAR-56, 350-watt, 75-volt lamps. See Volpe Report at Appendix D-4. Although the report notes that two 350-watt lamps sampled for luminous intensity produced peak intensity reading in excess of 200,000 candela, there is no indication in the report that those specific lamps were ever used in any of the subsequent testing. One of these measurements was on an isocandela plot supplied to Volpe by Quest Corporation, the lamp vendor, based on data supplied by General Electric Company (GE), the lamp manufacturer, and the second was from a test conducted by the U.S. Coast Guard for the Volpe Center. See Volpe Report at Table 4-5 and Appendix C. Based on information recently provided by GE,

FRA believes that the intensity readings on these two lamps were an anomaly in terms of peak intensity for 350-watt lamps. The data supplied by GE shows that only one of 93 samples of the 350-watt lamp tested from 1994 to present produced a maximum beam candle power above 250,000 candela. This leads FRA to suspect that the lamp data supplied by Quest Corporation and the lamp tested by the Coast Guard in relation with the Volpe Report was potentially the same lamp, which was not representative of the lamps actually used in the Volpe tests. In fact, the lamps used in the Volpe field tests (which validated the benefits of using auxiliary lights) were 350 watt lamps. A large proportion of the lamps used in the tests in all probability did not meet the luminous intensity requirement because they were from normal production runs which included a high proportion of lamps with a peak luminous intensity below 200,000 candela.

In addition to the fact that the 350-watt lamp was used in the Volpe tests, FRA also believes that the 350-watt lamp currently being used in the industry provides equal, if not greater, benefits when used in auxiliary light fixtures than a 200-watt lamp capable of producing 200,000 candela. The primary purpose of locomotive auxiliary lights is to enhance the visibility of the front-end locomotive of a train from the perspective of a driver of a motor vehicle approaching a grade crossing. See 61 FR 8881. With this purpose in mind, FRA believes that, due to the design of 350-watt lamps, they provide equal, if not greater, visibility to motorists approaching grade crossings. Although FRA used peak candela to describe the type of lamps to be used in auxiliary light fixtures, FRA believes that a more appropriate measure is the intensity of the light at an angle from the head of the locomotive. The Volpe Report indicates that the point of first detection of a train's auxiliary lights for a motorist approaching a grade crossing (205 feet from centerline of the tracks) occurred at approximately 1,550 feet, a point that is 7.5 degrees from the centerline of the locomotive. See Volpe Report at Section 5. The Volpe Report also indicates that the point at which the separation of the lamps in the headlight and auxiliary lights became detectable to an approaching motorist was at a distance of approximately 570 feet, a point that is 20 degrees from the centerline of the locomotive. *Id.* Based on this information, it is evident that the key intensity figure for an auxiliary light is the intensity of the light at angles of

between 7.5 degrees and 20 degrees from the centerline of the locomotive.

Although a 350-watt lamp does not generally produce a maximum beam candle power (MBCP) in excess of 200,000 candela, these lamps do produce a greater luminous intensity over a broader angle off of the beam centerline than the traditional 200-watt lamp capable of producing a MBCP in excess of 200,000 candela. In fact, the available data clearly establish that the currently produced 350-watt lamp has a higher light intensity at any angle greater than 3.5 degrees off the centerline when compared to the more traditional 200-watt lamp used on older locomotives. Thus, the 350-watt lamps are particularly well suited for use in auxiliary light locations, which are primarily intended to be seen by motorists well away from an approaching grade crossing. Consequently, FRA believes that available data support a determination that the 350-watt lamp currently being produced and which has been permitted to be used in most newer locomotive auxiliary light fixtures since the mid-1990s actually enhances the ability of a motorist to detect an on-coming train.

In addition to the supporting data, FRA also notes that it has accepted the use of both 200-watt and 350-watt lamps since they began being used in auxiliary light fixtures beginning in the early to mid-1990s. It should also be noted that grade crossing accidents, deaths, and injuries have dropped sharply since the introduction of the 350-watt auxiliary lights in the mid-1990s. Furthermore, FRA is not aware of any complaints by operating crews or any deficiencies being noted by its field inspectors related to the luminous intensity produced by the 350-watt lamps since they began being used in locomotives. Moreover, FRA is not aware of any private litigation where the intensity of the light produced by a locomotive's auxiliary lights was brought into question.

In order to reflect FRA's intent when issuing the regulations related to auxiliary lights and to incorporate FRA's existing enforcement posture with regard to the use of 350-watt lamps, FRA is amending the auxiliary light provisions currently contained at § 229.125(d)(2) to specifically permit the continued use of 350-watt lamps. FRA believes this modification is necessary to ensure that there is no misunderstanding by either the regulated community or its field inspectors with regard to FRA's position. The modification makes clear that FRA will accept the use of either a lamp capable of producing 200,000