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Part II

Environmental Protection Agency

Noise Emission Standards for Transportation Equipment; Interstate Rail Carriers

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 201

[FRL 1361-3]

Noise Emission Standards for Transportation Equipment; Interstate Rail Carriers

AGENCY: U.S. Environmental Protection Agency.

ACTION: Final rule.

SUMMARY: On April 17, 1979, the Environmental Protection Agency published in the Federal Register (44 FR 22960) proposed noise emission limits for facilities and equipment of interstate rail carriers.

The purpose of this notice is to establish final noise emission standards for four railyard noise sources. This final rulemaking is promulgated pursuant to Section 17 of the Noise Control Act of 1972, 42 U.S.C. 4916.

We have chosen to regulate only specific major railyard noise sources in this rulemaking. Additional study and assessment necessary to address the complex issues associated with the proposed property line noise standard will be completed by the Agency prior to final promulgation of that standard. The Agency is reopening the formal comment period for the previously proposed property line noise standards in order to facilitate this analysis. (Sections 201.17 and 201.30–201.33)

DATES: The effective date of this rule is January 15, 1980. Comments regarding the previously proposed property line noise standard will be accepted until 4:30 PM, April 4, 1980

ADDRESS: Written comments on the proposed property line standard should be addressed to: Rail Carrier Docket ONAC 80–01, Standards and Regulations Division (ANR–490), U.S. Environmental Protection Agency, Washington, D.C. 20460.

FOR FURTHER INFORMATION CONTACT: Mr. Robert Rose, Standards and Regulations Division (ANR–490), U.S. Environmental Protection Agency, Washington, D.C. 20460, Phone: (202) 557–7666.

SUPPLEMENTARY INFORMATION:

1.0 Background Information

The U.S. Environmenal Protection Agency issued, on December 31, 1975, a noise emission regulation for locomotives and railcars operated by interstate rail carriers (41 FR 2184). In developing that regulation EPA considered broadening the scope of the regulation to include facilities and additional equipment. Because of the wide disparity in perceived severity of noise problems found at differing rail facilities, we decided that railroad facility and equipment noise, other than that produced by locomotives and railcars, was best controlled by measures which did not require national uniformity of treatment. Further, we believed that the health and welfare of the Nation's population being jeopardized by railroad facility and equipment noise, other than locomotive and railcars, was best served by specific controls at the state and local level and not by federal regulations, which would have to address railroad noise on a national, and therefore on a more general, basis. Where the federal government establishes standards for railroad facilities and equipment, state and local noise control ordinances ordinarily are preempted unless they are identical to the federal standards. For this reasons, we decided that is was best to leave state and local authorities free to address site-specific problems on a case-by-case basis, without unnecessary federal hindrance.

The Association of American Railroads (AAR) challenged the regulation on the ground that it did not include sufficiently comprehensive standards for railroad equipment and facilities under Section 17 of the Noise Control Act of 1972. It did not, therefore, provide the rail carriers with adequate federal preemption of potentially conflicting state and local noise ordinances as intended by the Act. The U.S. Court of Appeals for the District of Columbia Circuit ruled that EPA must substantially broaden the scope of its regulation affecting rail carrier facilities and equipment, Association of American Railroads v. Costle, 562 F. 2d 131 (D.C. Cir. 1977). On April 17, 1979, EPA proposed additional rules in response to this court order (44 FR 22960). The proposed standards were developed in terms of typical or average situations. Consequently, the uniform national standards proposed were a compromise, only partially controlling railroad facility and equipment noise throughout the country. The primary factor limiting more effective federal noise control is the very substantial cost incurred when more stringent noise levels are applied on a nationwide basis to all railyards and equipment. Our health and welfare analysis indicated that there would be an appreciable number of people in the nation who would still suffer significant adverse effects of railroad noise even after such a rule was in effect. Further, because of the preemptive nature of the federal regulation, states and localities would find it difficult to provide further relief to their citizens in most of these cases.

The notice of proposed rulemaking (NPRM) was published on April 17, 1979, with a public comment period of 45 days. EPA extended the comment period by an additional 30 days, to July 2, 1979. Our review and analysis of the comments received, especially those regarding the availability of technology, costs associated with the property line standard, and the L_{dn} noise descriptor, have led us to divide our final regulation into two parts, each to be issued separately.

The first part, and the subject of this rulemaking, concerns the immediate promulgation of noise emission limits for four railyard sources. These include two equipment sources, active retarders and locomotive load cell test stands, and one railyard operation, car coupling, as well as switcher locomotive noise, which is covered by amending section 201.11 and 201.12 of the Rail Carrier Noise Emission Regulation (40 CFR Part 201).

The second part, the property line standard, will establish federal regulations limiting other noise emitted from railyard facilities which are not covered by the source standards. This two-phased approach will allow EPA to satisfy the first part of the court order, which requires promulgation of a source standard final rule by January 23, 1980. This two phase approach allows more time to resolve the complex issues raised by the public comments concerning the property line standard.

2.0 Regulation

2.1 Introduction

Specific source standards for locomotive load cell test stands and switcher locomotives were not proposed by the Agency in the notice of proposed rulemaking. Both of these sources were, however, identified as specific sources contributing to the property line noise level of railyards, and specific technologies and attendant costs were identified for controlling these sources in order to obtain the level of noise control necessary to meet the proposed rule. Comments were received relative to the specific technologies and costs estimated by the Agency to bring these sources into compliance with the proposed rule. These comments have been fully considered in developing the recommendation for a final specific source standard for each of these pieces of railroad equipment.

The amended portion of the Rail Carrier Noise Emission Regulation establishes noise standards for

stationary and moving switcher locomotives. Switcher locomotives are in compliance with §§ 201.11(c) and 201.12(c) in a particular railyard facility, if the A-weighted sound level from stationary switcher locomotives or any combination of stationary switcher locomotives and other locomotives does not exceed 65 dB at a residential or commercial receiving property. If this level is exceeded, all switcher locomotives in the railyard facility must meet the noise standards specified in §§ 201.11 and 201.12 of this regulation. Similarly, where the A-weighted sound level at the receiving property is 65 dB or less the locomotive load cell test stand is deemed to be in compliance. If the sound level from the locomotive load cell test stand exceeds 65 dB at the receiving property then that locomotive load cell test stand shall not exceed 70 dB measured at 30 meters (100 feet).

The remaining two noise standards apply to the respective source emissions as measured on receiving property. The latter is defined [1] to include only residential or commercial property. The proposed regulation required the railyards to apply noise reduction technologies and techniques to all types of land use classifications except undeveloped land. "Land use" as used in this regulation is not considered to be synonymous with "zoning" and should not be considered to be zoning.

These regulations reflect the degree of noise reduction achievable through the application of best available technology on a national basis taking into account the cost of compliance and the time provided for compliance. For this reason, the maximum allowable sound levels specified for each source standard are not uniform and vary according to the availability and cost of abatement technologies or techniques for the given source. For the purpose of determining the availability of technologies or techniques and costs of applying those technologies or techniques used in developing the final source regulations, the Agency considered the following: the use of local absorptive noise barriers around sources, reflective walls at the facility boundary, exhaust silencers on switcher locomotives, and for car coupling, controlling the operation of rolling stock or its location relative to adjacent receiving property. For example, noise barriers can be constructed in close proximity to the source, or at the railroad facility boundary, or both in combination, as appropriate to the situation. Additionally, barriers used to abate noise at one source would likely reduce the noise not only from that source, but also from other railroad sources, including locomotives and trains. Because these are performance, not design standards, the railroads have total flexibility to apply whatever noise control approaches are most attractive in terms of cost or other considerations, as long as the required noise levels are met.

The noise measurements required by the regulation to determine compliance with the noise levels can be accomplished in most instances by a single individual with the use of a direct reading sound level meter and a wristwatch.

To determine compliance with the retarder and car coupling standards, the measurements are to be made on receiving property. The quantity to be determined for intermittent single-event sounds (retarder and car coupling noises) is the energy-averaged maximum sound level.

For the nearly steady-state sounds, locomotive load cell test stands and switcher locomotives, the quantity to be determined is the level of the specific source sound level observed as separately identifiable from other noise sources.

By amending § 201.11 the Agency is no longer requiring locomotives to be connected to load cells when undergoing stationary tests in the idle throttle setting. This is a technical clarification of the Agency's original intent. The noise from a locomotive in the idle mode can be measured more conveniently and accurately without being connected to a load cell. The Agency further amends § 201.11 (a), (b) and (c) to require "slow" meter instrument response characteristic rather than "fast" for determining compliance with the noise emission standards of § 201.11. Because locomotives operate at steady-state conditions during compliance testing with the stationary locomotive standard in section 201.11, noise measurements made with an instrument on "slow" meter response are essentially equivalent to measurements made on "fast" meter response. An exception to this equivalence is a limited number of apparently highly random peak readings of 1 to 2 dB above the steady-state sound level which occur when using "fast" meter response and do not occur when using "slow" meter response. On further review, the Agency has determined that the random peak noise values are of such a random nature, and are sufficiently infrequent as not to constitute a reason for deterring use of the "slow" meter response characteristic which is procedurally easier to use for compliance testing.

All limits established in this rulemaking are effective January 15, 1984 (approximately 48 months after final promulgation) with the exception of the technical clarification amendments of § 201.11 which are effective upon promulgation of this regulation. Prior to that date state and local ordinances applicable to these railroad equipment and facilities are not federally preempted. The proposed regulation provided for three years (36 months) from final promulgation for the industry to comply with the noise standards. However, legislative amendments in the Congressional process at the time of the drafting of this final rule require that no final regulation issued under this Section be made effective earlier than 4 years (48 months) after publication. The Congressional intent is to provide this additional 12 months' compliance period for Congressional review of the final rule. Thus, the Congress would have the opportunity to act to change the EPA rule during that first 12 months of the four-year period, prior to the industry's having to undertake compliance actions that would involve financial expenditures. The four-year lead time also allows the railroad industry the flexibility of not having to commit financial resources for compliance until after the property line standard is promulgated in January 1981. Although specific sources may be in compliance with the source standards, it may be necessary to apply additional abatement technologies or techniques for compliance with the forthcoming comprehensive property line standard.

If land use changes occur around a railyard after promulgation of this rule, requiring noise abatement application in order to meet the requirements of this regulation, a four-year compliance period is provided from the time of the land use change.

[1] "Receiving property" means any residential or commercial property that receives the sound from railroad facility operations that is used for any of the purposes described in the following standard land use codes (ref. *Standard Land Use Coding Manual*, U.S. DOT/FHWA, reprinted March 1977): for residential land use, 1, Residential; 051, Medical and other Health Services; 59, Educational Services; 691, Religious Activities; and 711, Cultural Activities; for Commercial land use: 53–59, Retail Trade; 61–64, Finance, Insurance, Real Estate, Personal, Business and Repair Services; 652–659, Legal and other professional services; 671, 672 and 673, Governmental Services; 692 and 699, Welfare, Charitable and Other Miscellaneous Services; 712 and 719, Nature exhibitions and other Cultural Activities; 721, 723, and 729, Entertainment, Public, and Other Public Assembly; and 74–79, Recreational, Resort, Park and other Cultural Activities.

2.2. Standards

A. Nearly Steady-State Noise Standards

The noise sources included in these standards are locomotive load cell test stands and switcher locomotives measured at 30 meters (100 feet) from the respective source. However, these standards need be met only if the A-weighted sound level from either of these sources at a specific railyard facility is greater than 65 dB measured at a receiving property location. Thus, the standard requires abatement only where people are benefited.

1. Locomotive Load Cell Test Stands

The Agency has identified locomotive load cell test stands as a major contributor to excessive noise emission from rail facilities. Testing of engines by connecting them to load cell test stands, simulating up to full engine load, is required periodically to assure satisfactory engine performance. During these tests, locomotive engines are run continuously at high throttle settings resulting in noise levels often in excess of 90 dB at 30 meters (100 feet).

The abatement of locomotive load cell test stand noise was described by the Agency as a necessary part of the receiving property line standard in the proposed regulation. EPA believed that the noise from such operations could be dealt with reasonably by relocating locomotive load cell testing away from noise sensitive receiving areas close to the railroad facility boundary, or by enclosure of the test facility from which the noise was emitted. The Agency feels it appropriate to include locomotive load cell test stands in the final rule as a specific source standard because they are important sources of railyard facility noise and abatement technology is available at a reasonable cost for reducing their noise level.

After reviewing comments on the proposed rule, available abatement technologies and techniques, and cost data, the Agency has modified its technology and costing assessment approach to reducing noise from locomotive load cell test operations. EPA cost and benefit studies show that total enclosure of test stands is generally less attractive than the use of 150 foot (length) by 25 foot (height) absorptive barrier walls around the facility and the locomotive being tested. Thus, EPA believes that the standard for locomotive load cell test stands may be met with an absorbing barrier designed to typically give 15 dB noise reduction at 30 meters (100 feet).

The Agency does not intend that railyards apply noise reduction technologies or techniques to control noise emitted from locomotive load cell test stands except where noise reduction is deemed necessary to protect receiving property. Therefore, EPA has instituted a two part compliance procedure. The standard will limit locomotive load cell test stand noise to an A-weighted sound level of 78 dB when measured at 30 meters (100 feet) perpendicular to the centerline of the locomotive load cell track, and centered on the geometric center of the locomotive under test. If the noise level from this source measured at any receiving property measurement location does not exceed 65 dB, then the locomotive load cell test stand is deemed to be in compliance. If the measurement exceeds 65 dB, then that locomotive load cell test stand must meet the prescribed standard, which limits locomotive load cell test stand noise to an A-weighted sound level of 78 dB at 30 meters (100 feet) when measured as prescribed in Subpart C of this part (See Table 2.1).

Certain locomotive load cell test stands may not be able to comply with the measurement conditions specified in § 201.23(a) in that measurement at 30 meters (100 feet) is impossible. In these situations, the A-weighted sound level from the locomotive load cell test stand must not exceed 65 dB when measured at a receiving property measurement location more than 120 meters (400 feet) from the geometric center of the locomotive being tested and in accordance with Subpart C of the regulation.

The 65 dB standard at 120 meters (400 feet) is consistent with the 78 dB standard at 30 meters (100 feet). If the (validated L_{eq}) A-weighted sound level at 120 meters (400 feet) exceeds 65 dB at 30 meters (100 feet), the maximum A-weighted sound level would be greater than 78 dB, because of two factors:

(1) There is a minimum change in level of 12 dB between the 30 and 120 meter (100 and 400 feet) locations, due to the inverse-square propagation loss (6 dB per distance doubling) that occurs for all point sources and other air and ground absorption propagation losses, and

(2) There is an additional difference of at least 1 dB between the L_{eq} (specified as the noise level to be measured at receiving property locations) and the L_{max} (specified as the noise level to be measured at the 30 meter (100 feet) distance).

Subpart C identifies the measurement procedure for steady state noise levels of a locomotive load cell test stand at receiving property and at 30 meters (100 feet). If ambient noises are not constant, the locomotive load cell test stand steady state level can be determined, but if ambient levels are a constant steady state level above that of the locomotive load cell test stand, then the noise level of that locomotive load cell test stand may not be measurable at the receiving property, but it would be measurable at 30 meters (100 feet) or more than 120 meters (400 feet).

Table 2.1.—*Locomotive Load Cell Test Stand Standard*

Effective date	Standard, L_A
Jan. 15, 1984	78 dB at 30 meters (100 feet).

2. Switcher Locomotive Noise

Switcher locomotive noise is one of the most prominent forms of railyard noise. This locomotive noise is of two types: moving point source noise as the locomotive is involved in switching operations, and stationary point source noise as the locomotive is parked but is allowed to remain idling and not involved in any active operation.

In the proposed regulation switcher locomotives were considered a significant noise source contributing to the noise crossing the property line. Abatement of the noise they produced was included in the Agency's derivation of the overall property line standard as proposed. Because the switcher locomotive is one of the most important sources of railyard facility noise and since there is technology available to reduce its noise level at a reasonable cost the Agency has chosen to address switcher locomotives with a separate source standard and has regulated this source by an amendment to the Rail Carrier Noise Emission Regulation.

An available technology for meeting the switcher locomotive noise emission limits is exhaust silencing of the engine noise. The Agency's original proposal (39 FR 24580) required the retrofit of that part of the entire locomotive (road haul and switcher) fleet used in railyards. The Agency has chosen to include only the switcher locomotives at this time because of arguments by the industry that the retrofit costs for all locomotives used at any time in a railyard would be excessive and that it would be difficult to isolate those road locomotives used in railyard duty.

The Agency does not intend that switcher locomotives, as defined, be retrofitted except in those railyards where noise reduction is deemed necessary. Rather, the compliance procedure the Agency has developed involves taking initial measurements at receiving property locations to determine whether abatement is

necessary. If the adjusted average A-weighted sound level of the stationary switcher locomotives or combination of stationary switcher locomotives and other locomotives does not exceed 65 dB, switcher locomotives are deemed to be in compliance with the regulation. If the level exceeds 65 dB, then every switcher locomotive in that railyard must meet the standard. This standard, by amending §§ 201.11 and 201.12, requires that switcher locomotives manufactured prior to December 31, 1979 to emit no more than an A-weighted sound level of 87 dB at any throttle setting except idle, when operated singly connected to a load cell, and no more than an A-weighted sound level of 70 dB at idle when measured at a point 30 meters (100 feet) from the geometric center of the locomotive along a line that is both perpendicular to the centerline of the track and originates at the locomotive geometric center. For switcher locomotives manufactured prior to December 31, 1979, the standard will limit noise emissions of these locomotives to 90 dB when moving at any time or under any condition of grade, load, acceleration or deceleration, measured at 30 meters (100 feet) from the centerline of any section of track which exhibits less than a two degree curve (or a radius of curvature greater than 873 meters) (See Table 2.2). Sections 201.11 and 201.12 promulgated on December 31, 1975 already require all locomotives manufactured after December 31, 1979 to meet these same limits. All measurements must be made as prescribed in Subpart C of this part. EPA studies indicate that no switcher locomotive retrofit at all will be required for many railyards.

Table 2.2.—*Switcher Locomotive Standard*

Effective date	Standard, L_A
	Stationary switcher locomotive
Jan. 15, 1984	87 dB at any throttle setting except idle, at 30 meters (100 feet).
Jan. 15, 1984	70 dB at idle, at 30 meters (100 feet).
	Moving switcher locomotive
Jan. 15, 1984	90 dB at 30 meters (100 feet).

B. Short Duration Noise Source Standards

The noise sources included in these standards are active retarders and car coupling operations. The standards promulgated for these noise sources are adjusted average maximum A-weighted sound levels of 83 dB for retarders and 92 dB for car coupling operations, as measured at any receiving property measurement location.

1. Retarders

The Agency's analysis indicates that retarders are one of the major sources of extremely annoying noise emissions from hump type railyards. After January 15, 1984, the noise from active retarders will be limited to an adjusted average maximum A-weighted sound level of 83 dB, measured as prescribed in Subpart C of this part at any receiving property measurement location (see Table 2.3).

Technology is available at reasonable cost for reducing the noise from retarders. For purposes of identifying available technology which could be applied by rail carriers for abatement of retarder noise, the Agency believes that the application of absorptive noise barriers on both sides of the master retarders where noise adversely affects residential or commercial land use, and reflective barriers at the facility boundary line where it is necessary to reduce retarder noise, will permit compliance with the standard at reasonable costs. For example, a master retarder barrier parallel to the track and extending at least 12 feet above the retarder and 75 feet to each side from the geometric center of the retarder, and containing appropriate absorptive material appears in the majority of instances to permit the standard to be met. A facility boundary barrier placed in the general vicinity of the facility boundary, located for maximum benefit on receiving property, 15 feet high and long enough to prevent line-of-sight between any receiving property measurement location and any retarder, should in most cases provide sufficient abatement to meet the retarder noise standard. An additional option available to the railyard is the use of barriers around the group retarders, either individually or collectively, in various configurations and at various angles to the group retarders, to meet the receiving property standard. The Agency expects about 3 out of 4 humpyards will need to take noise control actions to meet the standard for retarders.

Table 2.3.—*Retarder Noise Standard*

Effective date	Standard, L_A
Jan. 15, 1984	83 dB at receiving property.

2. Car Coupling

The Agency has identified car coupling impacts as a major contributor to noise from rail facilities. This noise is particularly annoying to people, because it is an impulsive noise involving extremely high sound levels occurring at random intervals.

The proposed car coupling standard was 95 dB measured 30 meters (100 feet) from the coupling incident, with an exception provision for those couplings with sound levels greater than 95 dB for which the railroad could show that coupling occurred at speeds of four miles per hour or less. The basis for choosing this level was that the majority of railroads stated to the Agency that four miles per hour was their operating rule or recommended practice. There is substantial evidence, however, that railroads do not, as a matter of course, comply with their own published operating rules or recommended practices. Because we must presume that the railroads would comply with such a coupling speed limit if it were a federal rule, the Agency assessed the potential adverse operational impacts of the proposed rule on the railroads. There is some evidence that train movements could be adversely affected if rail carriers were to comply fully with the proposed rule on a nationwide basis, causing delays in product deliveries. Because of this the Agency has made the final rule less stringent. The rule requires that after January 15, 1984, the adjusted average maximum A-weighted sound level for car coupling operations not exceed 92 dB at any receiving property measurement location when measured according to Subpart C of this part (see Table 2.4). Data available to the Agency, as part of the docket and background studies indicate that this standard can be complied with if car coupling speeds are no greater than eight miles per hour. The Agency believes that the standard can be met at almost all railyards with no change in operations, thus avoiding further technology applications or additional costs.

The final standard clarifies the proposed measurement procedures by providing for measurement on receiving property and allowing an energy average of 30 car impacts during at least a one hour period. The exception provision has been changed so that if it is demonstrated that the standard is exceeded when representative cars are coupled at similar locations at speeds that do not exceed eight miles per hour, car coupling is deemed to be in compliance with the standard. The rail carrier has the burden of demonstrating the applicability of this exception. One method of demonstrating the applicability of this exception is to measure the noise impact from couplings using cars, loads, and locations

representative of the coupling operation where the standard was exceeded.

Table 2.4.—*Car Coupling Noise Standard*

Effective date	Standard, L_A
Jan. 15, 1984	92 dB at receiving property.

2.3. Deferment of Property Line Standard

The Agency has decided not to promulgate a receiving railyard property line standard in this rulemaking, but to wait for further assessment of the extensive comments received on this proposed standard. The Court has agreed to this approach, the EPA will issue the property line in accordance with the court order. The regulation will include the control of a wide variety of rail equipment and facilities associated with yard activity that is not specifically covered by the four source standards.

3.0 Public Participation

EPA had originally established a 45 day comment period for this rule. The review period was lengthened by EPA's granting a 30-day comment period extension on May 30, 1979, in response to a written request by the Association of American Railroads (AAR).

Because the review period was relatively short, a special effort was made to put the proposed regulation promptly before the public and encourage the submission of comments. This was accomplished through a massive direct mailing of the proposed regulation and related documents, such as the Act, the court decision, and seven other documents, written specifically to stimulate public participation. Mailings were made to over 1700 selected organizations and individuals, including those in the industry, the Congress, state and local governments, labor, public interest, news media, and many private citizens.

A press release was included in the mailing packages or sent separately, so that most recipients, including the news media, had the information within one day of the appearance of the proposed regulation in the Federal Register. In Addition to the direct mailing, a number of briefings were conducted immediately before and after publication in the Federal Register.

4.0 Docket Analysis

The Agency received 159 written comments which were placed in our official docket. A brief summary of these comments appears below. A more detailed summary of the comments and of the Agency's response appears in the Background Document to this regulation.

4.1 Summary

Of the 159 official docket entries, the respondent source mix was as follows: 30% private citizens, 22% city/county governments, 20% state agencies, 13% industry, 10% federal governments and agencies, 5% associations.

Numerous respondents addressed conceptual issues in their submissions. Strong concerns with the property line standard and the L_{dn} descriptor were voiced by some commenters in all categories. State and local entities argued that the proposed property line standard was too lenient to benefit their citizens, too complex and costly to be enforced adequately, as well as lacking non-degradation provisions and thereby allowing increased noise in currently relatively quiet railyards. Industry comments urged that the proposed standards were unreasonably stringent, considering the cost of compliance and effectiveness of abatement technologies and techniques. Additionally, they criticized both the use of L_{dn} as the appropriate descriptor and EPA's estimate of the health and welfare benefits. Arguments were made for a more precise delineation of receiving land use classes, as well as for elimination of the property line concept in favor of source standards alone.

Questions on the technical aspects of the regulation were also raised by many respondents. Specific questions dealt with the adequacy, effectiveness, and cost of the yard noise level standard and the individual source standards. Faulty, inappropriate, and inaccurate measurement procedures were alleged.

Doubt was expressed concerning the effectiveness of various abatement technologies suggested as available for complying with the regulation. Most industry sources claimed that EPA had overestimated the degree of quieting that was achievable with the techniques described.

Many respondents addressed the costs associated with the regulatory package. State and local commenters were particularly concerned with the costs required for state or local enforcement of standards, including manpower, equipment, training, and technical consultant costs. The railroad industry asserted that EPA either omitted or underestimated the costs associated with equipment, yard, and system-wide operational changes. They highlighted the possible additional costs to them if new technology or more stringent yard or noise source levels were required.

Comments not falling into these three major categories addressed a variety of topics, including the need for a federal enforcement program in the regulation, opposition to preemption of state and local regulation, the lack of land use planning provisions in the regulation, the exclusion of regulations on warning devices, the need for an extended comment period and more public participation, and health and welfare concerns.

Taking into account the wide range of views, concerns and interests of the commenters and their submissions, EPA believes that this final rule is responsive. Since commenters were especially critical of the property line portion of the rule, the Agency has separated the rulemaking into two parts, promulgating source standards as part one, and allowing more time to address the property line standard as part two. Additionally, EPA has responded to the commenters by requiring noise abatement only when necessary to protect receiving property; by simplifying the measurement procedure; and by adjusting compliance requirements through a reevaluation of costs and technology estimates and assumptions.

4.2 Analysis

A. Retarder Noise Standard

EPA originally proposed a retarder noise standard that would have required retarder noise to be abated to an A-weighted sound level of 90 dB at a distance of 30 meters (100 feet) from the centerline of the retarder track. The proposed standard would have required compliance for all active retarders.

Commenters outside of the railroad industry agreed with EPA, that retarder noise must be abated, particularly where receiving property abuts railyards. However, many of this group were concerned that to determine compliance with the standard at 30 meters (100 feet) from the source, measurements must be made within the railyard property in many instances.

The majority of substantive public comments on the retarder noise standard were submitted by the railroad industry. Railroad industry respondents questioned the effectiveness of noise barriers as a noise abatement technique. Assuming the use of barriers for abatement, however, they argued that EPA cost estimates were extremely low because the Agency had underestimated material and labor costs and excluded down time costs in the calculations. They stated that adoption of this standard would require that barriers be unnecessarily constructed around every

retarder, which would create exorbitant implementation costs.

Rail industry respondents further claimed that barriers could not be constructed around approximately 50% of the group retarders as a result of close trackage and other geographic factors. Also, they expressed concern as to safety and maintenance problems associated with barriers surrounding group retarders.

Some respondents observed that not all retarders are parallel to the railyard property line, but may actually point at an angle to receiving property in such a way as to render barriers parallel to the retarders of limited effectiveness.

Although the final regulation takes these situations into consideration, it does not deviate greatly from the proposed regulation. However, EPA has changed the measurement methodology, which is now applicable only at receiving property measurement locations. Where there is no adversely affected receiving property, no noise abatement by rail carriers is required. The rail carriers now have the option of placing barriers, if that is the selected abatement approach, at greater distances from the retarders than originally contemplated. This change minimizes the cost to the industry while maximizing the benefit to receiving property adversely affected by retarder noise. The new receiving property approach to measurement location may necessitate the use of barriers which are longer or higher or at an angle other than parallel to the retarder in some situations, or located at the facility boundary rather than at the retarder to achieve the specified noise level limits, but this approach avoids the problems of close trackage and other geographic factors which were the most serious problems with the proposed standard. In addition, because EPA has changed the measurement procedures, the total number of barriers needed for abatement is greatly reduced, since the railroad need only install barriers where they are most effective and are necessary to protect receiving property.

EPA believes that the application of absorptive barriers around master retarders, and reflective barrier walls at the railroad facility boundary where necessary to protect receiving property, constitutes technologies or techniques available to comply with the noise levels set by this regulation. The costs of this abatement approach are comparable to the costs set forth in the proposed regulation and are considered by the Agency to be acceptable.

B. Car Coupling Standard

EPA originally proposed a car coupling regulation based on a four mile per hour limit and the noise emission level associated with that speed. This was consistent with what was believed to be the industry's practice as reflected in operating rules and guidelines of individual companies and in the guidelines of the Association of American Railroads (AAR).

The AAR and several individual railroad carriers voiced strong objections to this standard. They observed that the technology has not been developed to achieve the four mile per hour car coupling speed and that many car couplings actually occur at much higher speeds than four miles per hour. They argued that car coupling speed is directly related to the judgment of the brakemen and certain external forces, e.g., weather conditions, conditions of retarders, weight of car, type of car, contents of car.

Several industry respondents expressed concern over the possible safety implication of coupling at lower speeds. Operational considerations were a major topic for comment. For the proposed rule EPA had assumed that railroads adhered to their published and stipulated operating rules or that, at least, most rail carriers attempted to comply with industry recommended practice. However, the railroad industry stated that in practice the companies often cannot adhere to these rules. They contend, with supporting data, that in actuality many couplings occur at much higher speeds than four miles per hour. Some argued that if they were forced to slow down to four miles per hour, the flow of rail traffic would be impeded. Major operational changes would be needed to accommodate this changed flow rate. The AAR claimed that this would result in estimated costs of $10 billion while bringing railroad traffic to a near standstill.

Other comments indicated that in order to minimize freight damage, coupling speeds no higher than eight miles per hour are desirable.

State and local governments and numerous other commenters found the enforcement aspect of the proposed coupling standard apparently too difficult to implement using a speed measure. They raised the question of how satisfactory compliance determinations can be made in active railyards during operations, particularly as the measurements made include coupling speed as well as the coupling noise generated. Several commenters were critical of the number of measurements required to determine compliance. As a result, the Agency has refined the measurement methodology to allow the measurement to take place at a receiving property location rather than 30 meters (100 feet) from the point of coupling. Further, at least 30 consecutive car coupling impact sounds are required for a period of not less than 60 minutes nor more than 240 minutes.

EPA has completed a further review of the actual car coupling practices of the industry, notwithstanding the railroads' own written operating rules and guidelines. As indicated by industry commenters, a large percentage of the time cars are actually coupled at speeds greater than 4 miles per hour, although most cars appear to be coupled at less than 8 miles per hour. Since elements of the industry assert that a four mile per hour speed limit requirement would seriously hamper railyard traffic flow, the speed parameter method of determining compliance has been amended. After careful review and evaluation, EPA feels it must establish a noise standard for this source on what is close to a lowest common denominator basis. Consequently, the Agency has substituted an equivalent noise level standard for cars coupling at eight miles per hour which appears more representative of industry operational practice than its published statements. This standard will not affect the coupling operations of all yards, but will control the case of excessive coupling speed which is unduly disturbing to the residents adjacent to these yards. A significantly lower decibel level (and consequently lower coupling speed) could be possible at many yards without any significant disruption of operations. However, in writing a national rule, the Agency found it had to write a rule which could be met by almost all yards to avoid exceedingly high compliance costs.

There remains considerable conflicting information regarding railroad car coupling speeds. Most major railroads have indicated in writing that their policy is to couple rail cars at 4 miles per hour or less (see Background Document, Appendix H). Other information including a large quantity of data on actual car coupling speeds during routine railyard operation indicated that in practice rail cars are coupled at speeds over 4 miles per hour a large portion of the time. This area of potential car coupling noise control will continue to be investigated.

EPA recognizes that the noise level generated at 8 miles per hour is high. However, based on the car coupling speed data available to the Agency at this time a standard reflecting lesser

speeds could result in some operational slowdowns which might result in national railroad system shutdowns and high cost impact. The Agency encourages further industry attempts to reduce car coupling speed. In selective cases where communities are adversely affected by car impact noise it would appear that the railroad concerned might well voluntarily reduce coupling speed without any disruptive effect on its operations or on those of the rail system.

C. Refrigerator Car Standard

EPA proposed a refrigerator rail car standard of 70 A-weighted decibels measured at 7 meters (23 feet) perpendicular to the centerline of the car. Abatement techniques the Agency identified as being available were muffler improvement, noise insulation, and fan modifications. The railroad industry was expected to incur minimal costs in applying these noise abatement technologies.

The major criticisms and issues raised in comments on the proposed refrigerator car standard were: (a) The baseline noise levels used in developing the proposed standard appear to be unrealistically low. (b) The present noise levels for refrigerator cars already represent the application of best available technology. (c) The technology used for quieting truck-mounted refrigerator car noise is unproven and inappropriate for railroad refrigerator cars. Proposed technological modifications for noise abatement purposes would not be effective in reducing refrigerator car noise to the proposed levels. Improvements which could properly abate refrigerator car noise would require more extensive system redesign or equipment modification at large costs to the industry. (d) EPA erred, both when estimating the simplicity and when estimating the moderate cost of meeting the standard. (e) The trend in transport of perishable goods has shifted away from mechanical refrigeration rail cars and these cars are now rarely manufactured.

Numerous respondents suggested solutions to the noise problems created by parked refrigerator cars, among which were the use of disconnects from the diesel generator system and a reconnect to an electrical AC line source, and relocating these cars away from boundary lines adjoining residential and commercial areas when their refrigeration equipment is in operation.

EPA had decided not to promulgate a source standard for refrigerator cars at this time, in part to allow time to evaluate the effect of their declining use. Their function is being replaced by containers on flat cars (COFC) and truck-mounted (trailer) refrigerator units on flat cars (TOFC), which were not addressed by EPA in the proposed rules. Further, the Agency was not able to evaluate fully at this time the potential for more significant noise reduction through technology applications. The Agency expects to respond to these comments in its promulgation scheduled for January 1981.

D. Locomotive Load Cell Test Stand Standard

The proposed regulation included locomotive load cell test stand noise abatement as a part of the property line standard. Available abatement technology for these facilities constituted relocation of locomotive load cell test stands away from receiving property lines, or total enclosure of these facilities.

The railroad industry commented that the load cells for conducting tests are generally located near repair facilities, and that relocation of the load cell test sites would be impractical as an alternative abatement technique. It was claimed that load cell relocations would result in substantial costs, losses in productivity, and a decrease in efficiency due to increased requirements for both manpower and locomotive movements to and from the repair facilities.

After reviewing available abatement technology, techniques, and cost data, EPA has modified its assessment and now believes that the application of absorptive barrier walls will serve as well as, or better than, the relocation or total enclosure approaches. For costing purposes EPA has assumed the use of 150 foot (length) by 25 foot (height) absorptive barrier walls around the test facilities and locomotives being tested, which EPA technology analysis showed were more attractive than total enclosure of test stands.

E. Switcher Locomotives

In the proposed rulemaking, EPA did not propose a specific source standard for switcher locomotives. Rather, switchers were identified as a noise source likely to require noise abatement in order that the industry meet the proposed L_{dn} receiving property line standard that limited noise from all railroad noise sources collectively.

The railroad industry took strong exception to EPA's recommended procedures for engine shutdown when not in use, parked locomotive relocation, and muffler installation for reducing noise from switch engines and idling locomotives.

The industry asserted that to reduce noise by measures such as engine shutdown or locomotive relocation is impractical and infeasible. Shutdown was claimed to bring about a high risk of damage from hydraulic lock on engine start up, while relocation was seen as feasible only in special limited circumstances. It was also claimed that muffler technology alone could not reduce the noise from switch engines an average of 3 dB at idle and 4 dB at higher throttle ratings, as EPA had estimated.

EPA considered these comments in arriving at this final regulation and believes that switcher locomotive noise emission levels should be addressed specifically. Further, the Agency believes that technology is available to control switcher locomotive noise emissions at an acceptable cost.

Switcher locomotives are deemed to be in compliance with the standard if the sound level from stationary switcher locomotives or combinations of stationary switcher and other locomotives does not exceed an A-weighted sound level of 65 dB at a receiving property. If the noise level from locomotives measured at a receiving property location(s) exceeds this level, all switcher locomotives must meet the specified noise standard, which requires switchers not to exceed specific noise levels measured at 30 meters (100 feet) under various operating modes.

Additionally, the Agency has eliminated the requirement that locomotives be connected to a load cell when undergoing a stationary test for the idle throttle setting.

F. Measurement Methodology

The proposed regulations specified noise levels at the perimeter of the railyard to be monitored by Type 1 instrumentation. The procedure would require that all noise not associated with the railyard, such as passing rail traffic, be excluded. Respondents argued that Type 2 meters should be adequate and that the requirement to factor out "extraneous" noise would require either modeling or a noise expert, or perhaps both. The proposed regulations did not include estimates of funds for state and local equipment/personnel acquisition. Hence, some respondents concluded that the requirement in the regulation for Type 1 sound meter use would impose undue costs on the enforcing body.

EPA's analysis has shown that railyard sounds are substantially different from those associated with highways or airports. Acoustically, the latter facilities have relatively

homogeneous noise sources. Quantification of sound emitted by railyards is much more difficult than quantification of highway or airport noise because railyards have many different types of noise sources, some possessing impulsive and high frequency characteristics.

Examination of Type 1 (precision) and Type 2 (general purpose) sound level meters as specified in the American National Standards Institute's standard for sound level meters, ANSI S 1.4–1971, has convinced the Agency that either the Type 1 or Type 2 sound level meter is appropriate as a measurement tool for railyard standards, if appropriate adjustments are made for use of Type 2 instrumentation. In many cases the effectiveness of enforcement efforts may be enhanced by the use of the more precise Type 1 equipment. The adjustments for use of Type 2 instrumentation for each of the source standards are shown in Table 4.1.

With respect to the standard for retarders, Type 1 sound level meters are especially appropriate, since a very large (4 dB) adjustment is necessary if Type 2 meters are used.

Table 4.1.—*Adjustments to Levels for Type 2 Sound Level Meter Usage*

Measurement section in regulation	Source	Decibels [1]
201.24	Locomotives	0
	Rail car	0
	Locomotive load cell test stand	0
201.26	Retarder	4
	Car coupling	2
201.27	Locomotive load	0
	Cell test stand stationary locomotive	0

[1] Amount of correction to be subtracted from measured level (dB).

This rule establishes specific source standards but avoids the technical problems of selectively excluding some noise sources such as through trains from the measurement.

C. *Health and Welfare*

Health and welfare aspects of the proposed regulation also received attention by public commenters. It was suggested that the proposed standards were not sufficiently stringent to provide adequate protection to people exposed to noise from railroad operations.

The proposed federal emission standards were higher (allow a greater level of noise from operations) than some state and local regulations now in effect. Respondents were concerned that the federal standards would (1) preempt the state and local standards and lead to degradation of state and local regulations currently in force, and (2) allow rail operations to be established in areas of presently little or no activity and to emit noise up to the levels allowed by the proposed federal regulations.

The industry questioned the health and welfare impacts of the proposed regulation. They suggested that EPA's railyard noise impact model may considerably overestimate the Equivalent Noise Impact (ENI, which is a method to account for the extent and severity of noise impact) due to the use of an "average" population density around the yards which does not account for the lower densities the AAR would expect near the yard boundaries (i.e., in industrial and commercial areas) in the higher noise regions. EPA anticipated this potential problem in the proposed regulation and conducted analyses using available data during the model development to estimate the possible error. EPA counted the population around the 120 sample railyards on which the model is partly based. The population data obtained in many cases indicated very high local average population densities around large railyards where residential land uses were mixed with industrial and commercial land uses. If the model "squeezed" the people back into the residential land uses rather than averaging, this would have the effect of reducing the area of impact with the given population, resulting in a higher population density and thus no net change in ENI. Furthermore, an analysis of ENI for actual population density distributions around seven hump yards (using data from the 1975 Background Document), as compared to the ENI results using an average density, indicated that on the average if EPA did overestimate, it was on the order of less than five percent. At the same time, EPA's use of ENI substantially underestimates noise impact because it addresses only residential exposures rather than exposure of people in all land use environments, particularly in sensitive land uses, such as hospitals, schools, and churches.

The railroad industry was also concerned that the railyard noise impact model was technically incorrect in the method of aggregating ENI. However, under the assumptions of the analyses, EPA believes the model is technically correct. The key assumptions are that certain stationary sources are grouped in a relatively small area, that moving sources are on the same line, and that the source groups are sufficiently separated so that the $L_{dn}=55$ contours from any group do not overlap the next nearest group. There are insufficient data on railyard operations and noise source locations or interactions to compute connected L_{dn} contours around the typical railyards.

Anticipating that there could be complex noise overlap patterns from various noise sources in railyards, EPA conducted two types of analyses to determine the potential error. Analytical models were used to calculate the variation in ENI as two separate point sources and two separate line sources were merged in various degrees of overlap, from two completely separated sources to a combined source of twice the noise energy of a single source. The results indicated that the ENI for two superimposed sources of equal strength was equal to the sum of the ENI from two completely separated sources. However, at intermediate degrees of overlap of two sources, the average difference between ENI for the separated sources vs. overlapped noise patterns was about 15 percent. Also, the railyard noise impact model was programmed to compare the results using the regular source groups (4 to 5 source groups at each type of yard) to the results of completely separating all types of sources (4 to 11 sources). The case of completely separated sources resulted in an 18 percent increase in total ENI compared to the 4 to 5 source group case. These analyses provide a reasonably good bound on the "error," which is less than 18 percent, since the length of the railyards precludes any significant overlapping of noise patterns from more than any two source groups. Once again, the result is an underestimate of impact.

H. *Costs and Economics*

Although the Agency has provided in Table 5.2 some cost comparative information, we feel that a meaningful cost comparison is not feasible. First, each of the rules is different as to its scope; i.e., the proposed rule encompassed a property line standard and three source standards (active retarders, refrigerator cars and car coupling) and the final rule four source standards (active retarders, car coupling, load cell test stands and switcher locomotives), the latter two being primary noise sources in the proposed property line standard. Second, the technologies and alternatives available to achieve abatement to meet the final standards are different. Third, the Agency feels that the cost estimates provided by the industry in response to the proposal significantly inflated the costs or portrayed a worst case situation.

A number of commenters took issue with the EPA's assessment of the costs

of compliance and economic impacts associated with the proposed property line and individual source standards.

The railroad industry in general took exception to EPA's estimates of the capital, operating, and maintenance costs, and the potential costs associated with various operational changes or opportunity costs which might occur. These latter costs would be due to installation of noise control devices, the rescheduling and rearrangement of railroad operations, or the potential redesign of the yards in order to meet the proposed rules. The curtailment of nighttime operations, the reduction of car coupling speeds, the need for shutdown of idling locomotives, and the potential track clearance problems associated with the installation of barriers around active retarders were heavily criticized. Another major assertion was that an additional 450 road locomotives would have to be purchased to replace a portion of the existing road fleet which would have to be retrofitted and dedicated to yard service in order to meet the proposed rules. Industry estimates of compliance costs were approximately ten times greater than those estimated by the EPA for the total capital costs of the regulation. Annualized costs similarly were estimated by the railroad industry to be 7.5 times greater than the EPA estimates.

Because of the time constraints the Agency is not in a position to resolve fully all cost discrepancies. For example, estimates received from industry and state and local agencies relative to the costs of absorptive barriers required to meet the retarder standard ranged from $50 to more than $200 per linear foot for materials and installation, while the original EPA estimate was $75 per linear foot. Additional review has indicated to the Agency that barrier costs of $100 to $162 per linear foot, depending on height, for materials and installation represent the best "average" cost to use for regulatory purposes.

Since the proposed rule required all master, group, intermediate, and tangent point retarders to comply with the standard, barriers were to be required around each such retarder.

As a result of the potential operational costs associated with a source standard requiring barriers around all active retarders, EPA has decided to base its active retarder standard on a receiving properly not-to-exceed limit, to allow the industry the flexibility to choose its abatement procedures to mitigate or eliminate the various potential operational opportunity costs involved. It is anticipated that the industry will be able to comply with the receiving property retarder standard by using combinations of absorptive barriers around most master retarders, some group retarders (if located very near the railroad property line), and reflective walls at railyard boundaries adjacent to receiving property. This approach could eliminate the need for placing absorptive barriers around each active retarder.

Additionally, bankrupt firms or financially distressed firms were concerned that they would be unable to raise the required capital to purchase and install the requisite noise abatement equipment. Concerns were also expressed that the industry would not be able to pass through the noise abatement costs via rate increases because of trucking and waterborne competition, ICC rate regulations, and associated federal inflationary guidelines. Another concern of the weak and bankrupt firms was that because of their low profit margins, they could not take advantage of investment tax credits to offset the noise abatement expenditures.

State and local agencies were concerned that the complexity of the measurement techniques involved in determining compliance would impose costs in excess of those estimated by the EPA. These costs involved the need for purchase of new noise measurement equipment and costs associated with extensive training of existing personnel and the hiring of engineers and technicians. Some state and local agencies provided capital and operating cost estimates for source abatement techniques that were substantially lower than those of the railroad industry and also somewhat lower than EPA's estimates.

Several federal agencies commented on the costs and economic impacts associated with the proposed rules. Concerns were expressed that the proposed rules were not cost-effective because the costs of compliance for industrial uses were not justified by the potential benefits involved. An additional concern was that the incremental benefits achieved by lowering the property line standard for hump yards to an L_{dn} value of 65 dB were not justified by the extra costs involved. On the other hand, several commenters argued that imposing a nationally uniform property line and individual source standards should be limited to worst case situations to avoid excessive cost. EPA recognizes that regulations adequate to protect public health and welfare would require more stringent property line and source levels which would of necessity be more costly.

5.0 Impact of the Regulation

5.1 Health and Welfare Impact

The impact of the final source standards on the health and welfare of the nation's population can be examined by first measuring the exposure levels and total number of persons subjected to railyard noise that may jeopardize their health and welfare, prior to the institution of source standards, and second, the reduction in the extent and severity of harmful railyard noise after the source standards become effective.

The Agency has identified an outdoor L_{dn} value of 55 dB as the noise level protective of public health and welfare with an adequate margin of safety. It is estimated by EPA that between 0.5 and 10.0 million people in the United States are currently exposed to day-night average sound levels in excess of 55 dB resulting from railyards.[3] Compliance with the final source standards will result in approximately a 10–15% reduction in impact, considering both extent and severity.

The total number of persons affected by railyard noise is a function of the penetration of noise into the community and the number of people in proximity to railyard property. The Agency has chosen to consider only residential and commercial property in formulating the final source standards. Given the extensive intermingling of land uses surrounding railyards as demonstrated by aerial photography, EPA believes that a regulation based on noise emissions received on residential and commercial property should provide significant protection for other land uses.

5.2 Cost Impact

The estimated cost of this final source standard regulation was developed using the following sequential procedure:

1. Determination of the noise sources located in railroads which need to be abated.

2. Identification of the various noise abatement techniques and technologies that can be applied to each noise source.

3. Estimation of noise abatement resulting from each abatement technique or technology, based on available data.

4. Calculation of the cost of each abatement technique or technology.

[3] This figure is based on an assumption of a background ambient noise level of L_{dn}=55 dB. The ambient noise is assumed to add to railyard noise levels, but the railyard noise is still dominant.

5. Calculation of the total cost of the abatement technique or technology selected.

6. Comparison of costs and noise reduction benefits of the abatement technique or technology selected. Computations are made from individual unit costs to establish total capital cost, operation and maintenance cost, and uniform annualized cost.

Table 5.1 presents the estimated cost by noise source for compliance with this regulation.

Table 5.1.—*Cost Estimates for Noise Abatement of Railyard Source Standards*

Noise sources	Control techniques/ technologies	Unit cost range	In thousands of dollars		
			Capital costs	O&M costs	Uniformed annualized costs
Active retarders	Barrier sets	$100-$162/ft	40.1	0.0	3.5
Switcher locomotives	Exhaust Silencers	$7,275-$12,500.	54.6	6.4	17.2
Locomotive load cell test stands	Barrier sets	$325/ft	14.0	1.1	2.4
Car coupling	Speed control	NA	NA	NA	NA
Measurement	Instrumentation	$10,000	1.0	1.4	1.2
Totals			109.7	9.8	24.3

NA = Cost on a national basis has been determined to be minimal relative to other noise source and abatement costs of this rulemaking.

After making the necessary adjustment for the effective date of this final regulation, the total capital investment by the railroad industry for compliance with the rulemaking is estimated to be approximately $110 million. The total industry-wide uniform annualized cost of compliance is estimated to be approximately $24 million. Cost estimates for installing active retarder barriers and for retrofitting of switcher locomotive exhaust silencers incorporate sufficient downtime cost to accomplish the modifications required, which is part of the total compliance cost of the particular standard. The car coupling standard is associated with a speed in excess of that cited as the standard operating practice within the railroad industry.

To assess further the estimated cost of the four source specific regulations compared with the proposed rule, the Agency carefully reviewed the cost impact comments received in the docket. Table 5.2 illustrates comparisons of costs examined in determining the final rule.

Table 5.2.—*Estimated Costs of Implementing Regulation*

[Annualized costs $ x 10⁶] [1]

	EPA estimates of proposed regulation	Industry estimates of proposed regulation	EPA estimates of final regulation
Active retarders[2]	$3.0	$38.0	$6.0
Car coupling[3]	(7)	10,000.0	(7)
Switcher locomotives[4]	3.6	144.3	23.0
Locomotive load cell test stands[5]	4.0	20.1	3.3

[1] Annualized costs include capital investment, operating and maintenance costs, and costs of operational changes.

[2] EPA's proposed regulation assumed installation of barriers on both sides of each master and group retarder (all active retarders). EPA assumed no costs for operational changes due to problems of installation of retarder barriers. AAR asserts that clearance problems exist at approximately one-half of the retarder locations requiring (a) track and retarder relocation, (b) rewiring of retarders and switchers, (c) extra downtime, and (d) purchase of additional real estate to maintain existing car capacity. The final regulation assumes installation of absorptive noise control barriers on both sides of all master retarders which affect residential or commercial land use, and reflective barriers at the facility boundary line where necessary to reduce noise from group and tangential retarders.

[3] EPA's proposed car coupling standard was estimated by the Agency to be a no cost rule, given that the 4 mph limit was believed to be consistent with industry-published policy on car coupling speed. Industry representatives, however, claimed that imposition of a 4 mph speed limit would impede the flow of rail traffic, necessitating major operational changes. The Agency's final regulation is reflective of an 8 mph speed limit. The cost on a national basis is expected to be minimal relative to other noise source and abatement aspects of the rulemaking.

[4] The proposed regulation assumed a mix of retrofit of the entire road haul and switcher locomotive fleet used in railyard duty, and incremental cost of installation on new switcher locomotives. EPA neither assumed out of service costs of retrofit switcher engines nor assigned operational change costs involving the extra queuing of road locomotives and the purchase of new road locomotives. The industry cost estimates assumed the GM/EMD retrofit cost figures as the basis for their estimates (See Background Document). For costing purposes in the final rule EPA assumed switcher locomotives must be retrofitted only in those railyards near residential or commercial land uses.

[5] EPA's proposed regulation assumed construction of a simple enclosure performing no function other than noise reduction. Industry costs are based upon a more elaborate facility with heating, cooling, lighting, and ventilation adequate to allow the facility to be used for other purposes. The final regulation estimates are based on construction of 150'x25' absorptive barrier walls around the facility and the locomotive being tested.

[6] No cost.

[7] Minimal cost.

5.3 *Economic Impact*

An analysis of the economic impact of the noise regulations is included as part of the Background Document. It was based on the railroad industry's current financial and operating structure and its recent competitive history. Potentially important intermodal competition was not considered because the regulation of noise emission from other modes of transportation should offset the impact of these regulations on the railroad industry; i.e., while the noise regulations will increase railroads' costs, similar regulations now affect new medium and heavy duty trucks, so that a significant shift among competing modes is probably unlikely as a result of this regulation. In addition, the greater energy efficiency of rail transport may lead to increased demand for rail freight transportation services, further mitigating any adverse costs of the noise regulations.

The total capital expenditure (initial capital costs plus out-of-service costs) required to comply with this regulation for residential and commercial receiving property is estimated to be $109.7 million. In 1978, Class I and Class II railroads invested $2,776 million in capital expenditures. Thus, the projected investment in the noise abatement technologies and techniques amounts to 4.0 percent of the industry's total capital expenditure in 1978. If the regulation were to be fully enforced and complied with only at residential receiving property lines, capital expenditures of only $90.7 million would be required, or 3.3 percent of total 1978 capital expenditures. These represent fairly large outlays relative to normal capital expenditures.

Several factors suggest that the magnitude of these capital expenditures relative to normal capital expenditures could increase some firms' difficulties in securing the necessary financing. Large capital expenditures are needed simply to maintain existing roads and to replace aging rolling stock. The firms' first priority is in maintaining these revenue producing components of their capital stock. As a result of inadequate cash flow and low rates of return relative to other industries, some railroads may find it difficult to finance capital expenditures for noise abatement technologies, as well as for other non-federally required actions, either internally or from external capital markets. However, it does not appear that these difficulties will preclude any firm from complying.

The general procedure for estimating impacts was first to calculate a weighted average demand price elasticity for each Class I railroad's range of commodities hauled. Next, a weighted total cost of compliance was

calculated for each railroad based on the average cost of compliance per yard, with costs allocated by railroad according to the number of yards requiring investment in quieting technologies or techniques operated by each railroad. The short-run impact on each railroad was computed assuming no price increase; thus, increased costs were translated directly into reduced operating profits. Long-run impacts were computed assuming that the ICC would allow 100 percent of the costs to be passed on to customers in the form of rate increases. Existing literature suggests that average costs are relatively constant for railroads within the Class I category, so the average price increase was assumed to be equal to the average unit cost increase. Using this assumption, the percentage decrease in revenue ton-miles for each railroad in the long run was simply the percentage change in price multiplied by the weighted average price elasticity of demand.

The regulation is expected to have very little impact on the demand for rail freight transportation services. The weighted average demand price elasticity ranges between −.348 and −1.037. Based on annualized average capital and operating and maintenance costs, the cost per revenue ton-mile could increase approximately 0.1. This translates into a decrease in revenue ton-miles of between 0.04 percent and 0.15 percent. Based on a total of 858.1 billion ton-miles in 1978, ton-miles may decrease between 391 million and 1,279 million ton-miles. If other conditions, primarily fuel shortages or costs continue to worsen, even these small decreases will be compensated for as additional truck freight is diverted to the more fuel efficient rails.

Employment impacts were calculated assuming that labor-output ratios were constant for small changes in output. Thus, the percentage change in employment was simply the percentage change in output (measured in revenue ton-miles) multiplied by the labor-output ratio. The net reduction in railroad employment ranges between 236 and 777 jobs, and total U.S. railroad employment in 1978 was 471,516 people. Again, this figure was for the long-run impact; due to the small changes in employment predicted and the long-run adjustment framework, it is likely that employment reductions could be accomplished through normal attrition and that no disproportionately adverse impacts will be borne by railroad employees.

The question as to what the impact will be on individual railroads is also a particularly important one. The impact of the noise abatement regulations on the railroad industry as a whole appears to be very small, but some railroads will be more adversely affected than others. Conrail is of particular interest because of the large governmental subsidies it already receives. EPA's analysis suggests that Conrail's costs will rise by about 0.2 percent of total capital plus operating costs. The number of revenue ton-miles shipped by Conrail could fall between 0.6 and 0.2 percent if the full increase in costs is passed through as a price increase. After Conrail the railroad with the next largest deficit relative to operating revenues (excluding the Long Island since they primarily provide commuter service) which will be affected by the regulations is the Chicago, Milwaukee, St. Paul and Pacific. It is a smaller railroad, ranking 15th in terms of revenue ton-miles of the 49 Class I and Class II railroads studied. Its total costs could increase by 0.2 percent but its traffic could decrease by 0.09 to 0.28 percent.

Two of the railroads with the largest potential increase in costs relative to total capital plus operating costs are the Pittsburgh and Lake Erie, and Richmond, Fredericksburg and Potomac. For both, their costs could increase by as much as 1.0 percent (or as little as 0.4 or 0.3 percent, respectively). Both are small railroads, ranking 38th and 39th respectively in revenue ton-miles shipped in 1978. However, both should be better able to absorb increased costs in the short run than many of their competitors. The Pittsburgh and Lake Erie's net income as a percent of total operating revenue was 16.6 percent in 1978, and that of the Richmond, Fredericksburg and Potomac was 43.8 percent.

The major conclusion is that the noise abatement of these final source regulations should lead to only minor impacts in the rail freight transportation industry in the short run as well as in the long run after railroads have had the chance to pass through added costs. Employment impacts likewise will be extremely small with no reduction in jobs in some firms. Conrail may experience a reduction of as many as 215. However, even this reduction in employment amounts to less than 0.25 percent of Conrail's total labor force. These firm by firm projections are based on a statistical analytical analysis that does not account, for example, for other employment controls such as union contracts, or for increases in employment which could occur by railroads in complying with this regulation.

6.0 Enforcement

The Noise Control Act places primary enforcement responsibility with the Federal Railroad Administration (FRA) of the Department of Transportation. Specifically, Section 17 of the Act directs the Secretary of Transportation to promulgate regulations to ensure compliance with the EPA railroad noise standards. In addition, Section 17 directs the Secretary of Transportation to carry out such regulations through the use of his powers and duties of enforcement and inspection authorized by the Safety Appliance Act, the Interstate Commerce Act, the Noise Control Act (as amended), and the Department of Transportation Act.

The FRA has indicated to EPA that it will promulgate compliance regulations, will conduct investigations to determine compliance, and use the FRA enforcement authorities and limited enforcement resources to enforce this regulation.

EPA believes that the FRA has adequate authority to enforce these regulations. While EPA has some concurrent authority to enforce, the Act clearly places the primary responsibility for enforcement with FRA, and EPA has not dedicated any resources to enforcement of these regulations.

EPA anticipates that the major enforcement activity will need to be conducted by state and local agencies if the regulation is to be effective. In fact, EPA has designed these regulations in a manner which will facilitate the adoption and enforcement of identical regulations by state and local governments.

7.0 Background Document

Information used as a basis for the final regulation has been compiled in a document entitled "Background Document for Final Interstate Rail Carrier Noise Emission Regulation: Source Standards." The document may be obtained from: U.S. Environmental Protection Agency, Public Information Center (PM-215), (Lobby West Tower Gallery No. 1), Waterside Mall, Washington, D.C. 20460, (202) 755-0717.

8.0 Evaluation Plan

The effectiveness and need for continuation of the provisions contained in this action will be reviewed no more than five years after the initial effective date of the final regulation. In particular, we will solicit comments from affected parties with regard to actual costs incurred and other burdens associated with compliance and will also review noise impact data in order to evaluate the regulation's effectiveness.

9.0 Reporting and Recordkeeping Requirements

This regulation should impose no significant new or additional reporting or recordkeeping requirements on affected parties. This regulation will be reviewed specifically with respect to reporting and recordkeeping requirements within five years of its effective date.

10.0 Regulatory Analysis

EPA has determined that this action is a "significant routine" regulation and therefore does not require a Regulatory Analysis under Executive Order 12044. However, in accordance with that Executive Order, we have prepared an economic analysis which is located in Section 6 of the Background Document (referenced in Section 7.0 of this Preamble).

11.0 Public Comment

At this time the Agency is reopening the public comment period on the proposed property line noise standards (44 FR 22960–22972) (Sections 201.17 and 201.30–201.33). Extensive comments were received on the property line standard, reflecting a variety of views. Further comment may now be submitted on any aspect of the proposed property line standards. Given the diversity of views already expressed, EPA particularly encourages and solicits further comment addressing arguments and information from comments on the proposed rule, including its applicability to particular land uses, such as residential, commercial, industrial, and agricultural.

The public comment period will close at 4:30 p.m. on April 4, 1980.

12.0 Environmental Impact Statement

The Agency has prepared an Environmental Impact Statement which presents the effect of the final regulation. This document may be obtained from EPA's Public Information Center (PM-215), (Lobby West Tower Gallery No. 1), Waterside Mall, Washington, D.C. 20460, (202) 755-0717.

This regulation is promulgated under the authority of Section 17 of the Noise Control Act of 1972 (42 U.S.C. 4916).

Dated: December 13, 1979.

Douglas M. Costle,

Administrator, U.S. Environmental Protection Agency.

Part 201 is being revised and amended as follows:

PART 201—NOISE EMISSION STANDARDS FOR TRANSPORTATION EQUIPMENT; INTERSTATE RAIL CARRIERS

Subpart A—General Provisions

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Authority: Noise Control Act of 1972, sec. 17(a), 86 Stat. 1234 (42 U.S.C. 4916(a)).

Subpart A—General Provisions

§ 201.1 Definitions.

As used in this part, all terms not defined herein shall have the meaning given them in the Act:

(a) "Act" means the Noise Control Act of 1972 (Pub. L. 92-574, 86 Stat. 1234).

(b) "Car Coupling Sound" means a sound which is heard and identified by the observer as that of car coupling impact, and that causes a sound level meter indicator (FAST) to register an increase of at least ten decibels above the level observed immediately before hearing the sound.

(c) "Carrier" means a common carrier by railroad, or partly by railroad and partly by water, within the continental United States, subject to the Interstate Commerce Act, as amended, excluding street, suburban, and interurban electric railways unless operated as a part of a general railroad system of transportation.

(d) "Classification of Railroads" means the division of railroad industry operating companies by the Interstate Commerce Commission into three categories. As of 1978, Class I railroads must have annual revenues of $50 million or greater, Class II railroads must have annual revenues of between $10 and $50 million, and Class III railroads must have less than $10 million in annual revenues.

(e) "Commercial Property" means any property that is normally accessible to the public and that is used for any of the purposes described in the following standard land use codes (reference *Standard Land Use Coding Manual*, U.S. DOT/FHWA, reprinted March 1977): 53–59, Retail Trade; 61–64, Finance, Insurance, Real Estate, Personal, Business and Repair Services; 652–659, Legal and other professional services; 671, 672, and 673 Governmental Services; 692 and 699, Welfare, Charitable and Other Miscellaneous Services; 712 and 719, Nature exhibitions and other Cultural Activities; 721, 723, and 729, Entertainment, Public and other Public Assembly; and 74–79, Recreational, Resort, Park and other Cultural Activities.

(f) "dB(A)" is an abbreviation meaning A-weighted sound level in decibels, reference: 20 micropascals.

(g) "Day-night Sound Level" means the 24-hour time of day weighted equivalent sound level, in decibels, for any continuous 24-hour period, obtained after addition of ten decibels to sound levels produced in the hours from 10 p.m. to 7 a.m. (2200–0700). It is abbreviated as L_{dn}.

(h) "Decibel" means the unit measure of sound level calculated by taking ten times the common logarithm of the ratio of the magnitude of the particular sound pressure to the standard reference sound pressure of 20 micropascals and its derivatives. It is abbreviated as dB.

(i) "Energy Average Level" means a quantity calculated by taking ten times the common logarithm of the arithmetic average of the antilogs of one-tenth of each of the levels being averaged. The levels may be of any consistent type,

e.g. maximum sound levels, sound exposure levels, and day-night sound levels.

(j) "Energy Summation of Levels" means a quantity calculated by taking ten times the common logarithm of the sum of the antilogs of one-tenth of each of the levels being summed. The levels may be of any consistent type, e.g., day-night sound level or equivalent sound level.

(k) "Equivalent Sound Level" means the level, in decibels, of the mean-square A-weighted sound pressure during a stated time period, with reference to the square of the standard reference sound pressure of 20 micropascals. It is the level of the sound exposure divided by the time period and is abbreviated as L_{eq}.

(l) "Fast Meter Response" means that the "fast" response of the sound level meter shall be used. The fast dynamic response shall comply with the meter dynamic characteristics in paragraph 5.3 of the American National Standard Specification for Sound Level Meters. ANSI S1.4–1971. These publications are available from the American National Standards Institute, Inc., 1430 Broadway, New York, New York 10013.

(m) "Idle" means that condition where all engines capable of providing motive power to the locomotive are set at the lowest operating throttle position; and where all auxiliary non-motive power engines are not operating.

(n) "Interstate Commerce" means the commerce between any place in a State and any place in another State, or between places in the same State through another State, whether such commerce moves wholly by rail or partly by rail and partly by motor vehicle, express, or water. This definition of "interstate commerce" for purposes of this regulation is similar to the definition of "interstate commerce" in section 203(a) of the Interstate Commerce Act (49 U.S.C. 303(a)).

(o) "Load Cell" means a device external to the locomotive, of high electrical resistance, used in locomotive testing to simulate engine loading while the locomotive is stationary. (Electrical energy produced by the diesel generator is dissipated in the load cell resistors instead of the traction motors).

(p) "Locomotive" means for the purpose of this regulation, a self-propelled vehicle designed for and used on railroad tracks in the transport or rail cars, including self-propelled rail passenger vehicles.

(q) "Locomotive Load Cell Test Stand" means the load cell § 201.1(o) and associated structure, equipment, trackage and locomotive being tested.

(r) "Maximum Sound Level" means the greatest A-weighted sound level in decibels measured at fast meter response § 201.1(l) during the designated time interval or during the event. It is abbreviated as L_{max}.

(s) "Measurement Period" means a continuous period of time during which noise of railroad yard operations is assessed, the beginning and finishing times of which may be selected after completion of the measurements.

(t) "Rail Car" means a non-self-propelled vehicle designed for and used on railroad tracks.

(u) "Railroad" means all the roads in use by any common carrier operating a railroad, whether owned or operated under a contract, agreement, or lease.

(v) "Receiving Property Measurement Location" means a location on receiving property that is on or beyond the railroad facility boundary and that meets the receiving property measurement location criteria of Subpart C.

(w) "Receiving Property" means any residential or commercial property that receives the sound from railroad facility operations, but that is not owned or operated by a railroad; except that occupied residences located on property owned or controlled by the railroad are included in the definition of "receiving property." For purposes of this definition railroad crew sleeping quarters located on property owned or controlled by the railroad are not considered as residences. If, subsequent to the publication date of these regulations, the use of any property that is currently not applicable to this regulation changes, and it is newly classified as either residential or commercial, it is not receiving property until four years have elapsed from the date of the actual change in use.

(x) "Residential Property" means any property that is used for any of the purposes described in the following standard land use codes (ref. *Standard Land Use Coding Manual*, U.S. DOT/FHWA Washington, D.C., reprinted March,1977): 1, Residential: 651, Medical and other Health Services; 68, Educational Services; 691, Religious Activities; and 711, Cultural Activities.

(y) "Retarder (Active)" means a device or system for decelerating rolling rail cars and controlling the degree of deceleration on a car by car basis.

(z) "Retarder Sound" means a sound which is heard and identified by the observer as that of a retarder, and that causes a sound level meter indicator at fast meter response § 201.1(l) to register an increase of at least ten decibels above the level observed immediately before hearing the sound.

(aa) "Sound Level" means the level, in decibels, measured by instrumentation which satisfies the requirements of American National Standard Specification for Sound Level Meters S1.4–1971 Type 1 (or S1A) or Type 2 if adjusted as shown in Table 1. This publication is available from the American National Standards Institute, Inc., 1430 Broadway, New York, New York 10018. For the purpose of these procedures the sound level is to be measured using the A-weighting of spectrum and the FAST dynamic averaging characteristics, unless designated otherwise. It is abbreviated as L_A.

(bb) "Sound Exposure Level" means the level in decibels calculated as ten times the common logarithm of time integral of squared A-weighted sound pressure over a given time period or event divided by the square of the standard reference sound pressure of 20 micropascals and a reference duration of one second.

(cc) "Sound Pressure Level" (in stated frequency band) means the level, in decibels, calculated as 20 times the common logarithm of the ratio of a sound pressure to the reference sound pressure of 20 micropascals.

(dd) "Special Purpose Equipment" means maintenance-of-way equipment which may be located on or operated from rail cars including: Ballast cribbing machines, ballast regulators, conditioners and scarifiers, bolt machines, brush cutters, compactors, concrete mixers, cranes and derricks, earth boring machines, electric welding machines, grinders, grouters, pile drivers, rail heaters, rail layers, sandblasters, snow plows, spike drivers, sprayers and other types of such maintenance-of-way equipment.

(ee) "Special Track Work" means track other than normal tie and ballast bolted or welded rail or containing devices such as retarders or switching mechanisms.

(ff) "Statistical Sound Level" means the level in decibels that is exceeded in a stated percentage (x) of the duration of the measurement period. It is abbreviated as L_x.

(gg) "Switcher Locomotive" means any locomotive designated as a switcher by the builder or reported to the ICC as a switcher by the operator-owning-railroad and including, but not limited to, all locomotives of the builder/model designations listed in Appendix A to this subpart.

(hh) "Warning Device" means a sound emitting device used to alert and warn people of the presence of railroad equipment.

Appendix A.—Switcher Locomotives

The following locomotives are considered to be "switcher locomotives" under the general definition of this regulation.

Type	Engine
General Electric Co.	
44 ton	8-D17000(2).
70 ton	6-CBFWL-6T.
95 ton	6-CBFWL-6T.
Electromotive Division (GMC)	
SC	8-201A.
NC	12-201A.
NC1	12-201A.
NC2	12-201A.
NW	12-201A.
NW1	12-201A.
NW1A	12-201A.
NW2	12-567.
NW2	12-567A.
NW3	12-567.
NW4	12-201A.
NW5	12-567B.
SW	8-201A/6-567.
SW1	6-567A/AC.
SW2	6-567.
SW3	6-567.
SW600	6-567C.
SW7	12-567A.
SW8	8-567B/BC.
SW900	8-567B.
SW9	12-567B/BC/C.
SW1200	12-567C.
SW1000	8-645E.
SW1001	8-645E.
SW1500	12-645E.
MP15	12-645E.
MP15AC	12-645E.
GMD1	12-567C.
RS1325	12-567C.
Transfer Switcher including "Cow and Calf"	
T	12-201A(2)
TR	12-567(2)
TR1	16-567(2)
TR2	12-567A(2)
TR3	12-567(2)
TR4	12-567A(2)
TR5	12-567B(2)
TR6	8-567B(2)
Baldwin	
VO-660	8-VO.
DS-446	6-606NA.
DS4475	6-750.
S-8	6-606.
VO-1000	8-VO.
DS-4410	8-608NA.
DS-4410	6-608SC.
S-12	6-606A.
DRS-4410 [1]	6-606SC.
DRS-12 [1]	6-606A.
Fairbanks Morse	
H-10-44	6-OP.
H-12-44	6-OP.
H-12-44TS	6-OP.
H-12-48 [1]	6-OP.
Lima	
750 hp	6-Hamilton.
800 hp	6-Hamilton.
1000 hp	8-Hamilton.
1200 hp	8-Hamilton.
LRS [1]	6-Hamilton.
TL [1]	8-Hamilton (2).
ALCO and MLW	
S1	6-539NA.
S2	6-539T.
S3	6-539NA.
S4	6-539T.
S5	6-251.
S6	6-251A,B.
S7	6-539.
S10	6-539.
S11	6-539.
S12	6-539T.
S13	6-251C.
RSD-1	6-539.
RSC-13	6-539.
RSC-24	12-244
RS1	6-539T.
RS2 [1]	12-244.
RS3 [1]	12-244.
RS10 [1]	12-244.
RSC-2 [1]	12-244.
RS3 [1]	12-244.
RSD-4 [1]	12-244.
RSD-5 [1]	12-244.
T6	6-251B.
C-415 [1]	8-251F.
M-420TR	12-251.

[1] These models may be found assigned to road service as well as switcher service, but are considered switcher locomotives for the purpose of this regulation.

Subpart B—Interstate Rail Carrier Operation Standards

§ 201.10 Applicability.

The provisions of this subpart apply to all rail cars and all locomotives, except steam locomotives, operated or controlled by carriers as defined in Subpart A of this part, except that §§ 201.11 (a), (b), and (c) do not apply to gas turbine-powered locomotives and to any locomotive type which cannot be connected by any standard method to a load cell. They apply to the total sound level emitted by rail cars and locomotives operated under the conditions specified, including the sound produced by refrigeration and air conditioning units which are an integral element of such equipment. The provisions of this subpart apply to all active retarders, all car coupling operations, all switcher locomotives, and all load cell test stands. These provisions do not apply to the sound emitted by a warning device, such as a horn, whistle or bell when operated for the purpose of safety. They do not apply to special purpose equipment which may be located on or operated from railcars; they do not apply to street, suburban or interurban electric railways unless operated as a part of a general railroad system of transportation. When land use changes after the publication date of this regulation from some other use to residential or commercial land use around a specific railyard facility, this regulation will become effective four (4) years from the date of that land use change.

§ 201.11 Standard for locomotive operation under stationary condition.

(a) Commencing December 31, 1976, no carrier subject to this regulation shall operate any locomotive to which this regulation is applicable, and of which manufacture is completed on or before December 31, 1979, which produces A-weighted sound levels in excess of 93 dB at any throttle setting except idle, when operated singly or when connected to a load cell, or in excess of 73 dB at idle when operated singly, and when measured in accordance with the criteria specified in Subpart C of this part with slow meter response at a point 30 meters (100 feet) from the geometric center of the locomotive along a line that is both perpendicular to the centerline of the track and originates at the locomotive geometric center.

(b) No carrier subject to this regulation shall operate any locomotive to which this regulation is applicable, and of which manufacture is completed after December 31, 1979, which produces A-weighted sound levels in excess of 87 dB at any throttle setting except idle, when operated singly or when connected to a load cell, or in excess of 70 dB at idle when operated singly, and when measured in accordance with the criteria specified in Subpart C of this part with slow meter response at a point 30 meters (100 feet) from the geometric center of the locomotive along a line that is both perpendicular to the centerline of the track and originates at the locomotive geometric center.

(c) Commencing January 15, 1984, no carrier subject to this regulation may operate any switcher locomotive to which this regulation is applicable, and of which manufacture is completed on or before December 31, 1979, which produces A-weighted sound levels in excess of 87 dB at any throttle setting except idle, when operated singly or when connected to a load cell, or in excess of 70 dB at idle, and when measured in accordance with the criteria specified in Subpart C of this part with slow meter response at a point 30 meters (100 feet) from the geometric center of the locomotive along a line that is both perpendicular to the centerline of the track and originates at the locomotive geometric center. All switcher locomotives that operate in a particular railroad facility are deemed to be in compliance with this standard if the A-weighted sound level from stationary switcher locomotives, singly or in combination with other stationary locomotives, does not exceed 65 dB when measured with slow meter response at any receiving property measurement location near that particular railyard facility and when measured in accordance with Subpart C of this regulation.

§ 201.12 Standard for locomotive operation under moving condition.

(a) Commencing December 31, 1976, no carrier subject to this regulation may operate any locomotive or combination of locomotives to which this regulation is applicable, and of which manufacture is completed on or before December 31, 1979, which produces A-weighted sound levels in excess of 96 dB when moving at any time or under any condition of

grade, load, acceleration, or deceleration, when measured in accordance with the criteria specified in Subpart C of this regulation with fast meter response at 30 meters (100 feet) from the centerline of any section of track having less than a two (2) degree curve (or a radius of curvature greater than 873 meters (2865 feet)).

(b) No carrier subject to this regulation may operate any locomotive or combination of locomotives to which this regulation is applicable, and of which manufacture is completed after December 31, 1979, which produce A-weighted sound levels in excess of 90 dB when moving at any time or under any condition of grade, load, acceleration, or deceleration, when measured in accordance with the criteria specified in Subpart C of this part with fast meter response at 30 meters (100 feet) from the centerline of any section of track having less than a two (2) degree curve (or a radius of curvature greater than 873 meters (2,865 feet)).

(c) Commencing January 15, 1984, no carrier subject to this regulation may operate any switcher locomotive or a combination of switcher locomotives to which this regulation is applicable, and of which manufacture is completed on or before December 31, 1979 which produce A-weighted sound levels in excess of 90 dB when moving at any time or under any condition of grade, load, acceleration or deceleration, and when measured in accordance with the criteria in Subpart C of this part with fast meter response at 30 meters (100 feet) from the centerline of any section of track having less than a two (2) degree curve (or a radius of curvature greater than 873 meters (2,865 feet)). All switcher locomotives that operate in a particular railroad facility are deemed to be in compliance with this standard if the A-weighted sound level from stationary switcher locomotives, singly or in combination with other stationary locomotives, does not exceed 65 dB when measured with fast meter response at any receiving property measurement location near that particular railyard facility and when measured in accordance with Subpart C of this regulation.

§ 201.13 Standard for rail operations.

Effective December 31, 1976, no carrier subject to this regulation shall operate any rail car or combination of rail cars which while in motion produce sound levels in excess of (1) 88 dB(A) at rail car speeds up to and including 75 km/hr (45 mph); or (2) 93 dB(A) at rail car speeds greater than 72 km/hr (45 mph); when measured in accordance with the criteria specified in Subpart C of this part with fast meter response at 30 meters (100) feet from the centerline of any section of track which is free of special track work or bridges or trestles and which exhibits less than a two (2) degree curve (or a radius of curvature greater than 873 meters (2,865 feet)).

§ 201.14 Standard for retarders.

Effective January 15, 1984, no carrier subject to this regulation shall operate retarders that exceed an adjusted average maximum A-weighted sound level of 83 dB at a receiving property measurement location, when measured with fast meter response in accordance with Subpart C of this part.

§ 201.15 Standard for car coupling operations.

Effective January 15, 1984, no carrier subject to this regulation shall conduct car coupling operations that exceed an adjusted average maximum A-weighted sound level of 92 dB at the receiving property measurement location, when measured with fast meter response in accordance with Subpart C of this part, except, such coupling will be found in compliance with this standard and the carrier will be considered in compliance, if the railroad demonstrates that the standard is exceeded at the receiving property measurement locations (where the standard was previously exceeded) when cars representative of those found to exceed the standard are coupled at similar locations at coupling speeds of eight miles per hour or less.

§ 201.16 Standard for locomotive load cell test stands.

(a) Effective January 15, 1984, no carrier subject to this regulation shall operate locomotive load cell test stands that exceed an A-weighted sound level of 78 dB when measured with slow meter response in accordance with Subpart C of this part excluding § 201.23 (b) and (c), at a point 30 meters (100 feet) from the geometric center of the locomotive undergoing test, along a line that is both perpendicular to the centerline of the track and originates at the locomotive geometric center, and in the direction most nearly towards the closest receiving property measurement location. All locomotive load cell test stands in a particular railroad facility are in compliance with this standard if the A-weighted sound level from the load cells does not exceed 65 dB at a receiving property measurement location near that particular railyard facility and when measured with fast meter response in accordance with Subpart C of this regulation.

(b) If the conditions of any part of § 201.23(a) cannot be met at a specific load cell test stand site, then the A-weighted sound level from that specific load cell test stand must not exceed 65 dB when measured with fast meter responce at a receiving property measurement location more than 120 meters (400 feet) from the geometric center of the locomotive being tested and in accordance with Subpart C of this regulation.

Subpart C—Measurement Criteria

§ 201.20 Applicability and purpose.

The following criteria are applicable to and contain the necessary parameters and procedures for the measurement of the noise emission levels prescribed in the standards of Subpart B of this part. These criteria are specified in order to further clarify and define such standards. Equivalent measurement procedures may be used for establishing compliance with these regulations. Any equivalent measurement procedure, under any circumstance, shall not result in a more stringent noise control requirement than those specified in this regulation using the measurement procedures in Subpart C.

§ 201.21 Quantities measured.

The quantities to be measured under the test conditions described below, are the A-weighted sound levels for "fast" or "slow" meter response as defined in the American National Standard S1.4–1971.

§ 201.22 Measurement instrumentation.

(a) A sound level meter or alternate sound level measurement system that meets, as a minimum, all the requirements of American National Standard S1.4—1971 [1] for a Type 1 (or S1A) instrument must be used with the "fast" or "slow" meter response chacteristic as specified in Subpart B. To

[1] American National Standards are available from the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.

insure Type 1 response, the manufacturer's instructions regarding mounting or orienting of the microphone, and positioning of the observer must be observed. In the event that a Type 1 (or S1A) instrument is not available for determining non-compliance with this regulation, the measurements may be made with a Type 2 (or S2A), but with the measured levels reduced by the following amount to account for possible measurement instrument errors pertaining to specific measurements and sources:

Table 1.—*Sound Level Corrections When Using a Type 2 (or S2A) Instrument*

Measurement section	Source	Decibels [1]
201.24	Locomotives	0
	Rail cars	0
	Locomotive load cell test stand	0
201.26	Retarder	4
	Car coupling	2
201.27	Locomotive load cell test stand. Stationary locomotive	0

[1] Amount of correction to be subtracted from measured level (dB).

(b) A microphone windscreen and an acoustic calibrator of the coupler type must be used as recommended by: (1) the manufacturer of the sound level meter or (2) the manufacturer of the microphone. The choice of both devices must be based on ensuring that Type 1 or Type 2 performance, as appropriate, is maintained for frequencies below 10,000 Hz.

§ 201.23 Test site, weather conditions and background noise criteria for measurement at a 30 meter (100 feet) distance of the noise from locomotive and rail car operations and locomotive load cell test stands.

(a) The standard test site shall be such that the locomotive or train radiates sound into a free field over the ground plane. This condition may be considered fulfilled if the test site consists of an open space free of large, sound reflecting objects, such as barriers, hills, signboards, parked vehicles, locomotives or rail cars on adjacent tracks, bridges or buildings within the boundaries described by Figure 1, as well as conforms to the other requirements of this § 201.23.

(b) Within the complete test site, the top of at least one rail upon which the locomotive or train is located shall be visible (line of sight) from a position 1.2 meters (4 feet) above the ground at the microphone location, except as provided in paragraph (c) of this section.

(c) Ground cover such as vegetation, fenceposts, small trees, telephone poles, etc., shall be limited within the area in the test site between the vehicle under test and the measuring microphone such that 60 percent of the top of at least one rail along the entire test section of track be visible from a position 1.2 meters (4 feet) above the ground at the microphone location; except that no single obstruction shall account for more than 5 percent of the total allowable obstruction.

(d) The ground elevation at the microphone location shall be within plus 1.5 meters (5 feet) or minus 3.0 meters (10 feet) of the elevation of the top of the rail at the location in-line with the microphone.

(e) Within the test site, the track shall exhibit less than a 2 degree curve or a radius of curvature greater than 873 meters (2,865 feet). This paragraph shall not apply during a stationary test. The track shall be tie and ballast, free of special track work and bridges or trestles.

(f) Measurements shall not be made during precipitation.

(g) The maximum A-weighted fast response sound level observed at the test site immediately before and after the test shall be at least 10 dB(A) below the level measured during the test. For the locomotive and rail car pass-by tests this requirement applies before and after the train containing the rolling stock to be tested has passed. This background sound level measurement shall include the contribution from the operation of the load cell, if any, including load cell contribution during test.

(h) Noise measurements may only be made if the measured wind velocity is 19.3 km/hr (12 mph) or less. Gust wind measurements of up to 33.2 km/hr (20 mph) are allowed.

§ 201.24 Procedures for measurement at a 30 meter (100 feet) distance of the noise from locomotive and rail car operations and locomotive load cell test stands.

(a) *Microphone positions.* (1) The microphone shall be located within the test site according to the specifications given in the test procedures of paragraphs (b), (c) and (d) of this section, and shall be positioned 1.2 meters (4 feet) above the ground. It shall be oriented with respect to the source in accordance with the manufacturer's recommendations.

(2) The observer shall not stand between the microphone and the source whose sound level is being measured.

(b) *Stationary locomotive and locomotive load cell test stand tests.* (1) For stationary locomotive and locomotive load cell test stand tests, the microphone shall be positioned on a line perpendicular to the track at a point 30 meters (100 feet) from the track centerline at the longitudinal midpoint of the locomotive.

(2) The sound level meter shall be observed for thirty seconds after the test throttle setting is established to assure operating stability. The maximum sound level observed during that time shall be utilized for compliance purposes.

(3) Measurement of stationary locomotive and locomotive load cell test stand noise shall be made with all cooling fans operating.

(c) *Rail car pass-by test.* (1) For rail car pass-by tests, the microphone shall be positioned on a line perpendicular to the track 30 meters (100 feet) from the track centerline.

(2) Rail car noise measurements shall be made when the locomotives have passed a distance 152.4 meters (500 feet) or 10 rail cars beyond the point at the intersection of the track and the line which extends perpendicularly from the track to the microphone location, providing any other locomotives are also at least 152.4 meters (500 feet) or 10 rail car lengths away from the measuring point. The maximum sound level observed in this manner which exceeds the noise levels specified in § 201.13 shall be utilized for compliance purposes.

(3) Measurements shall be taken on reasonably well maintained tracks.

(4) Noise levels shall not be recorded if brake squeal is present during the test measurement.

(d) *Locomotive pass-by test.* (1) For locomotive pass-by tests, the microphone shall be positioned on a line perpendicular to the track at a point 30 meters (100 feet) from the track centerline.

(2) The noise level shall be measured as the locomotive approaches and passes by the microphone location. The maximum noise level observed during this period shall be utilized for compliance purposes.

(3) Measurements shall taken on reasonably well maintained tracks.

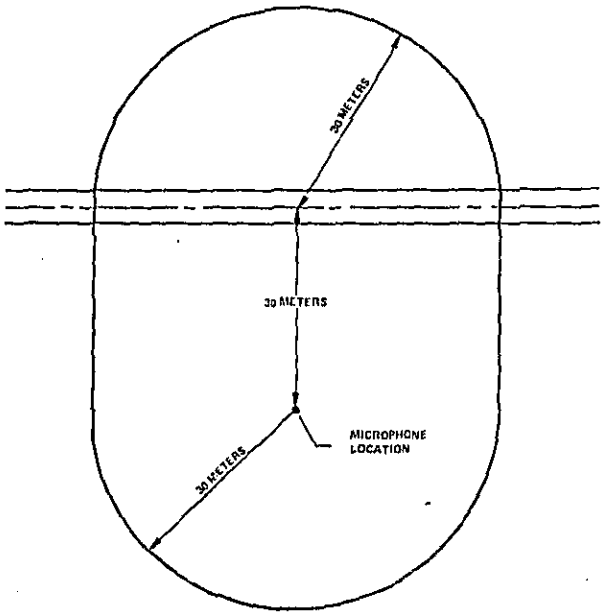

Figure 1. Test Site Clearance Requirement for Stationary Locomotive, Locomotive Pass-by, Rail Car Pass-by, and Locomotive Load Cell Test Stand Tests.

§ 201.25 Measurement location and weather conditions for measurement on receiving property of the noise of retarders, car coupling, locomotive load cell test stands, and stationary locomotives.

(a) Measurements must be conducted only at receiving property measurement locations.

(b) Measurement locations on receiving property must be selected such that no substantially vertical plane surface, other than a residential or commercial unit wall or facility boundary noise barrier, that exceeds 1.2 meters (4 feet) in height is located within 10 meters (33.3 feet) of the microphone and that no exterior wall of a residential or commercial structure is located within 2.0 meters (6.6 feet) of the microphone. If the residential structure is a farm home, measurements must be made 2.0 to 10.0 meters (6.6 to 33.3 feet) from any exterior wall.

(c) No measurement may be made when the average wind velocity during the period of measurement exceeds 19.3 km/hr (12 mph) or when the maximum wind gust velocity exceeds 32.2 km/hr (20 mph).

(d) No measurement may be taken when precipitation, e.g., rain, snow, sleet, or hail, is occurring.

§ 201.26 Procedures for the measurement on receiving property of retarder and car coupling noise.

(a) *Retarders.* (1) *Microphone:* The microphone must be located on the receiving property and positioned at a height between 1.2 and 1.5 meters (4 to 5 feet) above the ground. The microphone must be positioned with respect to the equipment in accordance with the manufacturers' recommendations for Type 1 or Type 2 performance as appropriate. No person may stand between the microphone and the equipment being measured or be otherwise positioned relative to the microphone at variance with the manufacturers' recommendations for Type 1 or Type 2 performance as appropriate.

(2) *Data:* The maximum A-weighted sound levels (FAST) for every retarder sound observed during the measurement period must be read from the indicator and recorded. At least 30 consecutive retarder sounds must be measured. The measurement period must be at least 60 minutes and not more than 240 minutes.

(3) *Adjusted average maximum A-weighted sound level:* The energy average level for the measured retarder sounds must be calculated to determine the value of the average maximum A-weighted sound level ($L_{ave\ max}$). This value is then adjusted by adding the adjustment (C) from Table 2 appropriate to the number of measurements divided by the duration of the measurement period (n/T), to obtain the adjusted average maximum A-weighted sound level ($L_{adj\ ave\ max}$) for retarders.

(b) *Car coupling impact.*

(1) *Microphone:* The microphone must be located on the receiving property and at a distance of at least 30 meters (100 feet) from the centerline of the nearest track on which car coupling occurs and its sound is measured (that is, either the microphone is located 30 meters (100 feet) from the nearest track on which couplings occur, or all sounds resulting from car coupling impacts that occur on tracks with centerlines located less than 30 meters (100 feet) from the microphone are disregarded). The microphone shall be positioned at a height between 1.2 and 1.5 meters (4 and 5 feet) above the ground, and it must be positioned with respect to the equipment in accordance with the manufacturers' recommendations for Type 1 or Type 2 performance as appropriate. No person may stand between the microphone and the equipment being measured or be otherwise positioned relative to the microphone at variance with the manufacturers' recommendations for Type 1 or Type 2 performance as appropriate.

(2) *Data:* The maximum A-weighted sound levels (FAST) for every car coupling impact sound observed during the measurement period must be read from the indicator and recorded. At least 30 consecutive car coupling impact sounds must be measured. The measurement period must be at least 60 minutes and not more than 240 minutes, and must be reported.

Table 2.—*Adjustment to* $L_{ave\ max}$ To Obtain $L_{adj\ ave\ max}$ for Retarders and Car Coupling Impacts [1]

$\frac{n}{T}$ = $\frac{\text{number of measurements}}{\text{measurement duration (min)}}$	C = Adjustment in dB
0.111 to 0.141	−8
0.142 to 0.178	−7
0.179 to 0.224	−6
0.225 to 0.282	−5
0.283 to 0.355	−4
0.356 to 0.447	−3
0.448 to 0.562	−2
0.563 to 0.708	−1
0.709 to 0.891	0
0.892 to 1.122	+1
1.123 to 1.413	+2
1.414 to 1.778	+3
1.779 to 2.239	+4
2.240 to 2.818	+5
2.819 to 3.548	+6
3.549 to 4.467	+7

[1] $L_{adj\ ave\ max} = L_{ave\ max} + C$ in dB.

Values in Table 2 were calculated from (C = 10 log n/T) with intervals selected to round off values to the nearest whole decibel. The table may be extended or interpolated to finer interval gradations by using the defining equation.

(3) *Adjusted average maximum A-weighted sound level:* The energy average level for the measured car coupling sounds is calculated to determine the average maximum sound level ($L_{ave\ max}$). It is then adjusted by adding the adjustment (C) from Table 2 appropriate to the number of measurements divided by the duration of the measurement period (n/T), to obtain the adjusted average maximum A-weighted sound level ($L_{adj\ ave\ max}$) for car coupling impacts.

§ 201.27 Procedures for: (1) determining applicability of the locomotive load cell test stand standard and switcher locomotive standard by noise measurement on a receiving property; (2) measurement of locomotive load cell test stands more than 120 meters (400 feet) on a receiving property.

(a) *Microphone:* The microphone must be located at a receiving property measurement location and must be positioned at a height between 1.2 and 1.5 meters (4 and 5 feet) above the ground. Its position with respect to the equipment must be in accordance with the manufacturers' recommendations for Type 1 or Type 2 performance as appropriate. No person may stand between the microphone and the equipment being measured or be otherwise positioned relative to the microphone at variance to the manufacturers' recommendations for Type 1 or Type 2 performance as appropriate.

(b) *Data:* (1) When there is evidence that at least one of these two types of nearly steady state sound sources is affecting the noise environment, the following measurements must be made. The purpose of these measurements is to determine the A-weighted L_{90} statistical sound level, which is to be used as described in subparagraph (c) below to determine the applicability of the source standards. Before this determination can be made, the measured L_{90} is to be "validated" by comparing the measured L_{10} and L_{90} statistical sound levels. If the difference between these levels is sufficiently small (4 dB or less), the

source(s) being measured is considered to be a nearly steady state source.

(2) Data shall be collected by measuring the instantaneous A-weighted sound level (SLOW) at a rate of at least once each 10 seconds for a measurement period of at least 15 minutes and until 100 measurements are obtained. The data may be taken manually by direct reading of the indicator at 10 second intervals (±1 second), or by attaching a statistical analyzer, graphic level recorder, or other equivalent device to the sound level meter for a more continuous recording of the instantaneous sound level.

(3) The data shall be analyzed to determine the levels exceeded 99%, 90%, and 10% of the time, i.e., L_{99}, L_{90}, and L_{10}, respectively. The value of L_{90} is considered a valid measure of the A-weighted sound level for the standards in § 201.16 only if the difference between L_{10} and L_{90} has a value of 4 dB or less. If a measured value of L_{90} is not valid for this purpose, measurements may be taken over a longer period to attempt to improve the certainty of the measurement and to validate L_{90}. If L_{90} is valid and is less than the level in applicable standards for these source types, the sources are in compliance. If the measured value of L_{90} is valid and exceeds the initial 65 dB requirement for any of the source types that appear to be affecting the noise environments, the evaluation according to the following subparagraph (c) is required.

(c) *Determination of Applicability of the Standard When L_{90} is Validated and is in Excess of One or More of the Source Standards:* The following procedures must be used to determine the compliance of the various source types when L_{90} is validated and in excess of one or more of the applicable standards.

(1) The principal direction of the nearly steady-state sound at the measurement location must be determined, if possible, by listening to the sound and localizing its apparent source(s). If the observer is clearly convinced by this localization process that the sound emanates only from one or both of these two sources, then:

(i) If only stationary locomotive(s), including at least one switcher locomotive, are present, the value of L_{90} is the value of the A-weighted sound level to be used in determining if the 65 dB requirement is exceeded and compliance with the standards in § 201.11(c) and § 201.12(c) is necessary.

(ii) If only a locomotive load cell test stand and the locomotive being tested are present and operating, the value of L_{90} is the value of the A-weighted sound level to be used in determining applicability of the standard in § 201.16.

(iii) If a locomotive load cell test stand(s) and the locomotive being tested are present and operating with stationary locomotive(s), including at least one switcher locomotive, the value L_{90} minus 3 dB is the value of the A-weighted sound level to be used in determining applicability of the standards in § 201.11(c), § 201.12(c) and § 201.16.

(iv) If a locomotive load cell test stand(s) and the locomotive being tested are present and operating, and a stationary locomotive(s) is present, and if the nearly steady-state sound level is observed to change by 10 dB, coincident with evidence of a change in operation of the locomotive load cell test stand but without apparent change in the location of stationary locomotives, another measurement of L_{90} must be made in accordance with paragraph (b) of this section. If this additional measure of L_{90} is validated and differs from the initial measure of L_{90} by an absolute value of 10 dB or more, then the higher value of L_{90} is the value of the A-weighted sound level to be used in determining applicability of the standard in § 201.16.

(2) In order to accomplish the comparison demonstration of (3) below, when one or more source types is found not to be in compliance with the applicable standard(s), documentation of noise source information shall be necessary. This will include, but not be limited to, the approximate location of all sources of each source type present and the microphone position on a diagram of the particular railroad facility, and the distances between the microphone location and each of the sources must be estimated and reported. Additionally, if other rail or non-rail noise sources are detected, they must be identified and similarly reported.

(3) If it can be demonstrated that the validated L_{90} is less than 5 dB greater than any L_{90} measured at the same receiving property location when the source types that were operating during the initial measurement(s) are either turned off or moved, such that they can no longer be detected, the initial value(s) of L_{90} must not be used for determining applicability to the standards. This demonstration must be made at a time of day comparable to that of the initial measurements and when all other conditions are acoustically similar to those reported in paragraph (c)(2) of this section.

§ 201.28 Testing by railroad to determine probable compliance with the standard.

(a) To determine whether it is probably complying with the regulation,

and therefore whether it should institute noise abatement, a railroad may take measurements on its own property at locations that:

(1) Are between the source and receiving property

(2) Derive no greater benefit from shielding and other noise reduction features that does the receiving property; and

(3) Otherwise meet the requirements of § 201.25.

(b) Measurements made for this purpose should be in accordance with the appropriate procedures in § 201.26 or § 201.27. If the resulting level is less than the level stated in the standard, then there is probably compliance with the standard.

(c) This procedure is set forth to assist the railroad in devising its compliance plan, not as a substantive requirement of the regulation.

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