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# SOME PROBLEMS OF THE RAILWAY NOISE REGULATIONS IMPLEMENTATION

**Summary**. The noise pollutes the environment. Therefore it is important to keep regulations and norms concerning this area. The paper deals with some uncertainties and ambiguities of the parameters in the railway noise regulations.

# NIEKTÓRE PROBLEMY ZASTOSOWANIA NORM HAŁASU W RUCHU KOLEJOWYM

**Streszczenie.** Hałas wpływa negatywnie na środowisko naturalne. Dlatego przestrzeganie norm i zarządzeń w tym zakresie jest sprawą ważną. Artykuł omawia pewne niejasności i dwuznaczności zawarte w normach przy ocenie parametrów związanych z ruchem kolejowym.

## 1. INTRODUCTION

Noise pollution is an increasing problem within the European countries. Sources of the noise are traffic, industrial manufacture, civil noise and other activities, but the transport noise has the main contribution to the noise environmental stress.

Among the first aims of environmental protection is observing the noise impact on human and on surroundings. Obtained data is basic factor for strategy of human and surrounding protection against the harmful and undesirable noise. Environmental noise monitoring requires large amount of measurements, calculations, analyzes, assessments and so on by help of measuring and analytic systems and models.

Since 1990 legislation has existed in advanced European countries to limit environmental noise from new and realigned railways. However, increasing awareness of the environmental noise problem across the EU has led to the adoption of further documents in the railway noise area which will have significant impact in the interoperability, which will help to unify noise limit values and noise map design according the agreed calculation method. In the EU Green Book on Noise Policy, European Committee deals with environmental noise as one of the main environmental problem in Europe. According the request of EU and Wealth Health Organization (WHO) it is necessity to do some preventive steps in this area in near future.

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## 2. REGULATIONS AND EUROPEAN COMMITTEE DECISION

In January 2001 European standard DRAFT prEN ISO 3095 Railway applications – Acoustics – Measurement of noise emitted by railbound vehicles was accepted [1]. In June 2002 Directive 2002/49/EC of the European Parliament and of the Council of EU of 25 June 2002 relating to the assessment and management of environmental noise was accepted [2]. Project "The assessment and management of environmental noise – Slovak Republic" Conclusive Report in category VI: Environment for Slovak Republic conditions was prepared [3]. EU Commission has edited Resolution 2006/66/ES of 23. December 2005 relating to technical specification interoperability concerning subsystem "rolling stock – noise" of transeuropean conventional railway, which replace basic parameters of Resolution 2004/446/ES of transeuropean conventional railway system [4].

## 3. NOISE LIMIT VALUES

Governmental regulation No. 44/2005 Z.z., of 2. February 2005, that changes and amends the Governmental regulation No. 40/2002 Z.z. about protection of health from noise and vibration [5], in which adjust exterior residential railway noise limits tab.3.1.

Table 3.1

Values of the limited noise levels

| Noise sources | Noise indicator values (dB) | | | |
|---|---|---|---|---|
| | Exterior residential | | Exterior residential with special protection from the noise | |
| | $L_{dvn}$ | $L_{noc}$ | $L_{dvn}$ | $L_{noc}$ |
| industry | 55 | 40 | 50 | 35 |
| airports | 60 | 50 | 60 | 50 |
| roads | 60 | 50 | 55 | 45 |
| Railway tracks | 60 | 50 | 55 | 45 |

Noise limit values are concerning the needs of the regional planning in the height of 1,5m or 4,0m above surface of the area but the distance from the noise source is not given.

In Resolution 2006/66/ES, besides others, limit values $L_{pAeq,Tp}$ for passing goods wagons noise are given, values ranging from 82 to 87 dB(A) depending on number of axles per 1m for new, reconstructed or modernized wagons. The equivalent sound pressure level for the passing train has to be measured at velocity of 80km/h and at maximum speed but lower than 190km/h and in the 7,5m distance from the railway and 1,2m over rail head. The same speed and distance values are applicable also for noise limit values of passing locomotives, rail motor units and passenger wagons. In table 3.2 limit values measured also according standard prEN ISO 3095: 2001 are presented.

Table 3.2

Values of the limited noise levels of railway vehicles [4]

| van | $L_{pAeq,Tp}$ at the distance 7,5m (dB) |
|---|---|
| Electric locomotives | 85 |
| Diesel locomotives | 85 |
| Electric motor units | 81 |
| Electric motor units | 82 |
| Passenger wagons | 80 |

Neither amendment to governmental regulation No. 44/2005 Z.z. [6] nor governmental regulation No. 40/2002 Z.z. [7] defines measuring distance from the noise source, only defines 2m from the protected building facade. Commission regulation No. 2006/66/ES defines 7,5m distance from the axle of the nearest track for individual passing vehicles and standard prEN ISO 3095: 2001 defines measuring distance 25m from the track axle or 7,5m if the length of the train is shorter than 50m or there is not enough place for measuring in the 25m distance. The height of measurement is 1,2m over rail head for distance 7,5m [1] and in [6] height of 1,5m over surface.

## 4. PREDICTION CALCULATION METHODS

Data about strategic noise maps and plans for noise protection are given in the governmental regulation No. 43/2005 [7] but calculation method for railway traffic is not defined.

In the Directive 2002/49/EC [2] the Netherlands calculation method, published in "Reken- en Meetvoorschrift Railverkeerslawaai '96, is given for railway traffic noise calculation.

German calculation method „Schall 03 Richtlinie zur Berechnung der Schallimmissionen" [8] is recommended in the Project "The assessment and management of environmental noise – Slovak Republic" [3].

So far there is no obligatory accepted standard for prediction calculation method from railway traffic in the Slovak Republic.

## 5. MEASUREMENT TIME INTERVAL

European standard prEN ISO 3095 [1] defines measurement time interval as the pass time of the measuring vehicle or train. But the literature [7] gives examples of train passing, while beginning and end of measurement is longer by time of increased noise level from background noise.

Experimental measurements for comparison of noise level differences between noise level measured only during the time of passing train and noise level measured during the time longer of increases sound pressure level were realized at the village Krásno nad Kysucou (km 269,870) – Fig. 5.1. Measuring microphone was situated 7,5m from the axle of the track No. 1 and 1,2m above the surface Fig. 5.2.

Fig. 5.1. View of the measurement place
Rys. 5.1. Zdjęcie miejsca pomiarowego

Fig. 5.2. Location of the microphone
Rys. 5.2. Lokalizacja mikrofonu

Figure 5.3 presents one hour measurement of noise level of passing trains: Os 3914, Ex 121 Košičan, Pn 45725, Mn 46801 a Os 3915. The value of one hour equivalent sound pressure level is 74,7dB.

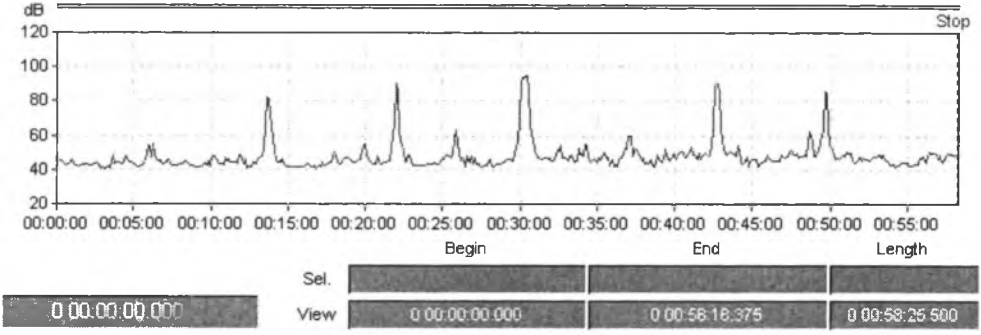
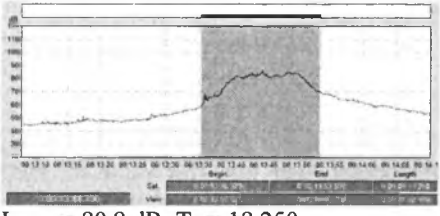
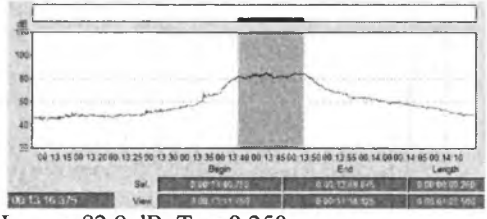



Fig. 5.3. One hour measurement of noise level of passing trains
Rys. 5.3. Pomiary godzinne poziomu hałasu przejeżdżających pociągów

The comparison of single train measurement with different measurement time is presented in Fig. 5.4 to 5.8.

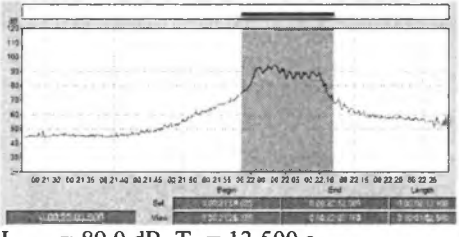


$L_{Aeq1}$ = 80.8 dB, $T_1$ = 18,250 s
$L_{Amax}$ = 86.0 dB

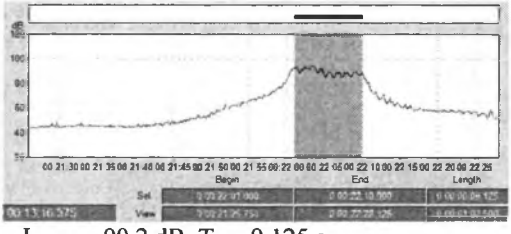


$L_{Aeq2}$ = 82.8 dB, $T_2$ = 9,250 s
$L_{Amax}$ = 86.0 dB

Fig. 5.4. Noise level measurement with different measurement time of the passenger train No. 3914
Rys. 5.4. Poziom hałasu przy różnych interwałach dla pociągu pasażerskiego Nr 3914

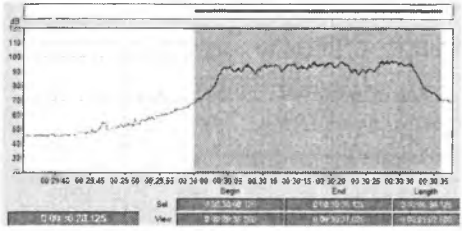


$L_{Aeq1}$ = 89.0 dB, $T_1$ = 13,500 s
$L_{Amax}$ = 94.4 dB

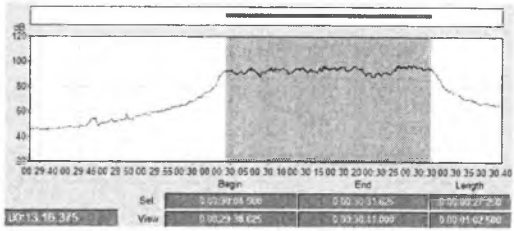


$L_{Aeq2}$ = 90,2 dB, $T_2$ = 9,125 s
$L_{Amax}$ = 94.4 dB

Fig. 5.5. Noise level measurement with different measurement time of the express train No. 121 – Košičan
Rys. 5.5. Pomiar poziomu hałasu przy różnych interwałach dla pociągu ekspresowego Nr 121 – Košičan

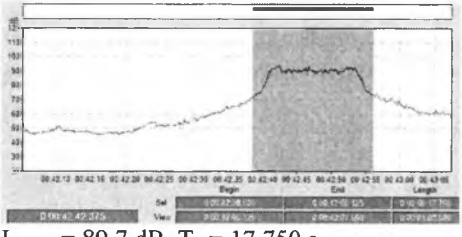


$L_{Aeq1}$ = 92.8 dB, $T_1$ = 36,125 s
$L_{Amax}$ = 97.6 dB

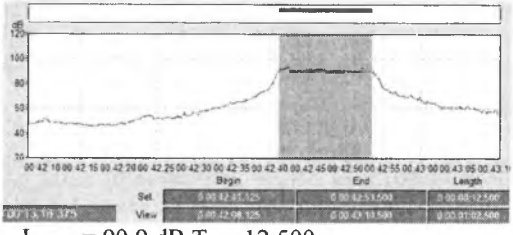


$L_{Aeq2}$ = 93.9 dB, $T_2$ = 27,250 s
$L_{Amax}$ = 97.6 dB

Fig. 5.6. Noise level measurement with different measurement time of the freight train No. 45725
Rys. 5.6. Pomiar poziomu hałasu przy różnych interwałach dla pociągu towarowego Nr 45725

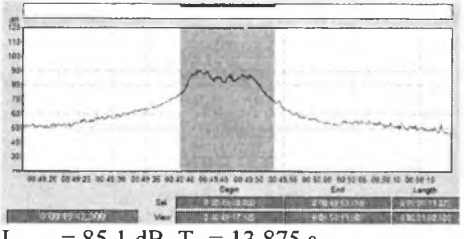


$L_{Aeq1}$ = 89.7 dB, $T_1$ = 17,750 s
$L_{Amax}$ = 93.9 dB

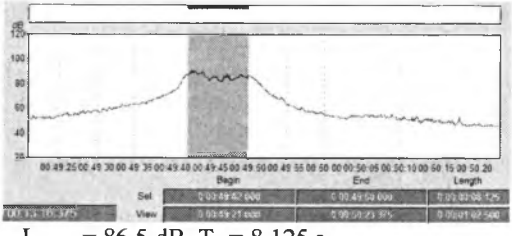


$L_{Aeq2}$ = 90,9 dB $T_2$ = 12,500 s
$L_{Amax}$ = 93.9 dB

Fig. 5.7. Noise level measurement with different measurement time of the freight train No. 46801
Rys. 5.7. Pomiar poziomu hałasu przy różnych interwałach dla pociągu towarowego Nr 46801



$L_{Aeq1}$ = 85.1 dB, $T_1$ = 13,875 s
$L_{Amax}$ = 90.7 dB



$L_{Aeq2}$ = 86.5 dB, $T_2$ = 8,125 s
$L_{Amax}$ = 90.7 dB

Fig. 5.8. Noise level measurement with different measurement time of the passenger train No. 3915
Rys. 5.8. Pomiar poziomu hałasu przy różnych interwałach dla pociągu pasażerskiego Nr 3915

Considering the fact that equivalent noise level $L_{Aeq}$ is actually mean intensity of noise within the examined time interval, the values of $L_{Aeq1}$ and $L_{Aeq2}$ are different. Value of $L_{Aeq2}$ is higher from 1,1 to 2,0 dB because of higher noise level emitted during shorter time interval. The difference depends on speed and length of passing trains. The values of equivalent sound pressure level for different measuring time period and their comparison are presented in the tab. 5.1.

Table 5.1
The comparison of equivalent sound pressure level for different measuring time period

| No. of measuring. | train | rail | $L_{Amax}$ (dB) | $L_{Aeq1}$ (dB) | $L_{Aeq2}$ (dB) | $\Delta L_{Aeq} = L_{Aeq2} - L_{Aeq1}$ (dB) | speed (km/h) | train lenght (m) | train weight (t) |
|---|---|---|---|---|---|---|---|---|---|
| 12. | Os 3914 | 2 | 86,0 | 80,8 | 82,8 | 2,0 | 40 | 120 | 375 |
| 13. | Ex 121 Košičan | 1 | 94,4 | 89,0 | 90,2 | 1,2 | 67 | 180 | 478 |
| 14. | Pn 45725 | 1 | 97,6 | 92,8 | 93,9 | 1,1 | 71 | 559 | 1465 |
| 15. | Mn 46801 | 1 | 93,9 | 89,7 | 90,9 | 1,2 | 69 | 252 | 1294 |
| 16. | Os 3915 | 1 | 90,7 | 85,1 | 86,5 | 1,4 | 47 | 120 | 375 |

## 6. CONCLUSIONS

As it was mentioned in the paper, there is no defined distance and height of the microphone from the sources of the noise in the Slovak standards. There is no obligatory accepted standard for prediction calculation method from railway traffic in the Slovak Republic.

From these reason, to make possible relevant assessment and appreciate of equivalent railway noise level, it is eligible not only for Slovak Republic but also for EU countries to accept integrated system evaluation of noise emission. Only in this case it will be possible not only comparison railway noise levels but also their comparison with given limit values.

## References

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