

**ECORails –
Energy efficiency and environmental criteria in the awarding of regional rail transport
vehicles and services**

ECORails

Deliverable 23: Training Module for the Guidelines Annex 13 Part 3/Issue 12 – Noise

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Noise

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Content

- 1) **Political and environmental relevance**
- 2) **Existing regulations and systems of limit values**
- 3) **Technologies and/or operational measures to be considered**
- 4) **How to choose targets?**
- 5) **How to integrate in tenders or contracts?**
- 6) **How to monitor the contract?**

Political and environmental relevance

- Noise emission is not only molesting but causes health problems if people are affected by high noise levels.
- Noise is the “Achilles’ heel” of rail transport in terms of environmental effects.
- This is also true for passenger transport although to less extent than for freight transport.

Environmental Noise Directive (END, 2002/49/EC)

- Strategic noise maps in agglomerations and along trunk lines of transport, including railways.
- Noise Action Plans required by EU if certain immission limits are not complied with
- As far as railways are concerned, Noise Action Plans may result in:
 - Measures at the infrastructure (e.g. noise protection walls, enhanced superstructure)
 - Noise-related track access fees
 - Environmental criteria in public service contracts
 - Noise ceilings
 - Operational restrictions for certain vehicles, at certain times, on certain lines

Strategic Noise Map (NL)

ProRail

Keuze geluidcontouren

Geen geluidcontouren

Lden

- 55 - 59 dB
- 60 - 64 dB
- 65 - 69 dB
- 70 - 74 dB
- >= 75 dB

'Lden' staat voor de gemiddelde geluidbelasting gedurende een etmaal. Indicator voor hinder.

Lnight

Kaarten per gemeente

kies een provincie

Zoeken op postcode
(voer alleen de 4 cijfers in)

>>

Kaart
Satelliet
Beide

0 10 20 30 40 50 60 70 80 90 100

1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

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5

Main sources and causes of railway noise

- Rolling noise – dominant from 60 km/h to 250 km/h (approx.)
- Engine noise – dominant from 0 km/h to 60 km/h
- Noise from aggregates, doors etc. in stations or when stabled
- Braking
- Curve squeal
- Braking system has great influence on rolling noise (wheel roughness when brake shoes are used)
 - cast iron blocks (traditional)
 - composite blocks (reduction c. 8-10 dB (A) compared to cast iron blocks)
 - disk brakes (reduction of ? dB (A) compared to composite blocks)
- Further problems: tonality, fans (for traction engine), ...
- Improvements on vehicles effective ubiquitous, but ...
- Quality of infrastructure (e.g. rail surface, bridges etc.) plays an important role!

TSI Noise – a new approach

- For a long time, national noise regulations focused on immission limits in housing areas and often only applied in connection with major investment projects for (railway) lines.
- Only a few countries invented national regulations for the emission (homologation of vehicles), e.g. Austria, Italy, Switzerland.
- The TSI Noise are a new European approach to regulate the noise emissions of railway vehicles on the interoperable network (Decision of the Commission of 4 April 2011, 2011/229/EU, OJ L 99/1).
- The rules apply to new vehicles on the interoperable network.
- In case of modernisation of existing vehicles it has to be proven that the noise emissions have not been increased.

TSI Noise: Commission Decision of 4 April 2011 (2011/229/EU; OJ, L 99/1)

- The rules apply to new vehicles on the interoperable network.
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Type of value [dB (A)]	DMU	EMU	Diesel loco	Electric loco
Pass-by noise (80 km/h)	82	81	85	85
Start-up noise	83/85 $\leq 500\text{kW}$	82	86/89 $\leq 2.000\text{kW}$	82/85 $\leq 4.500\text{kW}$
Standstill	73	68	75	75

A second stage is envisaged for c2016/2018, being 2 dB (MU's) or 5 dB (all other vehicles) stricter than the actual regulation.

Special rules apply to measurement and quality of track when measuring.

Instructive example - politics and methodology

- TRAXX DE (class 246), procured by PTA of Lower Saxony, Germany (LNVG, pool of rolling stock)
- Noise criteria in the tender based on Austrian regulations because no German nor European regulations available at that time
- Proved to be better than required.
- Provides insight into the results of differing methodologies.



Austrian regulations vs. TSI Noise

Noise emission values of class 246, TRAXX DE (LNVG)

Requirements	Indicator	Limit TSI [dB (A)]	Limit SchLV [dB (A)]	Measured value [dB (A)]
External noise standstill TSI	$L_{pAeq, 60s}$	75	-	67
External noise standstill SchLV	$L_{pAeq, 60s}$	-	80	74
External noise passing at 160 km/h	$L_{pAeq, Fmax}$	-	95	91
External noise passing at 80 km/h	$L_{pAeq, Fmax}$	-	86	80
External noise start-up TSI	$L_{pAeq, Fmax}$	89	-	81
External noise passing, TSI (80 km/h)	$L_{pAeq, Tp}$	85	-	82

Source: Bitterberg/Schätzer/Zapf: Die Baureihe 246 – neue Traxx-Diesellokomotiven für den schnellen Regionalverkehr in Niedersachsen; Eisenbahn-Revue International, 8-9/2008, pp. 403-10

Comments on TSI Noise and its use for PTAs

- Tractive units (locos, MUs), fulfilling TSI Noise requirements are ca. 5-10 dB(A) more silent than previous ones.
- Announcement of 2nd step does not seem to be very ambitious, but it is necessary to differentiate between vehicle categories and concepts (e.g. normal FLIRT vs double-deck FLIRT)
- PTAs should use TSI methodology even if differing values are considered.
- No standardised methodology exists for the assessment of curve squeal and tonality.
- Retrofit of older rolling stock with K-blocks or disk brakes instead of cast iron blocks could be an option.

Some additional comments

Costs of noise abatement („rules of thumb“):

- If applying systematical acoustic management, no considerable additional production costs, but...
- ...in some cases additional costs for materials
- ...increased engineering costs (design process), meaning that additional costs per vehicle heavily depend on scale of series production.
- Potentials depend on spare space and weight limits in each particular case.
- Later refurbishment for noise reduction usually much more expensive.

How to choose targets?

- Targets depend on noise situation in the area and along the line.
- Targets should be defined with reference to emission norms.
- Targets depend on rolling stock strategy: new/old/modernised.

How to monitor the contract?

- Test certificates of engines required.
- Modernisation of fleet can easily be verified, but renewed test certificates should be required.
- If operation of certain vehicle categories is restricted to e.g. a limited share of train km, additional documentation is needed.
- Maintenance standards to be considered

Noise: Environmental law

Decision 2011/229/EU of 4 April 2011 („TSI Noise“):

- Regulates emission limits for stationary, starting and passing-by noise
- Binding for new rolling stock on the Trans European Network
- → binding (or important relevance) for regional trains
- Second step envisaged for 2016/2018
- Upon refurbishment, noise emissions must not be increased



Directive 2002/49/EC of 25 June 2002 („Env. Noise Dir.“)

- Strategic noise maps
- Noise action planning (no targets set by END)

Noise

How to include noise criteria in the awarding procedure

- 1) Analyse the relevance of noise emissions on your network.
- 2) Analyse available data about noise emissions of relevant rolling stock.
- 3) Require that newly procured vehicles fulfil the emission limits of TSI Noise.
- 4) Decide whether stricter emission limits shall be required or encouraged.
- 5) If existing vehicles are going to be accepted, decide
 - which emission limits to be fulfilled;
 - noise remediation to be required and which targets to set;
 - about stimulations for modernisation or replacement
 - about incentive schemes for intensified use of silent vehicles;
 - which method of verification to be required.
- 6) Require documentation of type-approvals in terms of noise emission.
- 7) Require a monitoring system which allows for the application of the defined incentive system.

Practice of awarding

As part of the same tendering project, the Verkehrsverbund Berlin-Brandenburg (VBB) also rewarded ambitious noise standards with additional scores.

Although the weight of these criteria was not very high, some of the trains to be used in the future will be better than required by TSI Noise.

Practice of awarding

Val Venosta Line and Ferrovia Circumvesuviana (FCV), both in Italy, use damped wheels in order to avoid noise. In case of FCV thus investments for protection walls could be avoided.

The mentioned railways are owned by the regions and noise reduction was required by the government.



DMU (Stadler) with Syope wheels on the Val Venosta line (photo: Pippert)

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