Current Framework of Vehicle Noise Regulation in Japan

Ministry of the Environment, JAPAN
Topics

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   - Environmental Monitoring Related to Road Traffic Noise
   - Area Evaluation of Road Traffic Noise
   - Situations on Road Traffic Noise
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1. Background of Vehicle Noise Regulations

**Environmental Quality Standards for Noise**

Environmental Quality Standards (EQSs) for Noise are designated as the standards to be maintained for the purpose of protection of human health by environmental pollution, in accordance with the Basic Environment Law, Article 16.

- **General Areas**

<table>
<thead>
<tr>
<th>Categories of area</th>
<th>Standard Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daytime (6:00~22:00)</td>
</tr>
<tr>
<td>Area AA (where silence is especially required, e.g. hospitals)</td>
<td>50dB or less</td>
</tr>
<tr>
<td>Area A or B (for residence, exclusively or mainly)</td>
<td>55dB or less</td>
</tr>
<tr>
<td>Area C (for commerce)</td>
<td>60dB or less</td>
</tr>
</tbody>
</table>

- **Areas Facing Roads**

<table>
<thead>
<tr>
<th>Categories of area</th>
<th>Standard Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daytime (6:00~22:00)</td>
</tr>
<tr>
<td>Area A facing road with two or more lanes</td>
<td>60dB or less</td>
</tr>
<tr>
<td>Area B facing road with two or more lanes and Area C facing road with one or more lanes</td>
<td>65dB or less</td>
</tr>
</tbody>
</table>

- **Space Adjacent to Road Carrying Arterial Traffic**

<table>
<thead>
<tr>
<th>Standard Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daytime (6:00~22:00)</td>
</tr>
<tr>
<td>70dB or less</td>
</tr>
</tbody>
</table>
◆ Environmental Monitoring on Road Traffic Noise

- **Subject of Monitoring**
  - Monitoring is conducted by prefectural governments in compliance with the Noise Regulation Law.
  - Subject of evaluation in fiscal 2010:
    - Length of roads extended: 35,903 km
    - Number of residences: 5,759 thousand

- **Disclosure of Data**
  - Data regarding road traffic noise is made public by each prefectural government, and MOE distributes a national summary.
  - Information on road traffic noise nationwide is available on the Internet
Area Evaluation of Road Traffic Noise

For areas along roads, achievement in principle is evaluated by choosing points considered to represent the noise of the respective concerned areas.

EQS:
- Daytime: 70dB
- Nighttime: 65dB
Disclosure of Area Evaluation Results via the Internet

Achievement of environmental standard (%)

- 60
- 80 - 95
- 95 - 100

環境基準達成状況

環境基準達成状況

- 60
- 80 - 95
- 95 - 100
Situations on Road Traffic Noise

Results of the Achievement of EQSs for Road Traffic Noise (FY2010)

<table>
<thead>
<tr>
<th></th>
<th>Below EQS both day and night</th>
<th>Below EQS in daytime only</th>
<th>Below EQS at nighttime only</th>
<th>Exceeded EQS both day and night</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of residences [5,759K]</td>
<td>5,260 (91.3)</td>
<td>222 (3.9)</td>
<td>248 (4.3)</td>
<td>28 (0.5)</td>
</tr>
<tr>
<td>Number of residences facing trunk roads [2,398K]</td>
<td>2,063 (86.0)</td>
<td>156 (6.5)</td>
<td>162 (6.8)</td>
<td>18 (0.7)</td>
</tr>
<tr>
<td>Number of residences not facing trunk roads [3,361K]</td>
<td>3,197 (95.1)</td>
<td>67 (2.0)</td>
<td>86 (2.6)</td>
<td>11 (0.3)</td>
</tr>
</tbody>
</table>

EQS: Environment Quality Standards for noise
Result of the Achievement of EQSs for Road Traffic Noise
(Since FY2000)

<table>
<thead>
<tr>
<th>Year</th>
<th>0%</th>
<th>10%</th>
<th>20%</th>
<th>30%</th>
<th>40%</th>
<th>50%</th>
<th>60%</th>
<th>70%</th>
<th>80%</th>
<th>90%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>316</td>
<td>5.6</td>
<td>83.8</td>
<td>(6.0)</td>
<td>(1.1)</td>
<td>(16.0)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>121.4</td>
<td>13.1</td>
<td>198.4</td>
<td>(8.2)</td>
<td>(0.9)</td>
<td>(13.3)</td>
<td>(6.6)</td>
<td>(1.2)</td>
<td>(12.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>1,549</td>
<td>23.9</td>
<td>233.6</td>
<td>(80.1)</td>
<td>(6.6)</td>
<td>(11.0)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>1,933</td>
<td>177.3</td>
<td>263.2</td>
<td>(80.7)</td>
<td>(7.4)</td>
<td>(10.5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>2,167</td>
<td>193.7</td>
<td>280.2</td>
<td>(81.4)</td>
<td>(7.3)</td>
<td>(10.5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>2,459</td>
<td>181.3</td>
<td>252.6</td>
<td>(84.4)</td>
<td>(6.2)</td>
<td>(9.0)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>2,812</td>
<td>218.1</td>
<td>228.7</td>
<td>(85.4)</td>
<td>(6.2)</td>
<td>(9.0)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>3,398</td>
<td>221.1</td>
<td>231.0</td>
<td>(88.0)</td>
<td>(5.5)</td>
<td>(7.8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>4,158</td>
<td>222.4</td>
<td>247.9</td>
<td>(89.8)</td>
<td>(5.5)</td>
<td>(7.8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>4,595</td>
<td>224.5</td>
<td>(90.6)</td>
<td>(4.7)</td>
<td>(5.5)</td>
<td>(7.8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>5,260</td>
<td>228.7</td>
<td>(91.3)</td>
<td>(4.4)</td>
<td>(4.6)</td>
<td>(4.4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legend:
- Below EQS both day and night
- Below EQS in daytime only
- Below EQS at nighttime only
- Exceeded EQS both day and night

Below EQS both day and night:
- [523K]
- [1,487K]
- [1,934K]
- [2,395K]
- [2,663K]
- [2,914K]
- [3,292K]
- [3,861K]
- [4,632K]
- [5,072K]
- [5,759K]
Results of the Achievement of the Environmental Quality Standards for Road Traffic Noise (Classified by Road Types, FY2010)

- Number of residences facing national expressways [81.5K]: 74.2% (91.0), 2.8% (3.4), 4.0% (4.9)
- Number of residences facing urban expressways [46.6K]: 38.8% (83.3), 2.0% (4.3), 5.8% (12.4)
- Number of residences facing national highways [1,670.2K]: 1,452.5% (87.0), 98.1% (5.9), 109.8% (6.6)
- Number of residences facing prefectural roads [3,261.8K]: 3,023.8% (92.7), 106.6% (3.3), 115.3% (3.5)
- Number of residences facing municipalities roads [902.0K]: 850.6% (94.3), 22.9% (2.5), 24.8% (2.7)
No. of Claims Related to Vehicle Noise (Since FY2000)

No. of claims related to Noise
(Total, including vehicle noise)

No. of claims related to Noise
(Vehicle noise only)

Source: Research of the Implementation of Noise Regulation Act by MOE, Japan
Framework of the Vehicle Noise Regulations

Methods for Testing Vehicle Noise

<table>
<thead>
<tr>
<th>Test types</th>
<th>Contents</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Throttle Acceleration (since 1971)</td>
<td>Measure the sound level when approaching to the measuring range at a constant speed (e.g. 50km/h or 0.75S for vehicle having at least four wheels) and accelerator fully depressed (throttle control fully opened)</td>
<td>A wide testing area and devices are required for these tests and it is difficult to conduct for in-use vehicles.</td>
</tr>
<tr>
<td>Cruising (Since 1951)</td>
<td>Measure the sound level when approaching to the measuring range at a constant speed (e.g. 50km/h for vehicle having at least four wheels) and keeping the speed</td>
<td></td>
</tr>
<tr>
<td>Stationary (Since 1986)</td>
<td>Measure the sound level in the immediate vicinity of the exhaust-system outlet during a period of targeted engine speed and deceleration by the release of accelerator/throttle</td>
<td>A wide testing area is not required and this test is applicable for in-use vehicles.</td>
</tr>
</tbody>
</table>

Full Throttle Acceleration/Cruising Test (A test course is required)

Stationary Test (A test course is not required)
### Maximum Permissible Levels for Vehicle Noise

<table>
<thead>
<tr>
<th>Vehicle Types</th>
<th>Full Throttle Acceleration</th>
<th>Cruising</th>
<th>Stationary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger vehicles (11 passengers or more) and commercial vehicles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GVW &gt; 3.5t and P &gt;150 kW</td>
<td>81 (82(^*1))</td>
<td>82 (83(^*1))</td>
<td>99</td>
</tr>
<tr>
<td>GVW &gt; 3.5t and P ≤150 kW</td>
<td>80 (81(^*2))</td>
<td>79 (80(^*2))</td>
<td>98</td>
</tr>
<tr>
<td>GVW ≤ 3.5t</td>
<td>76</td>
<td>74</td>
<td>97</td>
</tr>
<tr>
<td>Passenger vehicles (10 passengers or less)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>76</td>
<td>72</td>
<td>96 (100(^*3))</td>
</tr>
<tr>
<td>Motorcycles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cc ≤ 50</td>
<td>71</td>
<td>65</td>
<td>84</td>
</tr>
<tr>
<td>50 &lt; cc ≤ 125</td>
<td></td>
<td>68</td>
<td>90</td>
</tr>
<tr>
<td>125 &lt; cc ≤ 250</td>
<td>73</td>
<td>71</td>
<td>94</td>
</tr>
<tr>
<td>250 &lt; cc</td>
<td></td>
<td>72</td>
<td></td>
</tr>
</tbody>
</table>

*1 For all-wheel-powered vehicles, tractors or crane trucks  
*2 For all-wheel-powered vehicles  
*3 For rear engine vehicles
◆ Viewpoints for Reviewing the Noise Regulation Framework

- The values for new vehicles are reduced by 84% in maximum on the energy basis from the level in 1971, when the Full Throttle Acceleration Noise Regulation came into effect.
- A relative contribution of tire rolling noise is increasing in comparison to the power unit noise.
- In order to keep noise levels of in-use vehicle at the same level as new ones, it is effective to regulate noise levels of replacement tire and replacement exhaust silencer system (RESS).

![Graph showing contribution of each source to accelerated running noise by each year of regulations.](image)

In response to the Inquiry of June 2005, the Expert Committee on Motor Vehicle Noise, established under the Noise and Vibration Committee of the Central Environment Council, has been considering “the Future Policy for Motor Vehicle Noise Reduction”, including the measures for reduction of the in-use vehicle noise.
Framework of Vehicle Noise Regulation

At the Inquiry (2005)

- **New Vehicles**
  - **Acceleration Noise**
    - Regulation on the full throttle acceleration noise level
  - **Cruising Noise**
    - Regulation on the cruising noise level (on the vehicle-basis)
  - **Stationary Noise**
    - Regulation on the stationary test noise level with absolute values of upper limit of emission

- **In-use**
  - Lack of measures for in-use vehicles, especially equipped with RESS
  - Lack of measures for in-use vehicles equipped with replaced tires


- **New Vehicles**
  - **Acceleration Noise**
    - Four Wheelers: Regulation on the full throttle acceleration noise level
    - Motorcycles: Regulation on the $L_{urban}$
  - **Cruising Noise**
    - Four Wheelers: Regulation on Tire Rolling Noise (abolishment of Cruising Noise Regulation under consideration)
  - **Stationary Noise**
    - Regulation on the stationary test noise level with absolute values, the same as new vehicle values of upper limit of emission

- **In-use**
  - Regulation on the full throttle acceleration noise level for RESS (Advance Certification System for Replacement Mufflers)
  - Motorcycles: Abolishment of Cruising Noise Regulation
  - Regulation on the stationary test noise level with absolute values, the same as new vehicle values of upper limit of emission
2. Reinforcement of Muffler Noise Reduction

◆ Road Noise Level (Impact of the passage of vehicles with RESS)

- Ratio of RESS-Equipped Vehicles (Sampling Research)
  - Four Wheelers: About 5% (Resource: MOE Japan)
  - Motorcycles: About 40% (Resource: JAMA)

Source: JAMA

- Roughly 68dB
Adoption of Advance Certification System for Replacement Mufflers

- On 18 December 18 2008, the Noise and Vibration Committee of the Central Environment Council discussed and compiled the “Future Policy for Motor Vehicle Noise Reduction (Interim Report)”.

- The Interim Report recommended the adoption of Advance Certification System for Replacement Mufflers as a noise reduction measure that should be promptly implemented on in-use vehicles as well as a check scheme for certified mufflers at mandatory automobile inspections. In the System, full throttle acceleration noise regulation is applied to replacement mufflers and those meeting the requirement are marked as “Certified Mufflers”. The Report also recommended that after the system began, it should be reviewed in consideration of the survey on sales status of RESSs.

- On 26 December 2008, Regulation and relevant Bulletins for the Safety and Environmental Protection of Motor Vehicles were amended.

- The vehicles manufactured on and after 1 April 2010 have to equip original mufflers or Certified Mufflers.
◆ Additional Requirement for Muffler Structure and Performance
Prohibition of removal noise reduction devices.
3. Adoption of Tire Rolling Noise Regulation

◆ Background of Reinforcement of Tire Rolling Noise Reduction

☐ Sources of Tire Rolling Noise

Tire rolling noise is mainly divided into the noise owing to tread pattern, such as groove resonance and pattern vibration noise, and the noise owing to other elements, such as vibration noise by irregular road surface, friction (on the surface), and so on.

☐ Previous Discussions on the Adoption of Tire Rolling Noise Regulation

MOE established a Study Team for Tire Rolling Noise in 1998 with the aim of considering the effectiveness of tire noise regulation. The team concluded that the adoption of ECE R117-01 would not be very effective as a measure for vehicle noise reduction, since the tire rolling noise levels were already below the limits, which were regulated by ECE R117-01 in most of the tires manufactured and sold by Japanese tire manufactures at that time.
The Current Tire Rolling Noise Level

Once again, MOE established a Study Team for Tire Rolling Noise in 2009 with the aim of considering the effectiveness of tire noise regulation. The team conducted an analysis of the recent tire rolling noise and interviewed Japanese tire manufacturers, and came to the following understanding:

- About half of tires sold in Japan exceeded the limit values regulated by ECE R117-02.
- There are Sports Type Tires for passenger vehicles (PVs) and All Terrain and Studless Tires for sports utility vehicles (SUV) that exceed 1 to 3 dB, and Mud Terrain Tires for SUV that exceed 5dB as the maximum noise levels.
- The ratios of tire noise at cruising are over 82% for PVs, and between 45% and 81% for heavy duty vehicles (HDVs).

Discussion on Tire Rolling Noise Level

- The Current Tire Rolling Noise Level
- Once again, MOE established a Study Team for Tire Rolling Noise in 2009 with the aim of considering the effectiveness of tire noise regulation.
- The team conducted an analysis of the recent tire rolling noise and interviewed Japanese tire manufactures, and came to the following understanding:
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  - The ratios of tire noise at cruising are over 82% for PVs, and between 45% and 81% for heavy duty vehicles (HDVs).

Cruising Noise and Ratios of Tire Rolling Noise
(3 passenger vehicles (PVs) and 3 commercial vehicles (CVs))
Discussion on the Limit Values

- It seems possible to reduce 1 or 2 dB of tire rolling noise by implementing technical measures that are currently in use or under development.
- On the other hand, it is difficult to reduce the level of tire rolling noise below ECE R117-02 limit values, as the current technical measures have trade-offs between noise and wet grip or rolling resistance.

Requirements for Tire Performance

- Noise Reduction
- Maneuverability
- Wet Grip
- Rolling Resistance
- Durability
- Comfortability
- Wear Resistance
- Uneven Wear Resistance
◆ Evaluation of Environmental Effectiveness

- The simulation using the Road Traffic Noise Prediction Model developed by Japan Automobile Research Institute (JARI) was conducted for the evaluation of effectiveness of the introduction of ECE R117-02. The findings indicated that the adoption of ECE R117-02 noise regulation would reduce 1.3 dB(A) (equal to 26% reduction in traffic volume) at maximum.
Road Traffic Noise Prediction Model (JARI)

- It uses Micro Traffic Flow Model, which simulates each vehicle driving every moment and enables to evaluate the situation of inconsistent traffic flow such as near crossing.
- It requires separate data on vehicle power-unit noise and tire rolling noise in order to estimate the influence of different noise sources on road traffic noise in case of the adoption of vehicle noise regulations.
**Targeted Areas for Simulation**

**Area A:** Urban and facing a national highway where the traffic volume is large and the sound pressure level is quite high

**Area B:** Urban and facing a by-pass of national highway where vehicles can run at a constant speed despite the high traffic volume

**Area C:** Urban and facing a national highway where the traffic volume is less than that of “Area A”

**Estimation Result of Road Traffic Noise Simulation**

**Area A**

- **Morning (7:00AM–7:20AM):**
  - Vicinity of Crossing: 73.9 [dB(A)]
  - Constant Speed Zone: 72.4 [dB(A)]
  - Vicinity of Crossing: 73.6 [dB(A)]
  - Constant Speed Zone: 72.4 [dB(A)]

- **Daytime (11:30AM–11:50AM):**
  - Vicinity of Crossing: 73.6 [dB(A)]
  - Constant Speed Zone: 73.2 [dB(A)]
  - Vicinity of Crossing: 74.1 [dB(A)]
  - Constant Speed Zone: 73.6 [dB(A)]

**Area B**

- **Daytime (10:00AM–10:20AM):**
  - Vicinity of Crossing: 73.1 [dB(A)]
  - Constant Speed Zone: 71.1 [dB(A)]
  - Vicinity of Crossing: 72.9 [dB(A)]
  - Constant Speed Zone: 72.1 [dB(A)]

**Area C**

**Estimated Reduction of \( L_{Aeq} \) [dB(A)]**

<table>
<thead>
<tr>
<th></th>
<th>Morning (7:00AM–7:20AM)</th>
<th>Daytime (11:30AM–11:50AM)</th>
<th>Daytime (10:00AM–10:20AM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vicinity of Crossing</td>
<td>73.9</td>
<td>73.6</td>
<td>73.1</td>
</tr>
<tr>
<td>Constant Speed Zone</td>
<td>72.4</td>
<td>72.4</td>
<td>71.1</td>
</tr>
<tr>
<td>Vicinity of Crossing</td>
<td>73.6</td>
<td>73.2</td>
<td>72.9</td>
</tr>
<tr>
<td>Constant Speed Zone</td>
<td>72.4</td>
<td>73.7</td>
<td>72.1</td>
</tr>
<tr>
<td>Vicinity of Crossing</td>
<td>74.1</td>
<td>73.6</td>
<td>72.5</td>
</tr>
<tr>
<td>Constant Speed Zone</td>
<td>73.6</td>
<td>72.6</td>
<td>72.6</td>
</tr>
</tbody>
</table>

**Estimated Reduction of \( L_{Aeq} \) [dB(A)]**

<table>
<thead>
<tr>
<th></th>
<th>Morning (7:00AM–7:20AM)</th>
<th>Daytime (11:30AM–11:50AM)</th>
<th>Daytime (10:00AM–10:20AM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vicinity of Crossing</td>
<td>0.6</td>
<td>0.5</td>
<td>-0.7</td>
</tr>
<tr>
<td>Constant Speed Zone</td>
<td>0.9</td>
<td>0.7</td>
<td>-1.1</td>
</tr>
<tr>
<td>Vicinity of Crossing</td>
<td>0.5</td>
<td>0.8</td>
<td>-0.6</td>
</tr>
<tr>
<td>Constant Speed Zone</td>
<td>0.7</td>
<td>1.1</td>
<td>-1.0</td>
</tr>
<tr>
<td>Vicinity of Crossing</td>
<td>0.4</td>
<td>0.6</td>
<td>-0.9</td>
</tr>
<tr>
<td>Constant Speed Zone</td>
<td>0.6</td>
<td>1.0</td>
<td>-1.2</td>
</tr>
</tbody>
</table>

**Estimation of Tire Noise Level After Introduction of the Regulation**

**Case 1:** Immediately after the entry-into-force of the regulation

**Case 2:** Long time after the entry-into-force of the regulation
◆ Issues to be Addressed in the Future

☐ Timing for Implementation of the Regulation
  • New tires that are coming into market in the next 3 – 5 years will be able to meet the noise regulation standard.
  • However, in contrast to the existing regulations focusing on vehicle unit, the new regulation focuses on tires. Thus, the relevant ministries should examine in detail the regulatory method before determining the appropriate timing for implementation.

☐ Application of Regulation to Retreaded Tires
  Although retreaded tires currently used for heavy duty trucks in Japan are excluded from the regulation for the time being, their widespread use is expected in the future and thus it is appropriate to consider the future application of noise regulation by examining the number of their use, the status of their noise emissions, etc.

☐ Introduction of Tire Noise Labeling
  It is expected that the introduction of information regarding tire rolling noise would encourage consumers/vehicle users to choose lower noise emission tires as well as promote awareness of the importance of noise reduction.
4. Review of Motorcycle Noise Regulation

◆ Standpoints in Discussion of Motorcycle Noise Reduction Measures

- The basic regulatory noise test method has remained unchanged since 1971 for the acceleration noise, while the driving conditions for motor vehicles and the status of their noise emissions have improved over time along with engine power, etc.
- In some vehicles with electronically-controlled engines, it is possible that noise emissions increase rapidly under normal driving conditions although the vehicles passed the noise test.
- Instead of developing products exclusively for the domestic market and meeting more stringent noise regulation while the market itself is decline, harmonization with ECE R41-04 is one of the ways to help mitigate development costs.
Comparison between New Acceleration Test Method (ISO 362-2) and Actual Driving Condition

To verify the validity of the current acceleration test method (so called TRIAS) and new method (ISO 362-2) in ECE R41-04, MOE conducted a survey of actual driving conditions of and the acceleration tests on motorcycle in urban area.

Result of the Survey (400 cc with 5MT, PMR=71.6[kW/t])

Distribution of Engine Speed and Open Throttle Rate in Urban Driving

(Each line shows engine speed at 50 [km/h] with each gear.)

Distribution of Engine Speed and Acceleration in Urban Driving

Note: Analysis of Data of 45<V<55[km/h] and α>0[m/s²]
As ISO 362-2 is developed with driving data of countries including Japan, the following results were obtained from the comparison with domestic driving conditions:

- Compared to TRIAS, the ISO 362-2 test speed is closer to the one that is frequently used in the actual driving in Japan.
- In the case of Class 2 and 3 motorcycles, WOT acceleration used in TRIAS deviates greatly from acceleration in the actual driving. On the other hand, the ISO 362-2 targeted acceleration is appropriate for the upper limit of acceleration used in the actual driving.
- For manual-transmission motorcycles due to ISO 362-2 reference WOT acceleration, a lower gear among others used in the actual driving is selected.

### ISO 362-2 Test Conditions

<table>
<thead>
<tr>
<th>Vehicle Classification</th>
<th>Speed</th>
<th>Test Weight</th>
<th>Acceleration</th>
<th>α urban</th>
<th>α wot ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1, PMR ≤ 25</td>
<td>40 [km/h] (PP’)</td>
<td>WOT</td>
<td></td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Class 2, 25 &lt; PMR ≤ 50</td>
<td>Vehicle Weight +75kg</td>
<td>Urban Acceleration</td>
<td>1.37log(PMR)–1.08</td>
<td>2.47log(PMR)–2.52</td>
<td></td>
</tr>
<tr>
<td>Class 3, PMR &gt; 50</td>
<td>50 [km/h] (PP’)</td>
<td></td>
<td>1.28log(PMR)–1.19</td>
<td>3.33log(PMR)–4.16</td>
<td></td>
</tr>
</tbody>
</table>

### TRIAS Test Conditions (Reference)

<table>
<thead>
<tr>
<th>Vehicle Classification</th>
<th>Speed</th>
<th>Acceleration</th>
<th>Test Weight</th>
<th>Gear Selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>cc ≤ 50</td>
<td>25 [km/h] or 3/4S (AA’')</td>
<td>WOT</td>
<td>GVW</td>
<td>(For MT)</td>
</tr>
<tr>
<td>50 &lt; cc ≤ 250</td>
<td>40 [km/h] or 3/4S (AA’’)</td>
<td></td>
<td></td>
<td>Up to 3 gears: 2nd</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4 gears: 3rd</td>
</tr>
<tr>
<td>250 &lt; cc</td>
<td>50 [km/h] or 3/4S (AA’’))</td>
<td></td>
<td></td>
<td>5 gears or more: 4th</td>
</tr>
</tbody>
</table>
Among the motorcycles sold in Japan, there are some vehicles whose $L_{\text{urban}}$ exceeds ECE R41-04 limit values (Class 1: 73dB / Class 2: 74dB / Class 3: 77dB), and a majority of such vehicles are domestically not type-approved (imports). It is expected that they have a potential to reduce their noise emissions to around ECE R41-04 limit values but not further, due to technical and/or productivity reasons.

The regulatory limits for non-type-approved motorcycles have been relaxed under the current regulation, compared to type-approved motorcycles. Hence, the harmonization with ECE R41-04 can strengthen the noise regulation for these non-type-approved motorcycles.

Database of Acceleration Noise Level of Motorcycles Sold in Japan

(ECE R41-04 Limits)
Abolition of Cruising Noise Regulation for Motorcycles

• Under ISO 362-2, \( L_{\text{wot}} \) and \( L_{\text{crs}} \) are measured to calculate \( L_{\text{urban}} \) by linear interpolation for evaluation of noise emissions. Therefore, it is necessary to reduce both \( L_{\text{wot}} \) and \( L_{\text{crs}} \) in order to reduce \( L_{\text{urban}} \).

• As a result of a survey, it was found that the effect of reduction in both acceleration noise and cruising noise was almost the same, assuming the measures for reducing noise from power unit and power train were adopted. In addition, tire noise emissions from motorcycles are found negligible.

• For rationalizing the regulatory procedures, it is considered appropriate to abolish the cruising noise regulation for motorcycles.
5. Issues to be Addressed in the Future

◆ Future Policy for Vehicle Noise Reduction

(1) Review of Noise Regulation for Four-Wheeled Vehicles

• Similar to noise emissions from motorcycles, the test conditions of the current acceleration noise testing method for four-wheeled vehicles may differ from the actual driving conditions and the actual noise emissions in Japan.
• Japan has participated in the discussion on ECE R51-03 in the Working Party on Noise (GRB), and is in consideration of adopting a revised ECE R51-03.
• In order to adopt the regulation on tire noise, which contribution to the cruising noise emission is high, Japan should also consider abolishing the current cruising noise regulation upon the adoption of ECE R51-03 for rationalizing the regulatory procedures.

(2) Review of Advance Certification System for Replacement Mufflers

The current acceleration noise testing method used needs to be replaced with ISO 362-2, as well as the upper noise limits be reviewed.

(3) Review of Stationary Noise Regulation

Certain targeted maximum permissible limits at absolute values are specified for each vehicle class. For prevention of discrepancy of noise levels between the new vehicle test score and the actual use, a regulation using relative values should be considered.
The Future Policy Measures for Road Traffic Noise Reduction

- Automobile manufacturers, road administrators, law enforcement agency, transport business operators, and environmental departments and bureaus of national and local governments have promoted comprehensive measures for achievement of the Environmental Quality Standards (EQSs) for Noise, including vehicle units, structural improvements, traffic stream management, and measures for roadside environment.

- Although the achievement rate of EQSs for Noise is in moderate improvement as a whole, the condition remains severe in areas adjacent to urban expressways and national highways and the number of complaints over vehicle noise is hardly reduced.

- Upon 10th anniversary of the implementation of EQSs for Noise, the Ministry of the Environment, together with relevant ministries and agencies, have put together “the Future Policy Measures for Road Traffic Noise Reduction” in June 2009, describing measures to be implemented as well as topics to be discussed in the future including vehicle unit regulation.
Measures to be Implemented

1. Measures at Sound Source
   - Review on Regulatory Methods
     - Implementation of Advance Certification System for Replacement Mufflers
     - Consideration of revising the noise regulatory methods, incl. test methods
     - Consideration of Tire Rolling Noise Regulation
   - Promotion of Low-Emission Vehicles (LEVs)
     - Promotion of technological development on LEVs
     - Voluntary implementation by national/local governments & public organizations
     - Financial aids
     - Public awareness

2. Traffic Stream Management
   - Installation/Improvement of Road Networks
   - Reduction in Traffic Volume
     - Promotion of the use of public transportation (urban trains/buses/traffic junctions)
     - Improvement in distribution functions (establishment of urban distribution centers/ use of domestic vessels)
   - Traffic Control & Others
     - Promotion of Intelligent Transport Systems (ITS)
     - Dissemination of useful traffic information to drivers
     - Restriction of tracks to inner lanes for noise mitigation
     - Control on speeding, overloading, & poor maintenance

3. Structural Improvement
   - Construction of Noise Reduction Pavement
   - Implementation of Noise Barriers, Environmental Facility Zones & Planting
   - Giving Consideration to Local Needs
     - Comprehensive Measures for Viaducts (implementation of continuous girder or connection of discontinuous girders, installation of sound absorber panels, etc.)

4. Measures for Roadside Environment
   - Inducement for Proper Land Use of the Space Adjacent to Road Carrying Arterial Traffic
   - Use of Land Readjustment Projects & Urban Redevelopment Projects
   - Promotion of Implementation of Roadside District Plans & Roadside District Improvement Plans
   - Conversion of Urban Structure

5. Others
   - Promotion of the Use of Public Transportation
   - Promotion of Eco-Driving
   - Dissemination of useful traffic information to drivers
   - Restriction of tracks to inner lanes for noise mitigation
   - Control on speeding, overloading, & poor maintenance

Research Agenda Necessary for Promotion of Future Implementation
   - Automobile Noise Reduction Technology
   - Promotion of Measures for Effective & Efficient Use of Public Transportation
   - Promotion of Technological Development & Research on Measures for Road Structure
   - Enhancement of Measures for Roadside Environment

The Future Policy for Motor Vehicle Noise Reduction
Measures Implemented for Road Traffic Noise Reduction (Reference)

(1) Measures at Sound Source

- Strengthening of Automobile Noise Regulation

Trucks | Acceleration Noise | 82dB | 82dB | 82dB | 86dB | 82dB | 86dB | 82dB | 86dB | 82dB | 86dB | 82dB | 86dB | 82dB | 86dB |
        | Stationary Noise   | 92dB | 92dB | 92dB | 96dB | 92dB | 96dB | 92dB | 96dB | 92dB | 96dB | 92dB | 96dB | 92dB | 96dB |

(2) Measures for Traffic Stream

- Installation & Improvement of Road Networks

[Case: Naka-Kyushu Crossing Hwy & Inukai-Chitose Bypass of National Highway Route 57]

Since the Inukai-Chitose Bypass opened for service, 70% of traffic on National Hwy Route 57 was transferred & the number of large trucks was reduced in about 1,600. As a result, the traffic noise dropped about 5-7dB & EQSs for Noise was achieved.

Acceleration Noise Test

- Reduction in # of Large Vehicles
- Reduction in Noise

● Reduction in Both Entry of Large Vehicles & Corresponding Noise

- Daytime
- Nighttime

Energy reduced to 10%
### (3) Structural Improvement

- **Construction of Noise Reduction Pavement & Noise Barriers**

- **Public Awareness**

### (4) Measures for Roadside Environment

- **Roadside District Plans**

  - Prevention of road traffic noise & promotion of installation of the soundproofing system in residences through proper land use management of areas adjacent to the Loop 7.

### (5) Others

- **Public Awareness**

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**Case: Fukushima West Bypass of National Highway Route 13**

- Nighttime EQSs for Noise (65 dB) was exceeded in residential areas adjacent to Fukushima West Bypass of National Hwy Route 13.
- Transparent noise barriers were installed for prevention of blocking visibility of the entrance as well as spoiling the scenery.
- After installation, noise was reduced more than 3-5 dB at the road demarcation.
- About 70% of residents were happy about the installation of noise barriers, according to the questionnaire.

**Case: Roadside District Plan for the Loop 7 in Kita Ward**

- Building Facing The Loop 7
- Area Applicable to Building Ordinance
- The Loop 7 Demarcation
- Roughly 20m Width
- Roughly 30m Width
Influence of Textures of Road Pavement on Noise

Textures of the Test Road Pavements

**Dense asphalt concrete**
- Single-layered
- Double-layered

**Porous asphalt concrete**
- Single-layered
- Double-layered

**Porous elastic road surface**

Thank you !