Pass-by noise legislation is designed to provide a framework and maximum noise emission limits for on highway vehicles. This includes vehicles for the transportation of passengers or goods, but may also apply to motor bikes or its related variations such as trikes and quads. If the maximum noise emission of a vehicle is below the maximum level defined by local legislation, the vehicle is granted type approval and can be sold or distributed in the region for which the legislation applies.

ISO 362 pass-by noise testing standard

When it comes to pass-by noise testing, many standards exist. Most of them refer to the ISO standard 362. This standard prescribes how to measure the maximum noise emission, what the conditions of the test track should be, under which operational conditions the vehicle should be tested, which instrumentation should be used and the required quality of measurements that is acceptable. ISO 362 has been adopted by many regions as the process by which measurements should be taken, sometimes with slight modifications to serve local needs or requirements. It was first released in 1961 and has following revisions:

Current legislation limits

The ISO standard 362 does not specify the maximum noise limit; these levels are set and enforced by legislation passed by governmental bodies, in the case of Europe the European Council. For Pass-by Noise and its testing standard, ISO 362, the most important of these regulations is UNECE Regulation 51. UNECE stands for United Nations Economic Commission for Europe, often abbreviated to ECE or UN/ECE. The name is a bit misleading: since 1995, membership of the organization, and therefore signatory to implementing the ECE standards, has been open to the rest of the world. In other words, if a new car type is to be sold in any of the 56 member countries of UNECE, see figure 1 below, it has to have earned type approval under Regulation 51. The current significant exceptions to this are the USA and Canada, who have their own testing standards and limits controlled by federal legislation. India, China, Brazil and other nations indirectly adhere to ECE regulations in part, without being full signatories, allowing them more flexibility as their economies develop.

![Image of countries under UN/ECE Regulation 51](http://example.com/countries_map)

**Figure 1. Showing in green the countries that are under the jurisdiction of UN/ECE Regulation 51 for Pass-by Noise**

The current valid Regulation 51 is revision 2, in short R51.02, ECE R51.02 or UN/ECE R51.02. Under Regulation 51.02, type approval is done according to the procedures and standard set out in ISO 362:1998, and the maximum allowed level for passenger cars (M1 type) is set 74dB(A). Other current vehicle category limits can be found in table 1 below. Although a newer ISO standard exists, type approval for new vehicles ECE member countries is still subject to Regulation 51.02. The European Union has adopted UNECE Regulation 51.02 under Council Directive 70/157/EEC.

With increasing traffic and evolving insights into noise emissions, it has been accepted that the maximum noise emission result from a WOT (wide open throttle) acceleration test, as specified in the ISO 362:1998 standard and the current Regulation 51.02, does not correspond to the noise emission in a realistic urban driving condition. In such urban conditions, vehicle speeds are generally lower, in the 50km/h range, and accelerations do not exceed 1 m/s² for 90% of normal vehicle use. Moreover, the current Regulation 51.02 allows tuning a vehicle such that power output is suppressed under the exact test conditions, just staying within the allowed limits for this condition, thereby negating the usefulness of the standard in limiting noise in real life conditions.

These real-life needs were taken into consideration by the committee that was set up to review the procedures and standards in ISO362:1998. The result of their work was an updated ISO 362 standard including a combination of WOT and constant speed tests, together with stricter controls on which gearing and operating conditions the tests had to be carried out under, in order to make the results more attuned to real life performance and make it more difficult to tune the vehicle just to meet the limit. It should be noted that vehicles with a power to weight ratio under 25 (in general all vehicles above 3.5T in weight fall into this category) will not be subject to the constant speed test.

Proposed reductions in pass-by noise limits

Following the revision ISO 362-1:2007, discussions have been ongoing to also revise Regulation 51.02. In December 2011, this has resulted in a new proposal called Regulation 51.03. This proposal adopts the revision ISO 362-1:2007 as the testing standard, and proposes new lower maximum noise emission limits to be implemented in 3 phases. For M1 vehicles, the maximum noise emission level will drop from 74dB(A) to 70dB(A) in phase 1, and to 68dB(A) in phase 2 and phase 3. Phase 1 has to reached 2 years after publication of Regulation 51.03, phase 2 will follow 5 years after publication, and phase 3 will follow 7 years after publication. The proposed Regulation 51.03, as planned to be published by the EU under new Council Directive 70/157/EEC can be found at http://europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52011PC0856:en:NOT with translations in different languages. The EU has hereby overtaken the UNECE by proposing legislation. The current draft of the UNECE is identical though.

The list below summarizes the current testing standards that are supported in exterior pass-by noise testing, including notes on their application:

**Light Vehicles (passenger and goods):**

- ISO 362:1998: Old ISO 362 standard. Still used today (Jan 2012) for type approval in UNECE R51.02
  - Different microphone distance: 15m instead of 7.5m to reflect local environmental situations with more space, wider roads, larger distance between vehicle and by-passers.
  - Different track layout: start zone at -7.5m and end zone from +7.5m to +36m
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- For the acceleration test:
  - Approach speed: 48kmh +/- 1.2kmh (30mph target speed +/- 0.75mph)
  - Throttle release is at maximum rated rpm in the end zone or max speed before leaving the end zone
- For the deceleration test:
  - Approach speed: speed of throttle release of the acceleration test
  - Exit target: when the engine speed has dropped one-half or when the end of the end zone is reached
- Environmental conditions: different wind speeds
- Conclusion: Somewhat similar to ISO 362:1998, but measured with completely different parameters, and also different limits.
  - SAE J1470: American adoption of ISO 362:1998:
    - Acceleration noise for both light and heavy vehicles (M and N type vehicles)
    - Measurement: compared to ISO362:1998, 2 additional runs have to be measured (so 4 instead of 2)
    - Other differences are minor

Heavy Vehicles (HGV & Bus):

- ISO 362-1:2007: with its corriganda Cor 1:2009, same as light vehicle standard above
- SAE J366: American standard for heavy trucks and buses
  - Different track layout: -15.2m (-50ft) to +15.2m (50ft), with end zone starting at +3m
  - Different microphone distance from center line: 15.3m (=50ft)
  - Acceleration noise test
    - Approach speed at 2/3 of the rated engine speed
    - In such a gear that rated engine speed is reached in the end zone, but not exceeding a vehicle speed of 55kmh

- Deceleration test
  - Approach at the maximum engine speed reached during the acceleration test
  - Exit target: when the engine speed has dropped one-half or when the end of the end zone is reached

Motorcycles:

- F76A US: American standard for motorbikes acceleration noise

Exhaust Noise:

- EEC 93/97
- ISO 5130
- TRIAS 20

Tire noise:

- TRIAS 20: (incl. Tire coasting noise test)
- UN/ECE Regulation 117: for tire noise

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