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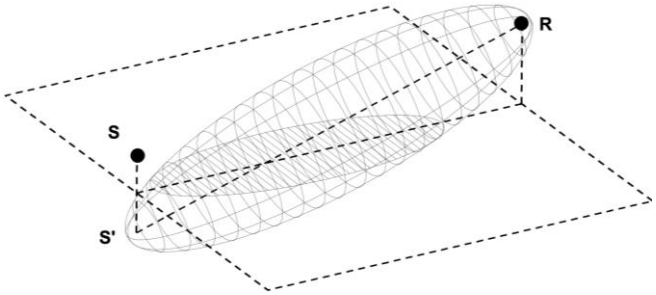

NORD2000

A comment on two errors in the official test cases for Nord2000 road traffic noise version December 2018

SUMMARY
Two errors in the official test cases for road traffic noise have been identified. Pending the correction of the test cases, it is recommended that the errors are considered and compensated for when evaluating a software.

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1 Background

When testing a new implementation of Nord2000 maximum level calculation in the SoundPLAN calculation software, two errors were identified in the official Nord2000 test cases for road traffic noise [1] One is that a change in the source model that was introduced in 2006 has not been included in the test cases, and the other is that the calculation of maximum levels has been done without converting energy mean sound power levels to arithmetic mean values.

When the errors were found, SoundPLAN and the author of the test cases at FORCE Technology were informed.

2 Two errors in the official test cases for Nord2000 road traffic noise

2.1 Incorrect axle width of vehicles

A new feature of the Nord2000 source model relative to older calculation methods is that the noise is not radiating from the centre of the vehicles, but from the side of the wheels that are closest to the calculation point, i.e. at a distance of half the axle width from the centre of the vehicle. In the first version of the Nord2000 source model that was published in 2001 [2] different axle widths were applied for light and heavy vehicles, 1,5 m for light vehicles and 2,5 m for medium heavy and heavy vehicles.

When the source model was revised in the Nord2000 Road project in 2006, a simplification was introduced that both light and heavy vehicles should use the axle width of 2 m, i.e. 1 m from the centre of the vehicle [3] [4]. However, the change was overlooked when the road traffic noise test cases were updated accordingly. The error is present in the version from December 2018 [1].

All sound levels in the test case report have thus been calculated using point sources placed 0,75 m from the vehicle center (in the direction of the receiver) for light vehicles, and 1,25 m from the vehicle center for heavy vehicles. To investigate the magnitude of the impact of this, the first seven test cases for straight roads (tabs 1–7 of the Excel file TestStraightRoad_20181101.xls) were calculated using both variants. The difference was found

to be ≤0.05 dB. It is likely that the difference will be small in the other test cases as well, but that has not been investigated.

2.2 Maximum levels are not based on the arithmetic mean value

The second error is that the maximum levels presented in the test case report do not include the arithmetic mean correction according to equation 2.13 in the Nord2000 source report from 2006 [3]. The calculated sound levels reported in the test cases have therefore been given too high values. Since the correction is dependent on the standard deviation of the maximum level, the size of the correction will vary. For example, the correction will be 1,9 dB with a standard deviation of 4,1 dB (which is the standard deviation of the maximum level from light vehicles at 40 km/h according to [5]).

3 Conclusion

The Nord2000 test cases for road traffic noise needs to be corrected and a revised test case report published. Until that has been accomplished, it is recommended that the errors are considered and compensated for when evaluating a software.

4 References

[1] B. Plovsing, E. Thyséll, *Test Cases for Road Traffic Noise – Nord2000. Version December 2018*, RL 18/18, Miljøstyrelsens referencelaboratorium for støymålinger, Oktober 2019.

[2] H. G. Jonasson, S. Å. Storeheier, *Nord 2000. New Nordic Prediction Method for Road Traffic Noise*. Version 1.0. SP Rapport 2001:10, SP Sveriges Provnings- och Forskningsinstitut, 2001-12-21.

[3] H. G. Jonasson, Acoustic Source Modelling of Nordic Road Vehicles, SP Rapport 2006:12, 2006.

[4] J. Kragh et al., *User's Guide Nord2000 Road*, AV 1171/06, DELTA, 2006.

[5] A. Gustafson, A. Genell, *Maximalnivå vägtrafik – Mätning av maximalnivåns spridning för underlag till bullerberäkningar*. Kunskapscentrum om buller, 2024.