

Errata: Communications - Scientific Letters of the University of Zilina, 21(1), 2019, Passenger Ride Comfort and International Roughness Index Specifications in the Slovak Republic, p. 15-22.

Authors have identified incorrect results in their paper [1]. Trend removal of measured acceleration signal in Matlab code was *inadvertently* not turned on. This caused incorrect and overstated acceleration RMS values after acceleration data processing (predominantly on the seat surface). Further, the correct multiplying factors in Equation (1) should be $k_{sx} = k_{sy} = 1.4$. Presented incorrect results of total vibration a_v in [1] were substantially higher than the correct values. The authors would like to apologise for any inconvenience caused.

Corrected text, figure and tables should read as follows:

6. Whole-body vibration and IRI road classes

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Median a_v value (P50) exceeds the lower bound of expected “fairly uncomfortable” human reaction ($a_v = 0.5 \text{ m/s}^2$, Table 1) for two IRI road classes (#2 and #3) and motorways and three IRI road classes (#3–#5) for the 1st and 2nd class roads (Table 4). For IRI road class #3 and motorways and IRI road class #3–#5 and the 1st and 2nd class roads a lower bound of “uncomfortable” level ($a_v = 0.8 \text{ m/s}^2$) was exceeded by the 90th percentile (P90) of a_v (Table 4).

The median values of a_v are shown in Figure 3. Comparison shows higher vibration total value a_v by 16 %, 20 % and 9 % for motorways in the same IRI road class.

On motorways, 27.1 % of processed segments induced passenger’s vibrations higher than the lower bound of expected “fairly uncomfortable” human reaction (0.5 m/s^2) and 2.9 % segments exceeded the lower bound of “uncomfortable” level. On the 1st and 2nd class roads it was 55.8 % (“fairly uncomfortable”) and 22.8 % (“uncomfortable”).

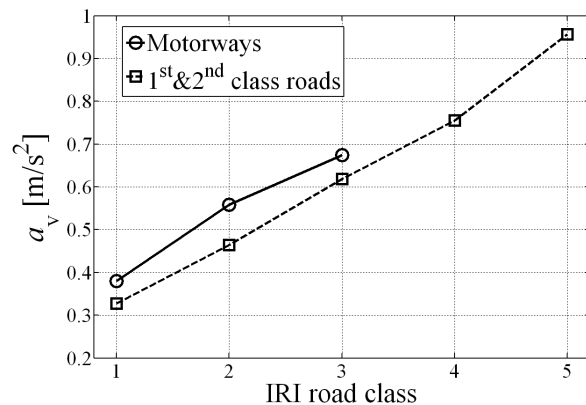


Figure 3 Median of the passenger vibration total value a_v as a function of IRI road class and road category

Results in Table 5 may be commented as follows:

Negligible portion of sections falls in the worst comfort likely reaction levels “very uncomfortable” and “extremely uncomfortable”.

Table 3 Fitting parameters of function $IRI = f(a_v)$ [Equation (2)] as a function of road category

Road category	N	Length (km)	b_1	b_2	b_3	RMSE	R	R^2
Motorways	3808	380.8	2.099	-0.0056	1.226	0.50	0.538	0.290
1 st class roads	4684	468.4	4.237	-0.0377	3.886	1.01	0.719	0.517
2 nd class roads	5462	546.2	3.664	-0.0368	5.210	1.42	0.545	0.297
1 st and 2 nd class roads	10146	1014.6	4.605	-0.0445	4.675	1.34	0.682	0.465

Table 4 Vibration total value statistics as a function of IRI road classes and road category

N	Length (km)	IRI road class	v		IRI (mm/m)				Vibration total value						
			(km/h)						a_v (m/s ²)						
			mean	std	min	max	mean	std	mean	std	P10	P25	P50	P75	P90
Motorways															
2940	294	1	118.3	14.4	0.65	1.89	1.2	0.32	0.405	0.124	0.281	0.321	0.380	0.461	0.560
837	83.7	2	118.5	14.5	1.9	3.28	2.3	0.34	0.561	0.167	0.345	0.442	0.558	0.672	0.771
31	3.1	3	111.5	14.0	3.31	4.31	3.7	0.38	0.643	0.321	0.274	0.313	0.674	0.883	1.096
3808	380.8	All	118.3	14.4	0.65	4.31	1.5	0.60	0.441	0.153	0.287	0.332	0.403	0.518	0.654
1 st and 2 nd class roads															
601	60.1	1	81.1	14.7	0.71	1.88	1.5	0.28	0.339	0.098	0.229	0.270	0.327	0.392	0.465
2604	260.4	2	76.7	16.9	1.9	3.29	2.6	0.40	0.484	0.142	0.323	0.381	0.464	0.562	0.678
3468	346.8	3	71.8	18.1	3.3	4.99	4.2	0.49	0.644	0.209	0.400	0.497	0.619	0.766	0.909
3375	337.5	4	68.2	19.1	5	9.94	6.2	1.02	0.770	0.274	0.423	0.575	0.755	0.942	1.122
98	9.8	5	48.7	10.1	10.03	16.47	11	0.95	0.877	0.320	0.399	0.658	0.957	1.102	1.224
10150	1015	All	72.2	18.5	0.71	16.47	4.4	1.84	0.629	0.254	0.343	0.438	0.586	0.779	0.970

Table 5 Percentage of travelled sections in comfort level according to the ISO 2631-1 as a function of IRI road classes for motorways

IRI road class	IRI (mm/m)		a_v (m/s ²)					
			< 0.315	0.315-0.63	0.5-1	0.8-1.6	1.25-2.5	> 2
	min	max	not uncomfortable	a little uncomfortable	fairly uncomfortable	uncomfortable	very uncomfortable	extremely uncomfortable
Motorways								
1	0	1.9	22.4	72.3	17.1	1.2	0.1	0
2	1.9	3.3	6	60.6	61.3	7.8	0	0
3	3.3	5	29	16.1	48.4	32.3	6.5	0
All	0.65	4.31	18.9	69.2	27.1	2.9	0.1	0
1 st and 2 nd class roads								
1	0	1.9	46.6	52.2	6.3	0.2	0	0
2	1.9	3.3	8.4	77.2	38.9	3.1	0	0
3	3.3	5	2.1	49.8	68.9	20.4	0.7	0
4	5	10	2.5	29.6	64.8	43.4	4.6	0.1
5	10	–	2	22.4	35.7	64.3	8.2	0
All	0.71	16.47	6.5	50	55.8	22.8	1.9	0

Comfort levels “a little uncomfortable” and “fairly uncomfortable” prevailed for all road categories.

Higher percentage of road segments in the same IRI road class corresponds to “fairly uncomfortable” (by 28.7%) and “uncomfortable” (by 19.9%) levels for the 1st and 2nd class roads than for motorways. The comparison is influenced with an unequal number of segments N in groups and higher mean speed by 30 to 40 km/h on motorways on the section of the same road class.

Road class #1 for motorways and road class #2 for the 1st and 2nd class roads indicate similar percentage of acceleration response in “uncomfortable” category (1.2% vs. 3.1 %).

Road class #3 for motorways and road class #4 for the 1st and 2nd class roads indicate similar percentage of acceleration response in “uncomfortable” category (32.3% vs. 43.4 %).

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Using Equation (2) to compare IRI thresholds, the correction factor in relation $IRI(130) = f(IRI(90))$ would be lower at about 0.30-0.35.

7. Conclusions

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- Indication of comfort levels “very uncomfortable” and “extremely uncomfortable” was very rare. Comfort levels “a little uncomfortable” and “fairly uncomfortable” prevailed. About fifty percent of all the processed sections exceeded a lower bound of expected “fairly uncomfortable” reaction ($a_v = 0.5$ m/s²). About 1.9 % of all the processed sections of the 1st and 2nd road class exceeded a “very uncomfortable” level.
- Different passenger’s WBV was identified for the same IRI road classes between motorways and the 1st and 2nd class roads. For the same IRI road class, the median total passenger vibration was about 10-20 % higher on motorways.

References

- MUCKA, P., STEIN, G. J., TOBOLKA, P. Passenger ride comfort and International Roughness Index specifications in the Slovak Republic. *Communications - Scientific Letters of the University of Zilina* [online]. ISSN 1335-4205, 2019, **21**(1), p. 15-22. ISSN 1335-4205/eISSN 2585-7878. Available from: <http://komunikacie.uniza.sk/index.php/communications/issue/view/36>