**Tables of European Standards**

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| --- | --- | --- | --- | --- |
| **Country** | **Title/reference** | **Code/number** | **Web link** | **Short Description and Comments** |
| Albania | -No data- |  |  |  |
| Andorra | -No data- |  |  |  |
| Armenia | -No data- |  |  |  |
| Austria | Building vibrations; blasting vibrations and comparable immissions of impulse shape | ÖNORM S 9020:1986 | www.on-norm.at | Assessments of distance – charge relation and structure classification. Discrete PPV limits on four different building categories. Influence of frequency is considered in two steps; distance 15 - 50 m, and above 50 m. PPV criteria is maximum vector sum of all directions. |
| Azerbaijan | -No data- |  |  |  |
| Belarus | -No data- |  |  |  |
| Belgium | German Standards | DIN 4150 |  |  |
| Bosnia and Herzegovina | -No data- |  |  |  |
| Bulgaria | International Standards2) | ISO 4866:2010 |  |  |
| Croatia | German Standards2.C) | DIN 4150 |  |  |
| Cyprus | -No data- |  |  |  |
| Czech Republic | Loads of technical structures by technical seismicity | ČSN 73 0040 (1996) | www.cni.cz | PPV limits estimated regarding ground conditions, classes of resistance (construction types), degree of damage (crack size generation) and duration and magnitude of work. Three frequency dependent steps (<10 Hz, 10-50 Hz, > 50 Hz). Charge assessment formulas included. |
| Denmark (Greenland and Faroe Islands) | German Standards  Swedish Standards  Norwegian Standards | DIN 4150  SS 4604866:2011  NS8141-1:2012 | http://explosives.dk/anvisning1.aspx |  |
| Estonia | Blasting projects requirements - Prediction of vibration limits and maximum charge1) | RTL 2005, 63, 910 | www.riigiteataja.ee | Basically the same as the Swedish standards, except two more construction type classes. |
| Finland | Finnish guidelines for environmental vibrations from construction work and traffic1) | RIL-253-2010 | www.ril.fi | Similar to Swedish standards. Additionally, PPV limit values adjusted according to officially qualified consultant competence on the actual project. |
| France | Decree of 22 September 1994 concerning mining and quarrying and rock material processing1) | NOR: ENVP9430348A | www.legifrance.gouv.fr | Only quarrying and mining regulations. Measurements are weighted according to a predefined frequency vs. movement log graph, giving a maximum PPV level of 10 mm/s for buildings occupied or inhabited by third parties or used for any other human activity and all monuments constructions. (Blasting in Public works has no obligation to follow the standard. Specific limits are set depending on the site environment and linked administrations.) |
| Georgia | -No data- |  |  |  |
| Germany | Vibrations in buildings - Part 1: Prediction of vibration parameters  Vibrations in buildings - Part 2: Effects on persons in buildings  Vibrations in buildings - Part 3: Effects on structures | DIN 4150-1:2001-06  DIN 4150-2:1999-06  DIN 4150-3:1999-02 | [www.din.de](http://www.din.de) | Standard divided in three separate parts. Part 3 treats the vibration effects on structures. PPV limits based on type of structure, and three frequency levels (1-10 Hz, 10-50 Hz, 50-100 Hz). Above 100 Hz the given values may be used as minimum criteria. Ground conditions not included in the PPV g values guide lines. The standard has a maximum PPV value for vibration measures at the top floor of the particular building, according to each frequency level. |
| Hellas/Greece | German Standards2) | DIN 4150 |  |  |
| Hungary | -No data- |  |  |  |
| Iceland | Explosives Regulations1) | No. 684/1999 | [www.reglugerd.is](http://www.reglugerd.is) | Discrete PPV limits based on ground conditions, construction type and building material, duration of project. |
| Ireland | British Standards (UK)2.D) |  |  |  |
| Italy | German Standards (Swiss standards)2.A) | DIN 4150  (SN 640 312a) |  |  |
| Kazakhstan | -No data- |  |  |  |
| Latvia | -No data- |  |  |  |
| Liechtenstein | German Standards (Swiss standards) | DIN 4150  (SN 640 312a) |  |  |
| Lithuania | -No data- |  |  |  |
| Luxembourg | German Standards | DIN 4550 |  |  |
| Macedonia | -No data- |  |  |  |
| Malta | British Standards (UK) | BS ISO 4866:2010 |  |  |
| Moldova | -No data- |  |  |  |
| Monaco | -No data- |  |  |  |
| Montenegro | -No data- |  |  |  |
| Netherlands | German Standards | DIN 4550 |  |  |
| Norway | Vibration and shock - Guideline limit values for construction work, open-pit and pit mining and traffic. Part 1: Effect of vibration and airblast from blasting on constructions, including tunnels and caverns. | NS 8141-1:2012 | [www.standard.no](http://www.standard.no) | PPV limits are frequency weighed. The PPV limits are based on an equation including factors related to construction type and condition, building material, and project duration. Ground conditions are not included in the vibration velocity guideline values. Separate PPV limits for underground facilities (tunnels and caverns).  The previous standard NS8141:2001 (still valid in a transition period till 2015), are similar to the Swedish standard. |
| Poland | Evaluation of harmful vibrations transmitted through the ground to buildings1) | PN-85/B-02170 |  | PPV limits are dependent on frequency, building shape (low or high) and the degree of damage influence on the buildings. (PPV limits must be estimated by one of the Polish Mining Office's two authorized bodies: Exploconsult or Poltegor.) |
| Portugal | Evaluation of influence of vibrations on buildings caused by explosions or similar sources1) | NP 2074:1983 | [www.bnportugal.pt](http://www.bnportugal.pt) | PPV limits are set as a product of three factors, which include ground conditions, construction characteristics and the number of blasts per day. |
| Romania | -No data- |  |  |  |
| Russia | Vibration and shock. Vibration of buildings. Measurement of vibration and evaluation of its effects on structure | GOST R 52892-2007 | [www.runorm.com](http://www.runorm.com) | The standard specifies the methods of measurement of vibration and evaluation of its impact on the design of buildings. Impact assessment is based on the risk of structural damage that could reduce its reliability. |
| San Marino | -No data- |  |  |  |
| Serbia | -No data- |  |  |  |
| Slovak Republic | EN Eurocode | EUR 25204 EN-2012 |  |  |
| Slovenia | German Standards (Austrian and Swiss) | DIN 4150  (ÖNORM S 9020:1986)  (SN 640 312a) |  |  |
| Spain | Control of vibration made by blasting | UNE 22381:1993 | [www.aenor.es](http://www.aenor.es) | Vibration criteria are both in PPV and particle displacement according to three structure classes and three frequency ranges. (2 Hz – 15 Hz, PPV is used. 15 Hz - 75 Hz particle displacement is used, >75 Hz PPV is used). |
| Sweden | Vibration and shock - Guidance levels for blasting-induced vibration in buildings | SS 4604866:2011 | [www.sis.se](http://www.sis.se) | PPV limits estimated according to an equation with factors describing type of ground, type of structure and construction material, distance and project time. |
| Switzerland | Vibrations. The effect of vibrations on constructions.1) | SN 640312a:1992-04 | [www.snv.ch](http://www.snv.ch) | Discrete PPV limits based on building sensitivity, number of impacts and three dominant frequency steps (<30 Hz, 30 – 60 Hz, >60 Hz). PPV criteria are maximum vector sum of all directions. |
| Turkey | German Standards2.B) | DIN 4550 |  |  |
| Ukraine | Norms of seismic safety.  Method for determination of actual seismic stability of buildings and constructions | DCTU 4704:2008  DCTU 7116:2009 |  | Translation coming... |
| United Kingdom (England, Northern Ireland, Scotland and Wales) | Evaluation and measurement for vibration in buildings.  Part 2: Guide to damage levels from groundborne vibration | BS7385 Part 2:1993 | www.bsigroup.com | Guide PPV values are limited to a curve defining no cosmetic damage. They are based on two building classes and three frequency steps (4 Hz to 15 Hz, 15 Hz – 50 Hz, > 50 Hz). For frequencies < 4 Hz a maximum particle displacement of 0.6 mm is the limit. The maximum of the triaxial components is should be used for the assessment. |
| Vatikan City | -No data- |  |  |  |
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| EN Eurocode | Eurocode 8: Seismic Design of Buildings - Worked Examples | EUR 25204 EN - 2012 | eurocodes.jrc.ec.europa.eu | The code treats mainly the design of buildings and earthquake resistance. |
| International Standard | Mechanical vibration and shock -- Vibration of fixed structures -- Guidelines for the measurement of vibrations and evaluation of their effects on structures | ISO 4866:2010 | www.iso.org | The ISO standard presents methods for the standardization of rules, is very general and does not present values for defining PPV limits. |
| *1) Unofficial translation 2) Based on second hand references (scientific papers or other articles)* | | | | |

SECOND HAND REFERENCES

1. Cardu, M. 2007. An example of preliminary seismic survey to evaluate the feasibility of blasting works in proximity of a sensitive monument. Vienna Conference Proceedings 2009, P. Moser et al © 2009 European Federation of Explosives Engineers. ISBN 978-0-9550290-1-1.
2. Kahriman et.al. 2009. The analysis of ground vibrations induced by blasting at Cebeci Quarries in Istanbul, Turkey. Budapest Conference Proceedings 2009, P. Moser et al © 2009 European Federation of Explosives Engineers. ISBN 978-0-9550290-2-8.
3. Vrkljan. D, et al. 2005. Safe seismic zone determination during construction pit excavation for a university library in Split, Croatia. Brighton Conference Proceedings 2005, R. Holmberg et al © 2005 European Federation of Explosives Engineers. ISBN 0-9550290-0-7.
4. National Roads Authority. 2004. Guidelines for the treatment of noise and vibration in national road schemes. Ireland.
5. Baliktsis, E et al. 2013. A multi-functional blast planning and vibration monitoring program for the construction of three tunnels on the Motorway Athens – Salonica, Hellas. Moscow Proceedings 2013 Part II, © European Federation of Explosives Engineers. ISBN 978-5-98746-016-0. "Alliance press" Ltd, Moscow.

OTHER USEFUL REFERENCES

Bernardo, P & Dinis da Gama, C. 2006. Suggestions to improve the Portuguese standard for vibration control in constructions. Centro de Geotecnia do IST , Lisboa, Portugal.

Holmberg, R & Jonson, D. 2004. Swedish standards for ground vibrations and airblast. Stockholm, Sweden

Malta Environment and Planning Authority. 2012. Terms of reference for vibration monitoring of quarry blasting.

Olofsson, S.O. 2002. Applied explosives technology for construction and mining. Ärla, Sweden. ISBN 91-7970-634-7.

Vuento, A. 2012. Finnish guidelines for environmental vibrations from construction work and traffic. Powerpoint Presentation, Nordic Ground Vibration Day 2012, Oslo.