

Fungus Cellar Test

Keywords

Fungus cellar, wood preservatives, use class 4, wood-deteriorating fungi

Fields of application

Testing of wood preservatives in ground contact. Uses: applications for efficacy testing, research projects on biocidal substances.

Procedure and equipment

Impregnated wooden stakes are buried half way into soil beds placed in brick basins in temperature and moisture controlled cellars.

The moisture content of the soils is adjusted by an electronically controlled sprinkler installation to produce and maintain a moisture range in the stakes that promotes fungal attack of the wood.

At annual intervals the stakes are removed from the soil, deterioration by micro-organisms is visually assessed according to a rating scheme outlined in EN 252 and they are finally subjected to a bending test to determine their modulus of elasticity (MOE). The bending test is controlled by a computer programme which was developed at BAM to ensure that the elastic (linear) range of deformation is not exceeded.

Test objects

- a) Wood preservatives and
- b) Specimens of timber species of which the natural durability shall be determined

Test parameters / criteria

- a) Determination of preservative retentions required for a long-term protection of wood based on the attack of micro-organisms in accordance with a rating scheme laid down in EN 252 as well as on the percentage reduction of the bending MOE over the exposure period.
- b) Determination of the natural durability of specimens of a timber species on the basis of the attack of micro-organisms according to a rating scheme laid down EN 252.

Uncertainty / reliability

- a) Depending on the preservative concentration series chosen. When a series with a factor $\sqrt{1.7}$ is chosen, which is recommended in EN 252, this corresponds to roughly one concentration level.
- b) Reliable values are obtained only for the tested lot of the wood species due to possible variations in the growth conditions of the wood.

Qualification und quality assurance

The system is worldwide unique due to its particular arrangement of the stakes and the moistening installation. The fungus cellar test as described above has been used at BAM for the past two decades. In other countries only the field test according to EN 252 or comparable methods are applied or laboratory procedures employing test specimens of very small dimensions, e.g. according to ENV 807, are used.

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Further information

Wood may be utilised and thus be destroyed by micro-organisms and wood boring insects. Attack by micro-organisms presupposes a certain moisture content which in turn depends on the environmental conditions to which the timber is exposed. In situations where wood is used out-of ground contact, it is exposed to the surrounding relative humidity and precipitation. When wood is used in contact with the ground its moisture content is related to the moisture content of the ground. The relevant micro-organisms are brown rot, white rot, and soft rot microfungi and to a lower extent also bacteria.

Preventive chemical wood preservatives are intended to increase the durability of timber by preventing the attack of micro-organisms and wood-boring insects. The effectiveness of the biocides used may vary greatly in relation to different types of micro-organisms. The same applies to tests of the natural durability of timbers.

Stakes treated with wood preservatives in accordance with EN 252 or untreated stakes of the timber species to be studied are buried half-way into a test soil. By means of a water-spraying apparatus the moisture of the soil is controlled at a level that promotes fungal attack. This sprinkler installation is controlled electronically. By means of tensiometers the suction tension in the soil is measured. The measured data are processed in a computer and the water quantity to maintain the required soil moisture is calculated.



Fig. 1: BAM Fungus Cellar. Tests of wood preservatives for wood to be used in ground contact.



Fig. 2: BAM Fungus Cellar. Tests of wood preservatives for wood to be used in ground contact. Determination of the soil moisture with tensiometers.

Tests with wood-deteriorating fungi are very time-consuming. According to EN 252 a minimum test period of five years is envisaged for field tests of wood used in ground contact. The fungus cellar offers a possibility for accelerating such tests. In the field the activity of micro-organisms is reduced by low temperatures and is stopped altogether at temperatures below zero. This can be prevented in the fungus cellar by maintaining constant favourable temperatures thus producing an acceleration of the tests by a factor of about 2. In addition, a reduction of the specimen size laid down in EN 252 to dimensions of 400 mm x 20 mm x 20 mm (Gersonde, 1987; Grinda and Göller, 2005a, b) contributes to the accelerating effect of the fungus cellar test.

EN 252 provides for at least one visual annual assessment of the fungal activity. As such visual assessments are rather subjective, the BAM fungus cellar test includes an evaluation of the strength of the wood specimens. On the basis of a bending test according to EN 52186 the static modulus of elasticity (MOE) of each stake is determined prior to its exposure in the fungus cellar. These measurements are repeated at yearly intervals and the residual MOE of each stake is determined as a percentage of the initial MOE (Stephan, Grinda and Rudolph, 1998). A computer-based procedure has been developed at BAM to prevent the timber from being overstressed in the bending test. The load is applied within the linear range of the load application curve, i.e. it is restricted to the elastic range of the timber without reaching a permanent deformation (Stephan, Göller and Rudolph, 1996).

According to the building regulations of the Laender of the Federal Republic of Germany load carrying and wood-bracing building components made of timber must be treated with a wood preservative which has been approved by the Deutsches Institut für Bautechnik (DIBt), Berlin. For assessing the performance of such wood preservatives the DIBt requires i.a. a fungus cellar test.

Literature

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