Danish Indoor Climate Labelling

Determination of release of particles from building products

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Further information:

Danish Indoor Climate Labelling
Danish Technological Institute
DK-2630 Taastrup

E-mail: indeklimamaerket@teknologisk.dk
Web: www.indeklimamaerket.dk

List of Contents

1. Introduction

The standard for determination of release of particles from building products was prepared with support from the National Agency for Enterprise and Housing. The 1st version of the present standard was prepared from July 1995 to September 1997.

This 2nd edition is slightly revised. The release of particles is only determined gravimetrically.

2. Scope

The present document describes a test method for quantification of the release of particles from materials. There is no differentiation between the type and dimensions of the particles.

The use of this method is prescribed by Danish Indoor Climate Labelling when testing products for the release of particles.

The method is based on NT Build 347 Ceiling boards, mineral fibres: Emission (Nordtest, 1989) in which background information is given.

By the method the release of particles is measured as sedimentary dust emitted from new, intact building products. Potential other properties relevant to the indoor environment are not considered. The method does not include evaluation of the particle release in the installation phase.

The method is intended for products which when installed according to the guidelines of the supplier can form part of the ceiling system. The method may be applied to other product areas.

3. Definitions

Sedimentary dust
By sedimentary dust is understood the amount of particles, which is able to settle at the bottom of the test chamber during the testing period including the time of at least 1 hour, in which the test setup is left untouched after the vibration has ceased.

4. References

Nordtest (1989) NT Build 347 Ceiling boards, mineral fibres: Emission. ISSN: 0283-7153. NORDTEST, Espoo, Finland.

5. Test setup

The test setup is designed as a chamber. The test specimen constitutes the chamber top and is vibrated by sound played through a set of loudspeakers mounted on the sides of the chamber. The test setup corresponds to the one described in NT Build 347.

The particles released from the test specimen fall onto the bottom of the chamber. After some time, the dust is collected from the bottom by means of vacuum cleaning through a filter. The weight of released particles per surface area is determined gravimetrically by weighing of the filter.

5.1 Test Chamber

The test chamber should have an interior surface, which neither emits particles nor gets statically charged and it should be easy to clean. The test chamber could be made of e.g. polished, stainless steel or wood covered with a metal plate on the inside.

In the following is an example of a test chamber described.

The test chamber has a basic area of 1.2 m x 1.2 m and a height of 0.6 m. The sides are made of 12 mm plywood. The chamber is double symmetrical and has two loudspeakers, two windows and four sliding doors. Inside it is covered with a 1 mm aluminium plate. Interior edges and corners are covered with aluminium foil, which makes the chamber bottom airtight and cleaning friendly.

The windows are equipped with 6 mm glass. The sliding doors are inside covered with 1 mm steel plates, which reduce the frictional resistance between door and the inside aluminium covering. The loudspeakers are on the front covered with a 0.2 mm rubber membrane (cofferdam plate), which makes cleaning simple.

The test specimen should be mounted as close as possible to practical conditions according to the guidelines of the supplier.

A sketch of the test chamber appears from Figure 1. A sketch with indication of dimensions and test specimen suspension/installation appears from NT Build 347 (Nordtest, 1989).

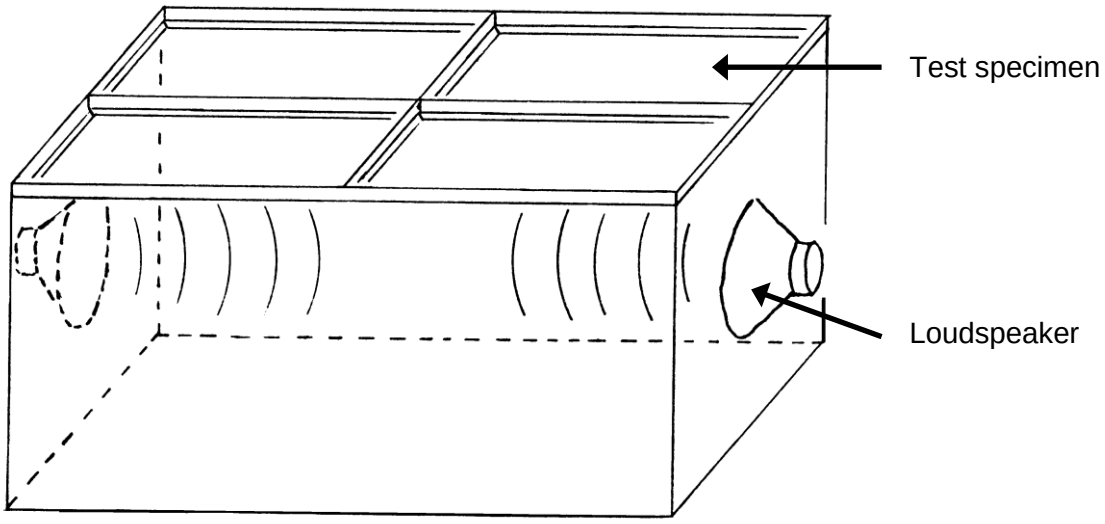

Figure 1 Sketch of test chamber

The test specimen is exposed to vibrations caused by pink noise induced to the test chamber from loudspeakers. The level of vibration is measured by means of an accelerometer.

The level of vibration is kept constant throughout the testing and measurements are carried out linearly with time weighting “RMS-slow” on directly showing measurement equipment or “RMS” on integrating measuring equipment.

The test should be carried out at constant air temperature and relative humidity. During the testing these parameters should be supervised. Test conditions should appear from the test report.

5.2 Noise generating equipment

Pink noise is used to induce vibrations to the test chamber. Pink noise is characterised by equal sound energy at all frequency bands from 20-20,000 Hz. The equipment used should be capable of applying frequencies in the range from approx. 80 to 4,000 Hz. The signal from the two loud-speakers should be in phase.

6. Material sampling

Collection of a material sample of the product is an important step in the testing procedure. The objective of the sampling is to obtain a material sample that is representative of the product being assessed and meets the requirements of the test to be performed.

6.1 Sampling location

The material sample shall be collected directly from the production or stock after normal manufacturing process as soon as the material may be released for sale.

If sampling at the production site is not possible, the material sample may be collected at delivery phase, provided the material has been stored in normal packaging. See also 6.3 Age of material sample below.

6.2 Packaging and transportation of sample to laboratory

The sample is packaged immediately after sampling in normal packaging. Different material samples shall be packed separately to avoid cross-contamination.

6.3 Age of material sample

The age of the material sample delivered to the test laboratory shall be similar to the typical product age when delivered for use/installation. I.e. if the product is available for installation/use only after a longer transportation period (weeks), the material sample should have the same age when arriving at the laboratory.

6.4 Sampling and handling of test specimens

At sampling the following should be recorded:

- Product name/type
- Date of production, batch or production number
- Date of packing
- Date of sampling
- Number and/or amount of sample(s)
- Sampling procedure (how the sample was taken)
- Other observations relevant to sampling and testing (e.g. storage of material before sampling)

- Name of the person responsible for sampling

7. Testing

The frame/suspension system with the test specimen is placed as a cover on the test chamber. The particles released during the test are settled at the bottom of the test chamber and collected by vacuuming the entire bottom of the chamber through a filter. At weighing of the filter before and after vacuum cleaning the amount of particles released is determined.

7.1 Preparation of a test specimen

The general guidelines for preparation and conditioning of the test specimen are stated below. Specific guidelines may appear from the product specific test and labelling criteria.

The test specimen is sampled at random from a larger quantity delivered by the supplier. Test specimen is sampled corresponding to the basic area of the test chamber (1.2m x 1.2m) and placed in a frame/suspension system, which as far as possible is similar to the installation system normally prescribed by the supplier. The number of joints between the panels should be the same as in practice. Joints should be placed above the centre of the test chamber. See Figure 2.

The test specimen should as far as possible remain its original form. If the test specimen is shaped, the edges should be treated according to the guidelines of the supplier.

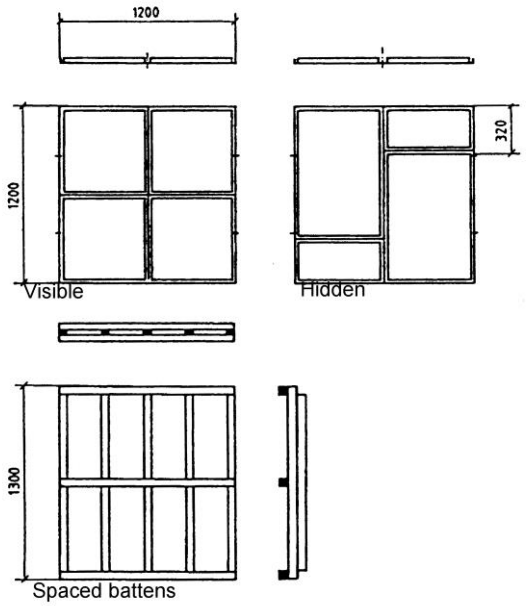

Figure 2 Examples of suspension of test specimen (Source: Nordtest, 1989)

Prior to testing the test specimen is conditioned at a constant temperature and relative humidity corresponding to the standard test conditions for a minimum of 24 hours. After conditioning the test specimens are placed in the suspension system.

7.2 Test conditions

Air temperature 23 ± 2°C

Relative humidity	50 ± 5%
Acceleration	2.4 ± 0.2 m/s^2

7.3 Procedure

The test specimen is placed in the supporting frame/suspension system and placed as a cover on the test chamber. The test setup is left untouched for a minimum of one hour. The bottom of the chamber is then vacuum cleaned thoroughly through the doors with the test specimen still in place.

The vibration is now turned on for one hour. The test setup is again left untouched for a minimum of one hour to allow for sedimentation of the released particles. With the test specimen still in place the bottom of the chamber is vacuum cleaned through the doors. The particles are collected on a filter.

The vibration is now turned on again for three hours. The test setup is again left untouched for a minimum of one hour to allow for sedimentation of the released particles. With the test specimen still in place the bottom of the chamber is vacuum cleaned through the doors. The particles are collected on a filter.

The vibration is now turned on for fifteen hours. The test setup is again left untouched for a minimum of one hour to allow for sedimentation of the released particles. With the test specimen still in place the bottom of the chamber is vacuum cleaned through the doors. The particles are collected on a filter.

7.4 Method of analysis

The analysis is based on a gravimetric method. The released particles are collected on a glass fibre filter, which detains particles larger than 0.7 µm. At weighing of the filter before and after vacuum cleaning the amount of particles released is determined and expressed in mg/m².

An industrial vacuum cleaner is used with a suction force of 40-50 l/sec and a vacuum of 20-23 kPa. A glass fibre filter (e.g. GF/F, Whatmann, 7.0 cm) mounted in a holder is placed as a nozzle on the vacuum cleaner tube. The nozzle is lead systematically from one side of the box to the other, then the same procedure is carried out transversely, so that the bottom is vacuum cleaned twice all over the area.

After removal of the filter from the holder, potential dust on the nozzle should be brushed onto the filter and be included in the amount of dust. Long plastic gloves should be used to avoid contamination from textiles and the skin.

Filters should be conditioned at controlled air temperature and relative humidity for at least 24 hours before and after sampling e.g. by placing the filters in a conditioned weighing room or in the test chamber. Simultaneously with the filters at least 3 reference filters are weighed. The weight should have a standard deviation of 20 µg and a resolution of 10 µg.

8. Assessment of results

For each individual testing the following should be described and documented:

- The sensibility of the method (detection limit) at standard test conditions should be documented
- Results documenting background values should be stated
- The test laboratory should document the standard deviation under the conditions in question

Blind measurements should be carried out like a normal measurement, but with a cover of plastic foil in stead of the test specimen. In this way the lower detection limit of the method is determined.

8.1 Calculation of test result

The particle release is determined by weighing the filters before and after exposure. The weight of the filter is corrected for the difference from the blind test.

The difference in weight of the blind tests before and after sampling should be determined for each weighing series.

The detection limit is determined as 3 times the standard deviation of the blind test exposed with plastic foil in the test chamber instead of specimen.

The result is stated as particle release calculated in mg dust per m² after 1, 3 and 15 hours respectively.

8.2 Assessment according to classes

The mean value for particle release determined after 3 and 15 hours' testing is used to assess the product.

The result is assessed in relation to the classification in 3 classes given in Table 1.

Table 1 Classes for release of particles

Class	Particle release [mg/m^2]
Low	≤ 0.75
Medium	0.75 < x ≤ 2.00
High	≥ 2.00

9. Test report

The test report should as a minimum contain the following:

- Name and address of the assignor
- Description and identification of the tested product, including:
  - Trade name
  - Production no., production week and date of receipt of the sample
  - Conditioning
  - Test period and test conditions
  - Description of the suspension system
- Result, including:
  - Calculated result and assessment according to classification
  - Detection limit
  - Background values of the test chamber