



norden

Nordic Innovation Centre

# POSITION PAPER

## NORDTEST VIEWS ON CLIMATIC REQUIREMENTS WHEN TESTING BUILDING MATERIALS AND STRUCTURES

Position paper 7  
Approved 1998 - 11

NORDTEST  
a Nordic Innovation Centre brand

## SUMMARY

Moisture content and temperature affect the properties of most building materials. It is therefore important that the climatic conditions are well specified when specimens are preconditioned and tests are performed. If this is not done, it will be almost impossible to obtain reliable test results.

It is difficult and expensive to condition laboratories and sometimes it is also almost impossible. European standards for testing building materials and structures specify many different climatic conditions for preconditioning and testing. There is therefore an urgent need for harmonisation of the climatic specifications in European standards.

The required climatic limits should correlate with the climatic influence on the test results. Unnecessarily tight demands should be avoided to save testing time and costs.

### **NORDTEST therefore makes the following statements:**

- Laboratory climate limits should not be specified when it is known that the climatic conditions do not significantly influence the test results.
- Laboratory climates specified in standards ought to be harmonised as far as possible
- A committee consisting of major interested parties should be set up by CEN and/or ISO for developing a standard on climates for conditioning and testing building materials and structures.

## **1. Background**

Concrete, wood, bricks and most other building materials are porous and hygroscopic. This means that their moisture content is dependent on the relative humidity of the surrounding environment: the higher the relative humidity, the higher their moisture content.

The moisture content affects many material properties. For example, the strength and Young's modulus decrease, ultra sound velocity is affected, density increases and frost resistance becomes poorer with increasing moisture content.

The temperature also affects many properties of building materials. Ageing processes are normally more rapid at higher temperatures. Brittleness, strength, emissions and in fact most other material properties are also more or less dependent on the temperature.

It is therefore important that the surrounding climatic conditions are sufficiently well specified when specimens are preconditioned and tests are performed. If this is not done, it will be almost impossible to obtain high precision, i.e. high reproducibility and high repeatability.

Other conditioning parameters such as the CO<sub>2</sub> content, wind velocity, etc., may also have an influence on the material properties. The discussion in this paper, however, is limited to the relative humidity and temperature, which are the two conditioning parameters normally considered to have the greatest influence on the test results.

## **2. Many different climates are specified in the European standards**

Manufacturing and testing of specimens normally take place in the laboratory while preconditioning and storage are often carried out in a climate chamber or a water bath.

EN, ENV and prEN standards for testing building materials and structures specify many different climatic conditions for preconditioning and testing. Cement testing, for example, specifies the different climates shown in the table below. As can be seen, three different laboratory climates are specified for cement testing alone: RF 50 %,

RF 65 % and RF 65 %. Different climates are also specified for preconditioning of specimens.

Other climates are used for other types of building materials. When testing asphalted roofing board, for example, the temperature is specified to  $23 \pm 2^\circ \text{C}$  and the relative humidity to 30-70%. The temperature  $20 \pm 2^\circ \text{C}$  and the relative humidity  $65 \pm 5\%$  are normally recommended for conditioning wooden materials and timber structures, see for example prEN 789. The list could be made much longer  
*EN standard climate specifications for testing cement*

**Determination of compressive strength, EN 196-1**

Laboratory  $20 \pm 2^\circ \text{C}$  RF  $\geq 50\%$

Climate chamber  $20 \pm 1^\circ \text{C}$  RF  $\geq 90\%$

Water bath  $20 \pm 1^\circ \text{C}$

**Determination of setting time, EN 196-3**

Laboratory  $20 \pm 2^\circ \text{C}$  RF  $\geq 65\%$

Climate chamber  $20 \pm 1^\circ \text{C}$  RF  $\geq 90\%$

**Determination of soundness, EN 196-3**

Laboratory  $20 \pm 2^\circ \text{C}$  RF  $\geq 65\%$

Climate chamber  $20 \pm 1^\circ \text{C}$  RF  $\geq 98\%$

Water bath  $20 \pm 1^\circ \text{C}$

**Determination of fineness, EN 196-6**

Laboratory  $20 \pm 2^\circ \text{C}$  RF  $\leq 65\%$

### **3. Conditioning of laboratories is expensive**

It is difficult and expensive to condition laboratories and sometimes it is also almost impossible. During the winter, the normal indoor climate in Nordic countries is very dry. The relative humidity is often only 20-30% and not infrequently even lower in the northern parts of Scandinavia. This necessitates the use of powerful, and therefore expensive and energy consuming, conditioning plants to obtain the specified climate. On the other hand, in some European countries the indoor climate may be very hot and humid during parts of the year. It is often even more complicated and expensive to reduce the humidity than to increase it. There is therefore an urgent need for harmonisation of the climatic specifications in different European standards in order to reduce the costs of climatisation of laboratories.

### **4. Proposals**

**Following on from the above discussion, NORDTEST makes the following statements:**

1. Laboratory climate limits are only to be specified when it is known that climate does significantly influence the test results. It is not always necessary to state limits for both temperature and relative humidity.

When developing a test method, the influence of climatic conditions on the test results has to be known. If this is not the case, investigations must be performed in order to clarify this influence.

2. The laboratory climates specified in European standards ought to be harmonised as far as possible. A standard laboratory climate should be specified and the range of the specified climate should be sufficiently wide to enable it to be obtained in all European climatic regions without excessive expense. Other climates should be specified only when it is known that the standard climate prevents the correct test results from being obtained with sufficiently high precision.

ISO 554 specifies standard atmospheres for conditioning and/or testing. The recommended atmosphere is  $23 \pm 2$  °C and  $50 \pm 5$  % RH. This climate is not normally used in EN-standards and the range of temperature and humidity is too narrow to be suitable for big laboratories used for testing building materials and structures.

NORDTEST therefore recommends that a committee consisting of major interested parties is set up by CEN and/or ISO for developing guidelines on standard climates for conditioning and testing of building materials and structures. The guidelines should be based on principles stated in ISO 554.

3. The climatic conditions for the preconditioning and storing specimens often influence the test results much more than the climate during the manufacture and testing of specimens. Preconditioning and storage are normally carried out in small climate chambers or in a water bath. It is much easier to obtain a specified climate in a climate chamber than in a whole laboratory. A number of different climates and more exactly specified climatic conditions can therefore be specified in standards for preconditioning, without introducing high costs. However, climatic conditions for preconditioning and storage should also be harmonised as far as possible.
4. Problems may arise when there is a substantial difference between the preconditioning climate and the climate of the laboratory in which testing is performed. This can be overcome by limiting the time for which the specimens

are permitted to be kept in the laboratory climate before testing. This aspect is not normally considered in EN-standards.

**NORDTEST POSITION PAPER 007**  
**Approved 1998-11**



**norden**

Nordic Innovation Centre



Return address:  
Nordic Innovation Centre,  
Holbergs gate 1,  
NO-0166 Oslo, Norway

## NORDTEST

NORDTEST is a Nordic Innovation Centre brand offering competence and expertise in the field of harmonizing of norms and methods, a large Nordic net-work of experts, more than 650 recommended Nordic testing methods and 550 published technical reports.

[www.nordicinnovation.net](http://www.nordicinnovation.net)

## Nordic Innovation Centre

The Nordic Innovation Centre initiates and finances activities that enhance innovation collaboration and develop and maintain a smoothly functioning market in the Nordic region.

The Centre works primarily with small and medium-sized companies (SMEs) in the Nordic countries. Other important partners are those most closely involved with innovation and market surveillance, such as industrial organisations and interest groups, research institutions and public authorities.

The Nordic Innovation Centre is an institution under the Nordic Council of Ministers. Its secretariat is in Oslo.

For more information: [www.nordicinnovation.net](http://www.nordicinnovation.net)