1 SCOPE
The scope of this NORDTEST method is to evaluate the suitability of walls especially walls containing wood or wood based materials in bathrooms or other rooms with a similar exposure to water. The test is intended to simulate the effect of long-term use.

2 FIELD OF APPLICATION
The method is applicable to all walls intended for use as watertight walls in bathrooms and similar rooms.

3 REFERENCES
Nordtest method NT-Build 448 "Wall coverings and bushings for water pipes and taps in bathrooms: Water-tightness".

4 DEFINITIONS
Water-tightness in this connection refers to the resistance to water penetrating into or through the wall during the test.

5 SAMPLING
Only one sample is used for the test. The sample is constructed in the laboratory as a test wall with adjoining floor and ceiling.

For the test of watertight membranes a commonly used wall type should be selected as substrate in collaboration with the client, for example gypsum boards on a steel framed partition. Preferably the type of test wall selected shall be the one assessed to be most critical for the membrane to be tested. If relevant the test may be performed on the watertight membrane without the final cladding, e.g. ceramic tiles.

The test wall shall be made in accordance with the manufacturer's and/or supplier's instructions and shall be made in the same way as intended to be used in practice. The wall shall be at least 2.3 m high and shall be specified by number and type of studs, fastenings, reinforcement for wash basin etc. For membranes or other watertight layers the application shall be in accordance with the instructions/directions of the manufacturer/supplier.

The test wall shall have at least one salient corner (facing into the room) and one window situated approximately 1.2 m above floor level and 0.3 m from adjoining walls. Two water pipes and one drain shall penetrate the wall. The penetrating pipes shall be perpendicular to the surface of the wall and shall be fixed to the wall in the same way as it is specified to be done in practice. The ends of the pipes shall be plugged. The dimensions of the pipes shall preferably be approximately 21.8 mm (1/2" pipe) for the water pipes and approximately 32 mm for the drain. Two supports for a wash basin are mounted approximately 0.8 m above floor level.

When relevant the test specimen might include other details than described above.

In order to facilitate the assessment of whether water is penetrating into or through the wall during the test, a moisture indicator might be applied to parts of the wall and/or the changes in moisture content in wood, gypsum boards etc. might be recorded during the test.

6 METHOD OF TEST
6.1 Principle
The wall is exposed to alternating influences from hot and cold water and changes in relative humidity. The pipes and the support for the wash basin are exposed to short term mechanical loads.

If relevant the specification of exposure described in the following might be modified, for example by adding supplementary moisture exposure to simulate the changes in relative humidity due to the influence of variations in seasons.

6.2 Apparatus
A test rig consisting of a watertight floor, a ceiling and two walls. The floor is made with a slope and a floor gulley large enough to avoid accumulation of water on the floor during the test. In the walls of the test rig there shall be a door and...
an inlet for air near the floor, e.g. under the door and an outlet for air near the ceiling. The test rig shall allow test walls to be made with realistic details. An example of a test room is shown in Figure 1.

![Diagram of a test room](image)

Fig. 1. Example of test room. The arrows indicates the nozzles. The windows is in the part of the wall between the re-entrant corners. Water shall not be sprayed directly on the window.

7 nozzles mounted about 1 m above floor level and at a distance of about 300 mm from the surface of the wall. The nozzles shall be connected to water pipes or tubes. The spray of water from the nozzles shall form a cone of about 60° and shall be evenly distributed. The water pressure shall be about 0.1 MPa before the nozzles, giving about 4 l water/min.

Note: A suitable nozzle is produced by Spraying Systems Inc., USA. It is marked:

\( \frac{1}{4} \text{ G} 10 \) (female) or

\( \frac{1}{4} \text{ GG} 10 \) (male)

Facilities to provide the test rig with hot and cold water and to control the relative humidity according to the following schedule:

- 55 ± 5°C hot water for 7.5 min.
- 10 ± 5°C cold water for 7.5 min.
- 95 - 100% RH for 45 min.

Decrease the relative humidity to 30-50% RH within 1 hour and maintain this level for another 4 hours.

An ordinary fan is used to ensure a quick decrease in the RH.

A device to test the resistance to dynamic forces of the bushing for the water pipes according to NT Build 448.

Note: The device consists of a small electric motor, e.g. a 12 V wiper motor, equipped with a rotating arm with a weight at the end. The length of the rotating arm is 400 mm and the mass of the deadweight is 0.5 kg. The arm shall rotate at 45 revolutions per minute. The motor is provided with a piece of pipe on the back so that it can be connected to the pipe penetrating the wall. The mass of the entire device is 2.5 kg. The rotating arm shall be at a distance of approximately 600 mm from the wall surface.

Moisture indicator, e.g. 1 part methylene blue and 200 parts talcum by weight, and/or moisture sensors or moisture meters.

### 6.3 Preparation of test samples

The test sample is constructed as described above (Section 5). If necessary, for example to allow hardening of membranes or adhesives, the entire construction is left in the test laboratory for sufficient time to allow hardening, drying out etc. There are no specific requirements regarding the temperature and humidity in the laboratory during the conditioning. Immediately before the test, the wall surface is washed with water with an admixture of neutral detergent.

To facilitate the assessment of the water-tightness of the bushing for the water pipes it is recommended to record the moisture content around the bushing during the test e.g. by mounting moisture sensors in the wall.

### 6.4 Procedure

A static load of 1500 N facing vertically down is applied on the front of the wash basin. The load is removed after 5 minutes. The deflections of the supports are measured at a distance of 300 mm from the wall prior to the loading and 10 minutes after the load has been removed. Any signs of damage are recorded. The procedure is repeated after 3 and 6 weeks.

The nozzles are placed so that the spray points towards the most critical parts of the wall, e.g. joints, corners and pipes, see Figure 1. The window must not be directly exposed to the water spray.

The walls are exposed to hot water, cold water, high humidity and low humidity, according to the schedule in section 6.2. The exposure is repeated 168 times (i.e. 6 weeks exposure time). After 3 weeks the electro-motor is mounted on one of the water pipes at a distance of 0.6 m from the wall surface. The motor shall run for 24 hours. The procedure is repeated on the other water pipe.

During the test, the test wall is daily inspected visually both from the inside and the outside. Any penetrations of water, change in appearance, change in moisture content etc., shall be recorded.

After the exposure the test wall is left in the laboratory climate for 2 weeks. Inspection during this period takes place after 1, 3, 7, and 14 days.

Finally the wall is dismantled and any water penetrations, dimensional changes or other factors, which may have influence on the durability, are noted.
6.5 Expression of results

The wall is said to be watertight if there is no sign of water penetrating the wall.
If no damage, e.g. dimensional changes, has occurred the wall is said to be water-resistant.

6.6 Test report

The test report shall include the following information:

a) Name and address of the testing laboratory
b) Identification number of the test report
c) Name and address of the organisation or the person who ordered the test
d) Purpose of the test
e) Name and address of manufacturer or supplier of the tested object
f) Method of sampling and other circumstances (date and person responsible for sampling)
g) Name or other identification marks of the tested object
h) Description of the tested object
i) Date of supply of the tested object
j) Date of the test
k) Test method
l) Conditioning of the test specimens, environmental data during the test (temperature, pressure, RH, etc.)
m) Identification of the test equipment and instruments used
n) Any deviations from the test method
o) Test results (use SI units)
p) Inaccuracy or uncertainty of the test result
q) Date and signature.