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Guidelines for SINTEF Technical Approval for

Vapour barriers

1. General information about SINTEF Technical Approval

General information about SINTEF Technical Approval procedures is available at http://www.sintefcertification.no/en-us/PortalPage.aspx?pageid=180

2. Properties to be included in the approval and how the properties are determined

SINTEF Technical Approval for vapour barriers shall normally include a documentation of product properties shown in Table 1 and 2.

Requirements concerning material and product descriptions related to environment properties are available at; http://www.sintefcertification.no/en-us/PortalPage.aspx?pageid=180

For vapour barriers it is required with documentation of emission, this means that an emission test must be performed.

3. Description of the manufacturer's factory production control

As a basis for the approval SINTEF must receive a copy of the description of the manufacturer's control plan for the product. This may be the relevant part of the manufacturer's quality control system for the product, or other documentation describing the manufacturer's factory production control. The person responsible for the factory production control shall be identified.

The control plan shall as a minimum describe the controls performed for:

- Incoming materials
- The production process
- Finished product
- Marking and storage (including the control frequency, how the controls are performed and by whom.

The factory production control description shall also include what measures are taken when faults are observed in the production or in the product.

4. Supervisory production control

Supervisory production control normally comprises an annual inspection at the plant performed by an independent body. General description of how the supervisory product and production control are performed is available at; http://www.sintefcertification.no/en-us/PortalPage.aspx?pageid=180

However, for vapour barriers, SINTEF axcept a certified quality system, according to ISO 9001, as an adequate supervisory production control. A copy of valid ISO certificate shall always be filed at SINTEF. In addition, SINTEF have to receive a confirmation each year which states still validity for the certificate.

Supervisory production control includes, in addition to the above mentioned conditions, an annual random testing of the products has to be carried out. Table 3 shows an overview of annual audit testing of vapour barriers.

5. Application for SINTEF Technical Approval and project management

Information regarding application and project management for SINTEF Technical Approval is available at; http://www.sintefcertification.no/en-us/PortalPage.aspx?pageid=180

6. More information

Further information about SINTEF Technical Approval can be found on www.sintefcertification.no.

7. Special technical conditions

7.1 Moisture adaptive vapour barriers

Water vapour resistance for several relevant moisture levels (% RH) have to be documented both in fresh and aged condition.

7.2 Reflective vapour barriers

Emissivity has to be documented both in fresh and aged condition.

7.3 Use of tape

Any tape belonging to the vapour barrier shall be documented in accordance with SINTEF's guidelines for tapes used in buildings. See also clause 7.6.

7.4 Thickness of vapor barriers

Regarding thicknesses of vapor barriers, the following guidelines are valid:

Vapour barriers of polyethylene (PE)

SINTEF recommends minimum thicknesses for vapor barrier of polyethylene. Mimimum thickness is is set to ensure that the vapor barrier has a certain robustness against damage in connection with installation, and during work on construction site, until a protective cladding is installed. These recommendations are based on years of experience.

We recommend **a minimum thickness of 0,20 mm** for vapour barriers used in compact flat roofs and also for use in floors on the ground. For use in walls and ceilings in traditional wooden structures, we recommend **a minimum thickness of 0,15 mm.**

SINTEF Technical Approval can also be issued for building systems of wood in the form of elements and modules produced in a factory. SINTEF ca, for prefabricated elements and modules, under certain circumstances, approve thicknesses down to 0,10 mm for vapour barriers of polyethylene. The vapour barrier has then to be covered and protected at the factory until installation on site.

The requirement for protection of the vapor barrier also includes possible protruding "flaps" in connection with overlap joints.

Production and detail design are evaluated in each case before a vapor barrier, with a thickness down to 0.10 mm may be included in a Technical Approval for a building system.

Fields of applications for vapour barriers, with the conditions described above, is so limited that SINTEF do not want thicknesses below 0.15 mm to be included in a separate Approval for a vapour barrier. This decision is made to avoid both misunderstandings, and use of vapor barriers with thicknesses less than SINTEF's recommendations.

Vapoour barriers of other materials than polyethylene

For other materials than polyethylene, the thickness requirement can be deviated provided that the material is assessed to be suitable for use (sufficient air tightness, sufficient strength- and durability properties, etc.).

7.5 Evaluation of durability

The durability is evaluated based of testing of fresh and and artificially aged material in laboratory. Changes in properties before and after ageing are evaluated.

- The properties must not change more than 20 % in relation to the tested fresh product.
- If the change is between 20 % and 30 % of the properties for fresh material, the properties must be within 15 % of the recommended value for the fresh product.
- If the change is larger than 30 %, the properties must be better than, or as good as, the recommended value for fresh product. The durability properties have to be evaluated in each case.
  - -For roll products can for example low values for elongation be balanced/compensated with high values for tensile strength and analogous can low values for tensile strength be compensated with high values for elongation.
  - -Use of tape together with vapour barriers are covered by own guidelines for tapes.
- Changes larger than 50 % will basically not be accepted.

Proposed text for approval documents:
XX vapour barrier is assessed to have satisfactory durability when used as described in clause 6. The durability is evaluated based on laboratory tests after artificial climate ageing consisting of alcaline ageing and ageing with and UV radiation followed by heat ageing.

7.6 Air tightness

Air tightness, inclusive joints, is one of the most important properties for a vapour barrier. Determination of air tightness must, of this reason, be evaluated for vapour barriers of other materials than polyethylene, for vapour barriers with other materials in the surface or for reinforced products. Determination of air tightness can then be carried out either using a simplified test or a full scale test as for wind barriers and combined roofing underlays and wind barriers in roll form (see SINTEF's guidelines for roofing undelays and wind barriers).

If the vapour barrier is of polyethylene, and is installed with clamped joints (according to Byggforskserien 523.255 *Bindingsverk av tre. Varmeisolering og tetting*), is such product considered to have sufficient air tightness without any testing.

Tape used in overlapping joints can also be approved presupposed that the two parts of the vapour barriers are fastened in other ways. An example is products in roll form with widths less than deck to ceiling height. When they are installed horizontally on a wall, there will be two parts with a horizontally joint which can not be clamped to a firm support. This joint can then be permanent air tight by use of tape presupposed that the vapour barrier is clamped to the studs in a normal way. An other example is horizontally vapour barrier layers in roofs where the vapour barrier parts are squeezed between other material layers. Then the overlapping joints can be made extra air tight using tape. The point is that the tape glue should not be subjected to gravity from the vapor barrier. If that happens, it may be a time

issue before the tape loosens. It is also a prerequisite that the tape has documented satisfactory durability and adhesion to the vapor barrier and any other materials to which the vapor barrier must be taped.

7.7 Products properties

Table 1 and 2 below show av overview over material properties for vapour barriers for fresh and aged material.

Table 1: Fresh material for 0,15 mm thickness

Property	Method	Unit	Recommended minimum values	Guidelines for approval
Weight- and weight margin,/Thickness and thickness margin	EN 1848-2:2001 EN 1849-2:2009	kg/m² / mm	Mean value	Declared value shall be met Declared value shall be met
Water thightness	EN 1928:2000	-	Tight at 2 kPa	Passed
Water vapour resistance	EN 1931:2000	s_d – value (m) m^2sPa/kg	Minimum Minimum	Declared value shall be met > 10 > 50 ·10^{-9}
Foldability at low temperature	EN 495-5:2013	°C	Maximum	Can be declared (recommended ≤ -20)
Dimensional stability	EN 1107-2:2001	%	Maximum	Can be declared. Relevant for reinforced products (recommended ≤ ± 1)
Resistance to tearing (nail shank) [1)]	EN 12310-1:1999	N	Minimum	Declared value shall be met (recommended ≥ 60)
Tensile strength [1) 2) 3)]	EN 12311-2:2013	N/mm²	Minimum	Declared value shall be met (recommended ≥ 15)
Elongation [1) 2) 3)]	EN 12311-2:2013	%	Minimum	Declared value shall be met (recommended ≥ 200)
Resistance to impact (23 ± 2)°C	EN 12691:2006 Method A	mm	Minimum drop height	100 (minimum 4 out of five specimens have to be tight after dropping)
Resistance to static loading	EN 12730:2015 Metode A EPS quality CS(10)150	kg	Minimum	≥ 5 3 out of 3 specimens shall be tight at relevant load
Environmental properties	EN-ISO 16000	-	Emissions	> xx
Air tightness construction	SINTEF Byggforsk simplified method [4)]	m³/(m²h50Pa)	Maximum	≤ 0,1
Emissivity	See footnote 5	-	Determined on fresh and aged material	Declared value shall be met

1) Accreditted methods
2) Metode B has to be used usually (for products which are not reinforced)
3) According to EN 13984, tensile strength and elongation for reinforced products shall be determined according to EN 13859-1 Annex A. Recommended minimum values: Tensile strength; ≥ 100 N/50 mm / Elongation L ≥ 10 % / T ≥ 5 %
4) Measuring area 1-2 m^2. Measured with, alternatively without, 1 m clamped overlapping joint
5) Applies to reflective vapour barriers. The value is calculated based on measurements carried out by use of SOC-100 HDR (Surface Optics Corporation, Hemispherical Directional Reflectance) device connected to a Thermo Nicolet 8700 FTIR spectrometer

Table 2: Aged material

Test method	Properties to be tested after ageing
Alkaline ageing (NT Poly 161)	Water tightness and tensile strength/elongation
UV 1) together with 12 weeks heat ageing at 70ºC EN 1297 / EN 1296)	Water vapour resistance and tensile strength/elongation

1) 48 hours according to EN 1297 (UV/heat **without** water spraying)

7.8 Annual control testing

Table 3 below shows an overview of annual control testing for vapour barriers.

Table 3: Annual control testing of vapour barrier

Property	Method	Control limit	Frequency
Fresh material			
Visual control, thichness and weight	EN 1848-2:2001 EN 1849-2:2009		Annual
Water thightness	EN 1928:2000		Two of these properties are tested each year
Resistance to tearing	EN 12310-1:1999		
Resistance to impact	EN 12691:2006 Method A		
Resistance to static loading	EN 12730:2015 Metode A EPS kvalitet CS(10)150		
Tensile strength 1)	EN 12311-2:2000 Method B		Each year
Elongation 1)	EN 12311-2:2000 Method B		Each year
Aged material			
UV + heat ageing: Water vapour resistance and tensile strength/elongation (fresh and aged)	EN 1931:2000 EN 12311-2:2013 Method B		Each 5th year
Alkaline ageing: Water tightness and tensilestrength/elonation (fresh and aged)	EN 1928:2000 EN 12311-2:2013 Method B		Each 5th year

1) According to EN 13984, tensile strength and elongation for reinforced products shall be determined according to EN 13859-1 Annex A. The results are then given as N/50 mm