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Contact person; Noralf Bakken

Guidelines for SINTEF Technical Approval for

Vapour barriers

Contents

1. General information about SINTEF Technical Approval

General information about SINTEF Technical Approval procedures is available at https://www.sintefcertification.no/portalpage/index/56

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 2 and 3.

Requirements concerning material and product descriptions related to environment properties are available at; https://www.sintefcertification.no/portalpage/index/56#Miljo

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; https://www.sintefcertification.no/portalpage/index/56

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.

Supervisory production control includes, in addition to the above mentioned conditions, an annual random testing of the products has to be carried out. Table 4 and 5 show an overview of annual audit testing for respectively vapour barriers and moisture adaptive vapour barriers.

5. Application for SINTEF Technical Approval and project management

Information regarding application and project management for SINTEF Technical Approval is available at; https://www.sintefcertification.no/file/index/2972

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

For moisture adaptive vapour barriers, the water vapour resistance should be documented for seven different moisture levels (% RH) on both sides of the product as shown in Table 1 below.

The tests are carried out according to a "cup-method" according to EN ISO 12572-2016.

Tabell 1: Determination of water vapour resistance for misture adaptive vapour barriers

Test series	Type of salt in the cup	% RH in the cup	Side of the produkt facing down in the cup	Side of the produkt facing up against the test chamber	RH in the room	Property that shall be clarified	Actual situation	Comment
1	$MgCl_2$	33	"cold side"	"warm side"	50	Ability to prevent moisture from being transported outward	At normal autumn-winter and spring conditions	**Has to be** documentet
2	NaCl	75	"warm side"	"cold side"	50	Ability to prevent moisture from being transported outward	At high RF on warm side and retracted vapor barrier (Re / Rt = 0.75)	**Has to be** documentet
3	KCl	85	"cold side"	"warm side"	50	Ability to exsiccate inward	At exterior heating	**Has to be** documentet
4	KNO_3	94	"cold side"	"warm side"	50	Ability to exsiccate inward	At exterior heating	**Has to be** documentet
5	KI	69	"warm side"	"cold side"	50	Ability to prevent moisture from being transported outward	At high RF on warm side, but not retracted vapor barrier (Re / Rt = 0.75)	Can be documentet
6	NaCl	75	"kald side"	"warm side"	50	If the moisture transport is directional		Kan dokumenteres
7	H_2O	100	"cold side"	"varm side"	50	Ability to exsiccate inward	At exterior powerful heating	Kan dokumenteres

Proposed text for approval documents:
xx vapor barrier can be used in floors, walls and ceilings in normal dry buildings. xx is particularly well suited for compact, flat roofs since xx can give such roofs a self-drying ability when they are heated by the sun.

xx will also have ability to dry inward in walls that are heated by the sun (e.g brick veneers that may be exposed to "summer condensation" (when using traditional vapor barriers). xx can work as a "safety valve" and release any confined moisture from a structure because of the fact that the vapor barrier achieves a low water vapor resistance at high RF on at least one side. xx can therefore be used on the entire underside of joist constructions, below partially heated ceilings (A-roof trusses), even if vapor-proof floor coverings are installed on the upper side. xx can also be installed at the top side of the insulation in joist constructions, above crawl spaces or outdoor air, even if wood-based subfloors and vapor-proof floor coverings are installed.

xx can be installed on the warm side of interior insulation in brick- or concrete walls. This applies to walls both above and below terrain and assumes that the walls have at least as much insulation on the outside as on the inside.

xx must not be used in rooms with high humidity (e.g swimming pools). xx can be used in tiled wet-room walls, but a water- and vapor-proof membrane must then be installed as a support for the tile adhesive. The water- and vapour proof membrane must have a water vapor resistance corresponding to a s_d - value of at least 10 m.

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 (any larger discrepancies must be discussed with either the quality assurance representative, subject coordinator or approval manager).

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 accelerated 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 2 and 3 below show av overview over material properties for vapour barriers for fresh and aged material.

Table 2: 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 EN ISO 12572:2016	s_d – value (m) m^2sPa/kg	Minimum Minimum	Declared value shall be met > 10 $> 50 \cdot 10^{-9}$
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 12691:2018 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 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 3: 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 4 and 5 below shows an overview of annual control testing for respectively vapour barriers and moisture adaptive vapour barriers.

Table 4: Annual control testing of vapour barriers

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
Artificial aged material			UV + heat aging, and alkaline aging, is performed alternately every 5 years
UV + heat ageing: Water vapour resistance and tensile strength/elongation (fresh and aged)	EN 1931:2000/EN ISO 12572 EN 12311-2:2013 Method B		Alternately every 5 years
Alkaline ageing: Water tightness and tensilestrength/elonation (fresh and aged)	EN 1928:2000 EN 12311-2:2013 Method B		Alternately every 5 years

[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

Table 5 Kontrollprøving av fuktadaptive dampsperrer

Egenskap	Kontrollgrense	Test method	Frequency
Tensile strength		EN 12311-1	Each year
Elongation		EN 12311-1	Each year
Water vapour resistance at 33% / 50% RH at 75% / 50% RH		EN ISO 12572	Each year