SINTEF Technical Approval – Health and Environmental Requirements

1 Background

A SINTEF Technical Approval includes the health and environmental properties of the product in use. The health and environmental assessment is based on the requirements given in TEK 17 – Regulations on technical requirements for building works (Norwegian: Forskrift om tekniske krav til byggverk). The requirements in TEK17 include:

- that products are chosen with no or low content of chemicals hazardous to health or environment (§ 9-2)
- that the amount of waste is reduced and that materials are chosen that can be reused or recycled (§ 9-5)
- that materials give little or no pollution of the indoor air (§ 13-1)
- that products in contact with potable water do not give of substances that reduce the water quality (§ 15-5)

The Product Control Act (Norwegian: Produktkontrolloven), § 3a, requires businesses to consider the substitution of hazardous substances with less harmful substances.

Recycled materials also need to have documented absence of chemicals hazardous to the health- and environment, see chapter 2.6.

Figure 1 shows an overview of the health and environmental evaluation process. The extent of the evaluation depends on how the product is used in the building. The health and environmental evaluation includes the construction stage, the use stage and the end of life stage.

Product in the manufacturing stage (manufacturing plant)	**Not part of the health and environmental evaluation for SINTEF Technical Approval**

Product in the construction process stage (installation – building site)	• **Waste from the installation process** • **Content of hazardous substances**

Product during use stage (installed in the building)	• **Content of hazardous substances** • **Products in contact with indoor air: Emission of hazardous substances to indoor air** • **Products in contact with potable water: Release of hazardous substances to potable water** • **Products in contact with soil, goundwater and surface water: Release of hazardous substances to soil, groundwater and surface water.**

Product at end of life stage (after both construction and use stage)	• **Content of hazardous substances** • **Waste fraction (e.g. wood, metal, hazardous waste)** • **Waste treatment (recycling, disposal)**

Figure 1. Evaluation of products for SINTEF Technical Approval. The extent of the evaluation depends on the placement in the building.

2 Documentation and limit values

2.1 Documentation that must be submitted for all products regardless of usage

A system may consist of one or several components. The applicant must submit the following documents for all components that are the to be part of the SINTEF Technical Approval:

- A list of all components that are to be part of the approval.
- A short description of where in the building the component is used
- The form "*Obtainment of health and environmental data – Manufacturer's declaration*" shall be filled out. If the system consists of several components, a separate form shall be filled out for each component. The form is filled out by the applicant if they are manufacturing the product, alternatively by the subcontractor if such is used.
- Technical data sheets or other product description of all components that are included in the technical approval
- Safety data sheets (applies only to products that are required to have safety data sheets)
- Products in contact with indoor air: see chapter 2.3
- Products in contact with soil, groundwater or surface water: see chapter 2.4
- Products in contact with potable water: see chapter 2.5
- Products containing recycled material: see chapter 2.6

2.2 Content of substances that are dangerous to health or the environment – limits

Allowable content of hazardous substances:

- Manufacturing stage: No requirements
- Construction stage:
  - chemical mixtures that dries or hardens during the construction stage: see table 1
  - articles: see table 2
- Use stage and end of life stage:
  - chemical mixtures that are dry or hardened: see table 2
  - articles: see table 2

The manufacturing stage, construction stage, use stage and end of life stage are described in figure 1.

Table 1. Concentration limits for the construction stage (product installation). The limits apply only to chemical mixtures that dry or harden during the construction stage. Examples of chemical mixtures: adhesives, sealants, paints, mortars and screeds.

Classification	**Concentration limit (m/m) – before the product dries or hardens – during installation**	**Comments**
Carc. 1A H350 Carc. 1B H350	0.1 %	
Carc. 2 H351	1 %	
Repr. 1A H360 Repr. 1B H360	0.3 %	
Repr. 2 H361	3 %	
Muta. 1A H340 Muta. 1B H340	0.1 %	
Muta. 2 H341	1 %	
Brominated flame retardants	0.1 %	The group does not include PolyFR (CAS 1195978-93-8)
Substances on the Norwegian Priority List	0.1 %	
Substances on the Candidate List	0.1 %	
REACH Annex XVII - Restriction list	Limitationa are set for each compound and area of usage	
PBT, vPvB	0.1 %	

Table 2. Concentration limits – construction stage (articles and dried or hardened chemical mixtures), use stage and end of life stage.

Classification	Concentration limits (m/m)	Comments
Skin Corr. 1A H314 Skin Irrit. 2 H315 Eye Dam. 1 H318 Eye Irrit. 2 H319	Sum H314: 1 % Sum H318: 10 % Sum H315 og H319: 20 %	Substances ≥ 1 % are included in the calculation
STOT SE 1 H370	1 %	
STOT SE 2 H371	10 %	
STOT SE 3 H335	20 %	
STOT RE 1 H372	1 %	
STOT RE 2 H373	10 %	
Asp. Tox. 1 H304	10 %	
Acute Tox. 1	Sum H300: 0.1 % Sum H310: 0.25 % Sum H330: 0.1 %	Substances ≥ 0.1 % are included in the calculation
Acute Tox. 2	Sum H300: 0.25 % Sum H310: 2.5 % Sum H330: 0.5 %	Substances ≥ 0.1 % are included in the calculation
Acute Tox. 3	Sum H301: 5 % Sum H311: 15 % Sum H331: 3.5 %	Substances ≥ 0.1 % are included in the calculation
Acute Tox. 4	Sum H302: 25 % Sum H312: 55 % Sum H332: 22.5 %	Substances ≥ 1 % are included in the calculation
Carc. 1A H350 Carc. 1B H350	0.1 %	
Carc. 2 H351	1 %	
Repr. 1A H360 Repr. 1B H360	0.3 %	
Repr. 2 H361	3 %	
Muta. 1A H340 Muta. 1B H340	0.1 %	
Muta. 2 H341	1 %	
Resp. Sens. 1 H334 Skin. Sens. H317	10 %	
Ozon H420	0.1 %	
Aquatic Acute H400	Sum Aquatic Acute H400: 25 %	Substances ≥ 0.1 % are included in the calculation
Aquatic Chronic 1 H410 Aquatic Chronic 2 H411 Aquatic Chronic 3 H412 Aquatic Chronic 4 H413	100*Sum H410 + 10*Sum H411 + Sum H412: 25 % Sum H410 + Sum H411 + Sum H412 + Sum H413: 25 %	H410: Substances ≥ 0.1 % are included in the calculation H411, H412 og H413: Substances ≥ 1 % are included in the calculation
Brominated flame retardants	0.1 %	The group does not include PolyFR (CAS 1195978-93-8)
Substances on the Norwegian Priority List	0.1 %	
Substances on the Candidate List	0.1 %	
REACH Annex XVII - Restriction list	Limitationa are set for each compound and area of usage	
PBT, vPvB	0.1 %	
Nano particles	No limit, but we ask that content of nano particles is declared	

2.3 Requirements for products that impacts the indoor environment

Products that impacts the indoor environment: products that are used inside of the vapour barrier or are part of the vapour barrier/vapour barrier system.

2.3.1 Glued wood based products

Tests of formaldehyde according to EN 717-1, EN 12460-3 (replacing EN 717-2) or EN 12460-5 (replacing EN 120) are accepted for glued wood products, e.g. OSB, particle boards, gluelam and plywood. The testing shall be carried out by an independent test laboratory that has been accredited for the test method. The products must meet formaldehyde emission class E1.

2.3.2 All products exept glued wood products

Testing shall be conducted according to the following standards (testing at 28 days):

- Emissions of volatile organic compounds (VOC) as specified in EN ISO 16000-9 combined with ISO 16000-6
- Emissions of formaldehyde to indoor air as specified in EN ISO 16000-9 combined with ISO 16000-3

Test specimen preparation, calculation of TVOC and the report shall be according to EN 16516. The testing shall be carried out by an independent test laboratory that has been accredited for the test method. The test results must meet the requirements given in table 3.

Products that are certified according to the following classification schemes meet the emission criteria for SINTEF Technical Approvals:

- M1 Emission Class for Building Materials
- GEV Emicode EC1 og EC1 Plus

Table 3. Requirements.

Parameter – 28 days	**Limits – very small areas[1)] [µg/(m² h)]**	**Limits – floor/ceieling, wall and small areas[2)] [µg/(m² h)]**
TVOC	7100 µg/(m² h)	200 µg/(m² h)
Formaldehyde	700 µg/(m² h)	50 µg/(m² h)
Sum carcinogenic	70 µg/(m² h)	10 µg/(m² h)

1) Very small areas are defined in PD CEN/TS16516:2013 as sealants and similar products used in small amounts, i.e. loading factor 0,007 m^2/m^3.

2) Floor/ceiling, wall and small areas (windows and doors) are defined in CEN/TS16516. These products are used in larger amounts than selants. Windows and doors are small areas.

2.4 Requirements for products that come in contact with soil and water

Products that come into contact with soil and water: products that come into contact with groundwater, surface water or soil - mainly outdoor surface products.

2.4.1 Testing of monolithic products

Monolithic construction products are tested according to CEN/TS 16637-1 and CEN/TS 16637-2. The following parameters are used:

- All leaching steps (64 days)
- Each eluate and the reference is tested for the following:
  - Concentration of As, Cr, Cu, Ni, Zn, Pb, Cd and Hg
  - pH
  - Conductivity
- The final eluate is analysed with respect to organic compounds according to EN 15768. Individual substances must be reported, as well as concentration estimates (toluene equivalents)

The testing shall be carried out by an independent test laboratory that has been accredited for the test method. The test results must meet the requirements given in table 4.

Table 4. Concentration limits, leaching test according to CEN/TS 16637-2.

Parameter	**Maxium allowable cumulated emission after 64 days, R_{64} days (=R_8) [mg/m^2]**
Arsenic, As	260
Cadmium, Cd	3.8
Chromium, Cr	120
Copper, Cu	98
Mercury, Hg	1.4
Nickel, Ni	81
Lead, Pb	400
Zinc, Zn	800

2.4.2 Testing of granulary material

Granular material is tested according to CEN/TS 16637-3.

2.5 Requirements for products that come into contact with potable water

Products that come into contact with potable water: products used for the supply of potable water that come into direct contact with the water.

2.5.1 Testing of metallic products

Metals which are in contact with potable water, e.g. couplings and taps, shall be tested with respect to leaching of lead and cadmium according to NKB Product Rules where these rules are available for the product group.

The testing shall be carried out by an independent test laboratory that has been accredited for the test method.

2.5.2 Testing of plastic, rubber and other non- metallic materials

Products of plastic, rubber and other non-metallic materials which are in contact with potable water shall be tested and assessed according to 4 MS guidelines or similar.

Products with the following documentation meet the requirements for SINTEF Technical Approval:

- Approved according to the German KTW-requirements from Umwelt Bundesamt, or similar

- Approved according to the Dutch guidelines "*Regeling materialen en chemicaliën drink- en warm tapwatervoorziening*"

The testing and assessment shall be carried out by an independent test laboratory.

2.6 Recycled materials

2.6.1 General information about recycled materials

Products with a SINTEF Technical Approval must have a very low content of chemicals hazardous to health or environment. The use of recycled materials in construction products is an important measure to reduce green house gases and to ensure a better use and extraction of resources. This reasoning is supported by SINTEF, but it is important to avoid products with hazardous chemicals to be recycled. Consequently SINTEF requires low content of hazardous chemicals also in recycled materials.

Recycled materials can be divided into two groups, internal recycled material and external recycled material, see figure 2. Chapter 2.6.2 specifies what documentation is needed for internal recycled materials, and chapter 2.6.3 defines what documentation is needed for external recycled materials.

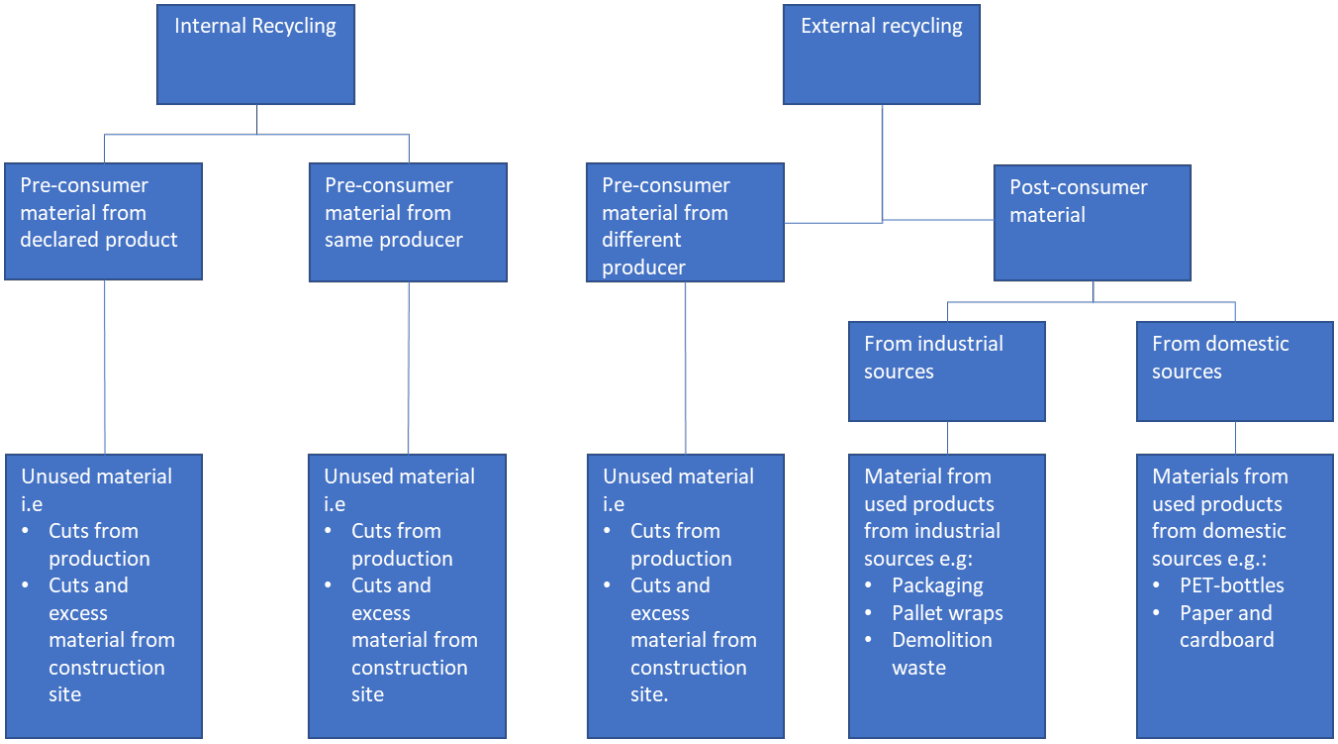

Figure 2
Flowchart of source to recycled materials

2.6.2 Interal recycling

Normally, no additional documentation related to internal recycled material is needed. However, what material is recycled and in what quantity must be stated, as well as confirming that the content of health and environmentally harmful substances in the recycled material is declared in the self-declaration "Manufacturers declaration".

2.6.3 External recycling

For products containing externally recycled materials, i.e from a third party, additional documentation may be required. The exeption is recycled metals, paper and glass from households, which normally does not require additional information.

The need for additional documentation depends on the source of the recycled material, see figure 2.

- For unused materials from another manufacturer the content of health and environmentally hazardous compounds needs to be known and documented. This can normally be done by obtaining a separate manufacturer's declaration from the manufacturer of the recycled product.
- For unused materials from other sources both the source of the material and the content of health and environmentally hazardous compounds must be known and documented. Documentation requirements will vary depending on type of material. If the recycled material does not have sufficient documentation, the product will not be approved.

2.6.4 Recycled plastic

There is a continuously development related to plastic recycling, and the technology associated with this is constantly changing. Mechanical recycling is most common today. In the event of mechanical recycling, will harmful substances in the plastic not be removed during the recycling process, and will remain in the new product. For other recycling solutions, such as chemical recycling, harmful substances may be prevented from being transferred into the new product. Documentation of recycled plastic is poorly standardized for the time being, and received documentation must be considered in each individual case.

In order to apply recycled plastic must low content of substances harmful to health and the environment be documented. Products manufactured and recycled in accordance with the Food Contact Regulation; Commission Regulation EU 10/2011 "on plastic material and articles intended to come into contact with food" can be approved if such documentation is available.

Recycled plastic with unknown content, for example from recycling plants with mechanical recycling, can be difficult to document. This is because the plastic may come from many different suppliers and product groups. Good traceability and chemical analyzes are required to ensure low content of hazardous substances. To be possible in practice to carry out a test regime rergarding chemical analyses, it requires in-depth knowledge of the chemical composition of the plastic fraction. EPS is an example where this may be possible. EPS has a simple composition and the potentially dangerous substances are known. By knowing where the plastic comes from, and knowing all the possible compositions the plastic may have, a purposeful search for a limited number of known chemical compounds and a safe recycling of the plastic is possible. Ordinary plastic fractions, such as PP and PVC, can contain many different compositions and chemical additives if these come from many unknown manufacturers. For these plastic groups it will be complicated to carry out targeted chemical analyzes, and there will be greater uncertainty about the content of hazardous substances.

Recycled plastic from unused material from a known manufacturer is easier to document since the manufacturer knows the composition of the plastic and the content of hazardous substances.

2.7 Additional documentation requirements

After assessment, additional documentation requirements can be made for special product groups.

3 References

[1] REACH vedlegg XVII. Restricted substances list. Se European Chemical Agency (ECHA) www.echa.europa.eu

[2] Authorisation list. ECHA Authorisation list. https://echa.europa.eu/authorisation-list

[3] Candidate list. ECHA Candidate list. Substances of very high concern (SVHC). http://echa.europa.eu/web/guest/candidate-list-table

[4] Norwegian Priority List. http://www.miljostatus.no/prioritetslisten;

www.miljodirektoratet.no/kjemikaliesok

[5] Kyoto protocol for limitations of green house gasses, see annex A in the protocol. http://unfccc.int/kyoto_protocol/items/2830.php

[6] Nanoparticles – definition: http://ec.europa.eu/environment/chemicals/nanotech/faq/definition_en.htm

[7] Product Control Act. Produktkontrolloven. Lov om kontroll med produkter og forbrukertjenester. www.lovdata.no

[8] TEK17. Regulations on technical requirements for bulding works. Forskrift om tekniske krav til byggverk (Byggteknisk forskrift). Norwegian: www.lovdata.no

4 Relevant Standards

CEN/TS 16637-1:2014 *Construction products – Assessment of release of dangerous substances – Part 1: Guidance for the determination of leaching tests and additional steps*

CEN/TS 16637-2:2014 *Construction products – Assessment of release of dangerous substances – Part 2: Horizontal dynamic surface leaching test*

CEN/TS 16637-3:2016 *Construction products – Assessment of release of dangerous substances – Part 3: Horizontal up-flow percolation test*

EN 120:1998. *Wood based panels - Determination of formaldehyde content - Extraction method called the perforator method*

EN 717-1:2004. *Wood-based panels - Determination of formaldehyde release - Part 1: Formaldehyde emission by the chamber method*

EN 717-2:1994. *Wood-based panels - Determination of formaldehyde release - Part 2: Formaldehyde release by the gas analysis method*

EN 16516:2017. *Construction products. Assessment of release of dangerous substances.Determination of emissions into indoor air*

EN ISO 12460-3:2015. *Wood-based panels - Determination of formaldehyde release - Part 3: Gas analysis method*

EN ISO 12460-5:2015. *Wood-based panels - Determination of formaldehyde release - Part 5: Extraction method (called the perforator method)*

EN ISO 16000-9:2006. *Indoor air - Part 9: Determination of the emission of volatile organic compounds from building products and furnishing - Emission test chamber method*

ISO 16000-3:2011. *Indoor air – Part 3: Determination of formaldehyde and other carbonyl compounds in indoor air and test chamber air – Active sampling method*

ISO 16000-6:2011. *Indoor air - Part 6: Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA sorbent, thermal desorption and gas chromatography using MS or MS-FID*

NKB Product Rules. Nordic Committee on Building Regulations.