FRITZOE ENGROS

DOLD 5-S PANEL
Emission measurements for the Finnish Classification of Building Materials

FINAS
Finnish Accreditation Service
T001 (EN ISO/IEC 17025)

Requested by: DOLD Puidutööstus AS

VTT EXPERT SERVICES LTD

Requested by DOLD Puidutööstus AS
Riia Maantee 56
EE 71009 VILJANDI
ESTONIA

Order Andrus Toom, August 27th 2014, VTT-O-161042-14

Contact person **VTT Expert Services Ltd**
Expert Hanna Kajander
P.O. BOX 1001, FI-02044 VTT
Tel. + 358 20 722 7433
E-mail: hanna.kajander@vtt.fi

Assignment

DOLD 5-S PANEL
Emission measurements for the Finnish Classification of Building Materials

Emission measurements of volatile organic compounds (VOC, TVOC), carcinogens, ammonia, and formaldehyde and sensory evaluation of the material were performed for test specimens conditioned for four weeks in standard conditions /1/.

FRITZOE ENGROS

Product

Product type	wood panel
Product name	**DOLD 5-S PANEL**
Batch number	1
Production date	September 3rd 2014
Sending date	September 5th 2014
Sample received	September 8th 2014
Packaging /transport	Aluminium foil and plastic wrapping / transport company
Sample description	5-layer wood panel
Test specimen preparation	edges and backside covered
Test period started, date	September 9th 2014
Conditions during ageing	Temperature (23±1)°C, RH (50±5) %
Emission sampling, date Sensory evaluation, date	October 7th 2014 October 9th 2014

Chamber technique

	Chamber volume	Air change/ supply air rate	Temperature	RH	Test specimen area	Area specific air flow rate
Chemical emissions **Sensory evaluation**	1 m^3	0.5 h^{-1}	(23±1) °C	(50±5) %	1.0 m^2	0.49 $m^3/(m^2\ h)$

The use of the name of VTT Expert Services Ltd or the name VTT Technical Research Centre of Finland in advertising or publication in part of this report is only permissible with written authorisation from VTT Expert Services Ltd.

Emission sampling and analytical methods

	Method	Adsorbent/ absorbent	Sampling volume, L	Quantification/ Analysis method	Lowest detection limit
TVOC	RTESIS495 (EN ISO 16000-9) RTESIS995 (EN ISO 16000-6)	Tenax TA 60/80 mesh	2.6-4.7	Quantification from FID-chromatogram as toluene equivalent. Column HP-5MS, 50 m x 0,2 mm x 0,33 µm	1 µg/m³
Formaldehyde	RTESIS101 (EN 717-1)	Diluted sulphuric acid	276-304	Spectrophotometric analysis with acetylacetone method	0.005 mg/m³
Ammonia	RTESIS295*	Diluted sulphuric acid		Ion selective electrode	0.005 mg/m³
Sensory evaluation	EN ISO 16000-28	-	-	Untrained panel of 15 members	-

*) method is accredited

VOCs were adsorbed on Tenax TA adsorbent /2/. VOC samples were analysed with a gas chromatograph after thermal desorption /3/. The gas chromatograph is equipped with a flame ionisation detector (FID) and a mass selective detector (MSD).

The total amount of VOCs (TVOC) was determined summing the individual concentrations of identified and unidentified compounds eluting from a gas chromatographic column between hexane and hexadecane inclusively, at concentration above 5 µg/m³ in model room, all calculated as toluene equivalent. Single VOCs were identified from the mass selective detector total ion chromatogram using Wiley 275 spectral library and quantified from the FID-chromatogram as toluene equivalents. Identifications are not confirmed with pure standards. The lowest detection limit of the measuring method for single VOCs is on the level of 1 µg/m³.

Formaldehyde and ammonia were absorbed in dilute sulphuric acid. Formaldehyde was analysed spectrophotometrically with acetylacetone method /4-5/. Ammonia was analysed potentiometrically with ammonia specific electrode /6/.

An untrained panel of 15 members performed the sensory evaluation of the product /1/. The panellists evaluated the acceptability of the chamber outlet air in scale clearly unacceptable … fully acceptable (-1…+1).

FRITZOE ENGROS

The use of the name of VTT Expert Services Ltd or the name VTT Technical Research Centre of Finland in advertising or publication in part of this report is only permissible with written authorisation from VTT Expert Services Ltd.

Results Results are presented in Tables 1 - 3.

***Table 1**. Results of the emission measurements.*

	Specific Emission Rate, SER				
	TVOC	**Formaldehyde**	**Ammonia**	**Carcinogens**	**Sensory evaluation**
	mg/(m² h) 1)	mg/(m² h)	mg/(m² h)	mg/(m² h) 1)	Acceptability
DOLD 5-S PANEL	0.69	0.033	< 0.005	< 0.005	+ 0.3
M1 classification criteria	< 0.2	< 0.05	< 0.03	< 0.005	≥ 0.0

1) As toluene equivalents

***Table 2.** Results of the emission measurements in reference room (30 m³). Emitting surface area 31.4 m².*

	TVOC	**Formaldehyde**	**Ammonia**	**Carcinogens**
	mg/m³ 1)	mg/m³	mg/m³	mg/m³ 1)
DOLD 5-S PANEL	1.45	0.069	< 0.010	< 0.010

1) As toluene equivalents

***Table 3**. The emissions of single VOCs between C_6-C_{16} as toluene equivalent (Specific Emission Rate SER >0.002 mg/(m²h)). Emitting surface area 31.4 m².*

			DOLD 5-S PANEL	
RT, min	**Compound**	**CAS**	**SER, mg/(m² h)**	**concentration in reference room, mg/m³**
5.93	Acetic Acid	64-19-7	0.004	0.009
9.02	Pentanal	110-62-3	0.002	0.005
11.74	Toluene	108-88-3	0.003	0.006
12.91	Hexanal	66-25-1	0.007	0.015
18.18	α-Pinene	80-56-8	0.305	0.639
19.42	β-Cymene	535-77-3	0.004	0.009
19.68	β-Pinene	18172-67-3	0.011	0.023
19.88	β-Myrcene	123-35-3	0.009	0.019
20.44	α-Phellandrene	99-83-2	0.003	0.007
20.79	Δ^3-Carene	13466-78-9	0.273	0.571
21.16	o-Cymene	527-84-4	0.008	0.017
21.33	D-Limonene	5989-27-5	0.047	0.099
21.39	Sabinene	3387-41-5	0.004	0.009
23.20	Terpinolene	586-62-9	0.009	0.019
26.27	Terpineol	10482-56-1	0.002	0.005
	TVOC		**0.692**	**1.448**

FRITZOE ENGROS

The use of the name of VTT Expert Services Ltd or the name VTT Technical Research Centre of Finland in advertising or publication in part of this report is only permissible with written authorisation from VTT Expert Services Ltd.

***Table 4**. The emissions of single VOCs outside the frame C_6-C_{16} as toluene equivalent (Specific Emission Rate SER >0.002 mg/(m²h)). Emitting surface area 31.4 m².*

			DOLD 5-S PANEL	
RT, min	**Compound**	**CAS**	**SER, mg/(m² h)**	**concentration in reference room, mg/m³**
-	-	-	-	-

Measurement uncertainty

TVOC/VOC emission factor	±25 %
Formaldehyde emission factor	±25 %
Ammonia emission factor	> ±50 %

References

1. Protocol for Chemical and Sensory Testing of Building Materials. Version 21.5.2014 (www.rts.fi)
2. In-house method RTESIS495, modified from standard EN ISO 16000-9.
3. In-house method RTESIS995, modified from standard EN ISO 16000-6.
4. EN 717-1. Wood based panels - Determination of formaldehyde release - Part 1: Formaldehyde emission by the chamber method October 2004.
5. In-house method RTESIS101. Determination of formaldehyde using spectrometric acetylacetone-method.
6. In-house method RTESIS295. Determination of ammonium concentration in indoor air.

FRITZOE ENGROS

Espoo, October 22nd 2014

Hanna Kajander
Expert

Appendices

Appendix 1: VOC sample FID-chromatogram
Individual results of the sensory evaluation
Photos

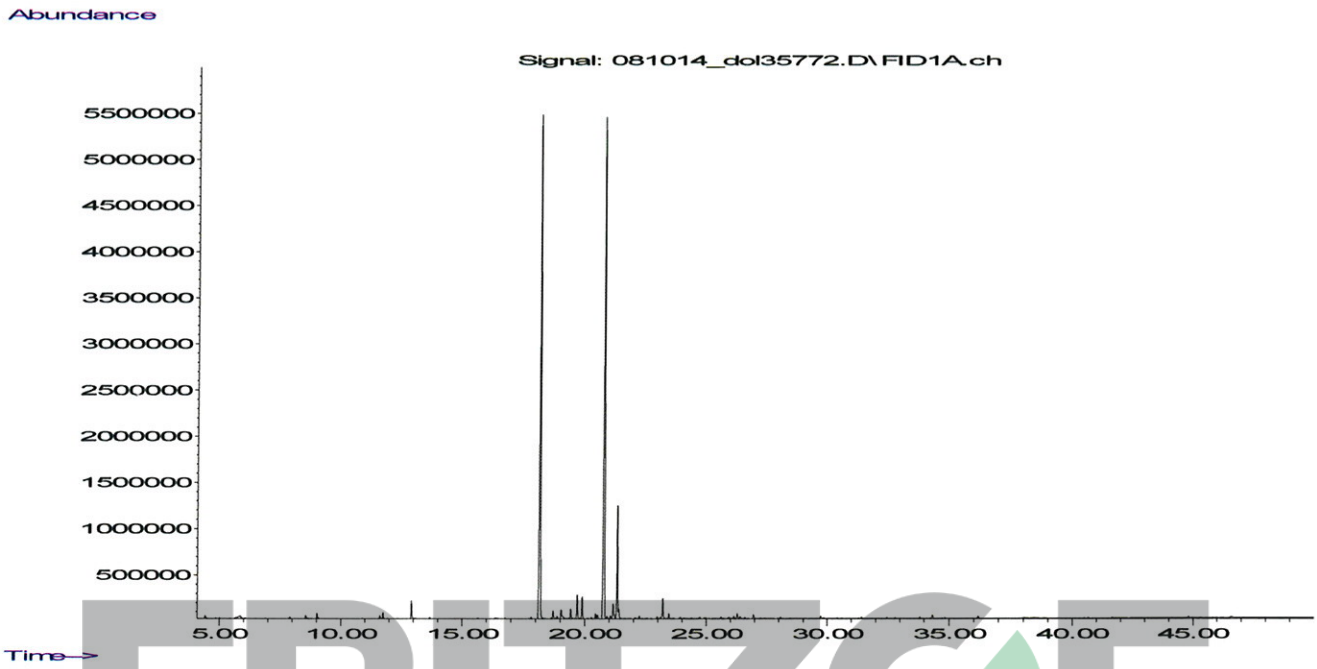
Appendix 2: Sampling report

Distribution

Customer	Original
Archive	Original

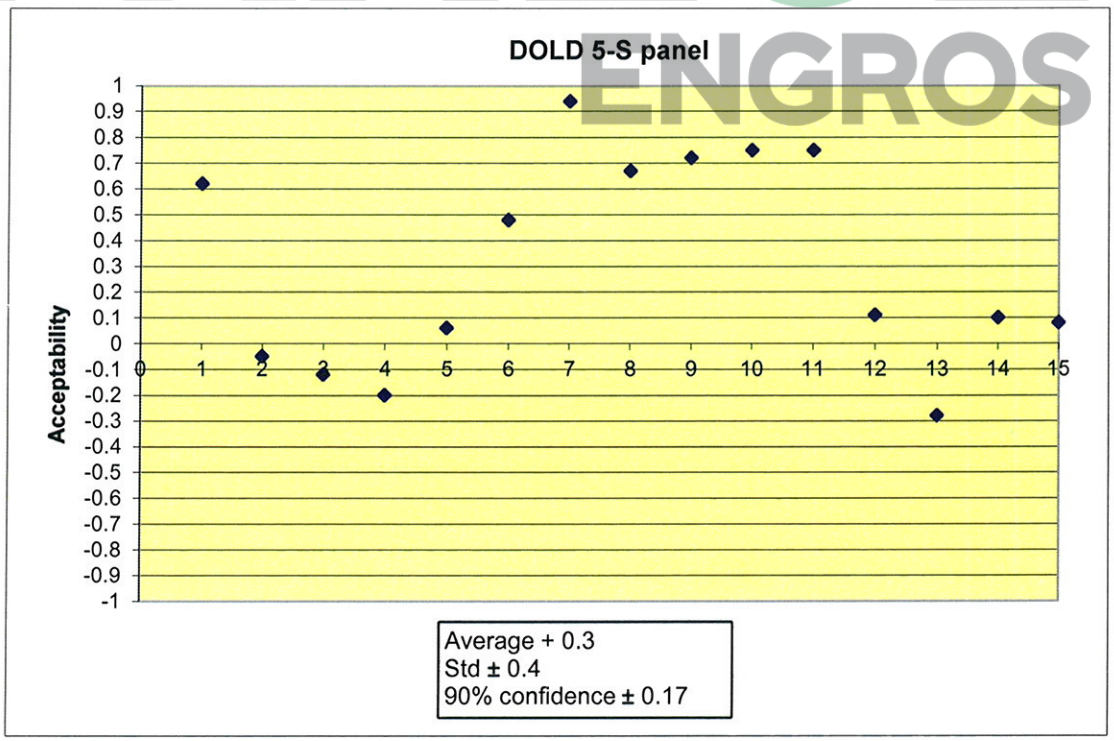
The use of the name of VTT Expert Services Ltd or the name VTT Technical Research Centre of Finland in advertising or publication in part of this report is only permissible with written authorisation from VTT Expert Services Ltd.

DOLD 5-S PANEL
VOC sample FID-chromatogram



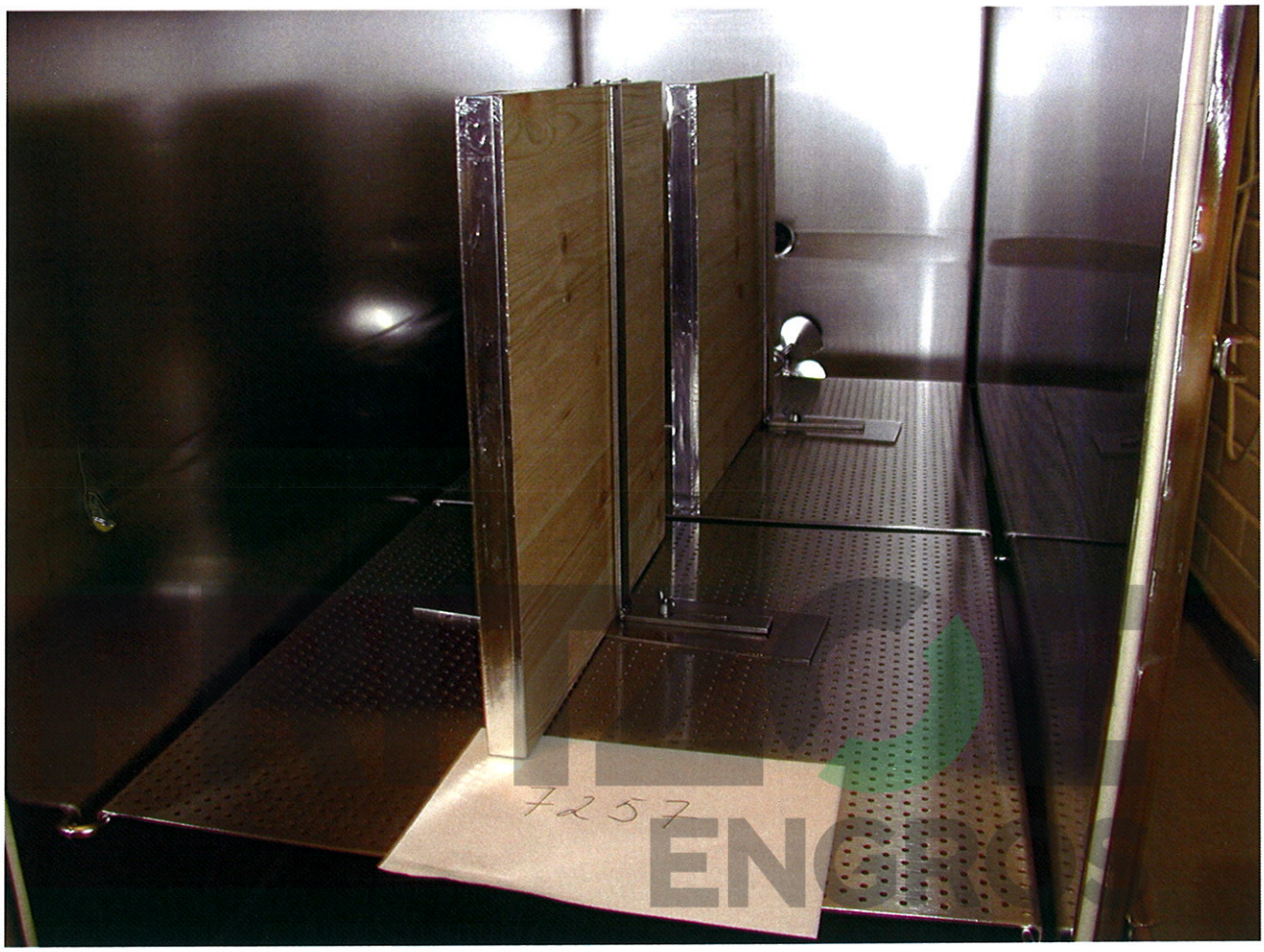
FRITZOE ENGROS

Individual results of the sensory evaluation



The use of the name of VTT Expert Services Ltd or the name VTT Technical Research Centre of Finland in advertising or publication in part of this report is only permissible with written authorisation from VTT Expert Services Ltd.

DOLD 5-S PANEL
Photos



The use of the name of VTT Expert Services Ltd or the name VTT Technical Research Centre of Finland in advertising or publication in part of this report is only permissible with written authorisation from VTT Expert Services Ltd.

VTT Expert Serivces Oy

Sample information: M1- testing

Invoicing address/ Contact person DOLID PUIDUTÖÖSTUS AS RIA MNT. 56 71009 VILJANDI ESTONIA. / ANDRUS TOOM	**Producer contact information** ANDRUS TOOM ANDRUS@ATLLIMBER.EE +372 533 40290
Product name DOLID 5-S PANEL	**Product type** CROSS-LAMINATED CONIFEROUS SOLID TIMBER PANEL
Date of production 03.09.2014	**Batch nr** 1
Date of sampling 04.09.2014	**Amount of samples** 4
The sample has been taken from production line [X] storage [ ] other [ ] -please specify:	How was the sample stored before sampling? WRAPPED IN FOIL
If taken from a larger lot, please describe how sample was taken —	
Other remarks —	
Packaging: Solid samples can be packaged by wrapping airtight in aluminium foil and then packaged in an unprinted airtight polyethylene bag and sealed. As an alternative, aluminium-coated packaging material may be used. To prevent external contamination, the package should be sealed maximally airtight with a film welding device, or with a low emission adhesive tape, or by mechanical tightening.	
Confirmation I confirm that the sample has been chosen, sampled and packaged according to instructions in the M1 testing protocol https://www.rakennustieto.fi/material/attachments/newfolder/5opVeipbi/Testing_protocol_version_21.5.2014.pdf	
Date 30.09.2014	**Signature**

FRITZOE ENGROS

Delivery address:

< 10 kg dispatch :
VTT Expert Services Oy
Eero Luostarinen
Biologinkuja 7
02150 Espoo

>10 kg dispatch (transport company):
VTT Expert Services Oy
Eero Luostarinen
Tietotie 4, Q-ovi
02150 Espoo