

| Contact person | Date | Reference | Page |
|---|------------|-----------------|-------|
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Betanzos HB S.L
Maria Barreiro
Carreteras Betanzos Santiago KM3
15319 Infesta, Betanzos, A Coruña
Spain

Emission measurements after 28 days

(3 appendices)

Object

One sample of a hardboard was delivered to RISE by the customer.

| | |
|---------------------------|---|
| Product name: | Hydro H1 |
| Manufacturer: | Betanzos HB S.L. Ctra Betanzos-Santiago km 3, Betanzos 15300 A Coruña, Spain |
| Manufacturing date: | 2025-08-30 |
| Size of sample, packaging | 2 pcs of 50 x 50 cm, plastic foil in a cardboard box |
| Date of arrival to RISE: | 2025-09-18 |
| Date of analysis: | week 39 – 46, 2025 |
| Place of test: | Chemistry and Applied Mechanics, Brinellgatan 4, Borås |

Assignment

Emission measurement according to ISO 16000-9:2024 (Indoor air - Part 9: Determination of the emission of volatile organic compounds from samples of building products and furnishing - Emission test chamber method), after 28 days regarding volatile organic compounds (VOC and VVOC/SVOC), carcinogenic substances (VOC-substances, EU Regulation No 1272/2008 Annex VI, cat 1A and 1B) and aldehydes. Reference room calculations according to EN 16516:2017/A1:2020 (EU-LCI values). Test specimen preparation according to ISO 16000-11:2024 (Indoor air - Part 11: Determination of the emission of volatile organic compounds from building products and furnishing - Sampling, storage of samples and preparation of test specimens).

Method

The test was started on September 22, 2025 by unpacking the sample. The hardboard panels were assembled back-to-back with the edges sealed with aluminium tape. The specimen was placed in a separate conditioning container (with air velocity of 0.2 m/s) in a room with controlled climate conditions of 23 ± 2 °C and 50 ± 5 % RH and placed into a chamber three days prior to air samplings. Air samplings after 28 days of conditioning were carried out on October 20, 2025.

RISE Research Institutes of Sweden AB

| | | |
|-----------------------------------|--|---|
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Confidentiality level
C2 - Internal

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Test conditions in the chamber:

| | |
|-----------------------------------|--------------------------------------|
| Chamber volume: | 1.0 m ³ |
| Temperature, Relative humidity: | 23 ± 0.5 °C, 50 ± 3 % RH |
| Surface area of test specimen: | 0.5 m ² |
| Air exchange rate: | 0.5 h ⁻¹ |
| Area specific air flow rate: | 1.0 m ³ /m ² h |
| Air velocity at specimen surface: | 0.1 – 0.3 m/s |

Tenax TA and multisorbents were used as adsorption mediums for VOC. The tubes were thermally desorbed and analysed in accordance with ISO 16000-6:2021 (Indoor air - Part 6: Determination of organic compounds (VVOC, VOC, SVOC) in indoor and test chamber air by active sampling on sorbent tubes, thermal desorption and gas chromatography using MS or MS FID). This means an analysis in a gas chromatograph and detection with a flame ionisation detector (FID) and mass selective detector (MS). The FID signals are used for compound quantification. The TVOC is quantified as toluene equivalents. The mass selective detector is used for identification of compounds. The capillary column used is coated with 5% phenyl/ 95 % methylpolysiloxane. Tenax TA and multisorbents were also used as adsorption mediums for testing of volatile carcinogenic compounds, according to EU Regulation No 1272/2008 Annex VI, cat 1A and 1B, (exclusive formaldehyde), 0.001 mg/m³ and above. Minimum duplicate air samples were taken and the results are mean values. Sampled volumes are 3 to 7 L.

The samplings of aldehydes were carried out with DNPH samplers. The samplers were analysed according to ISO 16000-3:2022 (Indoor air - Part 3: Determination of formaldehyde and other carbonyl compounds in indoor air and test chamber air– Active sampling method). This means analysis on a liquid chromatograph with absorbance detector. Duplicate air samples were taken and the results are mean values. Sampled volumes were 55 L.

Results

The results relate only to the items tested.

Decision rule: When stating conformity to requirement documents, the average value of the measured result is compared to the requirement level. The uncertainty is not taken into consideration unless it is a demand to the applicable requirement document. Procedure “Simple acceptance” for handling the measurement uncertainty is applied according to document ILAC-G8:09/2019, “Guard band 0”, shared risk < 50 % probability for false acceptance.

The emission results can be compared to different Emission Labelling Systems.

The results in Table 1 are expressed as area specific emission rates and as concentrations in a reference room (according to EN 16516:2017/A1). The reference room has a base area of 3 m x 4 m and a height of 2.5 m, with an air exchange rate of 0.5 h⁻¹. The wall area is 31.4 m², floor area is 12 m², small area, like a door, is 1.6 m² and very small area, like sealant, is 0.2 m². Floor area is used for the calculation of the concentrations.

Calculation of the concentration from the emission rate:

$$C = \frac{E_a \times A}{n \times V}$$

C = concentration of VOC in the reference room, in µg/m³
 E_a = area specific emission rate, in µg/m²h
 A = surface area of product in reference room, in m²
 n = air exchange rate, in changes per hour, here 0.5 h⁻¹
 V = volume of the reference room, in m³, here 30 m³

Table 1.
Emission results of **Hydro H1**, after 28 days

| Volatile organic compounds | CAS number | Retention time (min) | ID ¹ | Emission rate (µg/m ² h) | Concentration in reference room (µg/m ³) | LCI _i (µg/m ³) | R _i (c _i /LCI _i) |
|---|------------|----------------------|-----------------|-------------------------------------|--|---------------------------------------|--|
| TVOC (C₆ – C₁₆) | -- | 6.1 - 38 | B | 15 | 12 | -- | -- |
| Volatile Carcinogens² | | 6.1 - 38 | | | | | |
| No substances detected | -- | -- | B | < 1 | < 1 | -- | -- |
| VOC with LCI³ | | 6.1 - 38 | | | | | |
| Furfural | 98-01-1 | 12.7 | A | 37 | 30 | 10 | 3.0 |
| ∑ VOC with LCI | -- | -- | A | 37 | 30 | -- | -- |
| VOC without LCI⁴ | | 6.1 - 38 | | | | | |
| No substances detected | -- | -- | B | < 2 | < 5 | -- | -- |
| ∑ VOC without LCI | -- | -- | B | < 2 | < 5 | -- | -- |
| SVOC (C₁₆ – C₂₂)⁵ | | 38 - 51 | | | | | |
| No substances detected | -- | -- | B | < 2 | < 5 | -- | -- |
| ∑ SVOC | -- | -- | B | < 2 | < 5 | -- | -- |
| VVOC (< C₆)⁶ | | 5.0 – 6.1 | | | | | |
| Acetic acid | 64-19-7 | 5.6 | B | 17 | 14 | -- | -- |
| ∑ VVOC | -- | -- | B | 17 | 14 | -- | -- |
| Formaldehyde ⁷ | 50-00-0 | -- | A | 12 | 9 | 100 | 0.1 |
| Acetaldehyde ⁷ | 75-07-0 | -- | A | 3 | < 5 | 300 | -- |
| R = ∑ C_i / LCI_i⁸ | -- | -- | -- | -- | -- | -- | 3.1 |

¹) ID: A = quantified compound specific, B = quantified as toluene equivalent.

²) Volatile carcinogens = VOCs according to EU Regulation No 1272/2008 Annex VI, cat 1A and 1B.

³) VOC with LCI = identified VOC-compound with LCI-value according to EU-LCI, Dec 2023.

⁴) VOC without LCI = VOC-compound without LCI-value or not identified.

⁵) SVOC = semi-volatile organic compounds.

⁶) VVOC = very volatile organic compounds.

⁷) Aldehydes measured with DNPH samplers (ISO 16000-3).

⁸) R_i is the ratio of c_i/LCI_i, where c_i is the concentration in the reference room for compound *i*.

All VVOC, VOC, SVOC and carcinogens with LCI are included in the calculation of R value.

Only VOC-compounds with an emission rate higher than 2 µg/m²h are listed in Table 1, carcinogenic compounds ≥ 1 µg/m²h. Only compounds with a concentration in the reference room ≥ 5 µg/m³ are evaluated based on LCI (= lowest concentration of interest).

TVOC expressed in µg/m³ and µg/m²h is the sum of all individual substances with concentrations ≥ 5 µg/m³ (in toluene equivalents) in the reference room. Quantification limit for TVOC is 10 µg/m²h. Background of TVOC in the empty chamber was below 10 µg/m³ and is subtracted.

Measurement uncertainty for VOC is 25 % (rel) and for formaldehyde 36 % (rel). The measurement uncertainties are calculated with a coverage factor of 2, which gives a level of confidence of approximately 95 %.

See Appendix 1 for gas chromatograms (FID spectra) and Appendix 2 for a photo of the test specimen. Appendix 3 is the Sampling Report received from the customer.

RISE Research Institutes of Sweden AB
Chemistry and Applied Mechanics - Chemical Product Safety

Performed by

Examined by

Simon Hultman

Fredrik Solhage

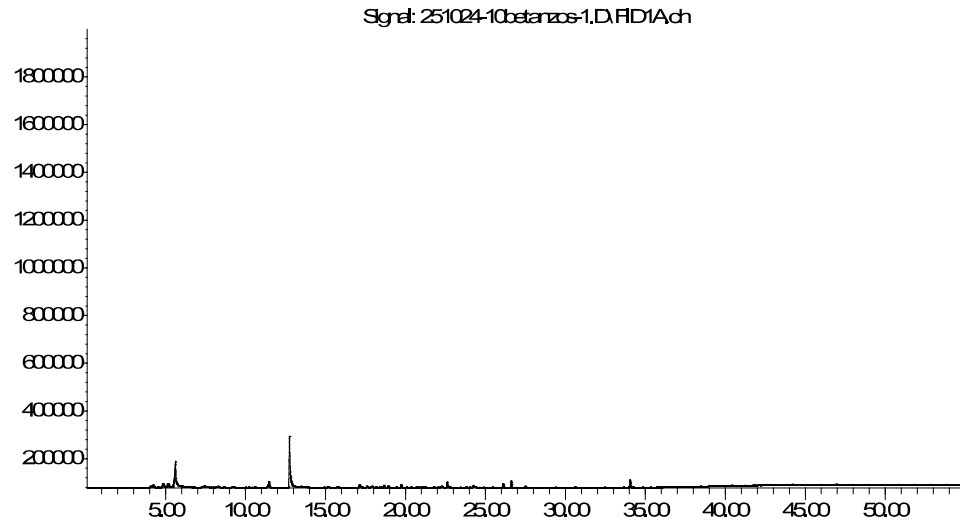
Appendices

1. Gas Chromatogram
2. Photo of the test specimen
3. Sampling report

Appendix 1

Gas chromatogram**Hydro H1, after 28 days**

Abundance



Time->


TVOC between C₆ and C₁₆, means compounds eluting between 6.1 and 38 minutes.

Appendix 2

Photo of the test specimen

Appendix 3

Sampling Report

| | |
|---|--|
| <p>Sampler (Name, Company, contact info):</p> <p>BETANZOS HB S.L.</p> <p>María Barreiro mbarreiro@betanzoshb.es</p> | <p>Manufacturer of the product (Company, address):</p> <p>BETANZOS HB S.L. Ctra Betanzos-Santiago km 3 Betanzos 15300 A Coruña Spain</p> |
| <p>Name of product:</p> <p>Hardboard</p> | <p>Type of product:</p> <p>Hydro H1</p> |
| <p>Manufacturing Date:</p> <p>30/08/2025</p> | <p>Batch No:</p> <p>57474034</p> |
| <p>Sample Details:</p> <p>157111</p> | <p>Date of sampling:</p> <p>16/09/225</p> <p>Amount/size of material sampled:</p> <p>50*50 cm</p> <p>Packing material: wrapped in plastic followed by cardboard</p> |
| <p>Sample is taken from:</p> <p>Production line <input type="checkbox"/></p> <p>Stock / Storage <input checked="" type="checkbox"/></p> <p>Miscellaneous <input type="checkbox"/></p> <p>-where, specify:</p> | <p>How was the product stored before sampling?</p> <p>Pack of 200 boards. Size 2440*1220</p> |
| <p>If a sub-sample was collected from a larger material amount, describe how the sub-sample was taken:</p> <p>Take 1 board from a pack of 200 units (not the top one). We cut on the saw to the requested size</p> | |
| <p>Observations and remarks:</p> | |
| <p>Confirmation</p> <p>I hereby confirm that the sample was selected, taken and packed in accordance with the instructions.</p> | |
| <p>Date: 16/09/2025</p> | <p>Signature:</p>  <p>SHB Betanzos Hardboard Ctra. Betanzos-Santiago, Km. 3 15310 Betanzos, A Coruña - España Tel: +34 981 77 98 04 MP: 087133708</p> |

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