Buildwise

BBRI trading as BUILDWISE
INSTITUTION RECOGNIZED BY APPLICATION OF THE DECREE-LAW OF 30th OF JANUARY 1947

BELAC 042 - TEST

All tests in this report are executed according to the ISO 9001 certified Quality management system of BUILDWISE (1)

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# TEST REPORT

| Laboratory | ACOUSTICS (AC) | O/References | DE-AC-0341<br>AC-23-034-02<br>Page 1 / 9 |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Requested by | Soudal NV<br>Everdongenlaan 18<br>B-2300 Turnhout | | |
| Date of the order | 05-06-2023 | Samples identification | S-2023-24-029/2 |
| Date of the test | 16-06-2023 | Date of reception of samples | 09-06-2023 |
| Remark(s) | / | Drafting date of the report | 31-08-2023 |
| Test carried out | Measurement of the sound reduction index R of a building element | | |
| Product tested<br>Manufacturer | Isotæt as acoustic sealant in gyproc wall<br>Soudal NV | | |
| References | NBN EN ISO 10140-2:2021 Acoustics - Measurement of sound insulation in buildings and of building elements - Part 2: Measurement of airborne sound insulation (ISO 10140-2:2021)<br>NBN EN ISO 717-1:2021 Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation (ISO 717-1:2020) | | |

**Disclaimer**

The laboratory is not responsible for the accuracy and completeness of the information provided by the customer and taken over in this report. The sampling was not carried out by the laboratory and thus the results of this report apply only to the sample as received by the laboratory. The equivalence between the tested product covered by this report and the commercialised product lies entirely under the responsibility of the requestor.

This report contains 9 pages. It may only be reproduced in its entirety.

- ☐ No sample
- ☐ Sample(s) submitted to a destructive test
- ☒ Sample(s) to be removed from our laboratories 30 calendar days after sending of the report, unless a written request is received by the demander of the test

| | AUTHORISED BY : ir. D. Wuyts | |
|---|---|---|
| Technical responsible of the test | Responsible in charge of the test | The head of the laboratory |
| B. Dewez | ir. D. Wuyts | ir. D. Wuyts |
|  | |  |

(1) BBRI trading as Buildwise (CBE establishment number 0407.695.057)

# R

## SOUND REDUCTION INDEX - GELUIDVERZWAKKINGSINDEX
## INDICE D'AFFAIBLISSEMENT ACOUSTIQUE - SCHALLDAMMINDEX

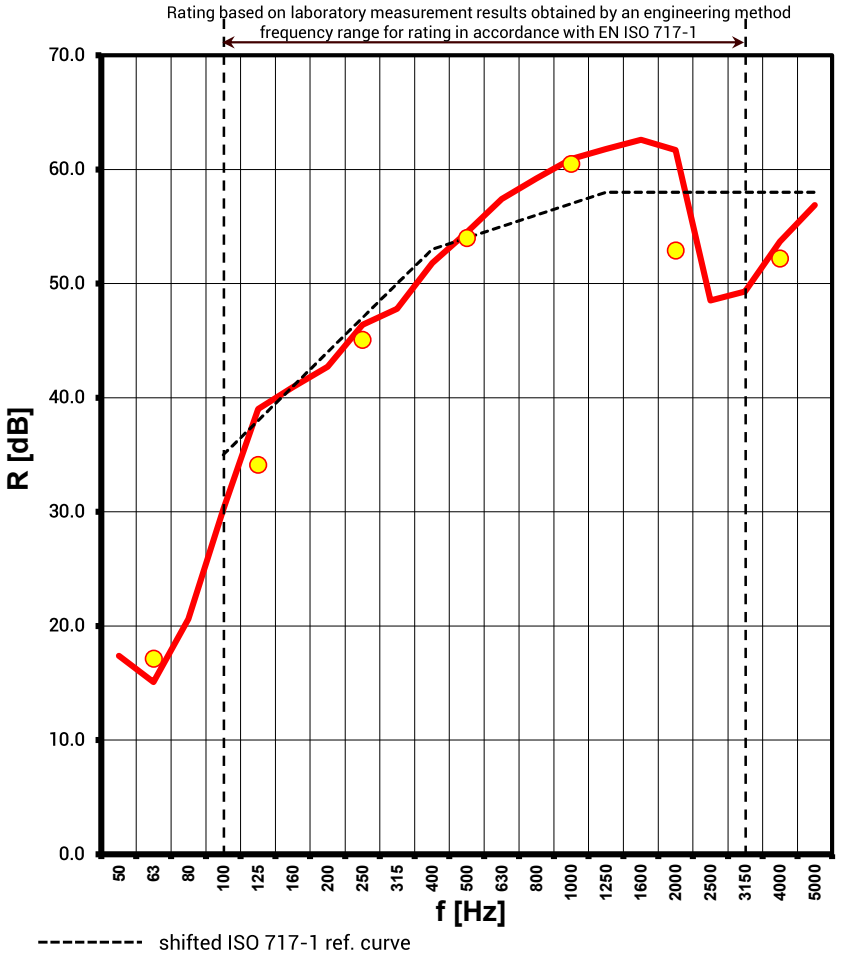
*EN ISO 10140-2:2021 Acoustics - Measurement of sound insulation in buildings and of building elements - Part 2: Measurement of airborne sound insulation*
*EN ISO 717-1:2020 Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation*

Mouting / Montage : 16/06/2023
Date of Test / Testdatum / Date d'essais / Prüfdatum: 16/06/2023
Source room / Zendruimte / Salle d'émission / Senderaum: A (V = 77.28 m³) (% H2O = 38.9 %) (T = 23.4 °C)
Receiving room / Ontvangstruimte / Salle de réception / Empfangsraum: B (V = 65.22 m³) (% H2O = 37.9 %) (T = 24.2 °C)
Static pressure / Statische druk / Pression statique / Statischer Druck: 0.1006 MPa
Test sample / Testelement / Elément de l'essai / Testelement: S = 9.6316 m²

| f (Hz) | R (dB) 1/3oct | R (dB) oct |
|---|---|---|
| 50 | 17.4 | |
| 63 | 15.1 | 17.2 |
| 80 | 20.6 | |
| 100 | 30.2 | |
| 125 | 39.0 | 34.1 |
| 160 | 40.9 | |
| 200 | 42.7 | |
| 250 | 46.4 | 45.1 |
| 315 | 47.8 | |
| 400 | 51.8 | |
| 500 | 54.5 | 54.0 |
| 630 | 57.4 | |
| 800 | 59.2 | |
| 1000 | 60.9 | 60.5 |
| 1250 | 61.8 | |
| 1600 | 62.6 | |
| 2000 | 61.7 | 52.9 |
| 2500 | 48.5 | |
| 3150 | 49.3 | |
| 4000 | 53.7 | 52.2 |
| 5000 | 56.9 | |

$R_w$ (C;$C_{tr}$) =
54 (-3;-6) dB

$C_{50\text{-}3150}$= -7 dB
$C_{tr,50\text{-}3150}$= -19 dB
$C_{50\text{-}5000}$= -6 dB
$C_{tr,50\text{-}5000}$= -19 dB




## REQUESTED BY / AANVRAGER / DEMANDEUR / AUFTRAGSTELLER:

Soudal NV
Everdongenlaan 18 - B-2300 Turnhout

## TEST ELEMENT / PROEFELEMENT / ELEMENT D'ESSAI / PROBE:

*(Short description by the manufacturer, details: see next page(s) / Beknopte beschrijving door het bedrijf, details: zie volgende blz(n) / Description sommaire par l'entreprise, détails: voir page(s) suivante(s) / Kurze Beschreibung durch den Hersteller, Details auf Nächste Seite(n))*

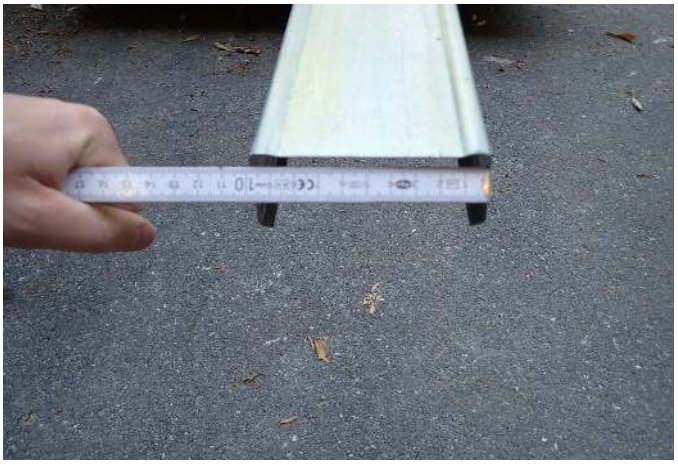
NL: Geen nederlandse beschrijving beschikbaar

FR: Pas de description en Français disponible

GB: Gyproc wall setup consisting out of MSV100 and MSH100 metal studs with 90mm mineral wool covered with 2 layers of gyproc plates (12,5mm) at both sides. Bottom and top joint of inner gyproc plate sealed with Isotæt. Top joint of outerplate sealed with Acryrub. Bottom joint of outer plate is coverd with baseboard and top of baseboard sealed with Acryrub.

## DETAILED DESCRIPTION OF THE BUILDING ELEMENT

This description is given by the producer of the test element and is not guaranteed by the laboratory. The equivalence between the tested product in this report and the commercialised product is the sole responsability of the producer.

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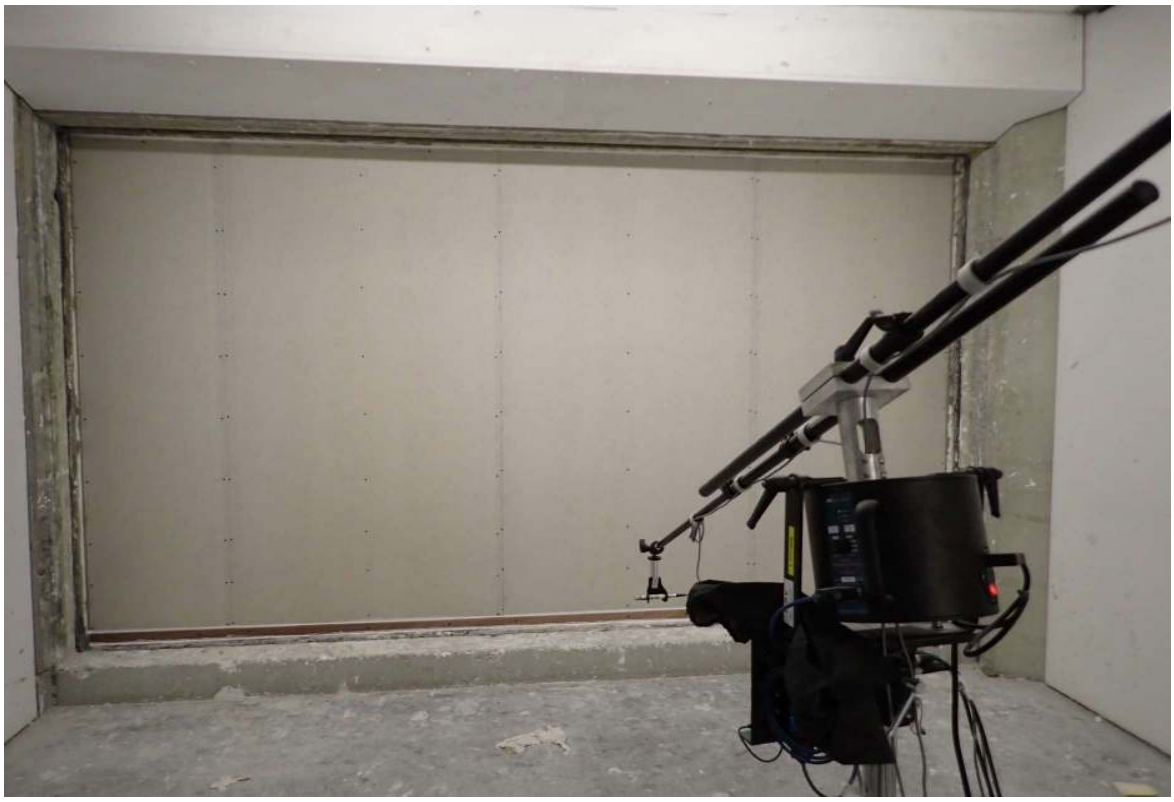


# MEASUREMENT PRECISION, TEST EQUIPMENT AND MEASUREMENT METHOD

## 1. MEASUREMENT PRECISION

| | |
|---|---|
| Air temperature | ± 0.5 °C |
| Relative humidity | ± 5% |
| Atmospheric pressure | 0.0005 MPa |

## 2. MEASUREMENT UNCERTAINTY

The values of standard deviation of reproducibility (Situation A) in Table 3 of the ISO 12999-1:2020 can be applied as an estimation of the standard uncertainty of the single number ratings. The reported expanded uncertainty is calculated for a coverage factor k = 1.96 (two-sided) corresponding to a confidence level of 95% assuming a Gaussian distribution.

$R_w$ = 54.4 dB ± 2.4 dB (k=1.96, two-sided)
$R_w+C$= 51.5 dB ± 2.5 dB (k=1.96, two-sided)
$R_w+C_{tr}$= 47.7 dB ± 2.9 dB (k=1.96, two-sided)

The values in Table 2 (ISO 12999-1) can be applied as an estimation for the standard uncertainty of the sound reduction index R, in one-third octave bands (page 2).

## 3. TEST EQUIPMENT

- 01dB-DO12: Two fixed loudspeakers (dodecahedrons) in each room
- Bruël & Kjaer - 4943: Two microphones in each room
- Bruël & Kjaer - 2669-L: Two preamplifiers for microphones
- Bruël & Kjaer - 2829: Two current supplies for microphones
- Bruël & Kjaer - 4228: A pistonphone calibration source
- Norsonic - Nor265: One rotating microphone boom in each room
- Norsonic - Nor850: A real time analyser
- Norsonic - Nor850: Building Acoustics software

## 4. MEASUREMENT METHOD TO DETERMINE R

A detailed description of the measurement method to determine the spectrum of the sound reduction indices R, can be found in the EN ISO 10140-2 standard (see references on the title page). In a limited and thus incomplete way, the test method can be described as follows:
The measurements are made in a dedicated laboratory construction (see last two pages) composed of a source room and a receiving room. This construction meets the requirements of EN ISO 10140-5. In the source room a steady pink noise is emitted. It is generated by two fixed sound sources (dodecahedrons) so as to obtain an as good as possible diffuse sound field. The sound sources and their fixed positions fullfil the requirements in annex D of EN ISO 10140-5. The average sound pressure level spectrum is measured per 1/3d octave bands in the source room and receiving room by means of two microphones mounted on a continuously rotating beam. In that way, an integration of the sound pressure level in time and space is obtained, resulting in the energetically averaged sound pressure level spectrum for the source room and receiving room.

In the receiving room the reverberation time is measured as well allowing to calculate the correction term in the formula for the sound reduction index R (via the equation of Sabine: A=0.16V/T, V = volume of the receiving room). The sound reduction index R is calculated with the formula:

$$R = L_{pm1}-L_{pm2}+10\log(S/A) \ [dB]$$

$L_{pm1}$ = the average (space / time) sound pressure level per 1/3d octave bands in the source room [dB] (ref. 20 micro Pa)
$L_{pm2}$ = the average (space / time) sound pressure level per 1/3d octave bands in the receiving room [dB] (ref. 20 micro Pa)
S = the surface of the test opening in which the test element is mounted [m²];
A = the equivalent absorption-surface of the receiving room [m²] (from A=0.16 V/T with V=volume of receiving room in m³).

*NOTE: RATING OF THE SOUND INSULATION and SPECTRUM ADAPTATION TERMS*

Calculations of the single rating and the different spectrum adaptation terms are carried out as to EN ISO 717-1 (see references title page) and cannot be explained in a few lines. For your information, the old national single values (NL, B, FR) are stated as well in this report (note: D & GB = EN ISO 717-1). Calculation modules and additional information about the rating of single values for sound insulation (and about standards related to building acoustics in general) are given on the following website:

www.normen.be (Dutch) and www.normes.be (FR)

*NOTE: RATINGS AS TO OLD, NATIONAL STANDARDS (B, NL, FR)*

*1. België - Belgique - Belgien: NBN S01-400:1977 - Criteria van de akoestische isolatie - Critères de l'isolation acoustique*

| | | | | | |
|---|---|---|---|---|---|
| categorie binnenwanden (100 - 3150 Hz): | II b | categorie binnenwanden (100 - 5000 Hz): | II b | | |
| categorie gevelisolatie (100 - 3150 Hz): | V a | categorie gevelisolatie (100 - 5000 Hz): | Va | | |

*2. Nederland: NEN 5079: mei 1989 - Geluidwering in woongebouwen. Het weergeven in één getal van de geluidisolatie van bouwelementen, gemeten in het laboratorium.*

| | | |
|---|---|---|
| buitengeluid: $R_A$ = 47 dB(A) | railverkeer: $R_{A,r}$ = 53.7 dB(A) | Laboratoriumisolatie-index voor luchtgeluid |
| wegverkeer: $R_{A,v}$ = 47 dB(A) | luchtverkeer: $R_{A,l}$ = 51 dB(A) | $I_{lu,\ lab}$ = 1.0 dB |

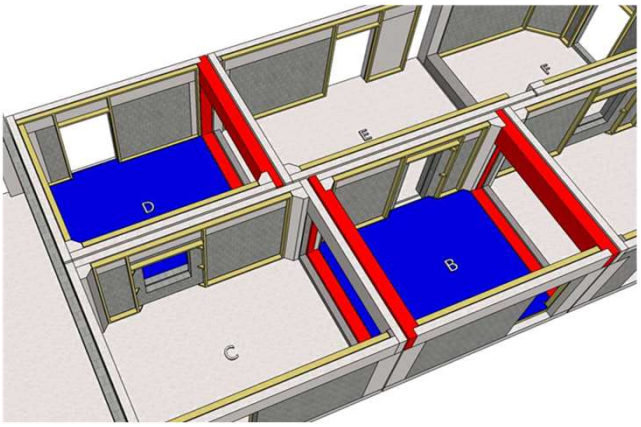
*3. France: NF S 31-051 (Décembre 1985) - Acoustique - Mesure du pouvoir d'isolation acoustique des éléments de construction et de l'isolement des immeubles. Mesure en laboratoire du pouvoir d'isolation acoustique au bruit aérien des éléments de construction.*

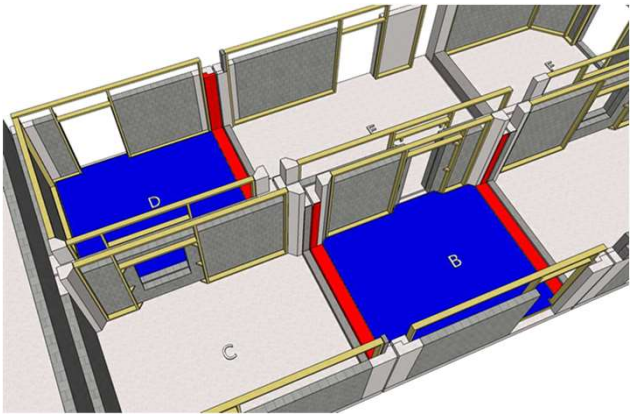
| | |
|---|---|
| Indice d'affaiblissement R exprimé en dB(A) pour un bruit rose à l'émission: | $R_{rose}$ = 51.4 dB(A) |
| Indice d'affaiblissement R exprimé en dB(A) pour un bruit routier à l'émission: | $R_{route}$ = 47.9 dB(A) |

# MOUNTING FOR TESTS ON LIGHTWEIGHT WALLS

## 1. Description of the test set-up

The pictures below show were the test wall is mounted (indicated in red): between A-B, C-B or E-D. For a proper visualization of the construction, the linings and the plaster on the filler walls (blocks of hollow concrete filled with stabilized sand) were omitted. The superior beams were also removed in the picture on the right hand, to illustrate the frame structure and the filler walls built around the columns. Cells D and B have an additional floating floor made of a 10 cm thick concrete slab on 5 cm thick resilient pads and rock wool cavity filling.




## 2. Mounting of the test wall

The sample is mounted by the client in the test opening according to the NBN EN ISO 10140-2, in a similar manner to the actual construction. (See also "Detailed description of the building element"). The mounting details are illustrated below.

## LABORATORY CONSTRUCTION (1/2)

### Generalities *(see next page with 3D drawings)*

The laboratory diposes of 6 fixed transmission rooms (A, B, C, D, E, F), a mobile room M and a reverberation room (alfa). The rooms are organized in such way that airborne sound insulation measurements are possible according to following combinations (source, receiving) : (A,B), (C,B), (C,D), (E,D), (E,F), (A,F) and (E,B). Measurements are always made from the largest to the smallest room (minimum volume difference of 10 %). Finally measurements can be made from the mobile room M (movable with overhead crane) to every other ixed transmission room underneath.

### Combinations of transmission rooms

(C,D) and (A,F): partition with small-sized test opening (1.25 m x 1.50 m) in accordance with "§3.3.3 Specific small-sized test opening" of the EN ISO 10140-5 to measure the sound reduction index, mainly for glazings or windows.

(E,B): partition with small-sized test opening (1 m x 2.6 m) to measure door constructions, board material, etc.

(E,F): special test opening on to which a mobile concrete frame can be mounted. The test element is mounted outside the room in the concrete frame and transported into this test opening with the overhead crane.

(A,B, (C,B) and (E,D) have traditional test openings in accordance with EN ISO 10140-5. The test element is mounted in rooms B or D which are completely built as a box-in-a-box by means of an additional floating floor on top of the floor slab mounted on resilient pads.

### Floor slabs

Each fixed room as well as the reverberation room is built up a 30 cm thick massive concrete floor slab, resiliently mounted by CDM-pads on massive foundation beams. These slabs are isolated from the environment and the adjacent rooms by a 5 cm large cavity filled with mineral wool. The mobile room is supported on the side of the central axis (seperation rooms A,B,C from rooms F,E,D) by the adjacent rooms, and on the outside by a steel frame attached to the columns carrying the overhead crane. This way no hard contacts exist between the mobile room M and any fixed room below . To complete the box-in-box construction in rooms B en D, a 10 cm thick floating concrete slab (in blue on the figures) is placed by means of 5 cm thick CDM-pads on top of the decoupled slabs. The cavity is filled with mineral wool.

### Ceiling slabs

The ceiling slab on each fixed transmission room consists of three parts, carrying from the outer walls to the central axis. The three parts are : (1) a concrete slab with 14 cm thick local savings, used for impact sound measurements according to EN ISO 140-3, and an all-around 30 cm thick and 25 cm large concrete border. (2) and (3) are 30 cm (or 35 cm) thick massive concrete elements. All ceiling slabs can be removed by the overhead crane. For each room, they are joint together and to the underlaying walls by a mortar joint. Still three exceptions remain: in rooms B en D a resilient joint is put into place between the border of the ceiling slabs and the concrete beam connected to the test element beneath, to avoid flanking transmission to the latter. The slab parts (2) and (3) as well as the thick edges of (1) are shielded by heavy (movable) suspended ceiling constructions. This in order to avoid radiated impact sound from slab parts (2) and (3), als well as to determine the vertical airborne sound insulation between the mobile room M and the fixed room below for test elements within the surface of (1) (adaptable, with or without shielded edges)

### Frame structure

The fixed rooms are built with a frame structure consisting of concrete columns supporting 60 cm high and 20 cm thick concrete beams. 30 cm thick beams are used in connection with test elements (in red on figure). The beams are fixed mechanically and can be removed easlily. The columns close to the central axis are conceived to allow for the filler walls to continue behind the columns and connect with the test element. Between the column and the filler wall, a decoupling insulation is placed. The aim of this construction is to allow for a sufficiently high, necessary coupling loss for the test element.

### Filler walls

The non load-bearing basic filler walls are made of 19 cm thick hollow concrete blocks, mounted inversely and fully filled with stabilized sand. The surface mass of such a wall is about 380 kg/m². Only the filler walls in the central axis are plastered. All walls are shielded with linings.

### Linings

To allow for the ceiling slabs to be removed, the linings are attached to the walls. Therefore a timberframe structure (see picture) is fixed resiliently, to which a lightweight metal frame (metal studs) en gypsum boards (2 x 15 mm) are mounted. The 18 cm wide cavity is completely filled with mineral wool.

## LABORATORY CONSTRUCTION (2/2)


*3D illustration of the acoustic laboratory, showing the overhead crane, the mobile room M and the ceiling slabs with local savings (rooms illustrated without doors).*

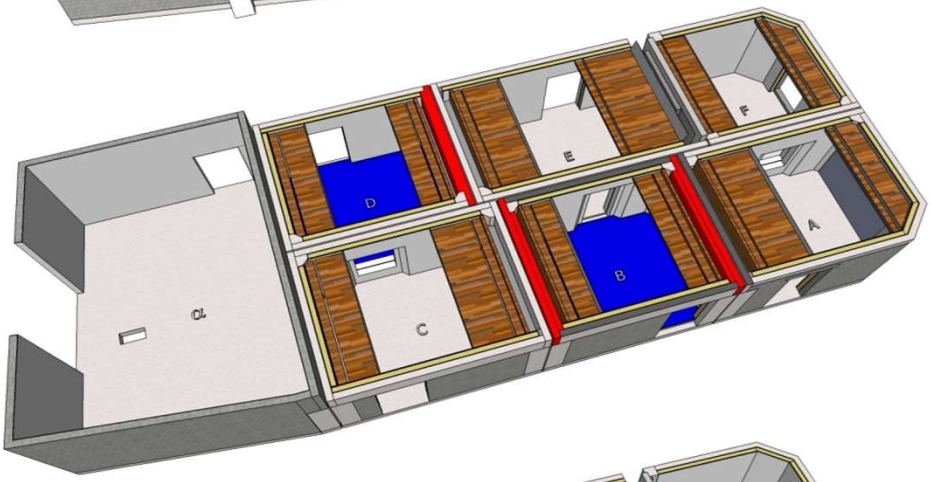
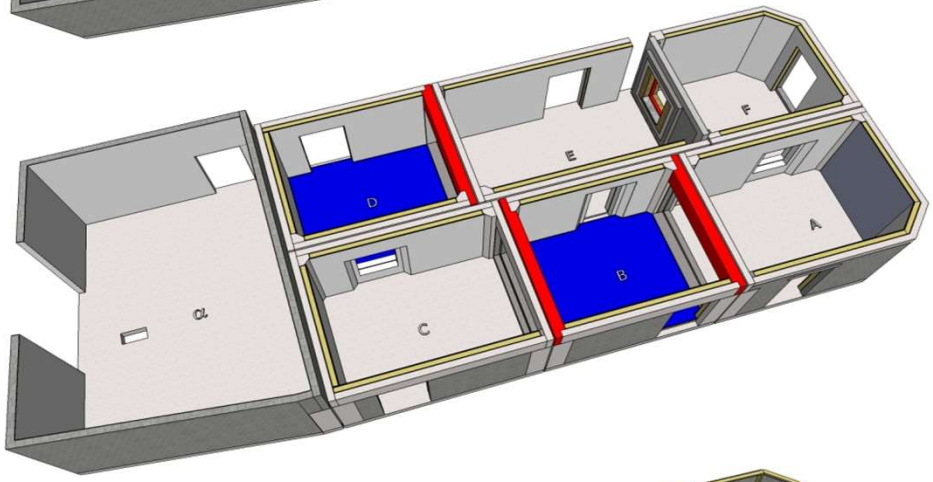
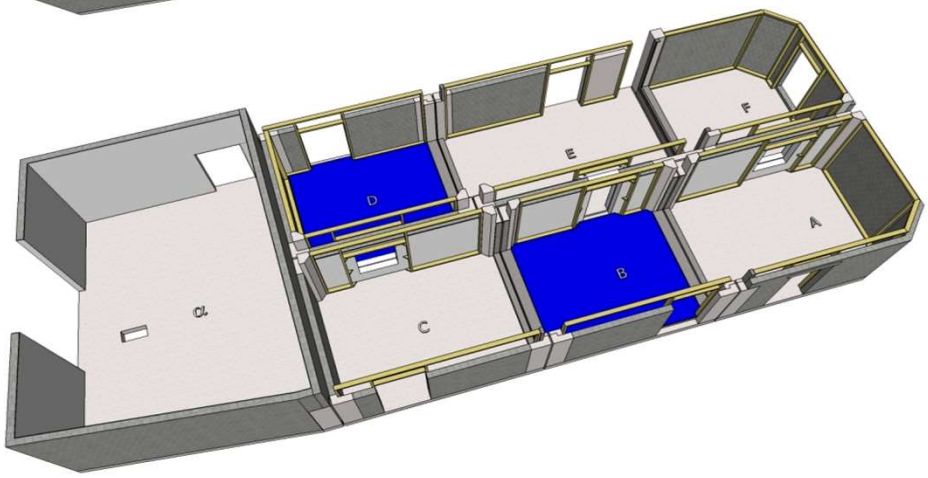



*Illustration of the laboratory without overhead crane, mobile room and ceiling slabs. View on the suspended ceilings inside the transmission rooms A to F.*




*View inside the transmission rooms. Blue : floating concrete slab inside rooms D and B. Red : beams and filler wall in connection with the test element (not illustrated).*




*View inside the transmission rooms showing the timber frame structure on which the metal framework and gypsum boards (ommitted in picture) of the linings are mounted.*