RECTICEL The passion for comfort

# International Development Center

Internal Use

Internal Note

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|---|---|
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| **Date** | |

**Project:** FTF13S08 - CBS Acoustics & Vibration Damping

**Subject:** TR-14-01 - glue testing with PGR

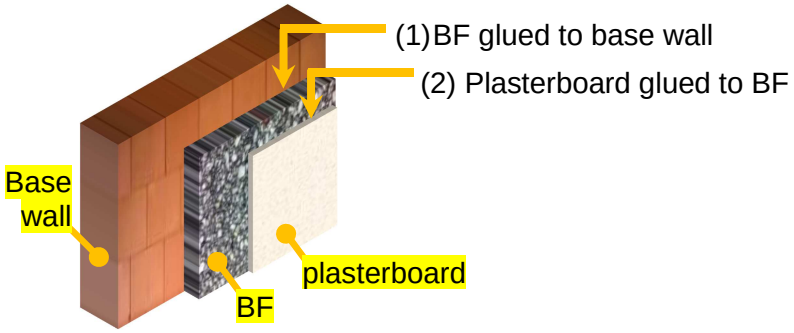
**Introduction**

Recticel Spain provides bonded foam products which can be used to improve the acoustic insulation in buildings.

To get a good sound insulation the BF-product must always be applied in combination with two separate mass-layers to form a double wall (so-called mass-spring system). The two mass layers should not make any rigid contact.

So usually in practice the application is as follows:

- Step 1: BF-plate is glued to a base wall (or ceiling)
- Step 2: gypsum plasterboard is glued onto the BF-plate




Doing so a good performing mass-spring system is realized.
The base wall (or ceiling) could be of any type of common building material. Instead of the gypsum plasterboard also other types of building panels could be used.

Today beside the BF-products also the glue product is provided. This report gives an overview of the testing which was done to qualify glue: Copopren Cola Profesional D5 – D20.

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**Test samples**

The following products were used to make test samples of:

- COPOPREN MASA PESADA DE 9MM
- Gypsum plasterboard 18 mm GBK A18/AK (supplier: KNAUF)
- Copopren Cola Profesional D5 – D20.

| **Tensile strength test**<br>ASTM D 1623 (IN/T.019.0) | **Initial tack test**<br>NT 414 |
|---|---|
| Complex: plasterboards glued onto both sides of BF (cured for minimum 24h)<br>  | Separate samples of BF and plasterboard: the glue will be freshly applied<br>  |

The glue layer was always applied over the full surface on one side using a paint roller.

Then both layers bonded foam and gypsum plasterboard were pressed against each other for 5 – 10 s.

**Test methods**

Tensile strength (ASTM D 1623)

During this test the force is measured that is required pulling the **cured complex** apart until the point where it breaks.

- Result: tensile strength (= value of maximum tensile stress that a material can take before breaking). In this case the breaking can occur in the following layers:
  - Plasterboard
  - Glue
  - Bonded foam
- Test sample size: 50 mm x 50 mm ( x thickness)
- Tested samples : 4

The test sample is clamped on the plasterboards on both sides. The test equipment pulls the 2 plasterboard-sides apart with a defined speed and continuously measures the pull force.

The maximum force at the break-point defines how much weight the complex can hold.

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Initial tack (NT 414)

During this test the force is measured that is required pulling a **freshly made complex** apart until the point where it breaks.

The needed force was determined depending on the time between applying the glue and pressing the samples together (= 'open dry time').
The following 'open dry times' were respected: 0, 2, 5, 10 & 15 min.

| Apply glue and await the 'open dry time' | Press the complex together for 5 s | Pull complex apart (measure the force) |
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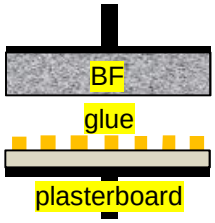
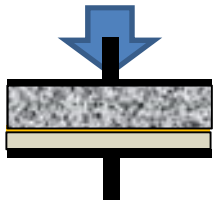
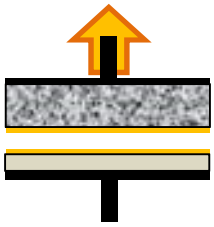
|   |  |  |

- Result: force that is needed to pull the freshly glued layers (BF and plasterboard) apart
- Test sample size: 50 mm x 50 mm ( x layer thickness)
- Tested samples : 3 (for each 'open dry time' variation)
- Room conditions: (23 ± 2) ℃ & (50 ± 10) %RH

## Test Results

Tensile strength

The tested Tensile Strength of the complex is 7.7 N/cm² (average of 4 samples; StDev = 3.3 N/cm²).
That means that such kind of complex can hold a tensile stress of about 77 kPa (or a weight of **up to 7850 kg/m²**).
In the annex the results are listed in a table.

**A Tensile Strength of 77 kPa is more than sufficient for this kind of building application.**

The break of the complex occurred at different locations for the tested samples:

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Sample 1 and 4: fracture in paper of plaster board

This means that the glue is stronger than the substrates.

Sample 2: frature between foam and plaster board

In this case, the glue seams to be the weakest point. However, a tensile strength of 3.35 N/cm² should be sufficient for this application.

Sample 3: fracture in plaster board

This means that the glue is stronger than the substrates.

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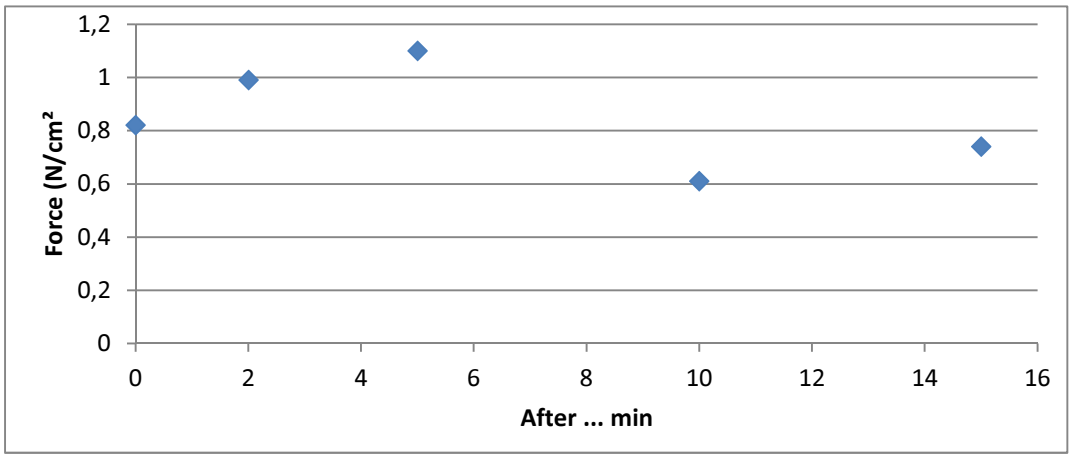
Initial tack

This testing resulted in tensile stress values between 0.61 and 1.1 N/cm² (depending on the 'open dry time'). The maximum StDev was 0.54 N/cm².




After the glue is freshly applied onto one side and if the 'open dry' waiting time is below 15 minutes before pressing the 2 layers against each other the glue can withstand a tensile stress of at least 0.61 N/cm² (= 6.1 kPa or ≈ **622 kg/m²**).
In the annex the results are listed in a table.

**An Initial Tack Tensile Stress of about 6 kPa is more than sufficient for this kind of building application.**

**Conclusion**

Copopren Cola Profesional D5 – 1200Wx2500Lx360H mm D20 is good enough to be used for building acoustic applications.

The tensile strength of a complex bonded foam and plasterboard (glued together with the water based adhesive product and dried for at least 24 h) is more than sufficient (at least 7850 kg/m²).

Also the initial tack of a 'freshly glued' complex is strong enough to directly hold a weight of at least 622 kg/m². While applying both bonded foam and plasterboard must be pressed against each other for at least 5 to 10 s. There was no linear behaviour of initial tack tensile stress and open time seen.

The ageing behaviour was not tested.

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# Annex

Results: Tensile strength (ASTM D 1623)

| | | Sample 1 | Sample 2 | Sample 3 | Sample 4 | Average | Stdev |
|---|---|---|---|---|---|---|---|
| **Tensile strength** | N | 184,8 | 83,7 | 283,4 | 213,9 | 191,5 | 82,9 |
| | N/cm² | 7,39 | 3,35 | 11,34 | 8,56 | 7,66 | 3,32 |

Initial Tack (NT 414)

| **Initial tack** | | Sample 1 | Sample 2 | Sample 3 | Gem. | Stdev |
|---|---|---|---|---|---|---|
| **After 0 min** | N | 17,8 | 19,1 | 24,9 | 20,6 | 3,8 |
| | N/cm² | 0,71 | 0,76 | 1,00 | **0,82** | **0,15** |
| **After 2 min** | N | 37,0 | 15,5 | 21,4 | 24,6 | 11,1 |
| | N/cm² | 1,48 | 0,62 | 0,86 | **0,99** | **0,44** |
| **After 5 min** | N | 20,3 | 19,3 | 43,1 | 27,6 | 13,5 |
| | N/cm² | 0,81 | 0,77 | 1,72 | **1,10** | **0,54** |
| **After 10 min** | N | 19,0 | 13,9 | 12,9 | 15,3 | 3,3 |
| | N/cm² | 0,76 | 0,56 | 0,52 | **0,61** | **0,13** |
| **After 15 min** | N | 22,2 | 11,4 | 21,7 | 18,4 | 6,1 |
| | N/cm² | 0,89 | 0,46 | 0,87 | **0,74** | **0,24** |

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