GLUING OF FACING BRICKS

Thin joints for a more attractive and stronger wall!
Over recent decades, innovations in the building market have led to new methods for handling exterior brickwork. In addition to traditional brick-laying, gluing stone has now become a permanent feature of the building site. Gluing or thin bed masonry produces narrower joints between the bricks and therefore gives an aesthetically different appearance: you can see more clay bricks and you get a wall that is stronger and more durable!

**EXTENSIVE POSSIBILITIES FOR CONSTRUCTION**

Over recent years, bricks have seen their role as a constructive element diminish. Often they have been reduced to nothing more than a ceramic cladding for the outer wall. The technique of gluing makes clay bricks viable once again as a constructive element, even in a modern building environment. This is because the joints between the bricks are no longer the weakest point. Gluing provides significantly greater and more homogeneous strength than traditional mortar does. The strength of the wall when glued is determined by the strength of the bricks. Compared with traditional masonry, the strength of the glued wall is increase by a factor of about 3. You can exploit this increased strength in a number of ways. For example, you cannot only permit larger openings or spans, but also make more slender constructions. The strength of the glue mortar, which is many times greater, allows relatively large apertures to be made in the wall without using steel or concrete lintels. Even larger wall openings can be bridged using a special mesh reinforcement in the horizontal joint above the opening. With gluing, you can also use a narrower cavity, since there is less “beard” formation when the gluing is done properly.

**THE ORIGINS: WHERE DID THE IDEA COME FROM?**

The clay brick industry was in the first instance looking for a way of handling bricks more quickly and more cheaply. The working conditions for the bricklaying were a point that a great deal of attention was paid to. It was noted that methods for gluing other construction materials such as calcium silicate blocks and aerated concrete were being used successfully. Attention was soon focused in that direction. However, the enormous variety of facing bricks available did not make the job any easier.

**DEVELOPMENT**

Omnicol has embarked on an intensive development programme, jointly with the clay brick industry, several suppliers and testing authorities. The first glued projects were completed as early as the start of the 90s. Finally, Omnicol developed a number of different glue-mortar types, providing solutions for the huge variety of facing bricks in use: clay bricks (by far the most commonly used facing bricks in the Benelux countries), concrete blocks and e.g. high-speed clay building blocks (interior walls), each with their own specific characteristics.

The processing of these glue mortars has been thoroughly investigated, which has led to a variety of handling methods being...
developed. The glue mortars for facing bricks may be processed either with equipment specially developed for this purpose, or in a more traditional manual fashion. The name “glue mortar” has been deliberately chosen, by the way. On the one hand, the material behaves like a mortar, but on the other it has the characteristics of a glue.

AESTHETICS

A facing brick laid with glue-mortar gives the outer wall a different look. The colour of the brick determines the appearance of the wall to a greater extent. In a traditionally-laid wall, the joints take up 20% of the surface. In a wall laid with glue-mortar, this is reduced to about 8%. Basically, all you see are the actual bricks. The fact that glazed outer walls are executed with recessed (thin) joints that are not filled to protrude also emphasises the colour intensity as well as the durability. Scientific research and references have shown that the recessed jointing stays cleaner for longer and thus has a favourable effect on the visual aging of the joint.

SPECIFIC FEATURES OF GLUED FACING BRICK MASONRY

Glued facing brick masonry units have the following general characteristics:

Better quality

Work is executed with industrially produced glue mortars that are always consistent in quality and which are delivered to the building site ready for use.

Greater durability

The joint, the weakest link, is eliminated completely. When the correct glue mortar is used, a glued masonry wall is much less sensitive to lime staining and efflorescence. This is due to the accelerated curing of the glue mortars and their specific composition.

Leaving head joints open has been investigated thoroughly as a glue mortar application and it works well, as can be seen from the many projects realised this way. The amount of moisture ending up in the cavity wall is in fact rather low, for a number of reasons. Firstly, the open head joints are very narrow. Optimum ventilation for the outer cavity wall is hereby provided, resulting in a zero pressure differential between the outside and the inside of the cavity. When gluing is done leaving the head joints open, we recommend using a darker coloured glue mortar because of the appearance of a shadow in the joint.

Standards

As mentioned before, glue mortar is both a glue and a mortar. There were therefore no standards available for such materials when development was started. At the request of industry, however, products were created that provide a number of distinguishing properties, such as:

- improved moisture behaviour
- higher bonding and tensile strengths
- positive efflorescence behaviour
- durability

In the Netherlands, there is an evaluation guideline (number 1905) that may be used as the basis for product certification. All Omnicol glue mortars have KOMO certification with product certificates. The WTCB in Belgium has set up a specific standard that covers glue mortars. Last but not least, the new technique is entirely in line with the European EC-6 standard.
European standard EN 998-2 covers a whole series of properties for masonry mortar. It is replacing all the national standards on the subject. Since the start of 2008, all masonry mortars must also have a CE identification symbol, in accordance with “Appendix ZA” of the said norm. Mortars are categorised on the one hand according to their composition and on the other according to their performance characteristics. Within the latter category, a further distinction is then made between:

- masonry mortars without special characteristics (G)
- masonry mortars with a maximum granule size (T)
- masonry mortars with densities below a certain threshold (L)

Because the method of application often differs very widely between the various countries concerned, this is often handled at a national level. For instance, the product standard is linked to the application by e.g. NEN 6790 in the Netherlands, DIN V 18580:2004 in Germany (albeit to a lesser extent and in a different way), and TRA BEN 651N in Belgium.

Products with a KOMO certificate (in the Netherlands) or a Benor or Ü quality mark (Belgium and Germany respectively) have been tested for use in those countries. The KOMO certificate (based on assessment directive BRL1905) and the Benor quality mark (based on TRA BEN 651N) in particular provide specific guidelines for processing items such as clay bricks as a function of the mortar layer thickness, on top of a large number of other items such as environmental aspects. For example, you use class G mortars for medium (M), thick (X) and very thick (XL) layers, whereas class T masonry mortars (glue mortars) are used for thin (S) and very thin (XS) layers. The glue mortars also have to comply with numerous more stringently defined properties such as adhesive strength and water absorption. An enormous amount of expertise has now been developed in the Benelux countries with regard to gluing clay bricks (glue mortar class T, joint type S) and thin-bed mortar work (masonry mortar class G, joint type M).

DURABILITY

The ageing of a masonry wall does not depend only on the ageing of the bricks, but above all on the joints between the bricks. As far as the joints are concerned, the technical ageing of the building mortar is rarely the weak link: the technical and visual ageing is almost entirely due to the jointing mortar. This weak link is not present in a glued wall. The strength and density of the glue mortar exceed that of the clay bricks. This means that re-pointing work on walls becomes unnecessary, and the environmentally unfriendly masonry cleaning work is also not needed.

The joints often become dirty due to moss and algae growing in the joints, which then in turn spreads to the bricks. This is possible because acid rain reduces the alkalinity of the jointing mortar. With glued walls, though, the glue mortar is not porous and is water-resistant. This means that the durability of the glued joint is much better than that of traditional masonry in terms of the growth of mosses and algae.

Because of the water resistance, glue mortar is also immediately dry after a shower, thereby depriving the mosses and algae of the water that they need to grow. The recessed joints also mean that the surface area of the bricks is also greater, which helps the bricks to dry more quickly after a shower.
STRENGTH
The strength of the glued joint exceeds that of the brick. This is due in part to the high cement content. This means that there are more potential applications:
- continuous vertical joints, for example when laying in tile bond;
- larger apertures without support;
- walls with open head joints;
- prefabricated glued brickwork.

DURABILITY
The weakest link in a masonry wall is generally the pointing, which is often less durable than the building mortar. There are no pointed joints in glued walls and the building mortar has been replaced by the glue mortar, which is about 3 times as strong. The UV ageing tests that have been performed, plus a variety of sequential freezing and thawing cycles, have shown that no measurable ageing occurs.

COLOUR
The colour of traditional masonry work depends strongly on the colour of the jointing mortar. Visual ageing is also determined to a large extent by the colour changes in the joints.

With glued walls, the jointing is recessed. The shadows in the narrow joints mean that it can in fact hardly be seen at all. Even after many years, the colour of the wall is primarily determined by the tonal expression of the clay bricks itself.
Omnicol has developed a mortar for thin layers especially for this application: GM omnifix. Because this mortar is easy to use in the traditional fashion, the bricklayers who are most likely to work with this material are in particular those with a more traditional approach. Please note, however, that you get a result that is visually comparable to the results with glue mortar. In qualitative terms, though, the comparison does NOT hold.

WHAT IS THE DIFFERENCE BETWEEN GLUING AND THIN-LAYER MASONRY WORK, ACTUALLY?

The joint is recessed in both cases, emphasising the effect of the brick much more strongly. A more colour-intensive wall is obtained, which no longer needs pointing.

The joint thickness is 3 to 6mm when glue mortar is used. For masonry work in thin layers, the joint thickness is 4 to 8 mm. In addition, the glue mortar has a number of properties that the building mortar for thin layers does not have. For instance, the glue mortar is much stronger, providing numerous options for construction such as stacked bond, bridging elements without lintels, savings generated on construction support facilities, etc. Moreover, the likelihood of efflorescence is almost zero with glue mortar. Masonry work in thin layers does have the advantage of allowing more variable brick shapes to be used with a thinner joint. This means that the aesthetic aspects approach those of using a glue.

WHEN SHOULD YOU CHOOSE THIN-LAYER MASONRY WORK AND WHEN SHOULD YOU GLUE THE FACING BRICKS?

It all depends on the technical characteristics that you require. For both techniques, the aesthetic aspect is a key starting point. If you do want to have all the additional functional benefits of a glue mortar, choose PVM omnifix. If the aesthetics are all that matter, you may choose GM omnifix.

The way the two systems are applied is the same: you can apply both PVM omnifix and GM omnifix with a pump, grouting bag or trowel.

PREFABRICATION

A recent development is the use of glue mortar for producing prefabricated masonry elements. The glue pump already provides a significant improvement in working conditions on the building site, but it can be exploited even more fully in the factory.

On the following pages you find a brief summary of the variants that exist at the moment.

MOISTURE

The cement-rich glue mortar is not very permeable and is also water-resistant. More moisture is therefore absorbed by the bricks and that it also evaporates through the bricks. This means that there is hardly any lime efflorescence in glued walls. This opens the way to applications of glued walls with open head joints.

CONSTRUCTION COSTS

The construction costs of a glued wall are determined by other factors than for a masonry wall, meaning that you have to take the following aspects into account:

- more bricks needed per square metre m²;
- more accurate work for the bricklayer with regard to shape and variations in the bricks;
- this may mean that additional cutting work is needed;
- additional actions needed when gluing the head joints;
- more precise organisation and planning is required;
- broader scaffolding than usual may be needed (when using the glue mortar pump - 1.20 metres is the optimum width);
- time for cleaning the pump (if a glue mortar pump is used).

The additional costs must be weighed against the fact that pointing is not needed. This means in turn that you only need the scaffolding for a shorter period, which also generates savings. If you choose to use larger sized bricks in combination with open head joints, then you can even produce a glued wall for the same price as a masonry one.

NOTE: Many manufacturers already have clay bricks available in modified formats – sizes designed for gluing!

Expensive restoration work for older walls is also no longer needed. In that respect, a glued wall means zero-maintenance. When clamped gluing is used (placing the brick on its side), there are a number of additional price benefits with respect to traditional masonry. You then need fewer bricks per square metre and this saves space: the net volume of the project will be greater, or for instance more isolation can be applied.

MASONRY WORK IN THIN LAYERS

An increasingly common phenomenon is brickwork in thin layers. The material used for this is (entirely incorrectly) referred to in the market as "thin bed mortar". This nomenclature is wrong because it does not match the categorisation of the various types of mortar according to the European standard.
SINGLE-SHELL ELEMENTS

These are made of whole bricks, glued together using glue mortar to produce a single element. The applications for this prefab system can basically be split into two variants:

- **Self-supporting single-shell elements**
  These are used for instance as parapet elements, in combination with a previously fully prefabricated body unit. It is important to make the right choice of method for fixing these elements to the load-bearing construction. For this, it is important that the element is well able to handle the wind loads and transfer them via the attachment points to the load-bearing structure. The benefits of this system are primarily the speed with which they can be put in place and the high quality gluing work obtained. In a factory setting, numerous variants can be produced (e.g. laid in different bonds).

- **Elements attached to suspension profiles**
  This prefab system is comparable to gluing natural stone to suspension profiles, and this is indeed where it comes from. The prefabricated single-shell half-brick exterior panels are glued at the building site onto an aluminium attachment system that has been fixed to the underlying interior wall.

DOUBLE-SHELL ELEMENTS

These comprise an external shell, cavity, insulation layer and internal wall. The internal wall is often made of concrete. The use of an air cavity makes it fit in well with traditional masonry walls. Construction using double-shelled elements has a number of substantial benefits with respect to single-shell elements. The key benefit is that placing the wall element gives you a fully closed outer wall in just a single action. This is because the window frames, glass and other outer wall elements can already be part of the wall element.

CLOSED WALL BRICKWORK

The “Metselfabriek” foundation has developed a prefab outer wall concept in which the outer wall and the inner wall are handled completely separately. The principle is a process in which a single-shell outer wall is built first, completing the entire outer wall area, after which the inner wall can be completed at a later stage.

For the production, bricks are first glued together in a mould. After gluing, a layer of concrete is poured onto the back of the whole clay bricks. Applications are for example where repeating outer wall elements are used in high-rise construction or in the construction of noise barriers.

SANDWICH ELEMENTS

Because masonry sandwich elements have already been being produced for decades, a variety of production methods have been developed for them. The final appearance of the various wall elements is largely the same. There is an important difference to note between masonry work and glued work. The key difference with regard to double-shell elements is the absence of an air cavity. As far as the outer shell is concerned, this means that high quality bricks and mortar have to be used to prevent water from being absorbed and rainwater from penetrating.

As with the single-shelled elements, it is also possible to make the external shell of the sandwich outer wall elements out of glued bricks. In that case, the outer shells are first glued together on tilting tables to produce separate single-shelled units. These separate glued outer wall segments are then placed in a mould, after which the sandwich element is completed with insulation and an interior wall.
PREPARATIONS REQUIRED

The setup for the construction work must be appropriate for gluing the facing bricks (scaffolding, water, power, stacking and supply of bricks, cutting facilities, etc.).

- The bricks must be free of grease and dust; pre-moistening is not needed. Excess sand must be removed from sanded bricks as far as possible.
- Correct scaffolding: provide sufficient space if you are going to be working with the glue mortarpump.
- Do not have scaffolding pipes up against the wall; these prevent you from being able to apply the glue continuously.
- Correct sizes: the layer dimensions are determined using several randomly selected bricks from different packs. Measure the length and height of these (in groups of ten).
- Carry out any cutting work that may be needed beforehand.
- Make sure that the right cavity wall ties are used.

APPLICATION

Make up the glue mortar with clean and cold tap water. The right amount and proper mixing are critically important for glue mortars. The appropriate amount depends on the usage, the colour and the required consistency for applying it. This amount is above all highly important if you are intending to pump the mortar.

First put the water in the mixer before adding the powder. Only then can you start mixing. If the mortar is too liquid, it is easy to thicken it by adding a little extra power; conversely, mortar that is too thick can be made more liquid by adding extra water. The material obtained must be mixed for at least 4 minutes, until you get a homogenous and lump-free mass. For the glue pump, the mixing time is preset. If you make the glue up manually, the mixing time of 4 minutes must be strictly observed.

The bricks are laid in the traditional fashion along a string in the wall. When determining the layer dimensions, make allowances for the tolerances of the bricks and the joint thickness to be used.

With a gluing machine: glue is applied to the layer surface by moving the gun over the bricks. The gun smoothes off the glue, which is applied in the appropriate amounts. A special rack allows glue to be applied to the head faces of the bricks in the same way. A second person can place the bricks, allowing a greater speed of production to be achieved. Be careful that the open time of the glue mortar is not exceeded. After a long pause or in warmer weather, it may be necessary to pump away the glue that is in the hose before continuing with the work. It is recommended that the stock of glue mortar that is present in the mixture should be used up before pauses and the hose should be pumped full of fresh water.

Manually: never prepare too much glue mortar at once. Take a brick in one hand and hold it upside down. Apply glue to the bottom/back side of the brick, using just enough so that no glue will come out of the front of the joints when the brick is placed in the wall. Then apply glue immediately to the head end. Place the glued brick in the wall. If you are using GM omnifix, this can be handled in the same way as traditional masonry mortars. If glue is squeezed out at the front, allow it to set for at least 20 minutes before scraping it away. Glue oozing out can be the result of applying too much of the material, or can be due to the glue mortar being applied at the wrong place.
With a grouting bag: an alternative for working with the glue mortarpump is to do the gluing with a dosing nozzle. This is like a large baker’s icing nozzle, supplying the glue from the bag. The nozzle aperture is adjusted to suit the glue thickness. Pressure on the nozzle creates a “glue sausage”. The bricks are then pressed into this layer of glue mortar.

- Be careful when gluing bricks with perforations. The glue must completely cover the perforations at the outer edge so that frost damage is avoided.
- When it is raining or when the temperatures are too low (below +5°C), the fresh glue mortar and wall must be appropriately protected. Be absolutely sure to avoid it freezing while being processed or while setting.

**TOOLS REQUIRED**
- Mixing/application equipment
- Racks (for applying glue to the head ends)
- Mixing tub
- Measuring beaker
- Trowel
- Tuck-pointing raker
- (wet) Cutting machine
- Dosing nozzle

**AMOUNT REQUIRED**
For stretcher bricks in running bond with glued horizontal joints and head joints, you should do the calculations using:
- consumption of between 12 and 21 kg/m² for glue mortar,
- consumption of between 18 and 30 kg/m² for thin layers.

The exact amount required also depends on items such as the dimensions of the bricks chosen, the presence or perforations and the desired joint thickness. A tool for calculating the consumption can be found on our site www.omnicol.eu.

Omnicol is the pioneer when it comes to gluing facing bricks. With more than 30 years’ extensive experience in gluing calcium silicate and aerated concrete, they have developed a complete range of glue mortars, in close cooperation with the brick industry. We distinguish between the following types of glue mortar, each of which has its own specific properties and area of application:

**PVM omnifix**
Adhesive mortar for all brick types

**Distinguishing product features**
- Suitable for all types of clay bricks, including hand-moulded, extruded and wire cut bricks.
- Glue mortar for pumping, available in three types (depending on the water absorption (ira) of the clay brick used). Check www.omnicol.eu for the suitable mortar.
- Greater strength, allowing new construction possibilities for clay bricks.
- Durable walls due to better moisture control and absence of efflorescence.
- Available in the most common colours. See page 22 for the colour chart.
- Certified: KOMO approval with product certificate in accordance with BRL 1905 and classified as a category 1A building material in line with the Dutch Building Materials Decree.

**Applications**
PVM omnifix suitable for gluing all possible types of clay brick and natural stone blocks. Because of its very high adhesive strength and tensile/flexion strength, it is possible to use PVM omnifix to produce prefabricated units in clay brick. The limited joint depth combined with the moisture behaviour of a glued wall make it possible to build walls with open lap joints.
The glue mortar is available as standard in three variants (A, B, or C) for gluing bricks with different water absorption properties while still maintaining the same production speed. Type A is particularly suitable for porous bricks, whereas type C also allows harder types of pressed bricks or pavers to be glued without the wall “floating”. Other than any soluble salts that may be present in the bricks, an intensely coloured wall without efflorescence can be guaranteed.
GM omnifix
Performance thin-bed mortar

Distinguishing product features
- Suitable for all types of clay bricks, including hand-moulded, extruded and wire cut bricks.
- Glue mortar for pumping, available in two types, depending on the water absorption of the clay brick employed. Check www.omnicol.eu for the suitable mortar.
- Can be handled traditionally, using a trowel.
- Available in the most common colours. See page 22 for the colour chart.

Applications
GM omnifix suitable for thin-layer masonry work using all possible types of clay bricks. Compared with traditional mortars, one distinguishing feature is the high adhesive strength. The joint thickness can vary from 4 mm to 8 mm.

NIVO omnifix
Bedding mortar for levelling blocks and base elements

Distinguishing product features
- For levelling lower blocks and base elements.
- Suitable for high-rise constructions.
- For supporting and non-supporting structures.
- Easily adjustable.
- Fast hardening.
- For indoor and outdoor use.

Applications
NIVO omnifix for levelling lower blocks and base elements. Can be used as an adhesive for lower blocks and base elements. Suitable for high-rise constructions. Easily adjustable. Fast hardening. For supporting and non-supporting structures. For new buildings and renovation work.
The 22 colours of PVM and GM omnifix.

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<thead>
<tr>
<th><strong>Group 1</strong></th>
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<tbody>
<tr>
<td>Ivoire</td>
<td>Wenge</td>
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<td>Sand</td>
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<td>Wine</td>
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<td>Pure</td>
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Colours may differ from the actual finish. However, Omnicol reserves the right to make modifications as part of its process of ongoing product improvement. Contact www.omnicol.eu for more details.

### Initial Rate of Water Absorption (IRA)

<table>
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<th>IRA class</th>
<th>Type facade brick</th>
<th>Initial water absorption (kg/m² min)</th>
<th>PVM</th>
<th>GM</th>
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<tbody>
<tr>
<td>IRA1</td>
<td>Very low absorption</td>
<td>IW ≤ 0.5</td>
<td>C</td>
<td>B</td>
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<tr>
<td>IRA2</td>
<td>Moderate absorption</td>
<td>0.5 &lt; IW ≤ 1.5</td>
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<td>A</td>
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<tr>
<td>IRA3</td>
<td>Normal absorption</td>
<td>1.5 &lt; IW ≤ 4.0</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>IRA4</td>
<td>Very high absorption</td>
<td>4.0 &lt; IW</td>
<td>A</td>
<td>A</td>
</tr>
</tbody>
</table>

IRA: Determined in accordance with EN 772-11
The weather conditions can affect the suction power.

**Colophon**

Omnicol would like to thank the following companies for their contribution of pictures:

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Further information about projects, bricks and designers displayed in this brochure are available upon request.
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