

## THE GELMEL CASTLE IN HOOGSTRATEN (BELGIUM): TOWARDS VISUAL PERFECTION OF THE BRICKWORK FACADES

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**Abstract.** *The Gelmel Castle, built by the famous architect Rombout II Keldermans (1460-1531), is based on a late medieval fortification emphasizing five flanking towers on a pentagonal layout with moat. At the beginning of the nineteenth century, the castle was reused as Residential Institution for Beggars. The modifications and retrofitting for this reuse required major renovation campaigns of the castle.*

*The unity of facades in the castle complex has always been compiled with the greatest possible care. To guaranty a uniform aspect after the nineteenth century renovations, only one type of bonding - which consists of alternative sequences of headers and stretchers - the so-called 'cross bond' was used or simulated. Basically, red bricks of approximately 18/18,5 x 5,5 x 8,5/9 cm and beige pointing mortars of 0,7 cm wide were combined. During the preliminary research different techniques such as tuck pointing (joint saillant), pointing lines (joint gravée), brickwork-imitating renderings and painted finishes (joint beurré) were found. From the nineteenth century onwards the new or renovated facades were finished with these different applications to achieve uniform brickwork aspects between old, new and renovated facades. Today these different treatments are strongly deteriorated.*

*Many different types of pointing have been developed over the centuries, but are often chosen according to their bonding capacity and the desired appearance of the designer. This research is twofold: to provide a unique insight into a rich variety of nineteenth and early twentieth-century techniques towards visual perfection of brickwork facades, and to deal with restoration issues of these labour intensive techniques.*

## 1 INTRODUCTION

The Gelmel Castle and farmhouse [1] is set in delightful farmland near the river Mark covering 70 hectares in the heart of Hoogstraten, a city in the Antwerp Region of Belgium. (figure 1-2) The entrance of the castle is accessible through the country lane ‘*Linden Dyk*’. The original fortification near the riverbank dates back to the ninth century when the Norsemen plundered Antwerp. [2] ‘*Gelmel*’ refers to the first residents of the building (Gemnich, Gimmenich). From the late twelfth to the early fifteenth century onwards a pentagonal castle with moat was erected in Gothic style at the inner courtyard. (figure 3)

In the early sixteenth century the famous Flemish architects *Rombout II Keldermans* and *Domien De Wagemakere*, commissioned by counts *Antoon I de Lalaing* and *Elisabeth van Culemborg* built a new castle complex with fortification in late Gothic style around the old inner castle. [3] Over the centuries, both the inner and outer castle experienced many changes and in 1768 the inner castle burned to the ground and was never rebuilt.



Figure 1 (left): Aerial view of the moated castle and surrounding farm complex anno 2014 (© L. Veroeven, Turnhout) - Figure 2 (right): View of moated castle anno 2014 (© A. Verdonck)

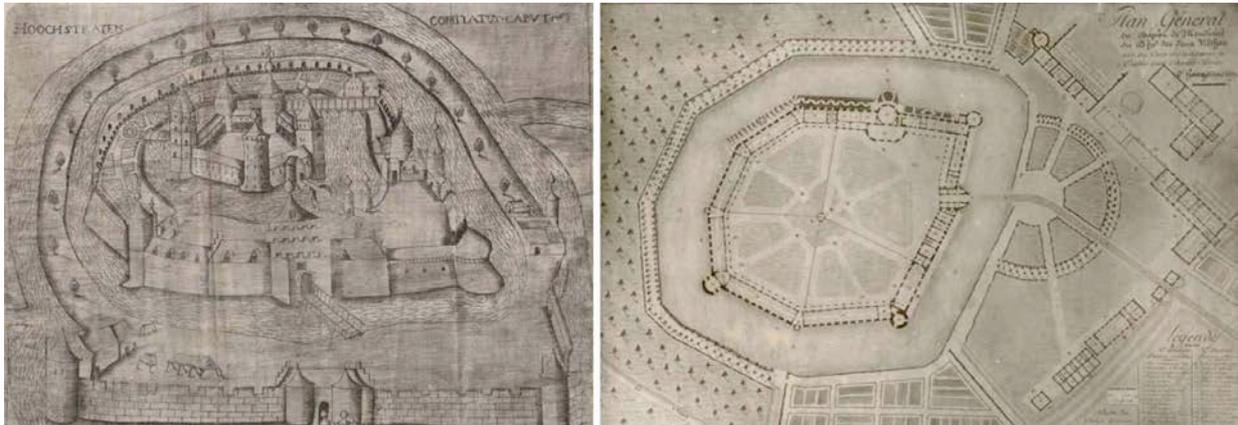


Figure 3 (left): S.n., engraving, *Hoochstraten comitatus caput*, 1606-1610 (© City Museum Hoogstraten): the inner castle is dismantled in 1751 - Figure 4 (right): Project of the Residential Institution for the Beggars in Hoogstraten, A. De Bourges, approx. 1804-1810 (© State Archives Antwerp)

In 1810 the Residential Institution for the Beggars (the so-called ‘*Bedelaarsgesticht van de Beide Nethen*’) was established in the castle by Napoleonic decree of 1808. As a consequence substantial improvement works were carried out between 1811 and 1815 under the supervision of the chief engineer of the Royal Corps, A. De Bourges, and architect-urban planner F. Stoop (figure 4). Central to the renovations was the establishment of a ‘modern’ complex ac-

ording to new standards concerning hygiene, health, and natural ventilation. Serious stability problems resulted in a second campaign in 1870-1904 under supervision of urban planner V. Besme. Since 1931 the castle was reused as a detention centre for the re-education of young prisoners (*Penitentiair Schoolcentrum*).

By means of these nineteenth century renovations the castle became a valuable Gothic Revival ensemble preserved to the present day.

## 2 PRELIMINARY INVESTIGATION: STRATEGY AND METHODS

The research methodology tried to maximize the link between historical research, material-technical observations and analysis of representative samples.

Drawings from the period 1811-1815 and 1878-1903 were found in the Antwerp State Archives (Beveren-Waas). Investigation of the personal archives of Vicor Besme prior to the on-site investigation provided valuable new information about the 1878-1903 period based on the available correspondence letters. [4] Historic photographic reports dating back to 1900 were found in the Hoogstraten City Archives and in the online photo library of the Royal Institute for Cultural Heritage.

The on-site investigation started with the survey of the facades, using traditional and digital equipment. Detailed drawings were indispensable to obtain insight into the finishes of the facades. The survey continued with a visual investigation of the different brickwork aspects and their damage patterns. The brick types and properties, jointing and pointing were mapped. Where necessary, mobile magnification (8×) with a Zeiss eye loupe was necessary to observe and understand the brickwork finishes.

In addition to the visual observations, mortar samples (pointing and brickwork finishing) were taken for further analysis in the laboratories of the Royal Institute for Cultural Heritage. Optical analysis using microscopic instruments (ZEISS, Axioplan) enables to determine the size of the aggregate particles.

Also SEM and EDX techniques show valuable information concerning the chemical composition of the sample. A scanning electron microscope (SEM) produces pictures of the sample by scanning it with a beam of electrons. Depending on the pattern of backscattered electrons, it is possible to identify heavy and lightweight constituents. The more weight the components, the more electrons will be reflected and the brighter the colour of the particle on the SEM image. Energy-dispersive X-ray spectroscopy (EDX) determines the average proportion of the main chemical elements in the binder mass. Knowing the atomic content enables the calculation of the binder hydraulicity.

Following these investigations, an inventory of all the different brickwork finishes was made on the drawings.

A rich variety of techniques and materials was found such as tuck pointing (*joins saillant*), ruled joints (*joint gravée*), brickwork-imitating, stone-imitating renderings and painted finishes (*joint beurré*). This treatment was, and still is, important since it can enhance the brickwork, but it can also affect its durability. [5]

## 3 BRICKWORK ASPECTS OF THE NINETEENTH-CENTURY RENOVATION

### 3.1 Tuck pointing technique

On the face of the brick walling of some castle and farm wings the joints have been treated in a tuck pointing technique (known as '*joint saillant*' in French and '*knipvoeg*' in Dutch).

Tuck pointing is a particular pointing style to simulate conscientious executed brickwork. The name refers to the eighteenth century ‘tuck and pat’ work:

*‘The pat was the small knob of lime putty lifted off the feather-edge and used for pointing. The joint finish was an illusion created to disguise the irregularities of stick brick and bonding. By colouring the joints the same as the bricks, and then forming a thin lime putty joint, it was possible to convince the observer that he was looking at accurate gauged brickwork. Tuck pointing, like gauged brickwork, was developed during the seventeenth century and remained a popular pointing style into the twentieth century.’ [6]*

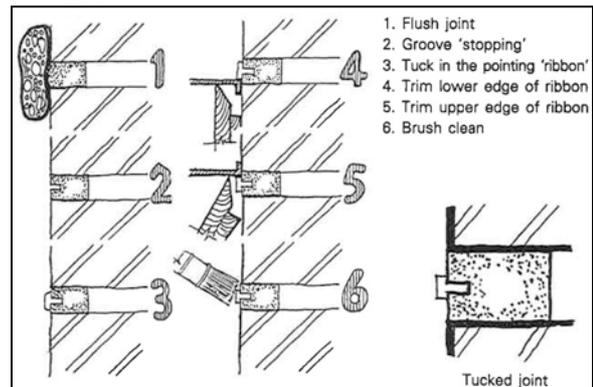


Figure 5: © LYNCH, G., Volume 2, 1994, p. 152

The development of nineteenth century Portland cements, combined with the desire for brickwork in sharp, straight lines made it possible to point the joints with cement mortars of different aesthetic aspects. Next to this aesthetic advantage, pointing provides a barrier to the infiltration of moisture and as such, it increases the lifetime of the masonry. Adam Hammond (1875) [7] documents the traditional tuck pointing application and Gerard Lynch (1994) [8] explains the modern procedure for tuck pointing (figure 5). But the Flemish tuck pointing version, developed in the nineteenth century, is at variance with this British technique. (figure 6) No stopping mortar was used and the ribbon is therefore an integral part of the pointing. After cleaning and moistening the wall, the pointing mortar is applied on the bed joints using a finger towel. Subsequently the mortar waste is trimmed along both sides of a 60 cm long jointer brace with a knife. (figure 9) The same procedure is repeated for the perpendicular joints by means of a smaller jointer brace.

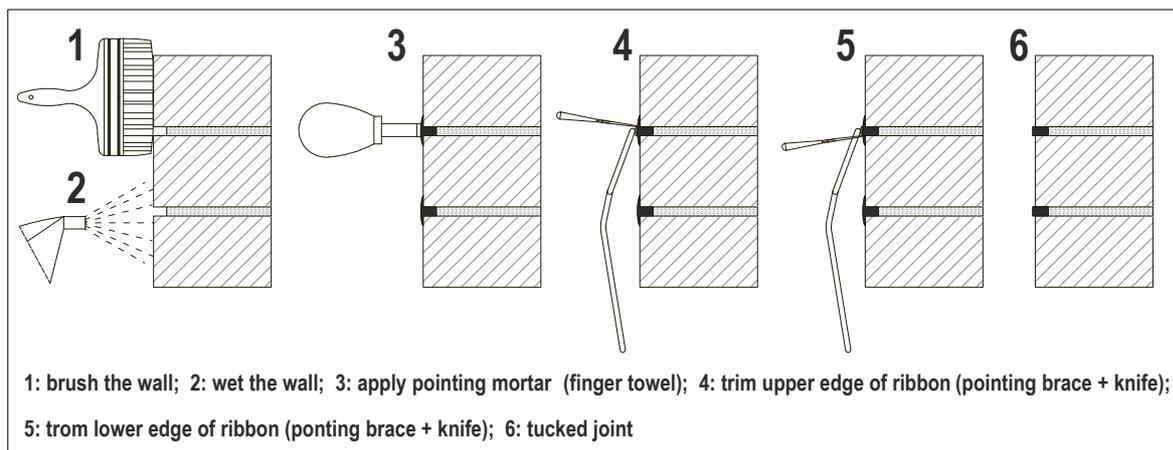


Figure 6: Flemish tuck-pointing procedure (© A. Verdonck)

Finally the bricks edges are often coloured to disguise irregularities of the bricks and bonding and to achieve sharp, straight lines. This kind of tuck pointing can differ in appearance; rectangular (*‘joint a ruban’* or *‘joint à l’Anglais’* in French and *‘rechthoekige knipvoeg’* in Dutch), triangular (*‘joint en diamant’* or *‘joint triangulaire’* in French and *‘driehoekige knipvoeg’* in Dutch) or round (*‘joint en moulure’* in French and *‘baguettevoegen’* in Dutch).

In the castle and farm complex only the rectangular aspect was found on the Victor Besme phase of 1880. Red bricks of 18/18,5 x 5,5 x 8,5/9 cm were used in cross bond. The ribbon of approximately 0,6 to 0,7 cm is beige and the bricks edges were coloured with red lime paint. (figure 7) In the cross section small lime granules and a few hydraulic remnants were found. The binder is therefore identified as light hydraulic lime. The medium coarse sand is a blend of microcrystalline quartz sand, poly and microcrystalline quartz granules and some feldspar granules. No added pigments were found in the beige mortar, which has a heavily polluted surface.

The damage of the tuck pointed facades in the castle is rather limited and in general due to mechanical issues. (figure 8) The brickwork is polluted and therefore a low pressure (max. 2 bar) steam cleaning is required. In the damaged zones the missing or broken joints have to be removed carefully using a hammer and small needle chisel guided by a feather edge to avoid brick damage. After reparation of the brickwork, the tuck pointing procedure can be applied using the historic mortar composition and technique. The red lime paint on the bricks edges is washed out, but this degradation does not affect the readability of the whole.



Figure 7 (left): Flemish tuck pointing of the Victor Besme phase (1880) on the facades of the inner court of the castle (© Verdonck Ann) - Figure 8 (middle): Damaged tuck pointing zone (© A. Verdonck) - Figure 9 (right): Reparation of the tuck pointing: trimming the upper edge of the ribbon with a pointing brace and knife (© A. Verdonck)

### 3.2 Ruled joint

Ruled joints (known as *'joint gravée'* in French and *'dagstreep'* in Dutch) were extensively used during the seventeenth and eighteenth century. Lynch describes the ruled joint procedure:

*'It was formed by running a thin-bladed jointer along the centre of the bed and perpendicular joints, usually flushed, or overhand struck, guided by the feather-edge to ensure level and plumb. The groove, from 1/16" (1mm) to 3/16" (3mm) wide, could also be formed using the edge of an old penny although the true term is 'penny-halfpenny' joint. This term originates the Victorian pointer's practice of using an old penny and halfpenny held between finger and thumb, or slotted into a small length of timber, with the coins flush nearest the pointer. (...) Another, though much less uncommon, method to achieve this finish was 'dinging'. To 'ding' a joint, a length of 16- to 18-gauge wire was used. Pulling the taut wire away from the joint face and then going meant that the wire hit the stopping, leaving a groove.'* [9]

The former weapons room is transformed and reconstructed in 1811 by architect-urban planner Frans Stoop as castle chapel. In 1845-1850 the chapel was transformed into a Gothic Revival ensemble. The rendering was removed and the brickwork was exposed and completed with stone imitation rendering on the corona, mouldings and lancets. At that time the brickwork (red bricks of approximately 19,5/20 cm x 7 cm x 4 cm in cross bond) was flat jointed. The face of the bedding lime mortar was finished as work proceeds and the surplus material, which has been squeezed out of the joints, left a rough finish on the bricks. To camouflage

this irregular appearance, the bricks edges were painted with red-pigmented lime wash. Before colouring the bricks, the joints were double grooved. Joint lines of approximately 1 to 2 mm deep and wide were drawn into the wet mortar and the bricks were painted leaving the joints between the lines untouched, simulating accurate gauged brickwork. Usually lines were applied on the bed joints only but in the castle chapel facades also the perpend joints were grooved. The used raking out method is certainly not executed by means of a penny neither by dinging. (figure 10) It is more likely that nails (nail jointer or thin-bladed iron jointer) were used guided by a feather-edge. (figure 11) [10]

The double grooving is well conserved but the paint on the brickwork is almost completely disappeared over time. Restoration test strips will be necessary to determine the right paint and colour for the reconstruction of the red brick finish.

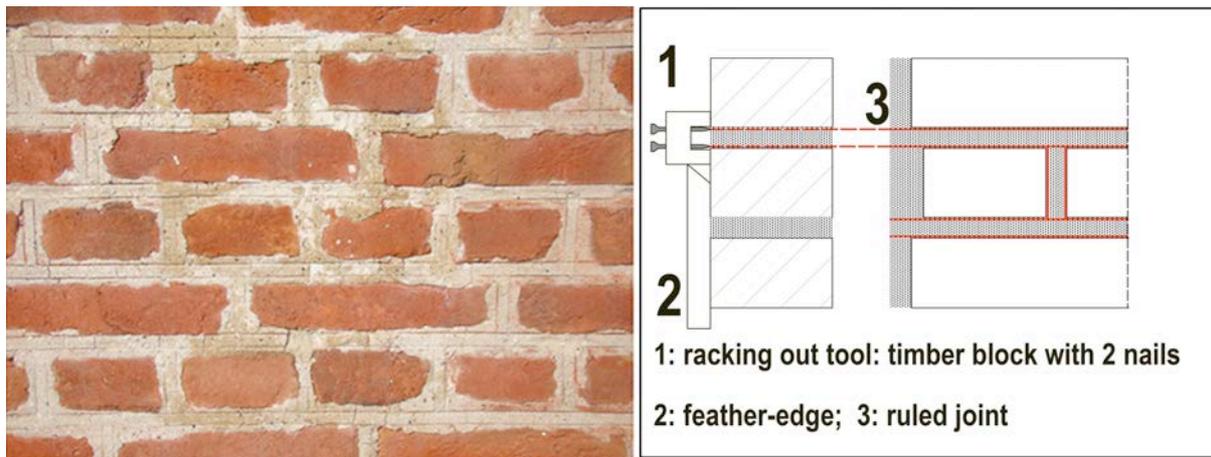


Figure 10 (left): Flat jointed brickwork with double grooved joints on the chapel facades (© A. Verdonck) - Figure 11 (right): Racking procedure (© A. Verdonck)

### 3.3 Brickwork-imitating renderings

Another technique used in the farm complex of the Gelmel Castle is brickwork-imitating rendering (known as *'joint beurré'* in French and *'voegschildering'* in Dutch). Stone-imitating finish has a long history. It was recorded at Saint Nicolas church (Ghent, Belgium 13th - 17th century) during architectural paint research where we exposed this exceptional early concept of working towards perfection of building materials. [11] Traces of a unique 14th and 17th century imitation of grey limestone (Limestone of Doornik - Belgium, known as *'Doornikse kalksteen'*) were found behind subsequent fillings. These remarkable lime stone imitations were situated on the brickwork between the canopies and on the pilasters between the chantries. By means of the building history and laboratorial analyses, these traces were dated as 14th (on the pilasters between the chantries) and 17th century (between the canopies) finishes. In both cases the masonry was painted with thin nuanced and balanced blue-grey lime paint while the joints were brushed, with an overwhelming accuracy, in a white beige oil paint.

The farm complex was heavily transformed between 1875-1882 (V. Besme). After transformation some brickwork facades of the farm complex and the vaults of the castle gallery were finished with a brickwork imitating finish. A lime mortar of approximately 0,4/0,5 cm was applied on the brickwork facade. This lime finish was afterwards treaded with sculpture spatulas to imitate the brickwork aspect; joints were drawn into the wet mortar and the brick surface was sculpted to simulate real brickwork. (figure 12) After drying, the walls were col-

our washed with red lime paint. The used pigments were red ochre and carbon black. [12] Finally the joints were painted beige using a brush guided by a feather-edge. (figure 14)

This particular finish is heavily damaged and has to be reconstructed. For this purpose, some restoration test strips were made to establish the rendering layer, the joints and surface treatment. (figure 13) We decided to use a mass coloured lime mortar to start with. The tests show the sculptured joints and brick surface. After hardening, the red colour wash and joint paintings can be applied. (figure 14)



Figure 12 (left): Brickwork-imitating finish on the north façade of the farm complex: heavily polluted but well preserved zone (© A. Verdonck) - Figure 13 (middle): Restoration test strip of the base layer with sculpted joints and brick surface to simulate real brickwork (© A. Verdonck) - Figure 14 (right): Application of the red colour wash and joint painting using a brush guided by a feather-edge (© A. Verdonck)

#### 4 CONCLUSION

This paper documents the concept of working towards perfection of building materials in the nineteenth century transformations of the Gelmel Castle. Different techniques used on both the castle and farm complex were twofold: to generate the image of uniform and perfect gauged brickwork and to dim the traces of the nineteenth century transformations. The observer has the idea that all facades are executed in cross bond brickwork, but a closer look reveals the use of different techniques. The ‘visual’ perfection of the brickwork facades in the Gelmel Castle and its farm complex can be seen as a success and has to be preserved in future restorations.

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