Old Palace Lodge Hotel, Dunstable: *Repair and restraint of the old clunch wall*

The Norman King Public House following the arson attack

The Clunch Wall Panel, temporarily supported and awaiting repair

The Old Palace Lodge Hotel was creating a Tudor garden landscaping scheme in the area of ground formerly occupied by 'The Norman King' public house. The Norman King was opened in the 1960s and comprised a thatched roof over predominantly brickwork walls. One wall of the building on the street facing elevation, however, incorporated a panel of much older, clunch stone masonry.

Clunch stone is another name for chalk when used in construction and is normally softer and more friable than other building stones. It is susceptible to weathering as it is highly permeable and susceptible to pollution driven acid erosion. Moisture is the principal cause of its deterioration. The clunch found in the wall panel would have come from the nearby Tottenhoe Quarry, part of a chalk seam that extends into Cambridgeshire and is often referred to as Cambridgeshire Clunch.

The public house was destroyed by arson in 2011 and the building was demolished. The panel of clunch remaining on site, being of historical interest, was shored up until a final repair could be implemented that integrated the clunch panel within the scope of the landscaping scheme.

One aspect of the landscaping was to enclose the garden both to provide security for the hotel and to act as an acoustic barrier to protect against vehicle noise on the busy adjacent road, Church Street. To this end, a high brickwork wall was constructed around the garden perimeter. As the clunch wall formed a part of the boundary, it had to be included in the boundary treatment.

The site team were unable to find a solution that was acceptable to all parties and AKSWard was commissioned for their conservation knowledge to review the issues and propose a solution that would both be structurally secure and follow good conservation principles.

HISTORY

The Old Palace Lodge Hotel is a Grade II listed property dating from the Georgian period, but is believed to be located on or near the site of a former palace built by Henry I; now referred to as Kingsbury Palace.

Much of the palace grounds and outbuildings were gifted to the nearby priory located on the opposite side of Church Street, where the church still stands, by King John in 1204. It is at this time the name Kingsbury probably came into being as the name means 'a gift of the King' and is listed in Priory records of 1275/6 as 'Kingsbyr.'

By the time of the dissolution of the monastaries in the mid-C16th the Priory no longer owned the land.

In the C18th the land was known to comprise a farm with farmhouse and outbuildings known as Kingsbury Farm. The farmhouse still stands and is now known as 'Kingsbury House'.

The clunch wall panel is believed to pre-date the Georgian buildings as this is the most plausible reason for the presence of clunch in the wall panel when the adjacent buildings were of red brick construction. The possibility, therefore, that the clunch panel was part of the former palace estate buildings, gifted to the priory, becomes a matter for further research and debate. The coarseness of the construction, with ill-regulated shaping of the stone, nominal but random coursing and the use of tile, brick and stone slivers as 'gallets' or packers in the wider joints all suggest that the building was of a low status when constructed.

The priory was founded in 1132 by Henry I and constructed of clunch from the Tottenhoe quarry nearby. It is expected that the palace would also have utilised the same quarry for its stone. Anecdotal evidence suggests that the clunch in the wall came from the priory, but neither is the author aware of any proof of this fact, nor does this provide significant insight into dating the wall. The fact that Tottenhoe chalk was used merely reflects the period and location of the building and does not determine the source of the stone deriving from the priory, the palace or the quarry.

It is the author's opinion that the wall was built by the priory or during the priory's ownership of the site and provided a home for a farm or estate worker: the presence of the window opening indicated that the wall was part of a habitable space and not an animal shelter or storage building.

DESCRIPTION

The clunch panel stood approximately 3.0m high and 8.4m long of which 1.2m at one end was of a poorer quality and lower height. The construction comprised two wythes of roughly coursed clunch stone and a rubble core amounting to an overall width of approximately 330mm. There was a window opening within the middle of the panel and the head of the wall was unrestrained following the loss of the roof in the fire. The wall was quite vertical and had been shored up before any significant lean could occur.

The clunch was very soft and the face of several stones had eroded, most significantly around small, localised areas of former repointing that had been undertaken in a cementitious mortar; typically, a much softer lime mortar was still present throughout the panel.

The full extent of the foundation was unknown. It could be expected that the foundation was shallow, which would be typical of a construction pre-dating the Georgian era and in particular for a wall that may once have served as a lower grade structure.

A masonry pier of a much later period, probably related to the construction of the public house in the mid C20th, had been constructed adjacent to the panel, but was slender and of no significant structural benefit being very poorly tied into the stone.

In some locations, embedded timbers were found to be in still good condition, probably as a result of the soft nature of the stone and lime mortar which had not trapped moisture against them.

A detailed dimensional survey was undertaken by others and formed the basis of our own survey.

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SOLUTION

Any repair solution had to meet current British Standards as the position and use of the wall had changed from a building elevation, restrained and protected by cross walls and a roof structure, to a free-standing, garden wall. It was also in an area where public safety was paramount, forming the boundary between a pavement and principal artery road through Dunstable on one side and a public garden serving the hotel on the other.

The height of the wall could not be reduced significantly. The new boundary wall abutting the panel was 2.4m high to act as an acoustic break, and to lower the clunch wall below this height would have compromised any acoustic benefit provided by the new boundary wall. There was also an aesthetic requirement to maintain the height of the wall: as a standalone construction it needed to be a feature of the garden and thus dominate the new wall and not be subservient to it.

More importantly, lowering the wall significantly would incur the loss of much historic fabric and would also intrude into the window opening, creating a need either to infill the opening to stabilise the panel, or provide additional vertical support to the unrestrained reveals of what would have been an incomplete opening.

Basic dimensional limitations state that the height of a free-standing wall must not exceed 12 times the effective thickness of the wall. This restricts the free-standing height of the wall to 1.6m (using higher strength modern materials), which was not acceptable. Further analysis of the free-standing panel confirmed that it was not stable without additional support.

A yield line analysis of the panel proved that the clunch could be retained provided it was set within a full perimeter frame that provided stability.

A steel-frame option was dismissed: steel-frames can deflect allowing strain induced cracking in the masonry; it would be difficult to get a secure connection between the steel and the clunch panel; the steel requires maintenance to prevent decay; decaying steel (rust) could cause damage to the clunch through expansion.

Additionally, steel would not fit aesthetically with the Tudor garden design and would need encasement within masonry, which prevents maintenance and conceals latent problems.

It was decided to utilise reinforced masonry to frame out the panel. The reinforced masonry could be more massive than a steel option and thus stiffer. Continuous support could be provided to the panel edges with a mortar joint which would also bond readily to the existing panel.

The choice of reinforced masonry resolved the structural issues, but the need to use cement based products to achieve the strength required in the supporting frame was a concern and careful design detailing was necessary to avoid the entrapment of moisture within the sensitive clunch stone.

The finished wall viewed from the Tudor Garden of The Old Palace Lodge Hotel

The final solution comprised two masonry piers each side of the frame, each with a reinforced concrete core secured into a deep foundation pad. The foundation was local to the pier and thus did not undercut the clunch panel and could be dug without creating significant temporary stability issues.

The piers were to act as cantilevers, both to support a proportion of the wind load transferred directly to them through the panel and to resist the reaction from a horizontally spanning head beam that was also to be installed to restrain the head of the panel.

The clunch panel itself showed no signs of foundation movement, being near vertical and without cracks. There was therefore no need to investigate or enhance its foundation.

The head beam was to comprise an external brick envelope designed to emulate the new garden wall. Inside this façade of brick was introduced a reinforced concrete beam, designed to free span horizontally between piers. To create the necessary strength and stiffness, traditional cover depths to the reinforcement could not be achieved and a repair mortar (Renderoc HB 45 by Fosroc) was specified in place of a traditional RC35

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View through the window of the clunch wall looking towards Church Street

as it has an equivalent compressive strength, but requires significantly less depth of cover to protect the steel.

DETAIL CONSIDERATIONS

The risks of using cement-based materials was both the hardness of the materials and their structural behaviour: the hardness of the material could trap moisture within the softer stone and mortar, exacerbating moisture driven degradation; the behaviour of the material could create hard spots that restrict the ability of the more pliable clunch construction to accommodate movement.

The hardness of the concrete was overcome by ensuring a soft lime mortar joint between the panel and the stiffer framing elements. The joints working hardest to resist wind shear were the top and bottom bed joints as they restrained the largest masonry areas.

These top and bottom joints were continuous, mortar joints (as with any bed joint). The same joint was, therefore, utilised at the sides of the panel, where only a relatively small shear force needed to be transferred from the panel to the pier.

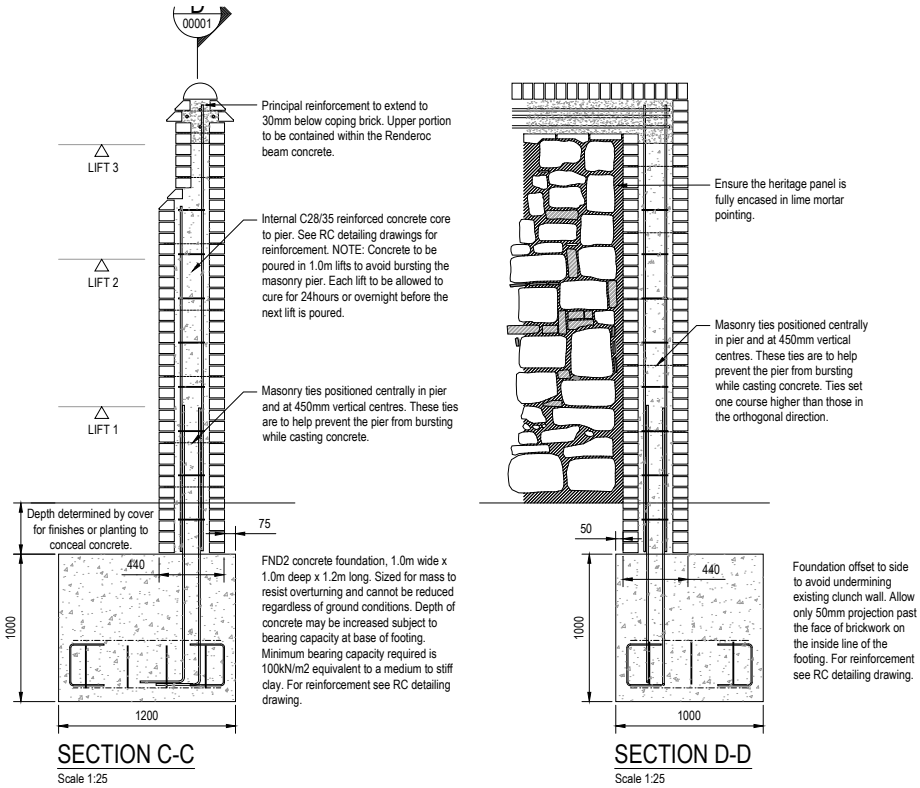
These lime mortar joints not only provided continuous restraint, but also softened the junction between the panel and the new, stiffer piers. In this way hard points of restraint such as masonry ties did not concentrate the loads to small, isolated locations.

The use of cementitious materials in combination with softer stones and mortars is always a last resort. On this project it was decided that it was the best solution if carefully considered.

The theory behind the application of cementitious materials was that only the central core of new masonry elements would be impermeable. Since the hardest and most impermeable material was to be located at the core of the construction, moisture within the envelope could still permeate to the atmosphere on all exposed faces and was not trapped within the wall.

The stiff impermeable head beam would also act like a weathering cap to the clunch panel, preventing water from entering the heart of the wall from the top and sheltering the more vulnerable material below.

Care was taken in the detailing to ensure that lime mortar joints separated all clunch and timber from cementitious materials and thus became a sacrificial layer of protection that will require maintenance from time to time.



CONCLUSION

The design proposal put forward met with approval from all parties and was constructed in early 2019. The wall now stands approximately 3.0m high and the sensitivity of the mason's work has created a unique feature of the garden.

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