

CONSULTING CIVIL, STRUCTURAL,
HIGHWAY AND TRANSPORTATION ENGINEERS

GCA



Castlefields, Bretby

**Foundation Design to mitigate
impact on heritage asset.**

For

Latham Architects

Ref: 6838 – Castlefields – Report

Date: 29th April, 2016



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Castlefields, Bretby – Provisional Foundation Design

1. Introduction

101. We have been requested by Chris Twomey, Director of Latham Architects on behalf of Michael Wright, to produce a provisional foundation design for an extension to an existing house at Castlefields, Bretby.
102. The house is located within the site of Bretby Castle (fortified manor house), a Scheduled Ancient Monument, as shown in the image below (*Latham Architects, Design and Access Statement, March 2011*). Consequently, it is required that the design of the new extension, and its foundations, minimises the impact of the construction on the heritage asset.



Image taken from Google Maps

103. The existing building comprises a 19th Century horseshoe shaped range of buildings constructed from brickwork, with a later 20th century extension to the west side (*Latham Architects, Design and Access Statement, March 2016*).
104. The proposed extension is located within the courtyard of the barn, connecting the two wings. It comprises two 'book ends' constructed from masonry cavity walls and a tiled pitched roof, and a central section with a flat roof constructed from a glazed timber frame.

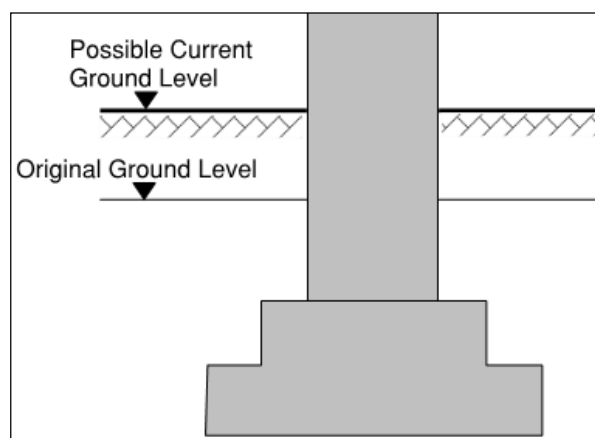
2. **Site Conditions and Existing Building**

Ground Conditions

201. A desk study was carried out on the possible bearing material at the site. BGS geological maps suggest that the bedrock is likely to be sandstone; but no records were available to indicate the superficial deposits in the area of the proposed construction.
202. It is possible that the site's current ground level is higher than when the original building was built due to material deposited from its previous agricultural use.

Design Assumptions

203. Based on the age of the building, it is likely that the foundations to the existing structure are shallow spread footings constructed from corbelled brickwork approximately 500mm below the original ground level. However, this would require verification prior to construction.
204. It has been assumed that a bearing pressure of 50kN/m² can be achieved at around 700mm below ground level. This is relatively conservative but would require verification prior to construction. It is expected that higher bearing pressures (up to 100kN/m²) would be available within the top 1500mm of existing ground build-up.
205. The levels assumed for the provisional foundation design are subject to the Architect's final floor build ups, and formation depths may vary in the final design.



3. Design Options

301. Two options are available to minimise the impact of the foundations on the heritage asset:

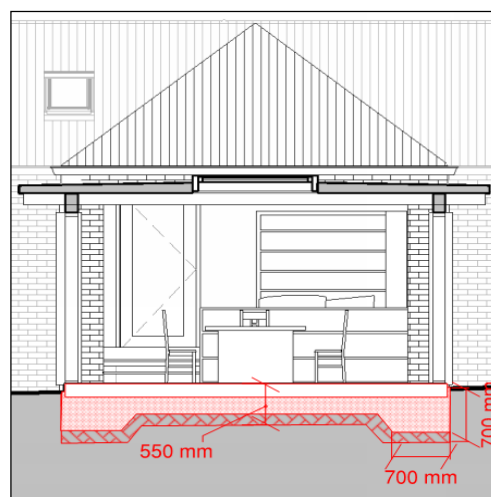
- a. Minimise the depth of the foundations.
- b. Minimise the footprint of the foundations.

302. In keeping with this approach, the following options are available:

- a. Option 1 - minimise depth.

Aim: to reduce the depth of excavations and so minimise the effect on the heritage asset.

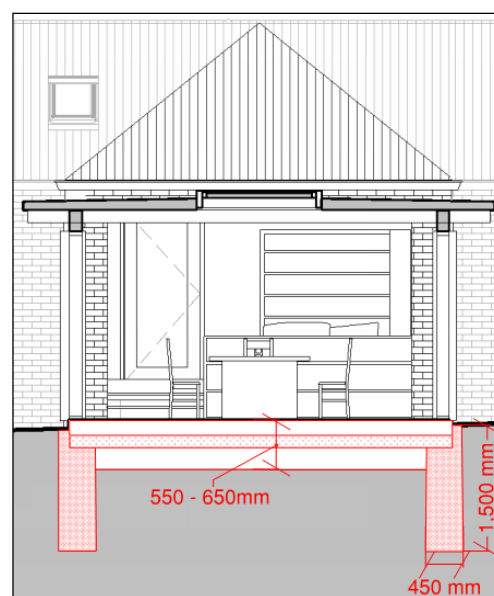
This option comprises a shallow raft foundation, with a minimum depth to formation of 700mm below existing ground level, subject to site investigation. This would minimise the disturbance to buried archaeology, as indicated in the image (right).



- b. Option 2 – minimise footprint.

Aim: to reduce the footprint of deep excavations and so minimise the effect on the heritage asset.

The second option comprises strip footings to a likely maximum of 1500mm depth, subject to site investigation, with a suspended ground floor slab. A reduced dig of only 550 to 650mm, again subject to site investigation, would be required over the footprint of the building. This would minimise the area of ground affected, see image (right).



Design Solution

303. Both options offer ways to minimise impact to the heritage asset, and both depend on the nature of the ground conditions.
304. On balance, and following discussions with Steve Baker at Derbyshire County Council, it was concluded that Option 1 should be pursued first, as having an overall net benefit in terms of understanding the existing archaeology through inspection of the excavated area prior to undertaking foundation construction.



305. It should be noted that, if site investigations conclude the near-surface strata to be unsuitable for a raft foundation, option 2 would also offer a valid method for reducing impact to the heritage asset with an overall reduction of dig depth across the main width of the new foundations.

4. Conclusion and Further Work

- 401. It has been concluded that shallow raft foundations are a slightly preferable option for the proposed extension in order to minimise the impact on the site, and give a better understanding of the archaeology below the building footprint.
- 402. Should ground conditions be unsuitable for this option, option 2 comprising strip footings and a suspended floor could be used.
- 403. A number of assumptions were made in the initial design of the foundations, including soil properties and the construction of the proposed structure.
- 404. In order to develop the design of the foundations, it is recommended that trial pits are dug and standard penetration (SPT) testing is carried out on the proposed bearing strata to confirm its strength. It may be that the results of these tests make option 2 a more viable structural solution whilst maintaining the principle of minimising impact to the construction on the heritage asset.

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