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ENGINEERS

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STRUCTURAL ENGINEERING STATEMENT IN RELATION TO STRENGTHENING WORKS REQUIRED IN THE SHORT TERM TO THE ROOF OVER THE CARTSHED (ADJACENT THE POOL AND OFFICE BLDGS) AT THE MANOR HOUSE , WINTERBOURNE BASSETT

Structurelle Engineers carried out an appraisal of the cart-shed building at the Manor House on 11 May 2023. The contractor, Stonewood Builders had raised questions regarding the potential lack of support to the purlins which support a brittle roof over the cart-shed, together with commenting on the apparent lack of connection of the roof to the walls which support the bldg.

We confirm as follows:

1.0 The cart-shed comprises a single storey rectangular bldg. under a monopitch roof, finished with asbestos cement sheeting. The bldg. stands in a garden in open country with few windbreaks surrounding it . The bldg. is open to its front elevation and is enclosed by walls on 3no sides.

2.0 The rear elevation, which faces the pool garden, consists of an historic c1800 brickwork wall (2 bricks in thickness); the end elevations / flank walls were likely to have been built in the late 1800s from the local stone. Modern blockwork walls c 1960s have been built adjacent the flank walls and partly over the rear historic wall and there are in addition, block partition walls which separate the end bays of the cart-shed .

3.0 The roof structure has 5 no bays in the long direction and comprises shallow steel UB section principal rafters supported on the rear historic wall to their one end and by slender steel columns, again UB sections to the front elevation. Shallow steel channels have been used as purlins which span as continuous over the steel principal rafters. The purlins are arranged such that they form 5 no bays front to back and these, in turn, support the asbestos cement sheeting roof finishes.

4.0 Presently, stability in the NW-SE direction of bending is provided by the end elevation flank walls acting as shear walls. In the NE-SW direction of bending(longways to the cart-shed), the rear elevation (historic brickwork wall) provides a stiff shear wall but due to the lack of stiffness to the front elevation, the rear historic wall is subjected to torsional forces which it was not designed for. The open nature of the front elevation lacks stability from a structural perspective. The original design lacked a beam to the leading edge / front of roof .

5.0 From our assessment, we recorded 203 x 102 UB section principal rafters of 6900mm approx. span with 100 x 50 channel section purlins spanning approx. 6000mm , all supported on 178 x 102 UB section front elevation columns. All structural steelwork is just adequate in terms of bending stress but the apparent deflection of all members which form this structure is excessive and too great for the brittle roof finishes. The connections at steelwork to steelwork junctions and the steelwork to masonry supports are inadequate and cannot be justified although all such connections are easily remedied using careful detailing techniques.

6.0 Of great concern is the lack of fixity from the present day roof structure to the walls which form this bldg. We calculate that net uplift is apparent which is hardly surprising for a lightweight monopitch roof over an open sided bldg. in open country. There is no mechanical connection whatsoever of the roof structure to the supporting walls and the roof is at high risk of lifting off the external walls when subjected to a moderate to high wind speed. Clearly, this would cause considerable damage to the adjacent bldgs. as well as injuring anyone using the garden and offices in close proximity to the cart-shed..

7.0 It would seem that the c 1960s blockwork walls were an earlier attempt to give stability to the bldg. Some principal rafters were re-supported to the rear historic wall during this era. The previous amateur attempts at strengthening and repair have now reached the end of their useful life. Indeed it will be recorded here that the feet of all steel columns to the front elevation have severely corroded and the structure has reached a very vulnerable stage. The bldg. is highly likely to collapse without further warning.

8.0 Our preliminary calculations have revealed that the structural steelwork is undersized for its long spans and brittle finishes being supported over. Reducing the loaded widths to the principal rafters is an easy remedy which also naturally reduces the spans to the present day purlins. The installation of intermediate steel principal rafters is very simple.

9.0 Indeed we propose that strengthening works to the cart-shed roof be implemented in the near future in order to retain the cart shed bldg and in particular the rear historic wall. We advise that all of the present day structural members can be retained with the exception of 1 no c 1960s steel column to the front elevation which has been damaged (probably by impact of a vehicle) . We propose that the steel principal rafter which is supported upon the present day damaged column be reused within the roof in order to lessen the loading to the principal rafters and the purlins. Furthermore, we would suggest that the present day 6m bays between principal rafters be reduced to a maximum of 4m by installing additional principal rafters to match the extg sections. The solution proposed is non invasive and will provide a robust roof solution.

10.0 From the above, our advice is that the bays between principal rafters be reduced which will naturally reduce the spans to the purlins. Simple , considered structurally detailed connections between the roof structure and the supporting walls will prevent net roof uplift to the open fronted bldg. We propose a steel plated repair to all the feet of the c 1960s columns to the front elevation. Lastly, we would intend to install a steel beam of approx. 356 x 171 UB section to the leading edge of the roof (front elevation) to provide the required stiffness to the roof structure and relieve the historic rear wall of its torsional forces.

11.0 The above will provide the necessary works to allow the cart-shed bldg. and the garden adjacent to remain in use at the Manor House.

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