# Danebridge Nursery, Much Hadham

## Structural assessment of building structures

Prepared for Dominic Cura

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15 December 2022

Glyme Structures Ltd

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# 1. Introduction

This report has been prepared to provide an assessment of the viability of various buildings on the site for reuse.

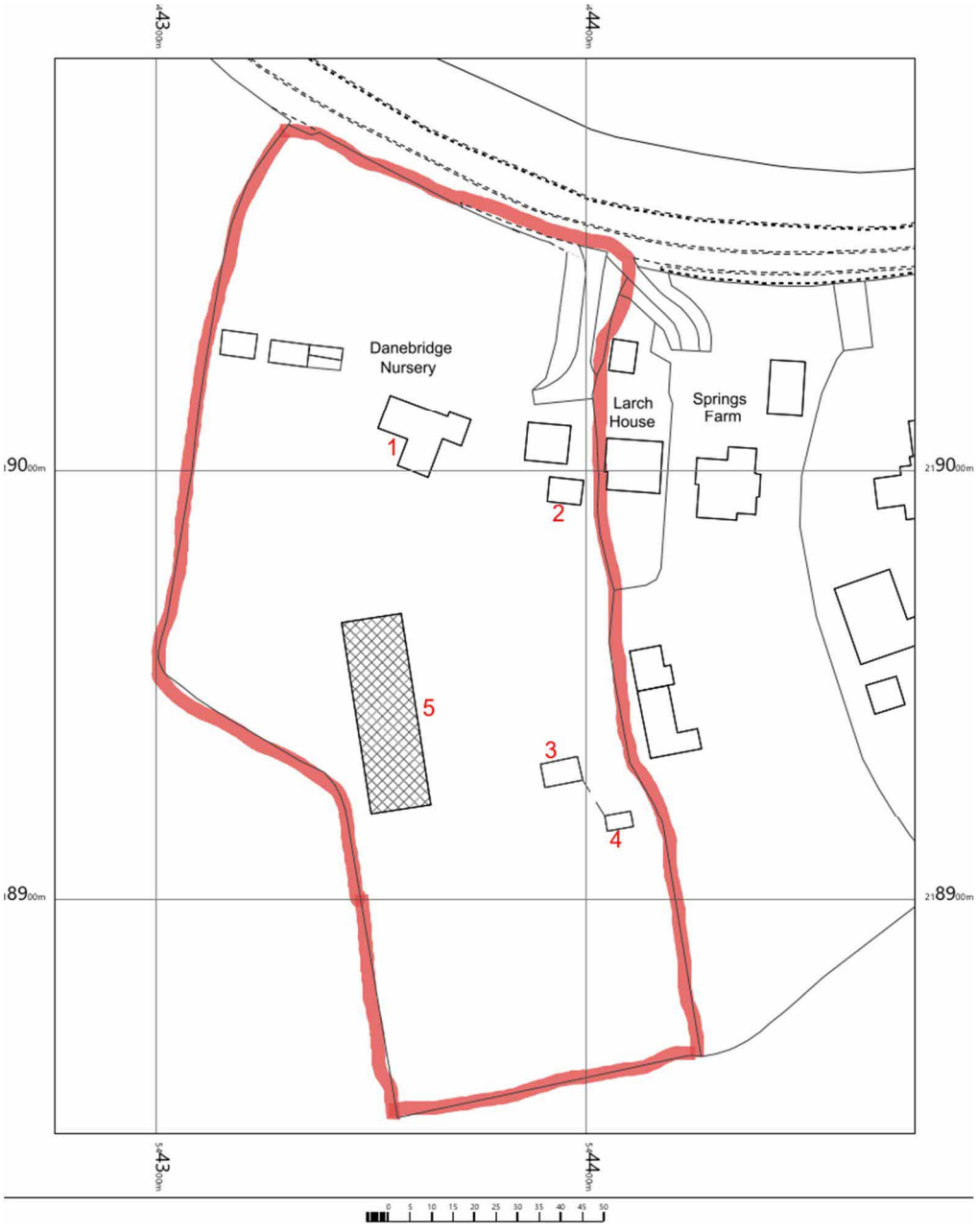
The findings are based on a site inspection carried out on 7 December 2022.

# 2. General description

The site was historically used as a nursery for the production of soft fruits year-round. It has a large commercial greenhouse and a number of ancillary buildings.

There is a substantial bungalow near to the entrance to the plot, where the owners lived.

The various buildings are described with reference to the numbering system shown in the figure.



# 3. Description of buildings and condition assessment

Building 1

Building 1 is the bungalow. It has been occupied until recently, when the owners moved into care facilities.

The walls were inspected internally and externally and they are free from any significant cracking. This is a strong indication that the foundations are adequate for the site.

A loading calculation is presented in Appendix A which assesses the ground pressures that would result from the addition of a first floor. The conclusion of this calculation is that the structure could straightforwardly accommodate an extra floor of structure without consequences to either the foundations or walls.

This is a well-constructed building, capable of supporting an additional storey of structure without specific strengthening measures.

Building 2

Building 2 is a well-constructed workshop building.

It has a profiled cement board sheet roof cover which is supported by steel angle purlins.

The purlins bear on the gables and on two internal trusses at third points. The trusses are triangulated trusses made from lightweight timber sections in pairs, with the joints formed by plywood plates. The trusses have a logical and well organized geometry, and are in good condition.

The trusses are supported on brick piers 225mm (one brick) square.

Between these piers, the brick wall panels are 100mm (half-brick) thick.

The line and level of the walls and roof is good.

This is a well-constructed building, where the structural elements are in a good condition. It is suitable for reuse without structural modifications.

Building 3

Building 3 is another well-constructed workshop building.

It has a profiled cement board sheet roof cover which is supported by timber purlins in three lines on each pitch.

The purlins bear on the gables and on two internal trusses at third points. The trusses are formed from solid timber sections (perhaps 150mm deep by 100mm wide). The trusses have a logical geometry, and are in good condition.

The trusses are supported on brick piers 675 mm (three bricks) wide by 225mm (one brick) thick.

Between these piers, the brick wall panels are 100mm (half-brick) thick.

The line and level of the walls and roof is good.

This is a well-constructed building, where the structural elements are in a good condition. It is suitable for reuse without structural modifications.

Building 4

This building housed substantial boiler plant used to heat the greenhouse.

It is very tall compared to its floor area.

It is an industrial building; the base is a substantial concrete pit or sump which forms the foundation.

The walls are also of robust, industrial construction, with two 225mm square brick piers at the quarter points of each of the four elevations. From each pier to each corner, there is a half-brick thick wall. Between each pair of piers is a large opening, used either for a window or to accommodate plant such as a large boiler tank which crosses one elevation transversely.

The roof is formed with profiled cement board spanning onto purlins onto two timber trusses resting on the brick piers, with a third, central raised collar truss.

The building is overgrown with ivy, and the windows are heavily degraded, which give the impression that the structure is also degraded, but this is actually not the case. The structural elements of the building are in fact in serviceable condition.

The line and level of the walls is good.

This is a solidly constructed industrial building. Work is required to clear the foliage growing on and through it, and to removed the boiler plant, but the underlying brick structure is sound and the building could be reused without structural modifications.

Building 5

Building 5 is a high-quality, well made industrial greenhouse.

In section there are three adjacent pitched roofs that are extruded for a distance of about 25m.

The valleys are supported off a robust grid of steel posts up to a timber beam line. The outside walls are formed from a grid of timber mullions reinforced at every fifth mullion with a heavy steel angle.

The side walls are built off half brick cill walls on a concrete foundation.

There are ties across the building between the valleys and the eaves, which restrain the timber rafters which span up to a ridge plate.

The structure is quite overgrown in places, so that access to all four sides was not practical. The line and level of the structure, where inspectable, is good.

This is evidently a lightweight structure, and any reuse would need to be similarly lightweight.

This is a lightweight structure. Work is required to clear the foliage growing in and around it.

There is a logical underlying structure that is in a serviceable condition. It is suitable for reuse without structural modifications in the right context – for example if clad with lightweight composite panels.

# Appendix A

## Assessment of bungalow foundations

# Calculation Index

The assessment is as follows:

1. Typical loads are determined for roof, walls and a suspended floor.
2. Line loading for a two storey building is determined, based on sensible assumptions. This is compared with the allowable line loads for different soil types and foundation widths as defined in the Building Regulations (Approved Document A).

The conclusion of this is that the addition of an extra storey can be comfortably achieved with the existing foundations.

| Glyme Structures | Project | Danebridge Nursery | Page | 2_1 |
|---|---|---|---|---|
| | Description | Dead and Imposed Loads | Author | JR |
| | | | Date | 15/12/2022 |

| Element | Construction | Notes | | | | | | Loading (kN/m2) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | dead | live | SLS | ULS |
| | | | | | | ULS factors | BS | 1.4 | 1.6 | | |
| Pitched Roof | | | | | | | | | | | |
| on slope | roof covering | concrete tiles (interlocking) | | | | | | 0.6 | | | |
| | insulation | 150 | mm | glass mineral wool | | | 0.12 kN/m3 | 0.018 | | | |
| | inclined soffit | none | | | | | | 0 | | | |
| | | dead load for entry into TRADA rafter sizing tables | | | | | | 0.688 | | | |
| | rafters | 47 | x 100 | @ 400 | ctrs | C24 timber | 4.2 kN/m3 | 0.05 | | | |
| | | sub-total of loads on slope | | | | | | 0.74 | | | |
| | | roof pitch | 35 | degrees | | equivalent plan load | | 0.9 | | | |
| on plan | beams, purlins | allowance | | | | | | 0 | | | |
| | ceiling ties | 47 | x 100 | @ 400 | ctrs | C24 timber | 4.2 kN/m3 | 0.05 | | | |
| | soffit | plasterboard & skim (12+3mm) | | | | | | 0.18 | | | |
| | services | minimal | | | | | | | | | |
| | | snow load to BS 6399-3 | | zone A | altidude <100m | | 0.75 | | | | |
| | | roof pitch correction factor | | | | | 0.833 | | 0.625 | | |
| | | | | | | | | 1.13 | 0.625 | 1.8 | 2.6 |
| Suspended Timber Floor | | | | | | | | | | | |
| | partitions | timber stud | | | | | | 0.5 | | | |
| | floor finish | carpet/vinyl | | | | | | 0.05 | | | |
| | floor boards | chipboard (22mm) | | | | | | 0.132 | | | |
| | joists | 47 | x 200 | @ 400 | ctrs | C24 timber | 4.2 kN/m3 | 0.10 | | | |
| | soffit | plasterboard & skim (12+3mm) | | | | | | 0.18 | | | |
| | services | minimal | | | | | | 0 | | | |
| | | imposed load category A1 to BS EN 1991-1-1 table NA.2 | | | | | | | 1.5 | | |
| | | | | | | | | 0.96 | 1.5 | 2.5 | 3.7 |

| | | | |
|---|---|---|---|
| Glyme Structures | Project | Danebridge Nursery | Page 2_2 |
| | Description | Dead and Imposed Loads | Author JR |
| | | | Date 15/12/2022 |

| Element | Construction | Notes | | | | | Loading (kN/m2) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | dead | live | SLS | ULS |
| Cavity Wall Inner Leaf | | | | | | | | | | |
| | inner finish | 20 | mm | gypsum plaster | 12 | kN/m3 | 0.24 | | | |
| | inner leaf | 100 | mm | aerated block | 8 | kN/m3 | 0.8 | | | |
| | | | | | | | 1.04 | 0 | 1 | 1.5 |
| Cavity Wall Outer Leaf | | | | | | | | | | |
| | outer leaf | 100 | mm | medium dense block | 14 | kN/m3 | 1.4 | | | |
| | outer finish | 25 | mm | cement render | 25 | kN/m3 | 0.625 | | | |
| | | | | | | | 2.03 | 0 | 2 | 2.8 |

## Introduction

This calculation determines an allowance for foundation loads, based on appropriate representative allowances for floor and roof spans and wall heights.

| Load component | notes | area loading DL kN/m² | area loading LL kN/m² | load width m | load DL kN/m | load LL kN/m | load Total kN/m |
|---|---|---|---|---|---|---|---|
| Line loads | | | | | | | |
| Pitched Roof | assume truss rafters, 7m span | 1.13 | 0.625 | 3.5 | 4 | 2.2 | 6.2 |
| Suspended Timber Floor | assume joists spanning 4m max | 0.96 | 1.5 | 2 | 1.9 | 3 | 4.9 |
| Cavity Wall Inner Leaf | | 1.04 | 0 | 5 | 5.2 | 0 | 5.2 |
| Cavity Wall Outer Leaf | | 2.03 | 0 | 5 | 10.2 | 0 | 10.2 |
| | | | | Total | 21.3 | 5.2 | 26.5 |

## FOUNDATIONS OF PLAIN CONCRETE A1/2

### Table 10 **Minimum width of strip footings**

| Type of ground (including engineered fill) | Condition of ground | Field test applicable | Total load of load-bearing walling not more than (kN/linear metre): 20 | 30 | 40 | 50 | 60 | 70 |
|---|---|---|---|---|---|---|---|---|
| | | | Minimum width of strip foundations (mm) | | | | | |
| I Rock | Not inferior to sandstone, limestone or firm chalk | Requires at least a pneumatic or other mechanically operated pick for excavation | In each case equal to the width of wall | | | | | |
| II Gravel or sand | Medium dense | Requires pick for excavation. Wooden peg 50mm square in cross section hard to drive beyond 150mm | 250 | 300 | 400 | 500 | 600 | 650 |
| III Clay<br>Sandy clay | Stiff<br>Stiff | Can be indented slightly by thumb | 250 | 300 | 400 | 500 | 600 | 650 |
| IV Clay<br>Sandy clay | Firm<br>Firm | Thumb makes impression easily | 300 | 350 | 450 | 600 | 750 | 850 |
| V Sand<br>Silty sand<br>Clayey sand | Loose<br>Loose<br>Loose | Can be excavated with a spade. Wooden peg 50mm square in cross section can be easily driven | 400 | 600 | | | | |
| VI Silt<br>Clay<br>Sandy clay<br>Clay or silt | Soft<br>Soft<br>Soft<br>Soft | Finger pushed in up to 10mm | 450 | 650 | | | | |
| VII Silt<br>Clay<br>Sandy clay<br>Clay or silt | Very soft<br>Very soft<br>Very soft<br>Very soft | Finger easily pushed in up to 25mm | Refer to specialist advice | | | | | |

Note:
Foundations on soil types V and VI do not fall within the provisions of this section if the total load exceeds 30kN/m.

## Discussion

The calculation at the top determines the approximate line load on the foundations assuming an additional storey is constructed onto the existing walls.

Below this is an extract from Approved Document A of the buidling regulations. This is a ready-reckoner for the width of strip footings for different soil conditions.

It is clear that even on very soft ground (class V or even class VI), a typical 600 wide foundation will be adequate.