CampbellReith
consulting engineers

# 9 St. Martins Almshouses

## NW1 0BD

### Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12466-97
Revision: D1

October 2017

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## Document History and Status

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## Document Details

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| Project Number | 12466-97 |
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| Planning Reference | 2017/4287/P |

## Contents



## Appendix

## 1.0 NON-TECHNICAL SUMMARY

1.1. CampbellReith was instructed by London Borough of Camden, (LBC) to carry out an audit on the Basement Impact Assessment submitted as part of the Planning Submission documentation for 9 St. Martins Almshouses, NW1 0BD (planning reference 2017/4287/P). The basement is considered to fall within Category B as defined by the Terms of Reference.

1.2. The Audit reviewed the Basement Impact Assessment for potential impact on land stability and local ground and surface water conditions arising from basement development in accordance with LBC's policies and technical procedures.

1.3. CampbellReith was able to access LBC's Planning Portal and gain access to the latest revision of submitted documentation and reviewed it against an agreed audit check list.

1.4. The BIA and the Structural Methodology Statement were carried out by individuals with suitable qualifications.

1.5. The Design & Access Statement identified that 1 to 9 St. Martins Almshouses are grade II listed buildings.

1.6. The property is a terraced two storeys plus lower ground floor house. The proposal is to deepen the existing lower ground level and the construction of a single storey rear extension with new basement and external lightwell.

1.7. A site specific ground investigation was conducted, with the geology identified as made ground and head deposits overlaying London Clay.

1.8. Groundwater was observed within the depth of the proposed basement excavation, however this has not been interpreted as the true ground water level. Dewatering strategies are being proposed and a conservative groundwater level is being accounted in the design which is accepted.

1.9. It is accepted that the cumulative impact on groundwater flows will be minimal.

1.10. The new basement and new underpinned foundations will be founded in London Clay. There are some trees in the vicinities, but the report does not mention any structural defects on the property and heave forces were considered in the design.

1.11. The proposed construction works will have a relatively low impact in the existing trees, which can be largely mitigated through design and precautionary measures.

1.12. It is not clear if the parameters taken for the GMA are suitable for the proposed construction, this should be clarified and the GMA updated if necessary. Despite this the calculation method for the GMA does not appear to be correct.

1.13. The area of surface area draining to the sewer system will be increasing. The adoption of SUDs should be considered in the scheme.

1.14. The construction methodology involves commonly applied construction techniques for basement construction, and is considered appropriate assuming employment of a suitably experienced contractor and good workmanship.

1.15. Further design calculations to account for the neighbouring building surcharge must be provided.

1.16. An outline works programme has been provided.

1.17. A movement monitoring strategy is being proposed to include visual inspections and monitoring of fixed points on the property and adjoining properties around the excavation.

1.18. Queries and requests for information are described in section 4 and summarised in Appendix 2. Until these are resolved, it cannot be confirmed that the BIA complies with the requirements of CPG4.

## 2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) in 23/08/2017 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 9 St. Martins Almshouses, Bayham Street, London, NW1 0BD, ref. 2017/4287/P.

2.2. The Audit was carried out in accordance with the Terms of Reference set by LBC. It reviewed the Basement Impact Assessment for potential impact on land stability and local ground and surface water conditions arising from basement development.

2.3. A BIA is required for all planning applications with basements in Camden in general accordance with policies and technical procedures contained within

- Guidance for Subterranean Development (GSD). Issue 01. November 2010. Ove Arup & Partners.
- Camden Planning Guidance (CPG) 4: Basements and Lightwells.
- Camden Development Policy (DP) 27: Basements and Lightwells.
- Camden Development Policy (DP) 23: Water.

2.4. The BIA should demonstrate that schemes:

a) maintain the structural stability of the building and neighbouring properties;

b) avoid adversely affecting drainage and run off or causing other damage to the water environment;

c) avoid cumulative impacts upon structural stability or the water environment in the local area, and;

d) evaluate the impacts of the proposed basement considering the issues of hydrology, hydrogeology and land stability via the process described by the GSD and to make recommendations for the detailed design.

2.5. LBC's Audit Instruction described the planning proposal as *"Demolition of existing rear extension and replacement with new single storey rear ground floor extension; new basement beneath the proposed rear extension including external light well; excavation of existing basement beneath house by additional 800mm; new conservation roof light at roof level; restoration and refurbishment works throughout original property."*

2.6. The Audit Instruction also confirmed the basement proposal involved or was a neighbour to listed buildings.

2.7. CampbellReith accessed LBC's Planning Portal on 25/09/2017 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment Report (BIA) Parts 1 of 2 and 2 of 2 – Symmetrys Ltd – ref. 2016277/DS rev.A (06/07/2017)
- Arboricultural Impact Assessment – Landmark Trees – ref. MOX/9STM/AIA/01 – 19/04/2017
- Design and Access Statement – Moxon Architects – July 2017
- Historic Building Report – Donald Insall Associates – July 2017
- Existing Floor Plans and Elevations – drawings 599_120rev01, 599_121rev01, 599_122rev01, 599_123rev01, 599_130rev01, 599_131rev01, 599_132rev01, 599_140rev01
- Existing Site Plan – drawing 599_101rev01
- Location Plan – drawing 599_100rev01
- Proposed Floor Plans and Elevations – drawings 599_220rev01, 599_221rev01, 599_222rev01, 599_223rev01, 599_230rev01, 599_231rev01, 599_232rev01, 599_240rev01, 599_241rev01, 599_242rev01, 599_243rev01, 599_244rev01, 599_245rev01
- Proposed Site Plan – drawing 599_201rev01
- 8 St Martins Almshouses (Rear Extension) Structural drawing CA3618/01 rev.B

## 3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

| Item | Yes/No/NA | Comment |
|---|---|---|
| Are BIA Author(s) credentials satisfactory? | Yes | |
| Is data required by Cl.233 of the GSD presented? | Yes | A works programme is provided in the construction management plan. |
| Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology? | Yes | |
| Are suitable plan/maps included? | Yes | |
| Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail? | Yes | |
| Land Stability Screening:<br>Have appropriate data sources been consulted?<br>Is justification provided for 'No' answers? | Yes | Question 6: One tree will be felled and works will clash with RPA but Arboricultural Impact Assessment establish low impacts resultant from proposed development. |
| Hydrogeology Screening:<br>Have appropriate data sources been consulted?<br>Is justification provided for 'No' answers? | Yes | Question 5: New hardstanding drainage to be clarified. |
| Hydrology Screening:<br>Have appropriate data sources been consulted?<br>Is justification provided for 'No' answers? | Yes | |
| Is a conceptual model presented? | Yes | Section 3.2.1 of the BIA. |
| Land Stability Scoping Provided?<br>Is scoping consistent with screening outcome? | Yes | |

| Item | Yes/No/NA | Comment |
|---|---|---|
| Hydrogeology Scoping Provided?<br>Is scoping consistent with screening outcome? | Yes | |
| Hydrology Scoping Provided?<br>Is scoping consistent with screening outcome? | Yes | New hardstanding drainage to be clarified; |
| Is factual ground investigation data provided? | Yes | |
| Is monitoring data presented? | Yes | |
| Is the ground investigation informed by a desk study? | Yes | |
| Has a site walkover been undertaken? | Yes | |
| Is the presence/absence of adjacent or nearby basements confirmed? | Yes | |
| Is a geotechnical interpretation presented? | Yes | |
| Does the geotechnical interpretation include information on retaining wall design? | Yes | |
| Are reports on other investigations required by screening and scoping presented? | Yes | |
| Are the baseline conditions described, based on the GSD? | Yes | |
| Do the base line conditions consider adjacent or nearby basements? | Yes | |
| Is an Impact Assessment provided? | Yes | |
| Are estimates of ground movement and structural impact presented? | Partially | GMA to be revised and reissued. |
| Is the Impact Assessment appropriate to the matters identified by screen and scoping? | Yes | |

| Item | Yes/No/NA | Comment |
|---|---|---|
| Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme? | No | SUDS should be proposed to mitigate increase surface water drainage. |
| Has the need for monitoring during construction been considered? | Yes | |
| Have the residual (after mitigation) impacts been clearly identified? | Partially | |
| Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained? | Partially | GMA not carried out correctly. |
| Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment? | No | Confirmation required of areas to be drained to existing sewer system. |
| Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area? | No | |
| Does report state that damage to surrounding buildings will be no worse than Burland Category 2? | Yes | |
| Are non-technical summaries provided? | No | |

## 4.0 DISCUSSION

4.1. The Basement Impact Assessment (BIA) and the Structural Methodology Statement were carried out by a firm of engineering consultants, Symmetrys in conjunction with a firm of geotechnical consultants Ground&Water, and the individuals concerned in its production have suitable qualifications in accordance with CPG4.

4.2. The LBC Instruction to proceed with the audit identified that the basement proposal either involved a listed building. The Design & Access Statement identified that houses number 1 to 9 on St. Martins Almshouses are grade II listed.

4.3. The property is a terraced two storeys plus lower ground floor house. The proposed development consists of deepening of the existing lower ground by 0.8m and the construction of a single storey rear extension with new basement, including a new external lightwell.

4.4. A site specific ground investigation was conducted, comprising two trial pits (to investigate existing foundations) and one borehole to a depth of 10mbgl.

4.5. The ground model consists of a layer of Made Ground (0.6-1.2mbgl) and head deposits comprising brown gravelly silty clay (up to 2.3mbgl) overlaying the London Clay.

4.6. On the borehole a ground water strike was observed at 3.1mbgl and, during a return visit, a groundwater level of 2.5mbgl was recorded in the standpipe installed. However, these results were not considered by the geotechnical consultant to represent the groundwater table and were interpreted as perched water within the top layers. No further repeat monitoring readings were presented. However despite the above a dewatering strategy has been proposed which is accepted.

4.7. It is claimed that the cumulative impact on ground water flows will be minimal given the basement will be formed in impermeable London Clay. However this does not take into account the permeable head deposits that overlay this. However it is accepted that the impact on ground water flows is anticipated as being minimal given the low depth of ground water recorded above the London Clay, however it is recommended that ground water monitoring continue until construction in order to better understand the seasonal variation of ground water.

4.8.

4.9. Structural calculations for the retaining wall and basement slab have been produced, with the retaining wall being designed for a conservative water level of 1mbgl. The basement slab has been designed to resist heave forces due to the unloading of the clay soil. Surcharge loading from the neighbouring rear extension have not been accounted for in the structural design, and should be considered.

4.10. The proposed construction works will occur on the vicinities of the trees and one tree will be removed. An Arboricultural Impact assessment was conducted and concluded that the impacts of the development are relatively low and the full potential of the impact can be largely mitigated through design and precautionary measures.

4.11. The basement is surrounded by a two storey building with no basement (number 8) on the north boundary, a private access on the west and south boundaries and the property garden on the east boundary.

4.12. A ground movement assessment (GMA) was conducted but it assumes that the excavation is in competent while the Site Investigation indicates made ground and head deposits to a depth of up to 2.3mbgl which could lead to increased ground movements. Therefore it is recommended that extra care is taken in providing both temporary and permanent propping to the wall to ensure that movements are kept to a minimum, or the GMA is reconsidered to take this into account by using CIRIA C760 guidance.

4.13. While the report suggests that the new ground floor extension is to be in timber, the drawings suggest reinforced concrete. The new extension ground floor construction should be clarified, with the GMA reviewed to ensure compatibility with the ground floor construction in relation to the floor providing a prop to the retaining wall.

4.14. The GMA does not appear to have summed the vertical movements from both installation and excavation correctly, with a maximum vertical movement of 3mm plotted which would approximately equate to the vertical movement due to excavation alone (for number 7 St Martins Almshouses). Clarification is required for No 7 which appears to have been confused with number 8. For this reason the GMA should be revised and reissued together with the revised. It should be noted that the maximum permissible damage category is 1.

4.15. The area of drained surface water will be increased by the construction of the lightwell and by a slight increase in roof area. The requirement for mitigations measures is identified in Scoping stage (BIA, appendix C, point 3.2.1) but no solutions are being proposed to mitigate this increase. Measures adopted should be in line with the principles of sustainable urban drainage system (SUDS) described on appendix C, point 7.8 of the BIA.

4.16. A construction methodology is presented which involves sequenced underpinning of existing foundations and a sequenced retaining wall construction, which is common practice and, assuming good workmanship, pose a low likelihood of significant risk of ground movement.

4.17. A works programme covering key phases of work and approximate durations has been included in the construction management plan.

4.18. A movement monitoring strategy is being proposed to include visual inspection and the monitoring of fixed monitoring points on the property and adjoining properties around the perimeter of the proposed excavation. This includes an outline movement monitoring strategy and generic trigger levels, trigger levels should be linked to the predicted movements calculated by the ground movement assessment, in order to prevent damage exceeding category 1. It should be noted that monitoring of the property to be underpinned itself is also required due to its listed building status.

4.19. Queries and requests for information are described in this section and summarised in Appendix 2. Until these are resolved, it cannot be confirmed that the BIA complies with the requirements of CPG4.

## 5.0 CONCLUSIONS

5.1. The BIA and the Structural Methodology Statement were carried out by a firm of engineering consultants in conjunction with a firm of geotechnical consultants and the individuals concerned in its production have suitable qualifications in accordance with CPG4.

5.2. The Design & Access Statement identified that houses number 1 to 9 on St. Martins Almshouses are grade II listed.

5.3. The property is a terraced two storeys plus lower ground floor house. The proposal is to deepen the existing lower ground and the construction of a single storey rear extension with new basement and external lightwell.

5.4. A site specific ground investigation was conducted. The ground model consists of a layer of made ground and head deposits overlaying London Clay.

5.5. Groundwater was observed at 2.5 and 3.1mbgl. However, these results were interpreted as perched water within the top layers by the geotechnical consultant. Dewatering strategies are being proposed and a conservative groundwater level is being accounted in the design.

5.6. The new basement slab and underpinned foundations will be founded in London Clay.

5.7. The new rear extension ground floor construction must be clarified. If reinforced concrete is not being used, the GMA must be revised with the wall unpropped.

5.8. The GMA does not appear to have summed together the vertical movements from both installation and excavation correctly. The GMA should be revised and reissued.

5.9. It is accepted that the impact on ground water flows will be minimal, given the relatively impermeable head deposits, and the shallow depth of perched groundwater. However ground water monitoring should continue until construction.

5.10. The area of drained surface water will be increased by the construction of the lightwell and by slight increase in roof area. New hardstanding paving drainage should be clarified and mitigation measures (SUDS) must be adopted considering this increase.

5.11. The construction methodology involves sequenced underpinning of existing foundations and sequenced retaining wall construction, which are common practice and should pose low risk, assuming good workmanship by an experienced contractor.

5.12. Structural calculations for the retaining wall and basement slab have been provided, however design accounting for a building load surcharge has not been accounted for.

5.13. An outline works programme has been provided.

5.14. A movement monitoring strategy is being proposed to include visual inspections and monitoring of fixed points on the property and adjoining properties around the excavation. This should be updated so that trigger levels match movements as anticipated by the GMA.

5.15. Queries and requests for information are described in section 4 and summarised in Appendix 2. Until these are resolved, it cannot be confirmed that the BIA complies with the requirements of CPG4.

# Appendix 1: Residents' Consultation Comments

None

# Appendix 2: Audit Query Tracker

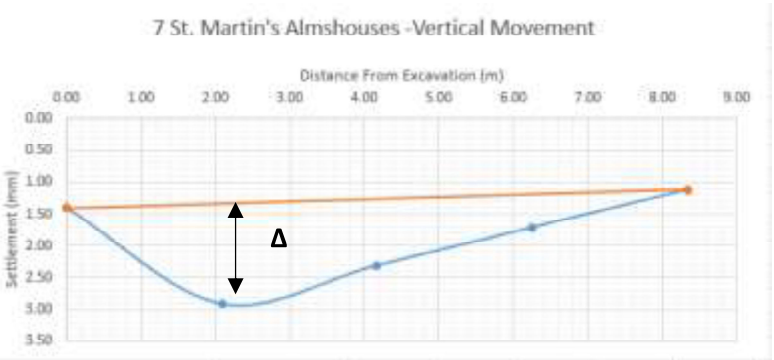
Audit Query Tracker

| Query No | Subject | Query | Status | Date closed out |
|---|---|---|---|---|
| 1 | Stability | Clarification of new rear extension ground floor form of construction. | Open | |
| 2 | Stability | GMA to be revised to account for cumulative movements caused by installation and excavation. | Open | |
| 3 | Stability | Retaining wall calculations to account for surcharge of neighbouring extension | Open | |
| 4 | Hydrology | Mitigation measure to be proposed (SUDS) due to increased discharge to sewer system | Open | |

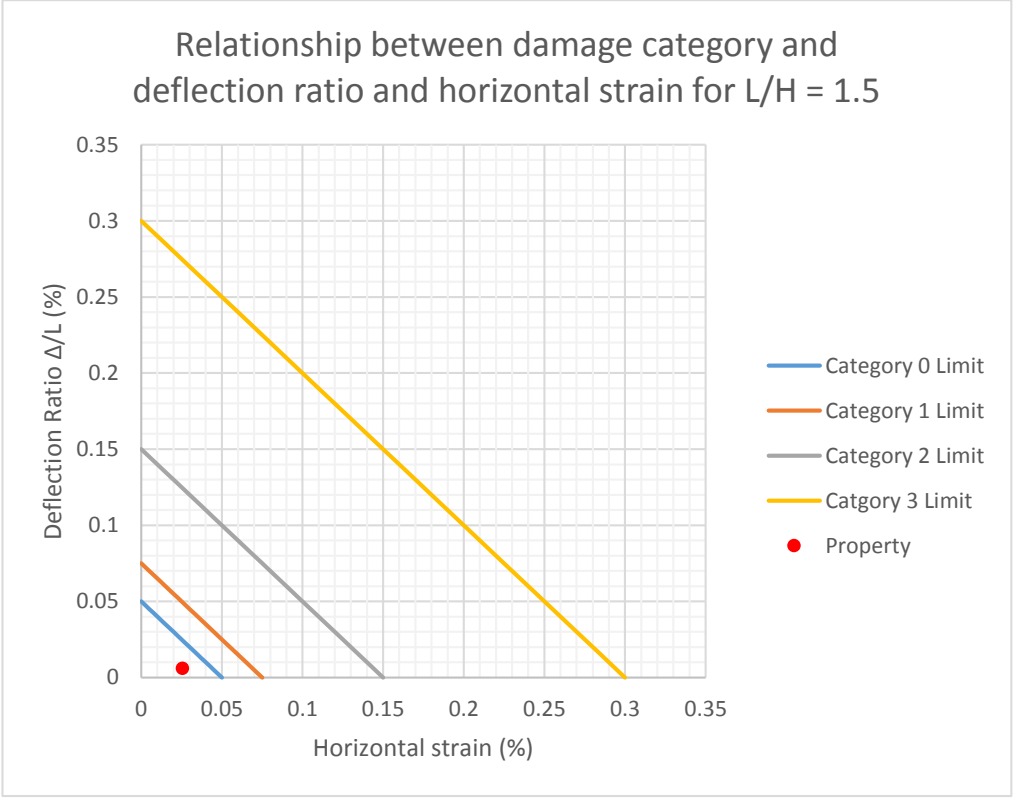
# Appendix 3: Supplementary Supporting Documents

**APPENDIX H**
**Ground Movement Assessment Calculations**

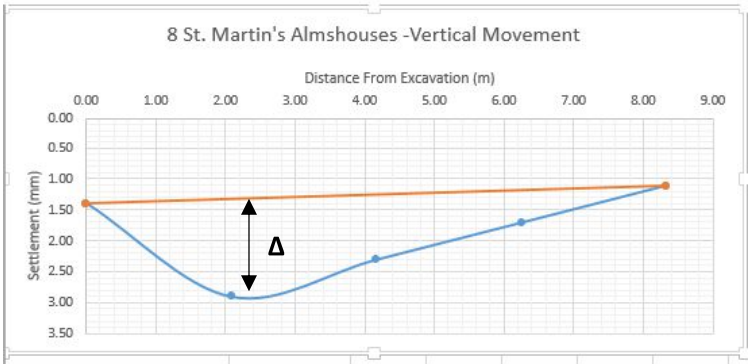
# No. 7 St. Martin's Almshouses– Potential Damage Calculations in Stiff Clay



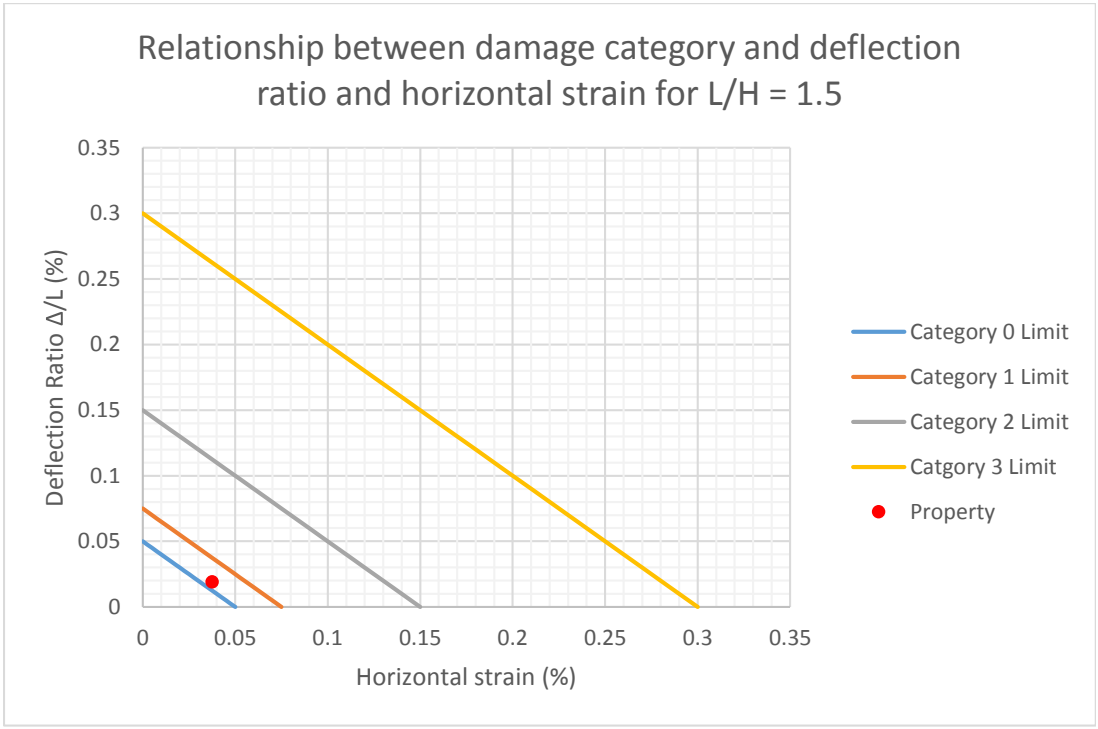

| Neighbouring Property 1 | No. 8 | | |
|---|---|---|---|
| | m | mm | |
| L | 8.33 | 8330 | |
| H | 5.00 | 5000 | |
| L/H | 1.67 | | |
| Vertical Deflection (Δ) | 1.4 | mm | from graph (max difference between blue and orange |
| Defelction Ratio (Δ/L) | 0.016807 | % | |
| Horizontal Movement (δh) | 3.12 | mm | difference between horizontal movement at nearest and farthest walls |
| Horzontal Strain (Ɛh) = δh/L | 0.03750 | % | |



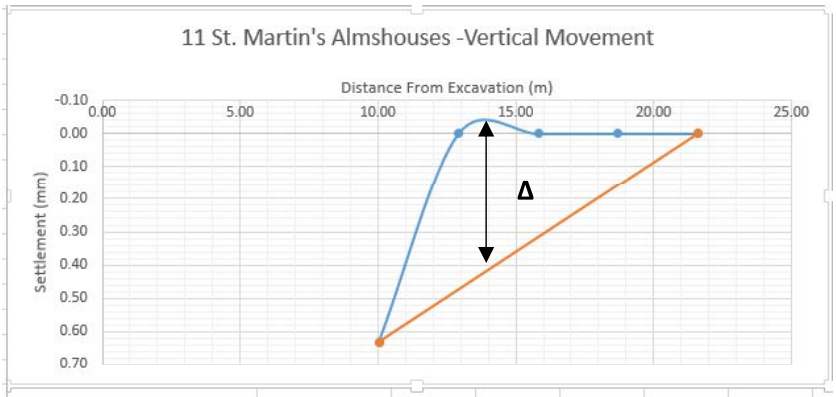
# No. 8 St. Martin's Almshouses– Potential Damage Calculations in Stiff Clay



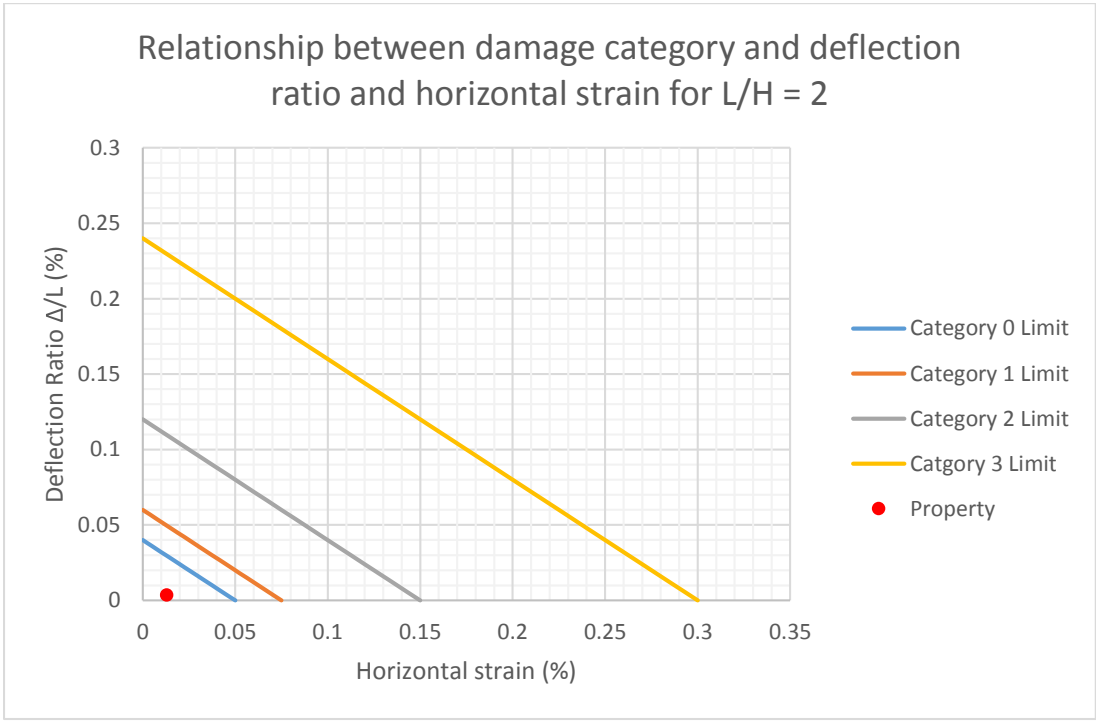

| Neighbouring Property 1 | No. 8 St Martins | | |
|---|---|---|---|
| | m | mm | |
| L | 8.33 | 8330 | |
| H | 5.00 | 5000 | |
| L/H | 1.67 | | |
| Vertical Deflection (Δ) | 1.6 | mm | from graph (max difference between blue and orange line) |
| Defelction Ratio (Δ/L) | 0.019208 | % | |
| Horizontal Movement (δh) | 3.12 | mm | difference between horizontal movement at nearest and farthest walls |
| Horzontal Strain (εh) = δh/L | 0.03750 | % | |



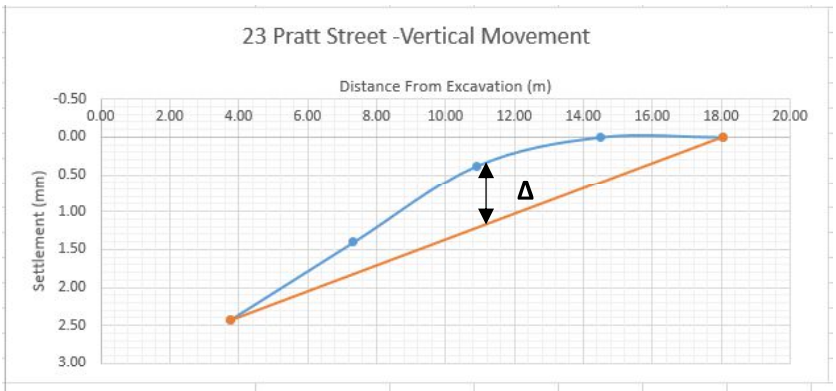
# No. 11 St. Martin's Almshouses– Potential Damage Calculations in Stiff Clay



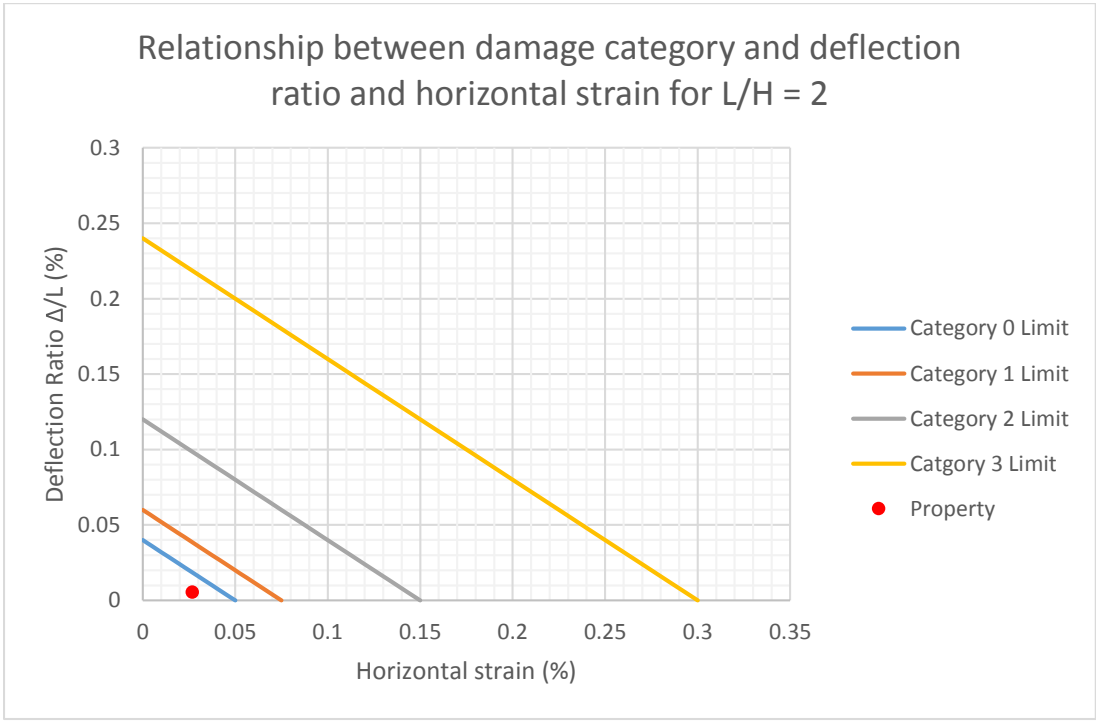

| | | | |
|---|---|---|---|
| **Neighbouring Property 1** | No. 11 St Martins | | |
| | m | mm | |
| **L** | 11.58 | 11580 | |
| **H** | 5.00 | 5000 | |
| **L/H** | 2.32 | | |
| Vertical Deflection (Δ) | 0.42 | mm | from graph (max difference between blue and orange |
| Defelction Ratio (Δ/L) | 0.003627 | % | |
| Horizontal Movement (δh) | 1.49 | mm | difference between horizontal movement at nearest and farthest walls |
| Horzontal Strain (Ɛh) = δh/L | 0.01286 | % | |



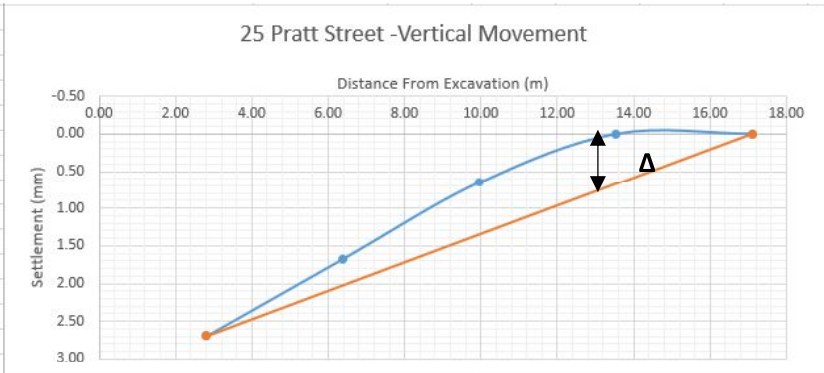
# No. 23 Pratt Street – Potential Damage Calculations in Stiff Clay



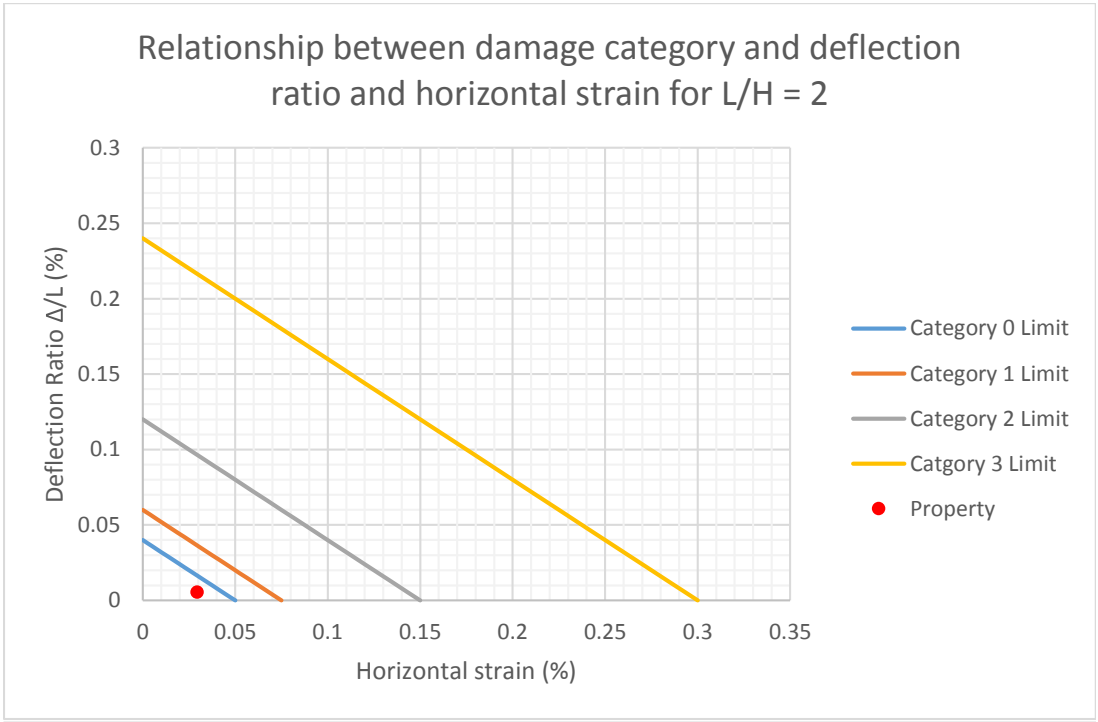

| Neighbouring Property 1 | No. 23 Pratt Street | | |
|---|---|---|---|
| | m | mm | |
| L | 14.31 | 14310 | |
| H | 7.50 | 7500 | |
| L/H | 1.91 | | |
| Vertical Deflection (Δ) | 0.8 | mm | from graph (max difference between blue and orange |
| Defelction Ratio (Δ/L) | 0.005590 | % | |
| Horizontal Movement (δh) | 3.84 | mm | difference between horizontal movement at nearest and farthest walls |
| Horzontal Strain (Ɛh) = δh/L | 0.02686 | % | |

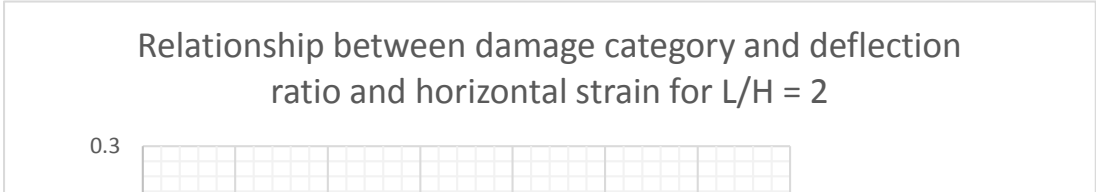


# No. 25 Pratt Street – Potential Damage Calculations in Stiff Clay

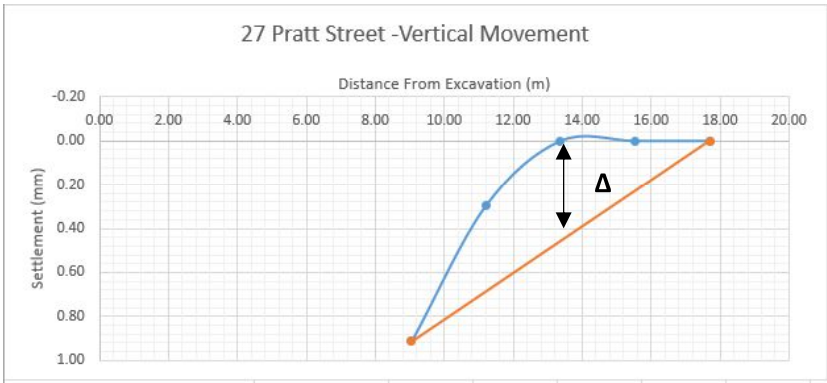



| Neighbouring Property 1 | No. 25 Pratt Street | | |
|---|---|---|---|
| | m | mm | |
| L | 14.31 | 14310 | |
| H | 7.50 | 7500 | |
| L/H | 1.91 | | |
| Vertical Deflection (Δ) | 0.8 | mm | from graph (max difference between blue and orange |
| Defelction Ratio (Δ/L) | 0.005590 | % | |
| Horizontal Movement (δh) | 4.20 | mm | difference between horizontal movement at nearest and farthest walls |
| Horzontal Strain (Ɛh) = δh/L | 0.02932 | % | |

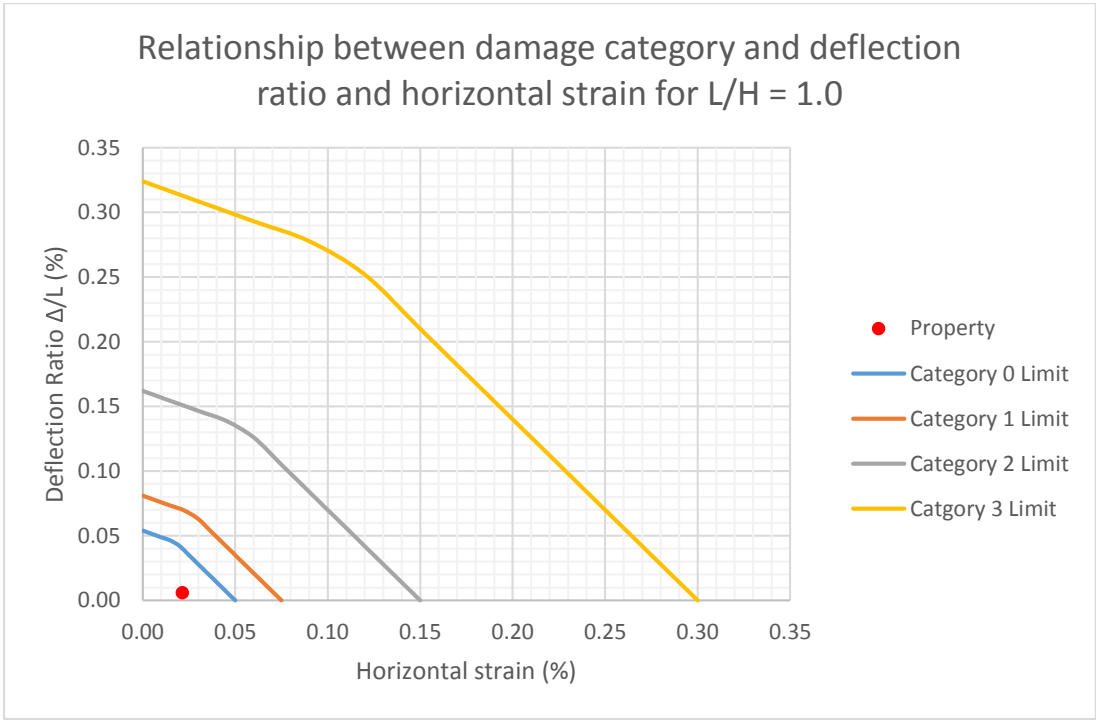


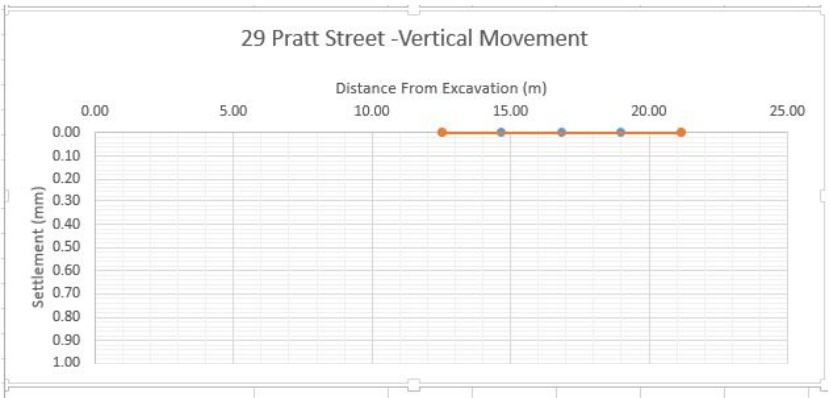
# No. 27 Pratt Street – Potential Damage Calculations in Stiff Clay



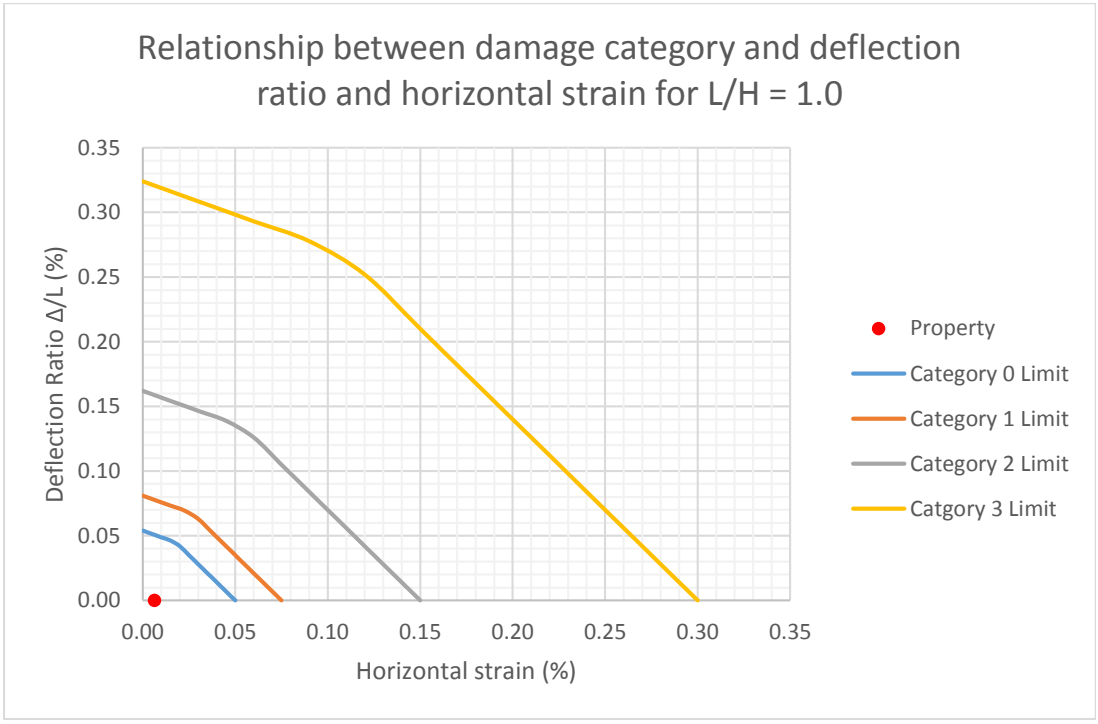

| Neighbouring Property 1 | No. 27 Pratt Street | | |
|---|---|---|---|
| | m | mm | |
| L | 8.64 | 8640 | |
| H | 7.50 | 7500 | |
| L/H | 1.15 | | |
| Vertical Deflection (Δ) | 0.5 | mm | from graph (max difference between blue and orange |
| Defelction Ratio (Δ/L) | 0.005787 | % | |
| Horizontal Movement (δh) | 1.86 | mm | difference between horizontal movement at nearest and farthest walls |
| Horzontal Strain (Ɛh) = δh/L | 0.02148 | % | |



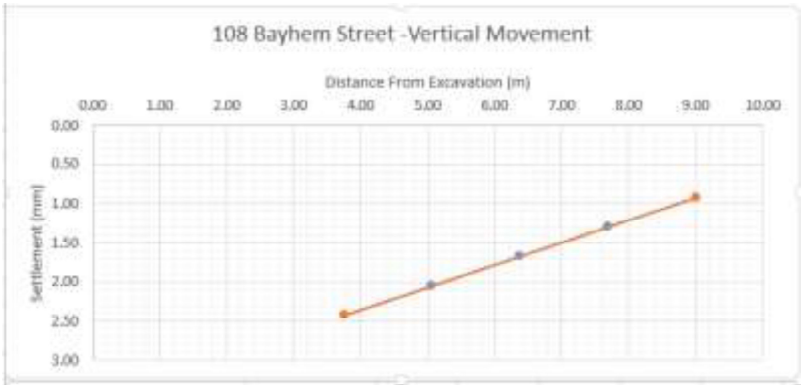
# No. 29 Pratt Street – Potential Damage Calculations in Stiff Clay



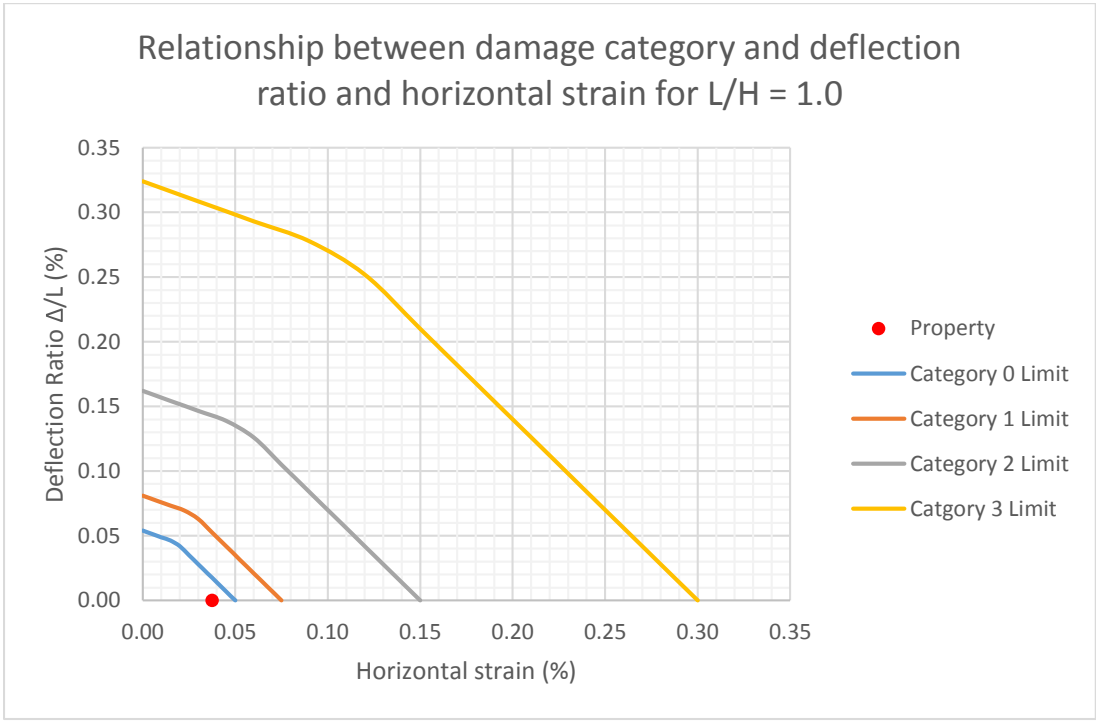

| | | | |
|---|---|---|---|
| **Neighbouring Property 1** | No. 29 Pratt Street | | |
| | m | mm | |
| **L** | 8.64 | 8640 | |
| **H** | 7.50 | 7500 | |
| **L/H** | 1.15 | | |
| Vertical Deflection (Δ) | 0 | mm | from graph (max difference between blue and orange |
| Defelction Ratio (Δ/L) | 0.000000 | % | |
| Horizontal Movement (δh) | 0.56 | mm | difference between horizontal movement at nearest and farthest walls |
| Horzontal Strain (Ɛh) = δh/L | 0.00642 | % | |



# No. 108 Bayhem Street – Potential Damage Calculations in Stiff Clay




| Neighbouring Property 1 | No. 108 Bayhem Street | | |
|---|---|---|---|
| | m | mm | |
| L | 5.25 | 5250 | |
| H | 5.00 | 5000 | |
| L/H | 1.05 | | |
| Vertical Deflection (Δ) | 0 | mm | from graph (max difference between blue and orange |
| Defelction Ratio (Δ/L) | 0.000000 | % | |
| Horizontal Movement (δh) | 1.97 | mm | difference between horizontal movement at nearest and farthest walls |
| Horzontal Strain (Eh) = δh/L | 0.03750 | % | |



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