# GOSH CCC
# Building Damage Ground Movement Assessment

20/05/2022
1226-A2S-XX-XX-RP-Y-0004-02

NHS Great Ormond Street Hospital for Children NHS Foundation Trust

A-squared Studio

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# Great Ormond Street Hospital Children's Cancer Centre (GOSHCCC)

## Building Damage Ground Movement Assessment

May 2022

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|---|---|
| Project Name | Great Ormond Street Hospital Children’s Cancer Centre (GOSHCCC) |
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| Document Name | Building Damage Ground Movement Assessment |



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# Contents

# 1. Introduction

A-squared Studio Engineers Ltd (A-squared) has been appointed by John Sisk & Son (Holdings) Ltd on behalf of Great Ormond Street Hospital for Children NHS Foundation Trust (the ‘Applicant’) to undertake a Ground Movement Assessment (GMA) for the proposed Great Ormond Street Hospital Children’s Cancer Centre (GOSHCCC) development at the Great Ormond Street Hospital (GOSH) in London.

The A-squared scope comprises an assessment of the potential impact of the proposed redevelopment works on the various neighbouring properties.

## 1.1. Study Aims & Objectives

A ground movement and impact assessment has been carried out in order to estimate the potential damage induced by the proposed redevelopment works at GOSH on neighbouring properties including hospital and residential buildings.

The Redevelopment of the Great Ormond Street Hospital (GOSH) Frontage Building comprising demolition of the existing building and erection of a replacement 8 storey hospital building (Class C2 Use) together with 2 basement floors, roof top, balcony and ground floor landscaped amenity spaces, cycle storage, refuse storage and other ancillary and associated works pursuant to the development.

The assessment encompasses properties located within the *zone of influence* of the proposed scheme. The GMA assessment is based on *greenfield* ground movements which are unlikely to be exceeded. The adopted assessment methodology provides a robust and conservative assessment, representative of current industry best practice, as detailed in Section 4.

The assessment carried out and described herein aims to:

- Assess the impact of ground movements induced by the proposed works on properties adjacent to the development under consideration.
- Provide performance criteria and inform aspects of substructure construction and design.

This report provides a detailed description of the:

- Site and proposed development.
- Modelling parameters and input.
- Analyses and results.

## 2. The Site & Development

The proposed development site, herein referred to as ‘the site’, is located at Great Ormond Street, London, WC1N 3JH as shown in Figure 2.1. The site is located at an approximate grid reference of 530516E, 182024N and falls within the administrative boundaries of the London Borough of Camden (LBC). The site covers an area of approximately 0.2 hectares. The existing site comprises part of the GOSH Frontage Building as shown in Figure 2.2 and Figure 2.3. The current land uses surrounding the site are summarised in Table 2.1. The proposed building basement footprint and retaining wall outline are shown in Figure 2.4.

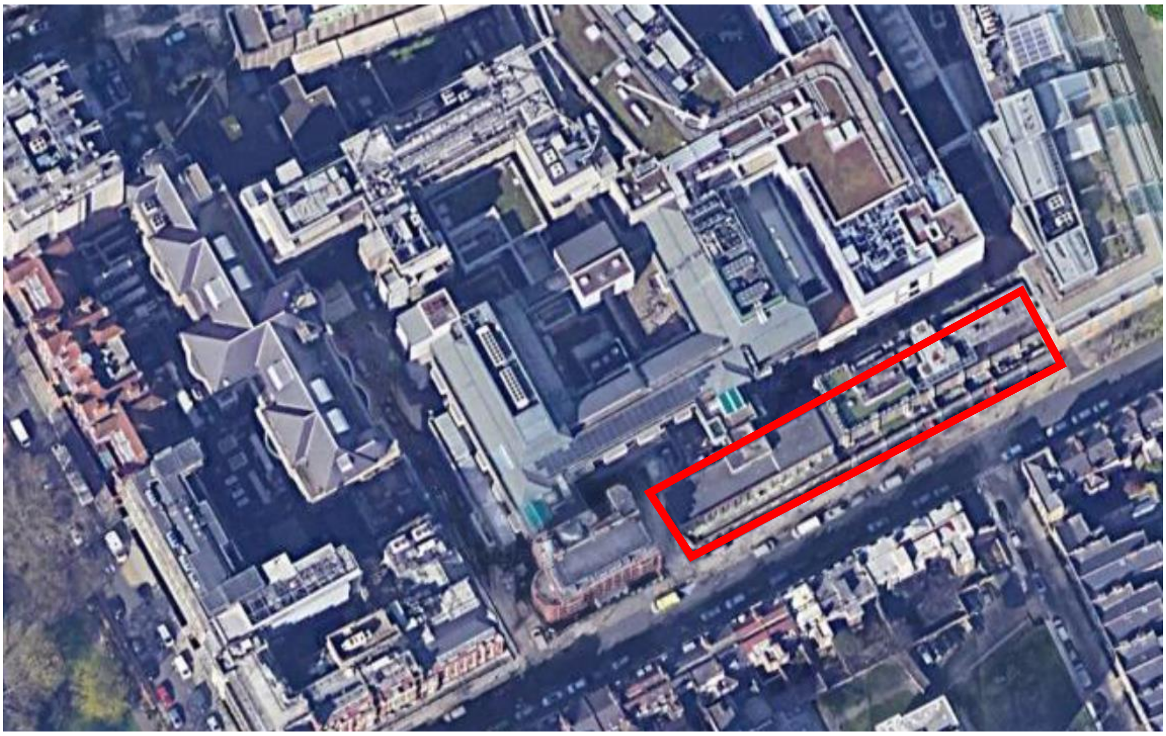
The majority of the site is currently occupied by the existing GOSH Frontage Building, a five storey building (inclusive of basement) dating from the 1950s that was constructed in two separate phases. The building is currently occupied by a number of GOSH departments including Audiology Department, Clinical Research Facility (CRF), Department of Child and Adolescent Mental Health and Paediatric Psychology Department.

The western most part of the site is occupied by the main GOSH Entrance providing connections to the wider GOSH island site and by a small rear element (external staircase) of the Paul O’Gorman Building that will be demolished to facilitate the proposed development.

The site is bounded by the Paul O’Gorman Building to the west, Octav Botnar Wing to the east, the Variety Club Building and Premier Inn Clinical Building to the north and Great Ormond Street to the south.

The site is relatively flat across the entire footprint, with an approximate ground level of +20mOD at the rear of the Frontage Building at lower ground level. The ground level at Great Ormond Street is approximately +23mOD.

The redevelopment of the Great Ormond Street Hospital (GOSH) Frontage Building comprising demolition of the existing building and erection of a replacement 8 storey hospital building (Class C2 Use) together with 2 basement floors, roof top, balcony and ground floor landscaped amenity spaces, cycle storage, refuse storage and other ancillary and associated works pursuant to the development.



Approximate site boundary marked in red. Image courtesy of Google.

**Figure 2.1 Location of the proposed development**

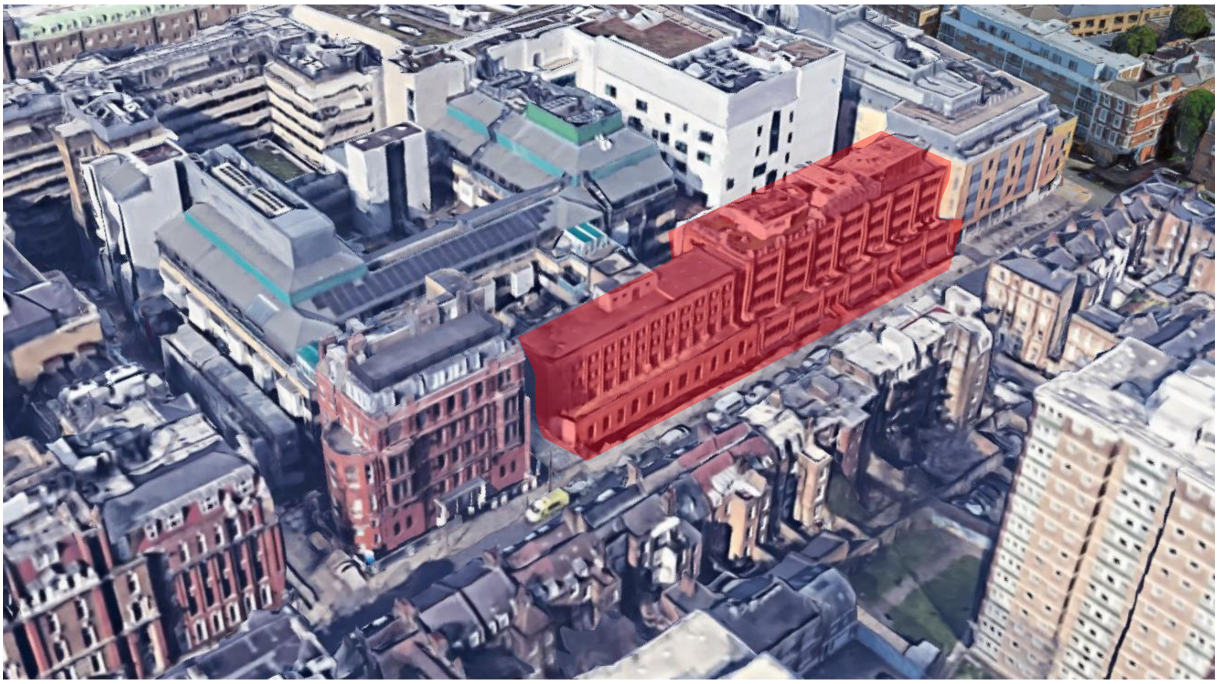
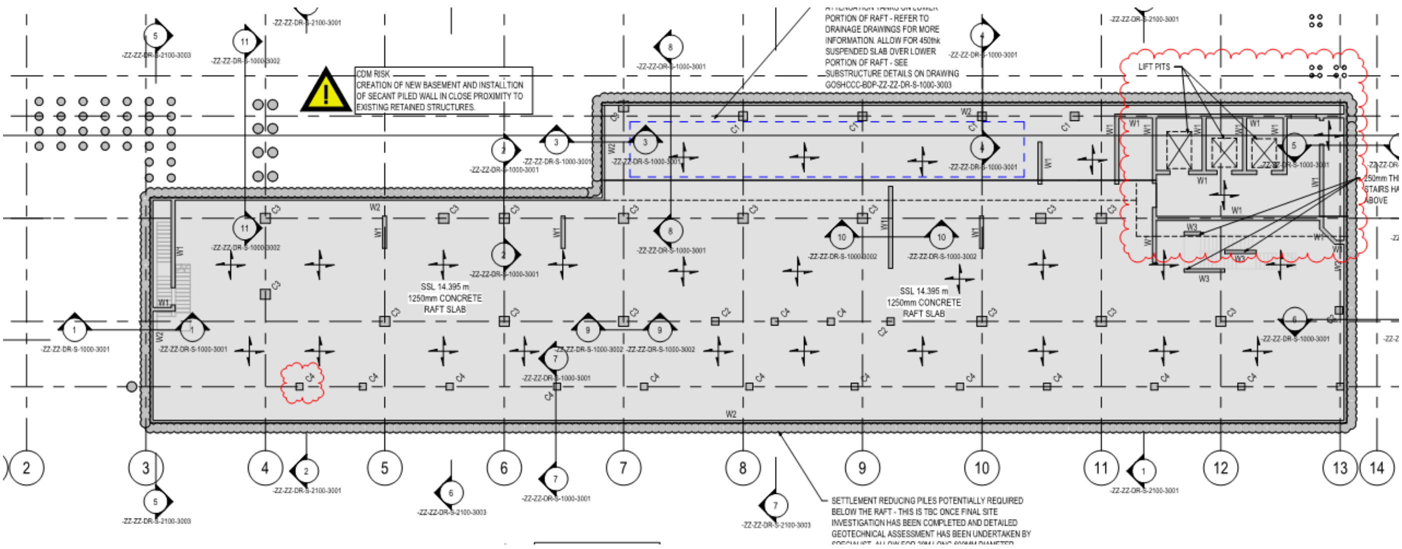


**Figure 2.2 Current site condition - Frontage Building**


**Figure 2.3 View of the current site condition, facing east towards the hospital entrance at Great Ormond Street**

**Table 2.1 Surrounding land uses summary**

| Bearing from Site | Features directly adjacent to the site boundary | Identified land uses and key structures |
|---|---|---|
| North | GOSH buildings | Russell square underground station located 200m to the northwest of the site. |
| East | Great Ormond Street with mixed commercial shops and residential terraced properties | GOSH buildings and commercial shops along Lambs Conduit Street. Open park space located 70m to the southeast of the site |
| South | Great Ormond Street | Terraced houses with gardens located across Great Ormond Street and two blocks of residential flats is located at approximately 70m south. Open park space located 70m to the southeast of the site, adjacent to the residential flats. |
| West | Paul O'Gorman Building | Queens Square gardens located approximately 90m to the west of the site. Russell Square located 250m to the west of the site. |



**Source:** *Great Ormond Street Hospital* (2021) prepared by BDP Ltd.

**Figure 2.4 Proposed building footprint (basement)**

# 3. Ground Conditions

Site-specific ground investigation works have been completed at the time of writing. Based on a review of ground investigation data and historical data in the vicinity of the project site, the ground conditions at the site were generally found to comprise the following (in order of succession):

- Made Ground – brownish grey to light brown sandy fine to coarse, angular to subangular Gravel.
- Lynch Hill Gravels – Medium dense yellowish grey sandy fine to coarse angular to subrounded Gravel.
- London Clay – firm to stiff dark grey silty CLAY.
- Lambeth Group – stiff to very stiff grey/brown mottled clay.

The above include the strata of engineering interest and significance, taking cognisance of the scale of the proposed development, depth of the proposed basement excavation, and the zone of influence.

The ground model adopted for this assessment is presented in Table 3.1. Material strength and stiffness parameters have been derived and assumed from ground investigation data and previous experience in this area of London.

**Table 3.1 Ground model and geotechncial parameters adopted for analysis purposes**

| Stratum | Elevation (mOD) | Thickness (m) | Undrained Young's Modulus, $E_u$ [2] (MPa) | Drained Young's Modulus, E' [2] (MPa) |
|---|---|---|---|---|
| Made Ground | +20.00 | 1.20 | - | 10.0 |
| Lynch Hill Gravels | +18.80 | 1.30 | - | 35.0 |
| London Clay | +17.50 | 15.00 | 20.0 + 5.33z[4] | 16.0 + 4.27z[4] |
| Lambeth Group | +2.50 | 19.50 | 115.0 + 3.85z[4] | 92.0 + 3.08z[4] |

1. Ground model based on site specific ground investigation data in the vicinity of the site. This data has been interpreted specifically for the scope of the GMA presented herein.
2. Stiffness data ($E_u$ and E') has been evaluated empirically from in-situ testing data taking into consideration the nature of the geotechnical/soil-structure interaction mechanisms and level of anticipated strain within the soil mass.
3. *Rigid boundary* was assumed at -17.0mOD / 37mBGL) for analytical purposes.
4. z refers to the depth in metres below the top of the London Clay/Lambeth Group formation. Lower bound stiffness values have been adopted for GMA purposes only.

# 4. Impact Assessment Methodology

## 4.1. Assessment Details

The assessment has been undertaken using proprietary spreadsheets and the commercially available software Oasys Pdisp and Xdisp, which consider the three-dimensional ground movement field induced by the proposed excavation works.

Ground movements will arise as a result of various mechanisms which are mobilised as part of the construction works for the proposed scheme. The demolition of the existing buildings and basement excavations will induce ground movements arising from the overburden removal and installation of the proposed retention system. The permanent condition loading will partially reinstate a portion of the removed overburden, yielding settlements across the foundation system. The induced ground movements will extend over a given zone of influence surrounding the building/excavation footprint.

A series of three-dimensional models of the proposed scheme have been developed in Oasys Xdisp/Pdisp and combined by means of superposition in order to enable ground movement assessments to be carried out representing the various construction stages. The ground movement displacement fields were separated in two groups (A & B) based on the approach followed, as detailed below:

**Group A – Unloading/Loading ground movements**

A1. Building demolition and basement excavation (short-term).

A2. Building demolition, basement excavation, and application of the proposed building loading (long-term).

**Group B – CIRIA-based ground movements**

B1. Secant pile wall installation and basement excavation.

B2. Secant pile wall, basement excavation, and application of the proposed building loading (long-term).

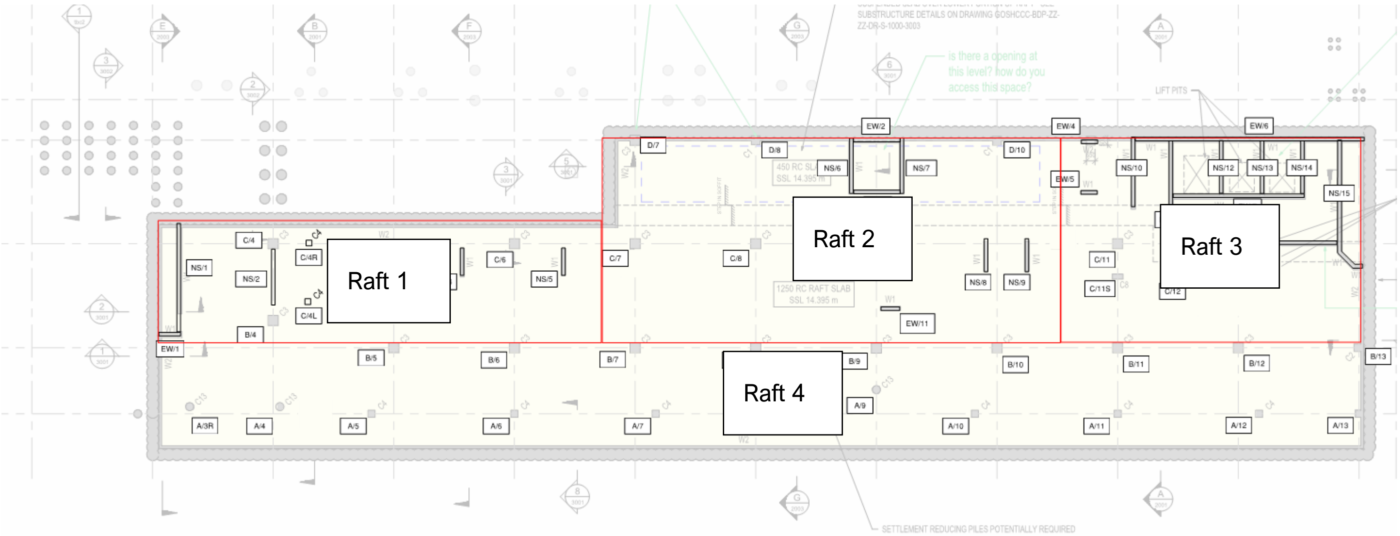
The Group A assessments are based on *greenfield* ground movements evaluated from linear half-space (Pdisp) analyses and focus on vertical ground movements induced by the overburden removal unloading and reloading processes.

Demolition pressures equivalent to 12kPa/storey have been applied over the footprints of the existing site building footprint. A total of 48kPa demolition upward pressure is applied in Pdisp to represent the demolition of existing building on site. Excavation unloading pressures have been modelled at the basement formation levels representing the removal of approximately 6.85m (137kPa) of overburden to form the additional basement level.

At this stage, it is envisaged that the proposed structures will be supported by a piled raft foundation. Based on a preliminary loading plan provided by BDP Ltd, uniformly distributed loading zones have been modelled at the proposed basement formation level. Figure 4.1 and Table 4.1 show the modelled loading pressures for the proposed structures. An uniformly distributed load of 31kPa has been adopted to represent the 1.2m thick Raft Foundation self-weight assuming a 25kN/m$^3$ reinforced concrete unit weight.

**Table 4.1 Proposed building loads modelled in Pdisp**

| Raft area | Total load from columns (kN) | Area ($m^2$) | Total load including raft self-weight (kPa) |
|---|---|---|---|
| 1 | 49215 | 308 | 190.0 |
| 2 | 75650 | 540 | 171.2 |
| 3 | 79355 | 333 | 268.8 |
| 4 | 111020 | 775.4 | 174.5 |




**Source:** *Sheet SK_S_XXX – LEVEL 0 Loading Plan* drawing (Jan 2022) prepared by BDP Ltd.

**Figure 4.1 Modelled loading areas in Pdisp**

The loadings on the retaining wall and piles from ground floor level are modelled as equivalent raft uniformly distributed loads acting at 2/3 of the embedded wall / pile length (i.e. circa 10.7mOD and 6.7mOD respectively) and assuming a 1:4 (horizontal:vertical) load spread distribution with depth. The retaining walls are assumed to be 10.5m long and the piles under the pile cap at northwest corner of the building are assumed 20m long. The loadings are provided by BDP Ltd and shown below in Figure 4.2. Examples of the loading scenarios applied in Pdisp are shown below in Figure 4.3 and Figure 4.4.

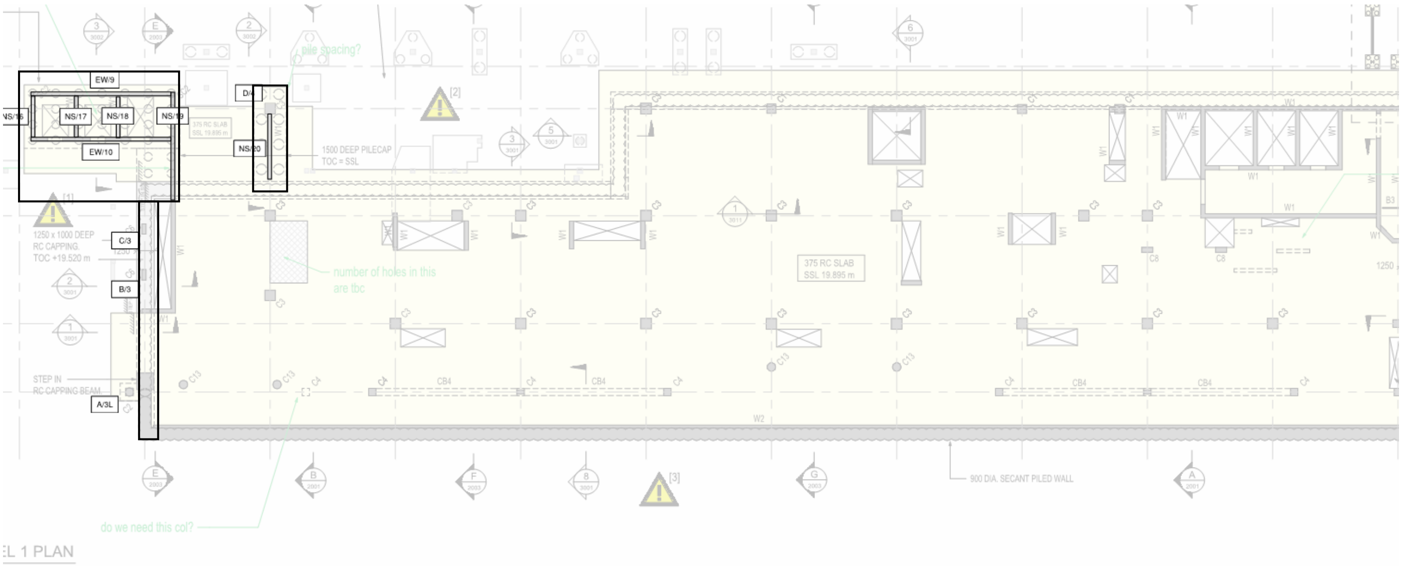



**Figure 4.2 Loadings on the retaining walls and pile cap at ground floor level**

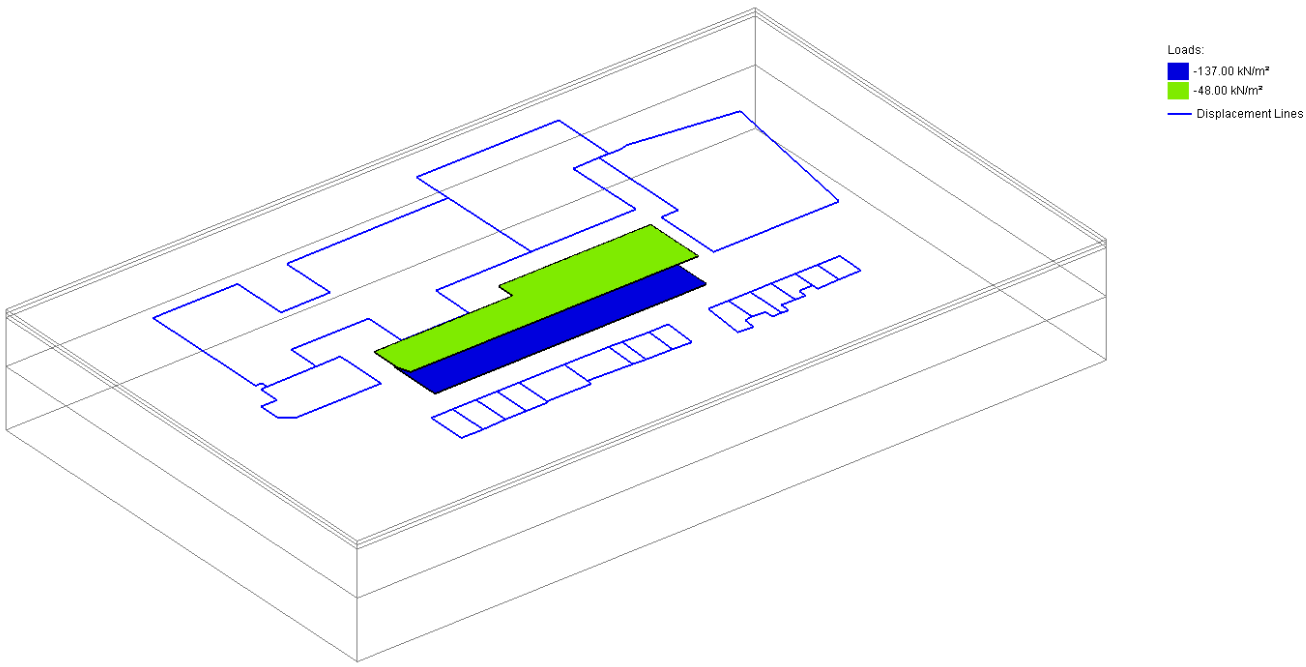



**Figure 4.3 Loadings in Pdisp - ST Excavation + Demolition**

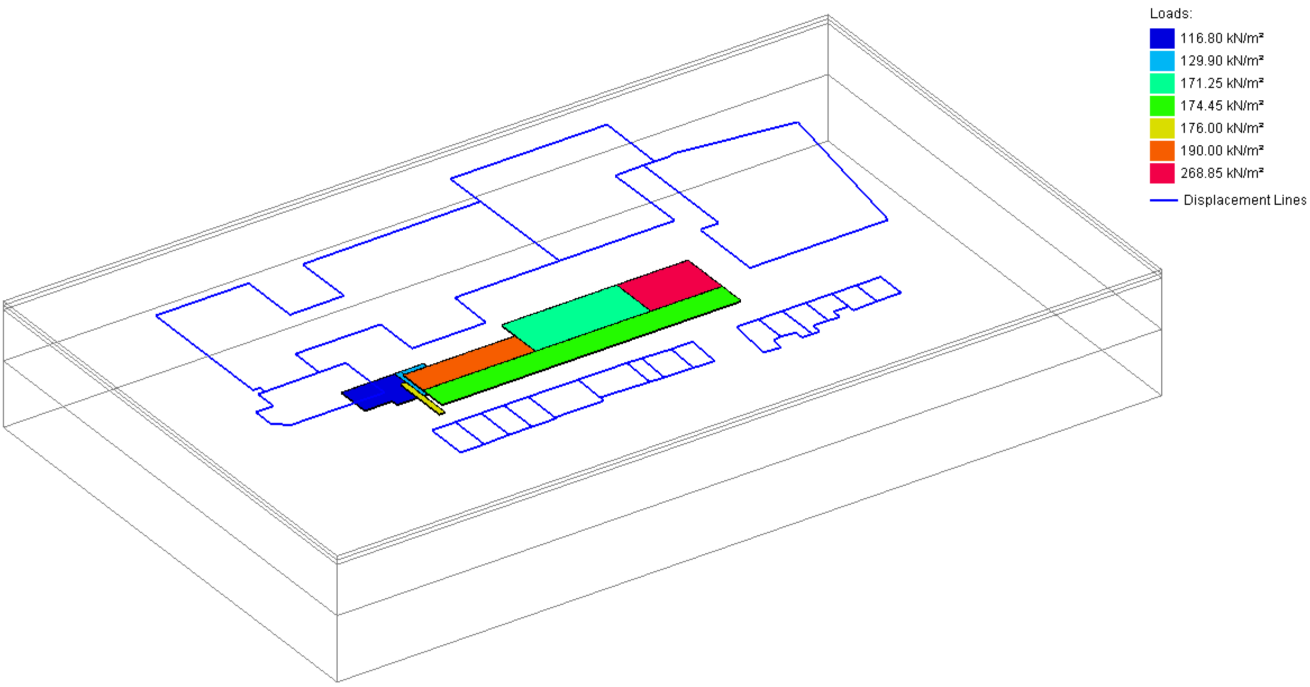



**Figure 4.4 Loadings in PDisp - LT Structural Loadings**

The Group B assessments adopt the normalised ground displacement curves reported in CIRIA C760. In addition to the effects arising from the basement excavation, the ground movement effects associated with the installation of the secant pile wall have been considered. The following CIRIA C760 normalised ground movement curves were adopted to assess ground movements due to retention system installation and excavation works:

- *Secant pile wall*: Installation of contiguous bored pile wall in stiff clay.
- *Excavation to formation*: Excavation in front of a high stiffness wall in stiff clay.

The modelling of the contiguous pile wall curve has been deemed suitable for calculating the installation effects of secant piled walls, contiguous piled walls, and/or sheet pile walls (assuming pre-boring or jetting installation aids, which may be required). For this assessment, the secant piles have been assumed to be 10.5m long (from existing lower ground level (+20.00mOD)).

Given the depth of the walls and proximity to sensitive infrastructure, utilities, and buildings, it is assumed that suitable construction controls and temporary works, including rigorous monitoring methodologies, will be implemented during the wall installation and basement excavation works on site to reduce the overall impact of the development.

In the B2 assessment, the CIRIA ground movements are combined with the long-term settlements induced by the loading redistribution (evaluated in Pdisp).

The two sets of analyses enabled the evaluation of an envelope of damage classification results, with the worst-case results presented herein. A simplified representative geometry has been adopted for defining the excavation/installation geometry implemented in the 3D modelling efforts, as shown in Figure 4.5.

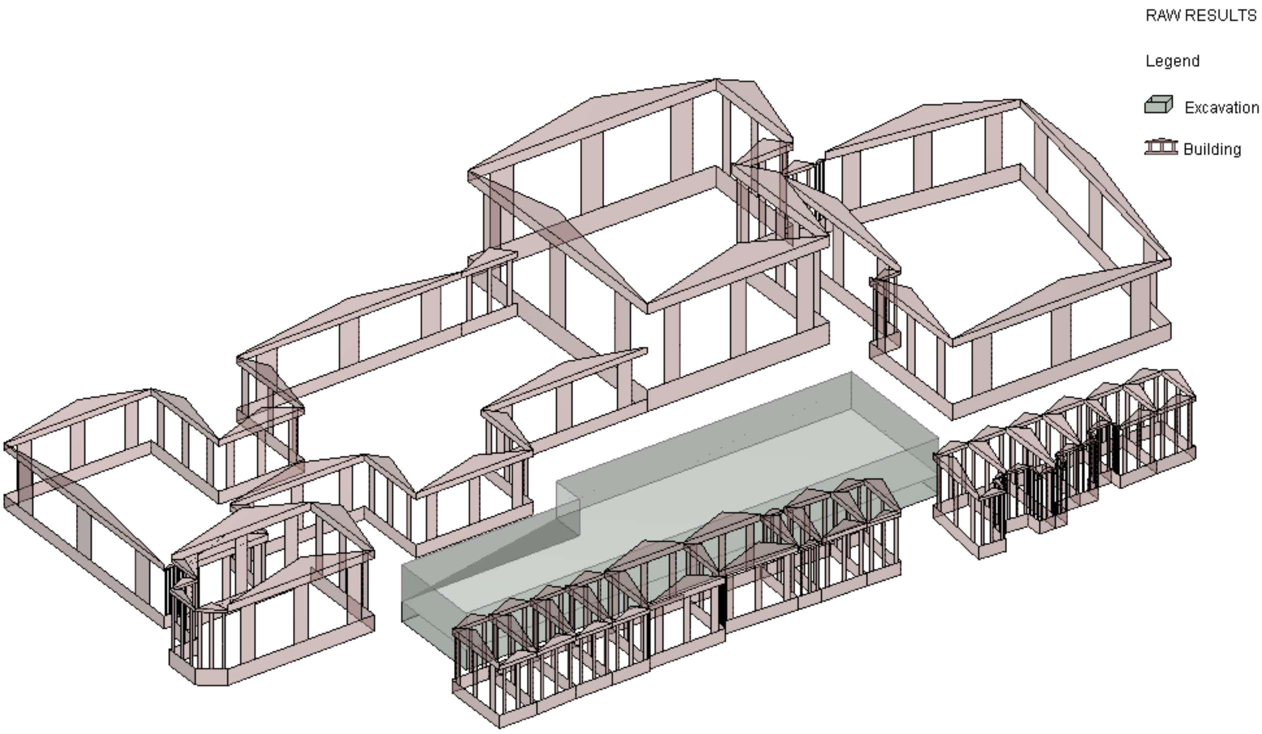



**Figure 4.5 Indicative plot of the three-dimensional analytical model using the Oasys Xdisp software suite**

## 4.2. Impact Assessment

### 4.2.1. General

The potential impact/damage induced on primary façade/wall elements of the buildings surrounding the proposed scheme have been evaluated on the basis of the calculated ground movement fields. The masonry walls of concern are shown in Figure 4.6, including the wall nomenclature/reference system adopted. The arrangement is based on the currently available survey information and presents an array of masonry façades running both perpendicular and parallel to the proposed basements (covering the key deformation mechanisms). In total, 95 façades of the neighbouring buildings were considered for the current study and these are grouped in the following manner:

- GH.1.1 – GH.1.7: Paul O'Gorman Building
- GH.2.1 – GH.2.16: Variety Club Building
- GH.3.1 – GH.3.6: Premier Inn Clinical Building
- GH.4.1 – GH.4.8: Octav Botnar Wing
- 47.GS.1 – 47.GS.3: 47 Great Ormond Street
- 29.OS.1 – 29.OS.4: 29 Orde Hall Street

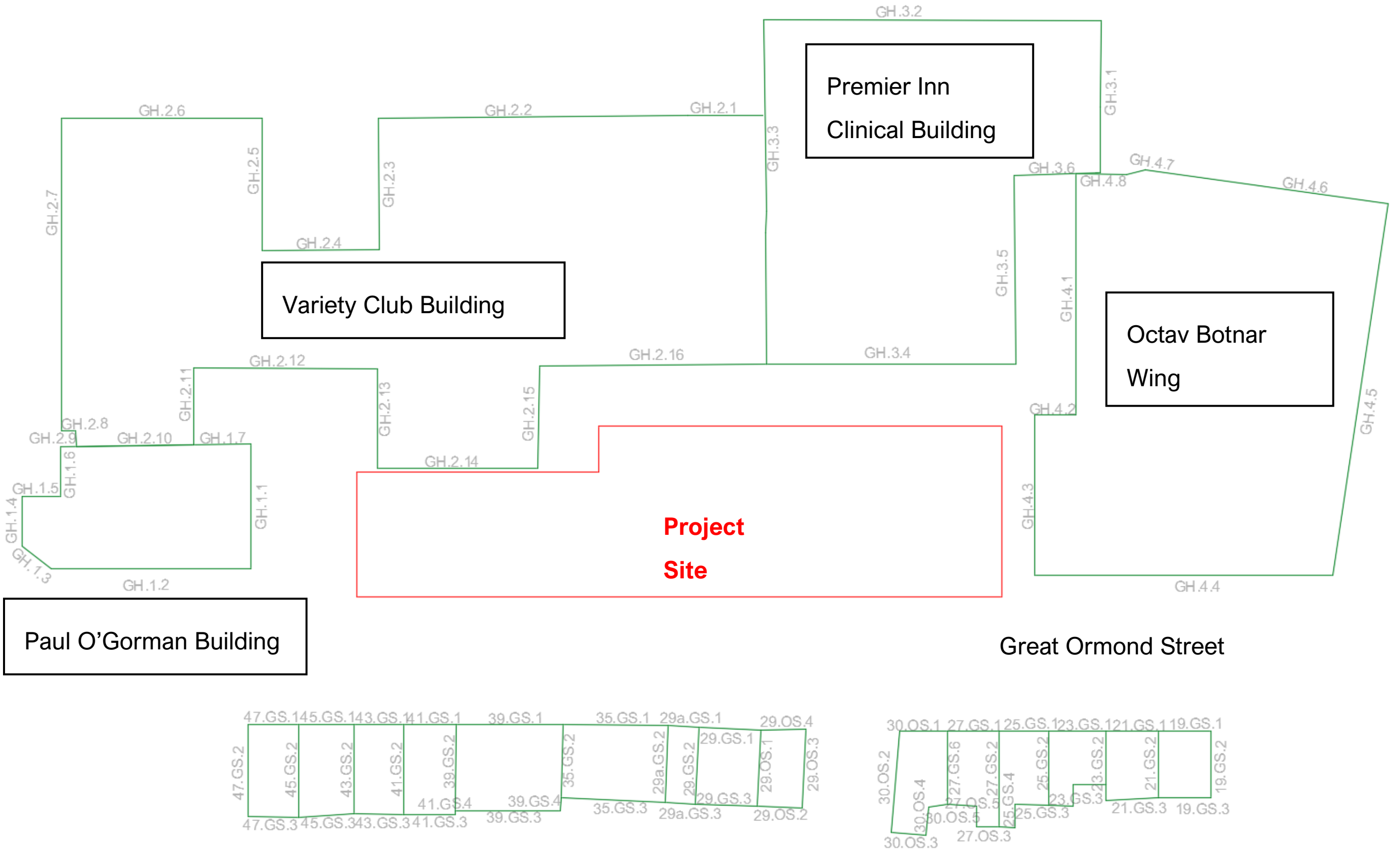



**Figure 4.6 Simplfied scheme and nomenclature for each building façade/masonry wall element**

Each wall has been assumed to behave as an equivalent beam subject to a bending and extension/compression deformation mechanism, based on the evaluated greenfield ground movement, as outlined previously.

Tensile strains induced within the building masonry walls have been evaluated based on the deflection ratios Δ/L and horizontal extension mechanisms estimated from the analyses. The assessment considers the well-established Burland (1997) damage classification method, as presented and summarised in Figure 4.7 and Figure 4.8. This method involves a relatively simple but robust means of assessment, which is widely adopted and is considered to comprise an industry standard/best practice basis for impact assessments of this typology.

Potential damage categories are directly related to the tensile strains induced by the proposed construction stages, arising from a combination of direct tension and bending induced tension mechanisms. The evaluated damage categories correspond to an unlikely to be exceeded scenario (on the basis of the data sets adopted and greenfield assumptions).

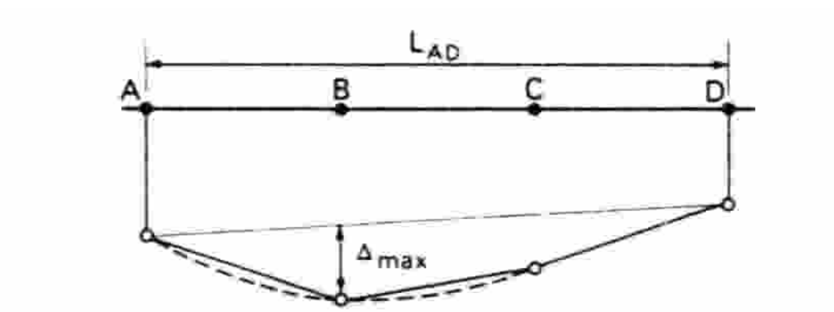



**Figure 4.7 Definition of relative deflection Δ and deflection ratio Δ/L**

| Category of damage | Description of typical damage (ease of repair is underlined) | Approximate crack width (mm) | Limiting tensile strain $\varepsilon_{lim}$ (per cent) |
|---|---|---|---|
| 0 Negligible | Hairline cracks of less than about 0.1 mm are classed as negligible. | < 0.1 | 0.0–0.05 |
| 1 Very slight | Fine cracks that can easily be treated during normal decoration. Perhaps isolated slight fracture in building. Cracks in external brickwork visible on inspection. | < 1 | 0.05–0.075 |
| 2 Slight | Cracks easily filled. Redecoration probably required. Several slight fractures showing inside of building. Cracks are visible externally and some repointing may be required externally to ensure weathertightness. Doors and windows may stick slightly. | < 5 | 0.075–0.15 |
| 3 Moderate | The cracks require some opening up and can be patched by a mason. Recurrent cracks can be masked by suitable linings. Repointing of external brickwork and possibly a small amount of brickwork to be replaced. Doors and windows sticking. Service pipes may fracture. Weathertightness often impaired. | 5–15 or a number of cracks > 3 | 0.15–0.3 |
| 4 Severe | Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Windows and frames distorted, floor sloping noticeably. Walls leaning or bulging noticeably, some loss of bearing in beams. Service pipes disrupted. | 15–25 but also depends on number of cracks | > 0.3 |
| 5 Very severe | This requires a major repair involving partial or complete rebuilding. Beams lose bearings, walls lean badly and require shoring. Windows broken with distortion. Danger of instability. | usually > 25 but depends on number of cracks. | |

After Burland et al. 1977, Boscardin and Cording 1989, and Burland 2001.

**Figure 4.8 Building damage classification – relationship between category of damage and limiting strain $\varepsilon_{lim}$**

### 4.2.2. Results

The results of the assessment indicate that four façades will experience damage *Category 1 – Very Slight* throughout the construction works. The affected façades are presented in Table 4.2. The remaining façades are not expected to exceed damage *Category 0 – Negligible* and are omitted from the table below. Figure 4.11 and Figure 4.12 depict the vertical and horizontal displacements, respectively, induced by the secant wall installation and excavation calculated using CIRIA C760 datasets (i.e. assessment B1).

**Table 4.2 Evaluated damage categories resulting from the assessment (façades which do not exceed Category 0 are not presented)**

| Façade Reference | A1 | A2 | B1 | B2 |
|---|---|---|---|---|
| GH.1.1 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.1.2 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.1.3 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.1.4 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.1.5 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.1.6 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.1.7 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.2.1 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.2.2 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.2.3 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.2.4 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.2.5 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.2.6 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.2.7 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.2.8 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |

| Façade Reference | A1 | A2 | B1 | B2 |
|---|---|---|---|---|
| GH.2.9 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.2.10 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.2.11 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.2.12 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.2.13 | Category 0 – Negligible | Category 0 – Negligible | Category 1 – Very Slight | Category 1 – Very Slight |
| GH.2.14 | Category 0 – Negligible | Category 1 – Very Slight | Category 0 – Negligible | Category 0 – Negligible |
| GH.2.15 | Category 1 – Very Slight | Category 0 – Negligible | Category 1 – Very Slight | Category 1 – Very Slight |
| GH.2.16 | Category 0 – Negligible | Category 0 – Negligible | Category 1 – Very Slight | Category 1 – Very Slight |
| GH.3.1 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.3.2 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.3.3 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.3.4 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.3.5 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.3.6 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.4.1 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.4.2 | Category 0 – | Category 0 – | Category 0 – | Category 0 – |

| Façade Reference | A1 | A2 | B1 | B2 |
|---|---|---|---|---|
| | Negligible | Negligible | Negligible | Negligible |
| GH.4.3 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.4.4 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.4.5 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.4.6 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.4.7 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| GH.4.8 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 47.GS.1 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 47.GS.2 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 47.GS.3 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
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| 45.GS.2 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 45.GS.3 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 43.GS.1 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 43.GS.2 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 43.GS.3 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |

| Façade Reference | A1 | A2 | B1 | B2 |
|---|---|---|---|---|
| 41.GS.1 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 41.GS.2 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 41.GS.3 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 41.GS.4 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
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| 39.GS.4 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
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| 35.GS.2 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 35.GS.3 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 29a.GS.1 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 29a.GS.2 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 29a.GS.3 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 29.GS.1 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 29.GS.2 | Category 0 – | Category 0 – | Category 0 – | Category 0 – |

| Façade Reference | A1 | A2 | B1 | B2 |
|---|---|---|---|---|
| | Negligible | Negligible | Negligible | Negligible |
| 29.GS.3 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 29.OS.1 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 29.OS.2 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 29.OS.3 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 29.OS.4 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 30.OS.1 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 30.OS.2 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 30.OS.3 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 30.OS.4 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 30.OS.5 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 30.OS.6 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 27.GS.1 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 27.GS.2 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 27.GS.3 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 27.GS.4 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |

| Façade Reference | A1 | A2 | B1 | B2 |
|---|---|---|---|---|
| 27.GS.5 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 25.GS.1 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 25.GS.2 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 25.GS.3 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 25.GS.4 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 25.GS.5 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 23.GS.1 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 23.GS.2 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 23.GS.3 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 23.GS.4 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 23.GS.5 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 21.GS.1 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 21.GS.2 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 21.GS.3 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 21.GS.4 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 19.GS.1 | Category 0 – | Category 0 – | Category 0 – | Category 0 – |

| Façade Reference | A1 | A2 | B1 | B2 |
|---|---|---|---|---|
| | Negligible | Negligible | Negligible | Negligible |
| 19.GS.2 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |
| 19.GS.3 | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible | Category 0 – Negligible |

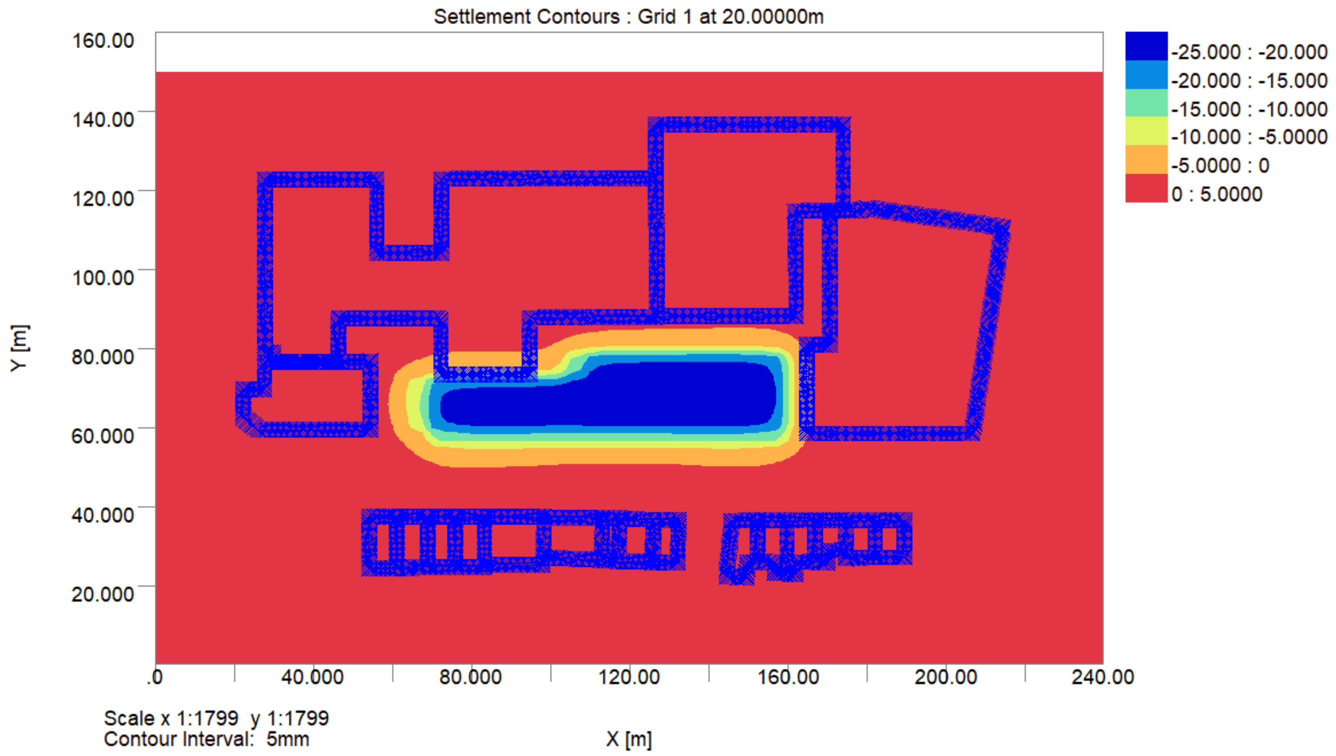



**Figure 4.9 Resultant vertical displacement contours for Scenario A1 - units in mm - short-term unload**

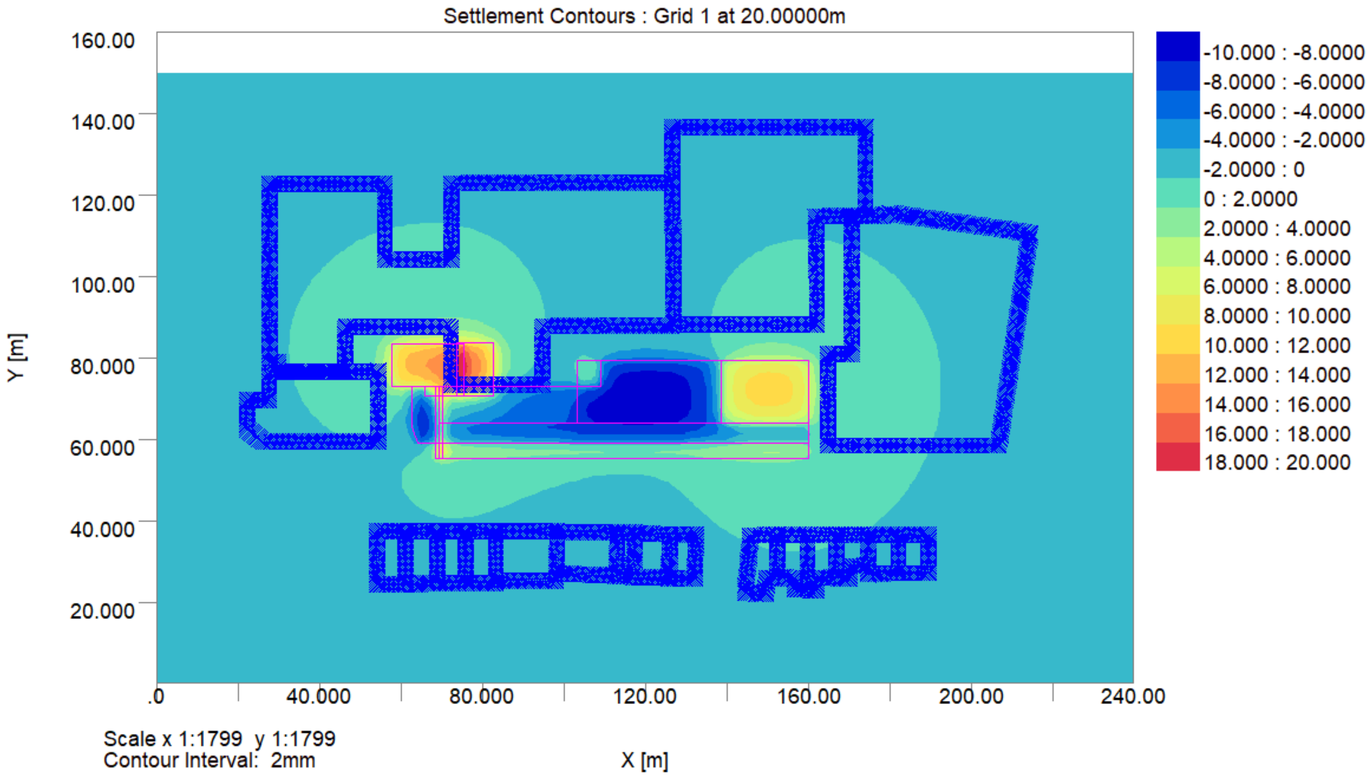



**Figure 4.10 Resultant Pdisp vertical displacement contours for scenario A2 – units in mm – long-term unload and reload**

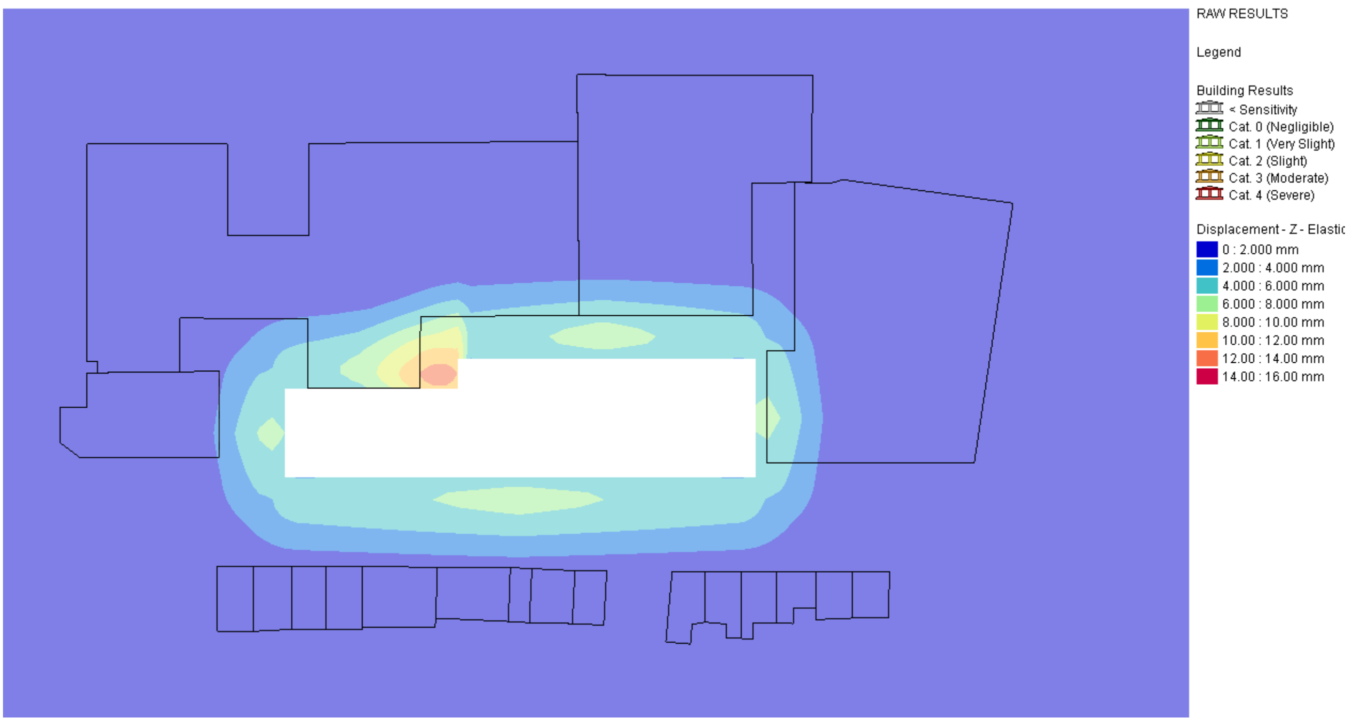



**Figure 4.11 Resultant Xdisp vertical displacement contours for scenario B1 – units in mm – retaining wall installation and excavation (CIRIA C760)**

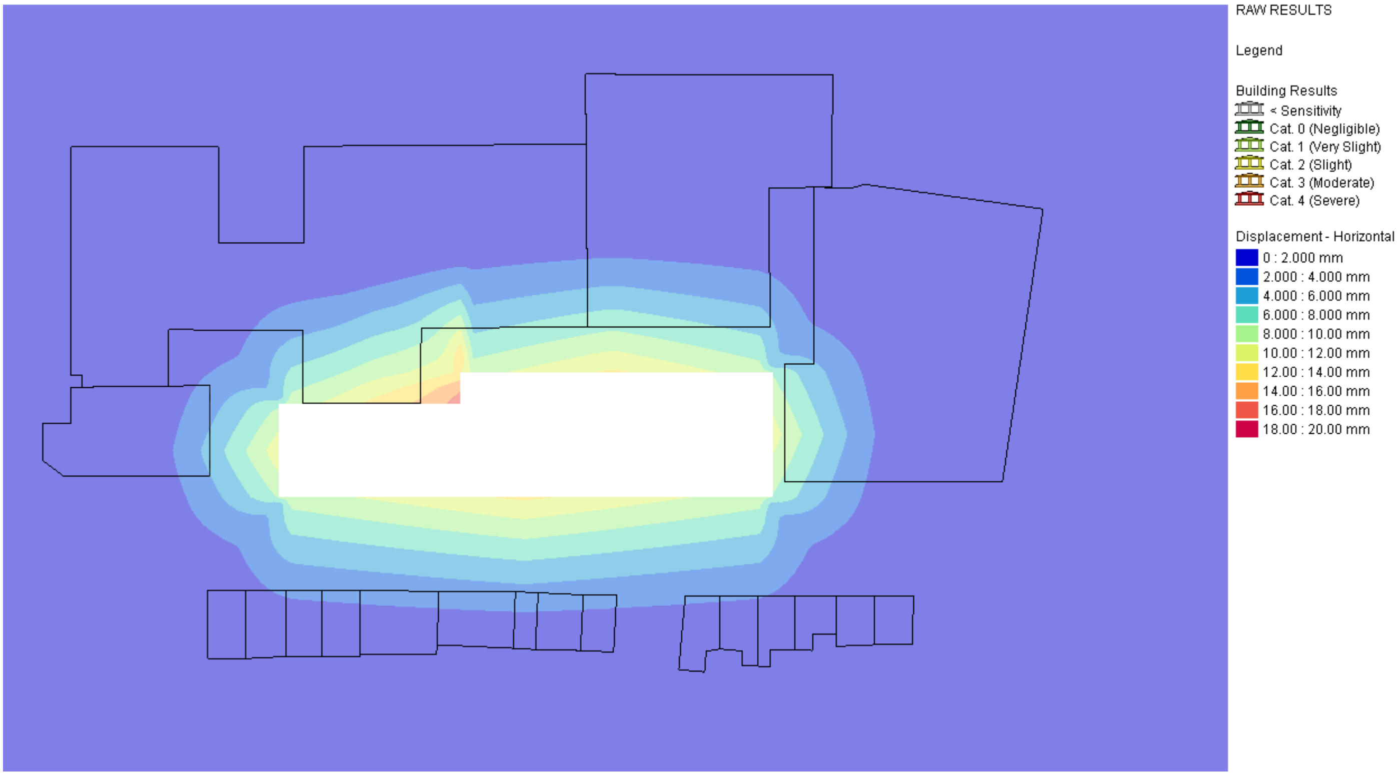



**Figure 4.12 Resultant Xdisp horizontal displacement contours for scenario B1 – units in mm – retaining wall installation and excavation (CIRIA C760)**

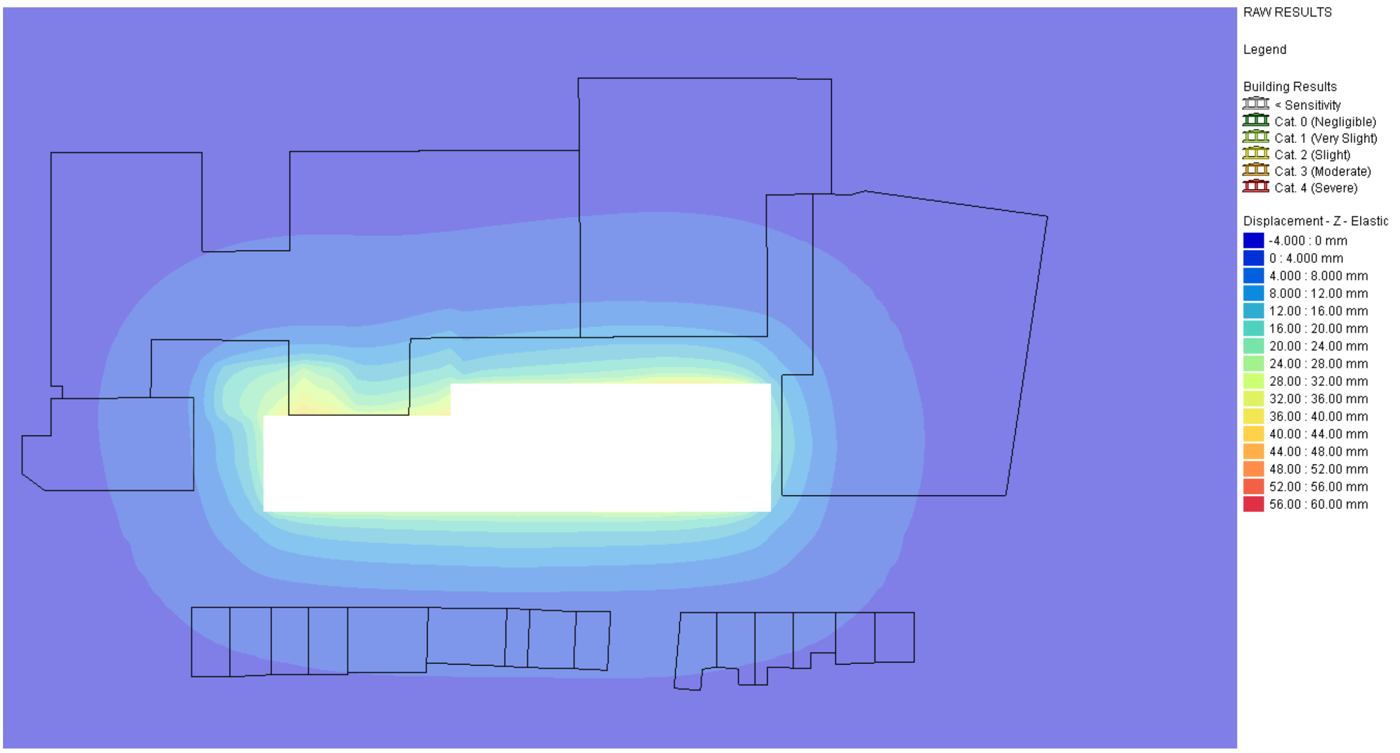



**Figure 4.13 Resultant Xdisp vertical displacement contours for scenario B2 – units in mm – retaining wall installation and excavation (CIRIA C760) + long term loading**

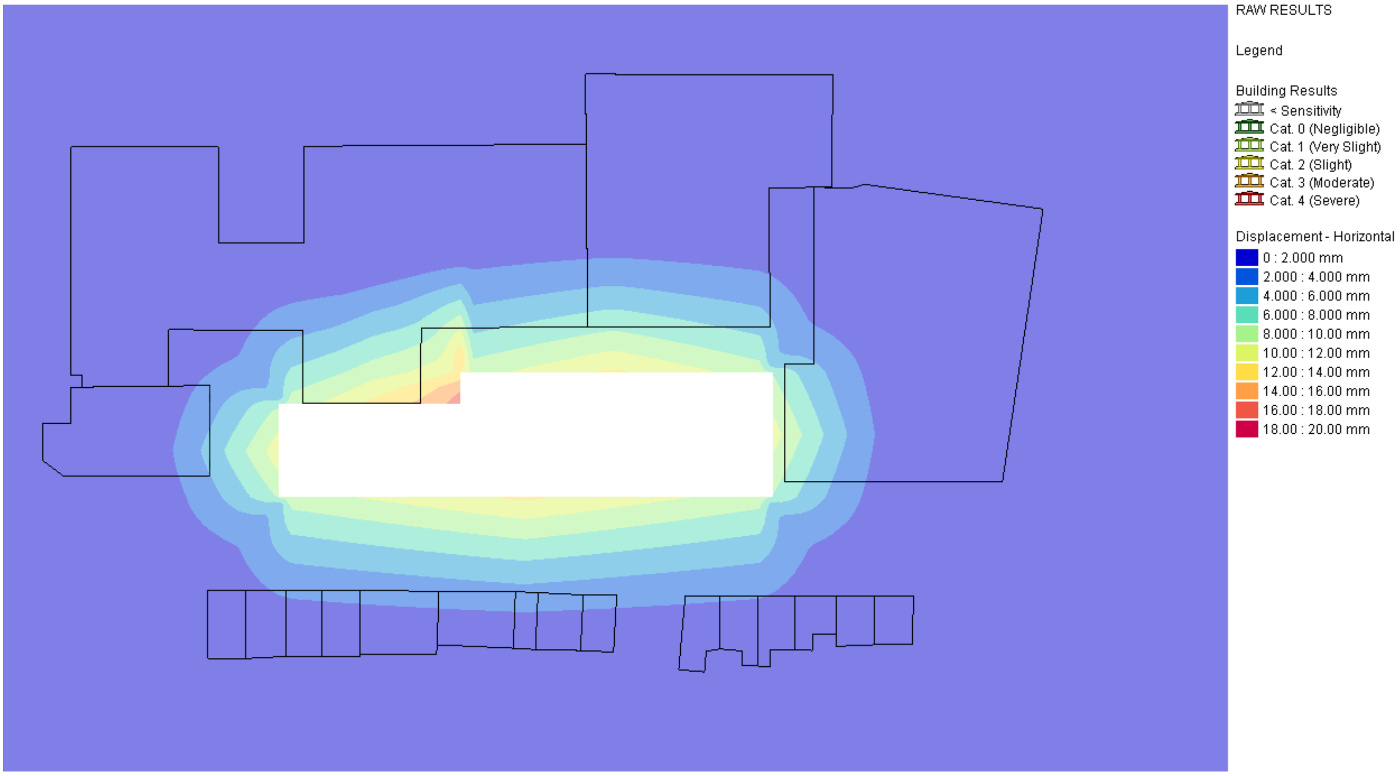



**Figure 4.14 Resultant Xdisp horizontal displacement contours for scenario B2 – units in mm – retaining wall installation and excavation (CIRIA C760) + long term loading**

## 4.3. Basement Excavation Criteria

The results of this analysis show that all buildings fall within acceptable damage classifications if the ground movements caused by the proposed development are limited to that predicted by this assessment.

It is recommended that ground movement / earth retention system design and construction movement criteria are developed based on the results presented herein. This will enable the design of the secant walls and any required temporary propping measures to be undertaken in a holistic fashion, ensuring ground movements are limited to no greater than that presented herein.

Specific wall/façade deflection limits and trigger levels may also be developed as part of the scheme monitoring regime. Such limits and trigger levels should be coordinated with the scheme monitoring specification and monitoring action plan / emergency preparedness plan.

# 5. Conclusions & Closing Remarks

The interaction between the proposed GOSHCCC development and the neighbouring properties within the zone of influence of the schemes has been reviewed as part of the GMA study presented herein. The proposed development comprises the demolition of demolition of the existing building and erection of a replacement 8 storey hospital building (Class C2 Use) together with 2 basement floors, roof top, balcony and ground floor landscaped amenity spaces, cycle storage, refuse storage and other ancillary and associated works pursuant to the development.

The impact of the various construction stages has been reviewed on the basis of two alternative methods, i.e. evaluating the effects of unloading / overburden removal using Pdisp and simulating the excavation-induced ground movement fields using empirical CIRIA curves in Xdisp. In the latter case, a propped embedded retaining wall solution (during the temporary works stage) has been considered, utilising the CIRIA C760 ground movement curves for excavation in front of *high stiffness walls in stiff clay*.

These two different scenarios have been considered in order to bind the potential ground movements arising from excavation operations (i.e. maximum potential heave and settlement respectively). This strategy ensures a robust evaluation of potential impact in light of the bespoke, intricate and workmanship-dependent construction methodology. Both short-term (undrained) and long-term (drained) conditions have been assessed by adopting the relevant soil stiffness parameters for each case.

In order to best limit ground movements in proximity to movement sensitive neighbouring buildings, due consideration may be given to suitable means and methods of construction. For example, reducing the extent of temporary excavations during earth removal operations in close proximity to buildings considered to be at most risk of damage.

The results from the GMA (denoting the evaluated damage categorisation in accordance with the Burland criteria described herein) considering neighbouring properties are presented in Table 4.2. It is observed that the maximum damage classification for the neighbouring properties is *Category 1 – Very Slight*.

It is noted that the predicted ground movements, the associated wall tensile strains, and the level of damage categorisation are considered to be moderately conservative in view of the relatively cautious data selection and *greenfield* nature of the assessment undertaken.

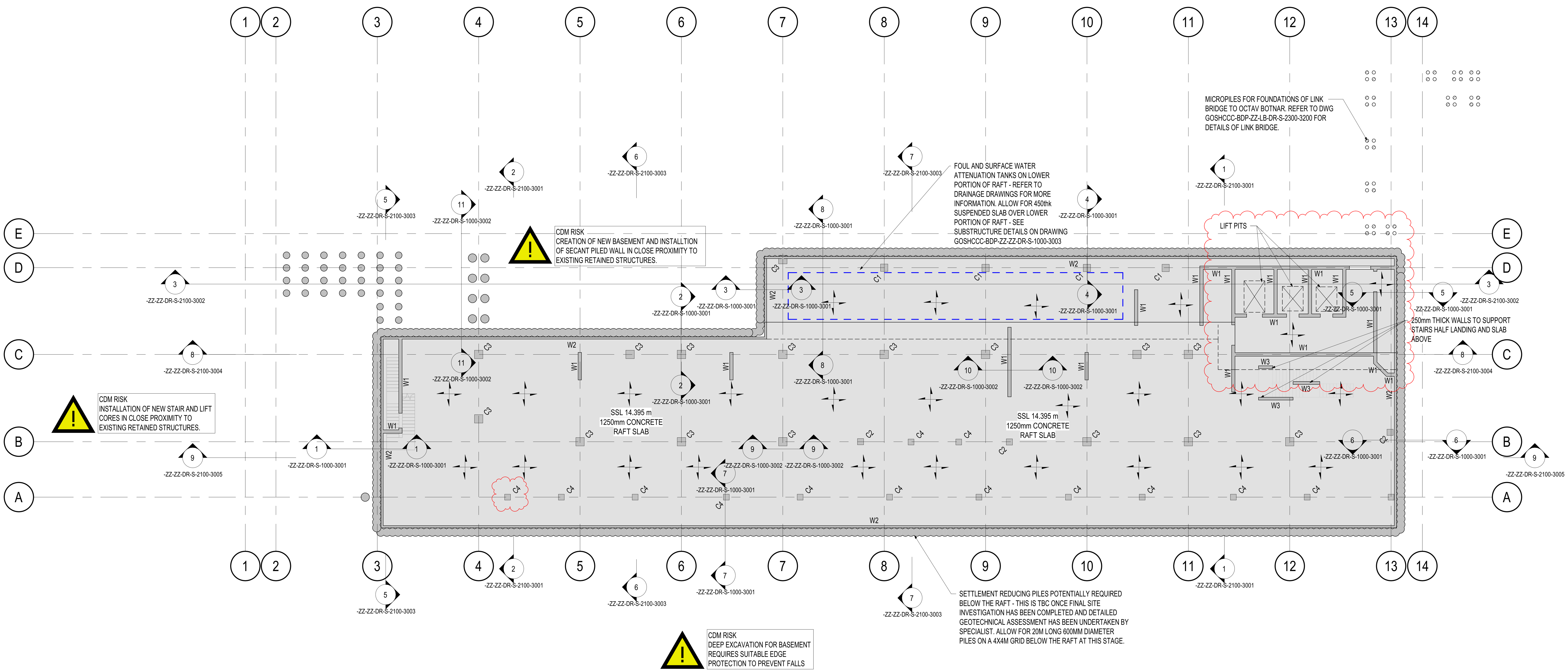
It is also noted that the GMA will be supplemented by a project-specific monitoring regime and Action Plan, which will delineate lines of responsibility, trigger levels in accordance with those presented in this GMA, and appropriate mitigation measures. The assessment presented herein is dependent and reliant on the works being undertaken by an experienced contractor, high quality workmanship and appropriate supervision of construction means and methods by experienced personnel.

It is recommended that this report is reviewed and understood in full by the project team and relevant stakeholders. Where significant changes are made to items such as construction sequencing, temporary propping arrangements and scheme design, the engineer should thoroughly review the change and evaluate any potential impacts on ground movement and building damage. If necessary, the building damage categories should be re-evaluated.

During the design of the secant walls and temporary propping measures, deflection performance criteria for these design elements should be derived on the basis of the results presented herein to ensure that the maximum damage classification of *Category 1 – Very Slight* is not breached.

It is critical that the permanent and temporary works designs are carried out in a coordinated manner between performance specified elements and substructure contractors, with the aim to ensure that such design elements are in alignment with the assumptions / findings of the GMA and overall design intent.

# Appendix A:  Selected Project Information




BUILDING DESIGN PARTNERSHIP SHALL HAVE NO RESPONSIBILITY FOR ANY USE MADE OF THIS DOCUMENT OTHER THAN FOR THAT WHICH IT WAS PREPARED AND ISSUED.

ALL DIMENSIONS SHOULD BE CHECKED ON SITE.

DO NOT SCALE FROM THIS DRAWING

ANY DRAWING ERRORS OR DIVERGENCIES SHOULD BE BROUGHT TO THE ATTENTION OF BUILDING DESIGN PARTNERSHIP AT THE ADDRESS SHOWN BELOW.

DRAWINGS SHALL BE READ IN CONJUNCTION WITH THE FOLLOWING BEFORE WORK COMMENCES:
- THE CDM DESIGN ISSUES REGISTER
- THE BDP RISK SERIES OF DRAWINGS
- THE PROJECT CDM RISK REGISTER

## NOTES

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3. LOCATION AND SIZE OF RISERS AND OTHER SERVICE OPENINGS TO BE CONFIRMED DURING THE DESIGN STAGE
4. OPENINGS IN CORE WALLS NOT SHOWN, TO BE COORDINATED DURING THE DESIGN STAGE
5. INTUMESCENT PAINT REQUIRED FOR ALL STEEL BEAMS AND COLUMNS TO ACHIEVE A 90 MIN FIRE RATING TYPICALLY.
6. EXTERNAL STEEL ELEMENTS SUCH AS PLANT SCREEN STEELWORK AND OTHER ITEMS AT ROOF LEVEL TO BE GALVANSIED OR STAINLESS STEEL.
7. ASSUMED THAT ALL STAIRS PRECAST CONCRETE TO SUBCONTRACTOR DESIGN
8. FOR MATERIAL GRADES PLEASE REFER TO STRUCTURAL OUTLINE SPECIFICATION GOSHCCC-BDP-ZZ-ZZ-SP-2000-3001
9. SECONDARY STEELWORK IS CURRENTLY BEING DEVELOPED AND IS NOT NECESSARILY COVERED DRAWINGS. PLANT SCREEN STEELWORK CAN BE FOUND ON THE DRAWINGS AND SECONDARY STEELWORK FOR THE CHIMNEYS CAN BE FOUND IN THE SKETCHBOOKS. OTHER ITEMS SUCH AS SECONDARY STEELWORK FOR THE FACADE AND PLANT SUPPORTS WILL BE DEVELOPED AS FURTHER INFORMATION BECOMES AVAILABLE DURING THE DESIGN STAGE.
10. SITE INVESTIGATIONS REQUIRED TO CONFIRM FOUNDATIONS AND STRUCTURE OF EXISTING ADJACENT BUILDINGS. SUITABLE ASSUMPTIONS HAVE BEEN MADE WHERE INFORMATION IS NOT AVAILABLE.
11. STEPS IN SLAB LEVELS TO SUIT EXTERNAL GARDEN AREAS TO BE CONFIRMED BY LANDSCAPE AND ARCHITECT
12 ALL TEMPORARY WORKS TO NEW STRUCTURE AND EXISTING STRUCTURES WHERE REQUIRED TO CONTRACTOR DESIGN
13. ALL STEEL TO STEEL AND STEEL TO CONCRETE CONNECTIONS TO SUBCONTRACTOR DESIGN
14. EXACT SIZE AND DEPTH OF RECESS FOR ATTENUATION TANKS TBC PENDING FURTHER INFORMATION ON SIZE AND LOCATION OF EXISTING DRAINAGE.
15. ALLOWANCE TO BE MADE FOR FILLING VAULTS ALONG GREAT ORMOND STREET WITH FOAMED CONCRETE TO FACILITATE CONSTRUCTION OF THE SECANT WALL
16. PILE NUMBERS ARE SHOWN INDICATIVELY AND ARE TBC ONCE FINAL SITE INVESTIGATION INFORMATION HAS BEEN RECIEVED
17. SIZES IN SKETCHBOOKS TAKE PRIORITY OVER PROFILE SIZES IN GAs & DETAILS

### RC COLUMN SCHEDULE

| MARK | TYPE |
|---|---|
| C1 | 650x650mm SQ |
| C2 | 550x550mm SQ |
| C3 | 750x750mm SQ |
| C4 | 525x525mm SQ |
| C5 | 700x700mm SQ |
| C6 | 300x750mm |
| C7 | 300x525mm |
| C8 | 350x800mm |
| C9 | 525Dia |
| C10 | 475Dia |
| C11 | 750Dia |
| C12 | 775Dia |
| C13 | 350x350mm SQ |

### RC BEAM SCHEDULE

| MARK | TYPE |
|---|---|
| CB1 | 1200wd x 1000dp CAPPING BEAM |
| CB2 | 500x750 DEEP RC DOWNSTAND |
| CB3 | 650x800 DEEP RC DOWNSTAND |
| CB4 | 300x600 DEEP RC DOWNSTAND |

### RC WALL SCHEDULE

| MARK | TYPE |
|---|---|
| W1 | 300mm THK RC CORE WALL |
| W2 | 200mm THK RC LINER WALL |
| W3 | 250mm THK RC WALL |

### STEEL COLUMN SCHEDULE

| MARK | TYPE |
|---|---|
| SC1 | UKC152x152x23 |
| SC2 | UKC254x254x73 |
| SC3 | UKC305x305x158 |
| SC4 | UKC203x203x60 |
| SC5 | SHS 150x150x10 |
| SC6 | CHS 88.9x5 |
| SC7 | SHS 200x200x10 |

### STEEL BEAM SCHEDULE

| MARK | TYPE |
|---|---|
| B1 | UKC254x254x89 |
| B2 | UKC305x305x198 |
| B3 | UKC254x254x107 |
| B4 | UKB356x171x57 |
| B5 | UKB203x133x30 |
| B6 | UKB178x102x19 |
| B7 | UKB457x152x74 |
| B8 | UKC305x305x137 |
| B9 | UKC305x305x158 |
| B10 | UKC152x152x23 (DIAGONAL) |
| B11 | UKC356x406x235 (DIAGONAL) |
| B12 | 305SFB198x15 |
| B13 | 356SFB177x15 |
| B14 | SHS 150x150x10 |
| B15 | RHS 200x100x10 |
| B16 | CHS88.9x5 CROSS BRACING |
| B17 | UKPFC150x90x24 |
| B18 | UKC356x406x287 |
| B19 | UKC254x254x167 |

### KEY

DENOTES SPAN OF TWO WAY SPANNING 1250mm THICK RC RAFT SLAB

DENOTES SPAN OF TWO WAY SPANNING 300mm THICK RC SLAB

DENOTES SPAN OF 300mm THICK HOLLOWCORE SLAB WITH 200mm RC TOPPING

DENOTES SPAN OF 350mm THICK HOLLOWCORE SLAB WITH 100mm RC TOPPING

DENOTES SPAN OF 150mm THICK COMPOSITE SLAB WITH 1.25mm GAUGE COMFLOR 80 DECK

DENOTES 300mm THICK INSITU CONCRETE WALL UNO.

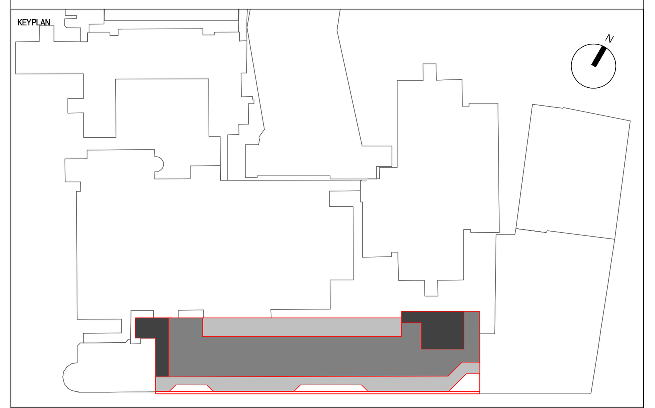
REFER TO DRAWINGS GOSHCCC-BDP-ZZ-ZZ-DR-S-2100-3001/3002/3007/3008/3009 FOR BUILDING SECTIONS

REFER TO DRAWING GOSHCCC-BDP-ZZ-ZZ-DR-S-1000-3003/3004 FOR SUBSTRUCTURE TYPICAL DETAILS.

REFER TO DRAWING GOSHCCC-BDP-ZZ-ZZ-DR-S-2100-3005/3006 FOR SUPERSTRUCTURE TYPICAL DETAILS.

| REVISION | DESCRIPTION | ISSUED BY | ISSUED TO | DATE |
|---|---|---|---|---|
| P02 | STAGE 3 REVISION | OB | TC | 11.08.21 |
| P01 | STAGE 3 ISSUE | OB | TC | 27.07.21 |

KEYPLAN



CLIENT

Great Ormond Street Hospital for Children NHS Foundation Trust

CONTRACTOR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2410 Regents Court
The Crescent
Birmingham Business Park
Birmingham

B37 7YE


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www.bdp.com


PROJECT TITLE: GREAT ORMOND STREET HOSPITAL

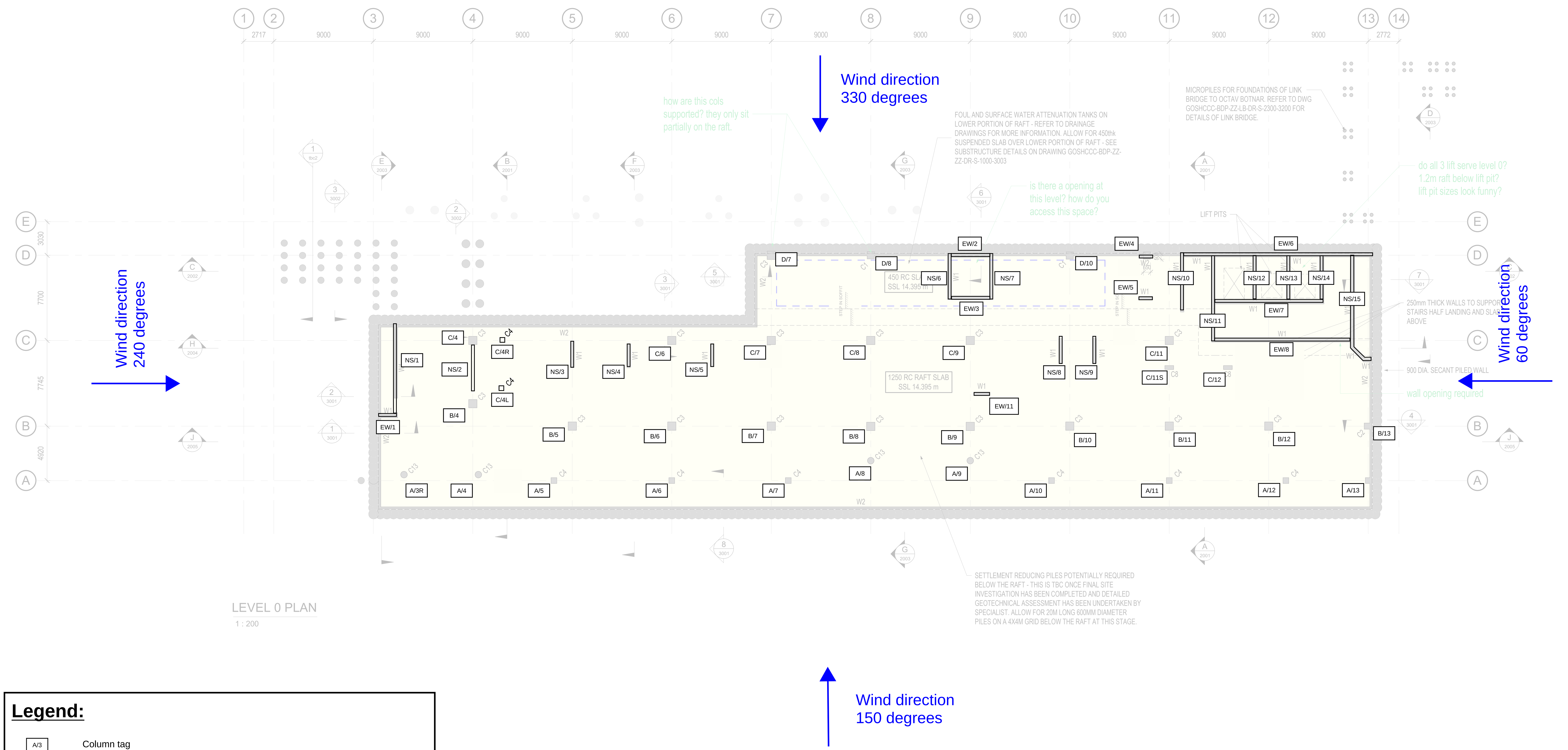
PROJECT NUMBER: 2007598

DRAWING TITLE: LEVEL 00 PLAN

DRAWING NO.: GOSHCCC-BDP-ZZ-00-DR-S-2300-1300

| STATUS/SUITABILITY | SCALE | DRAWING SIZE | REVISION DATE |
|---|---|---|---|
| S3 - For Review & Comment | As indicated | @ A1 | 11.08.21 |

| DRAW BY | CHECKED BY | APPROVED BY | PURPOSE OF ISSUE | REVISION |
|---|---|---|---|---|
| OB | TC | TC | Preliminary | P02 |

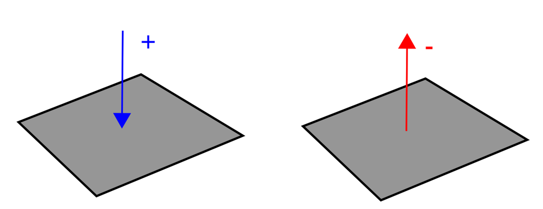



# Legend:

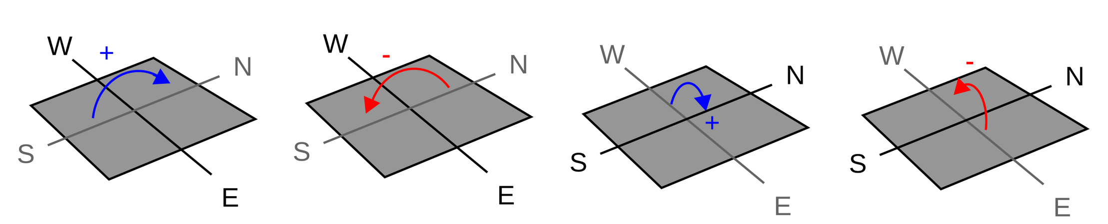
| | |
|---|---|
| A/3 | Column tag |
| NS/1 | Wall tag - Wall resisting wind action from 330 and 150 degrees. |
| EW/1 | Wall tag - Wall resisting wind action from 60 and 240 degrees. |

## Sign convention:

Axial force:



Moment:



## CDM RISK SCHEDULE

| DESCRIPTION |
|---|
| INSTALLATION OF NEW STAIR AND LIFT CORES IN CLOSE PROXIMITY TO EXISTING RETAINED STRUCTURES. |
| CREATION OF NEW BASEMENT AND INSTALLTION OF SECANT PILED WALL IN CLOSE PROXIMITY TO EXISTING RETAINED STRUCTURES. |
| DEEP EXCAVATION FOR BASEMENT REQUIRES SUITABLE EDGE PROTECTION TO PREVENT FALLS |
| CONSTRUCTION OF NEW FOUNDATIONS IN CLOSE PROXIMITY TO SUBSTRUCTURE OF EXISTING ADJACENT BUILDINGS |
| EXISTING SERVICES TRENCH IN YARD. NEW FOUNDATIONS TO AVOID TRENCH OR SERVICES TO BE DIVERTED PRIOR TO CONSTRUCTION. |
| LIFTING OF HEAVY ITEMS INCLUDING TRUSS IN CLOSE PROXIMITY TO EXISTING ADJACENT BUILDINGS. |
| INSTALLATION OF NEW STRUCTURE ON EXISTING VCB ROOF. |

## RC COLUMN SCHEDULE

| MARK | TYPE |
|---|---|
| C1 | 650 x 650 |
| C2 | 550 x 550 |
| C3 | 750 x 750 |
| C4 | 525 x 525 |
| C5 | 700 x 700 |
| C6 | 300 x 750 |
| C7 | 300 x 525 |
| C8 | 350 x 800 |
| C9 | 350 x 350 |
| C11 | 775 DIA. |
| C12 | 750 DIA. |
| C13 | 600 DIA |
| C14 | 525 DIA. |

## RC BEAM SCHEDULE

| MARK | TYPE |
|---|---|
| CB1 | 1250x1000 DEEP CAPPING BEAM |
| CB2 | 500x750 DEEP RC DOWNSTAND |
| CB3 | 650x800 DEEP RC DOWNSTAND |
| CB4 | 500x800 DEEP RC DOWNSTAND |

## RC WALL SCHEDULE

| MARK | TYPE |
|---|---|
| W1 | 300 RC WALL |
| W2 | 200 RC LINER WALL |
| W3 | 250 RC WALL |

## STEEL COLUMN SCHEDULE

| MARK | TYPE |
|---|---|
| C1 | 650 x 650 |
| C2 | 550 x 550 |
| C3 | 750 x 750 |
| C4 | 525 x 525 |
| C5 | 700 x 700 |
| C6 | 300 x 750 |
| C7 | 300 x 525 |
| C8 | 350 x 800 |
| C9 | 350 x 350 |
| C11 | 775 DIA. |
| C12 | 750 DIA. |
| C13 | 600 DIA |
| C14 | 525 DIA. |

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|---|---|
| B1 | UKC254x254x89 |
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| B3 | UKC254x254x107 |
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| B6 | UKB178x102x19 |
| B7 | UKB457x152x74 |
| B8 | UKC305x305x137 |
| B9 | UKC305x305x158 |
| B10 | UKC152x152x23 (DIAGONAL) |
| B11 | UKC356x406x235 (DIAGONAL) |
| B12 | 305SFB198x15 |
| B13 | 356SFB177x15 |
| B14 | SHS 150x150x10 |
| B15 | RHS 200x100x10 |
| B16 | CHS88.9x5 CROSS BRACING |
| B17 | UKPFC150x90x24 |
| B18 | UKC356x406x551 |
| B19 | UKC254x254x167 |
| B20 | UKC305x305x240 |

## LEGEND

- CDM RISK, REFER TO SCHEDULE
- IN SITU CONCRETE IN SECTION
- IN SITU CONCRETE SURFACE
- STEEL SURFACE
- STEEL BEAM - STICK DIAGRAM
- MOMENT CONNECTION
- THERMAL BREAK CC ISOTEC OR SIMILAR.
- DENOTES SPAN OF WITH 1.25mm GAUGE
- DENOTES SPAN OF WITH 1.25mm GAUGE
- DENOTES SPAN OF WITH 1.25mm GAUGE



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17. SIZES IN SKETCHBOOKS TAKE PRIORITY OVER PROFILE SIZES IN GAs & DETAILS

NHS Great Ormond Street Hospital for Children NHS Foundation Trust

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PROJECT NAME
GOSH CCC

PROJECT No.
P 2007598

DATE
05/01/22

SHEET No.
SK_S_xxx - LEVEL 0

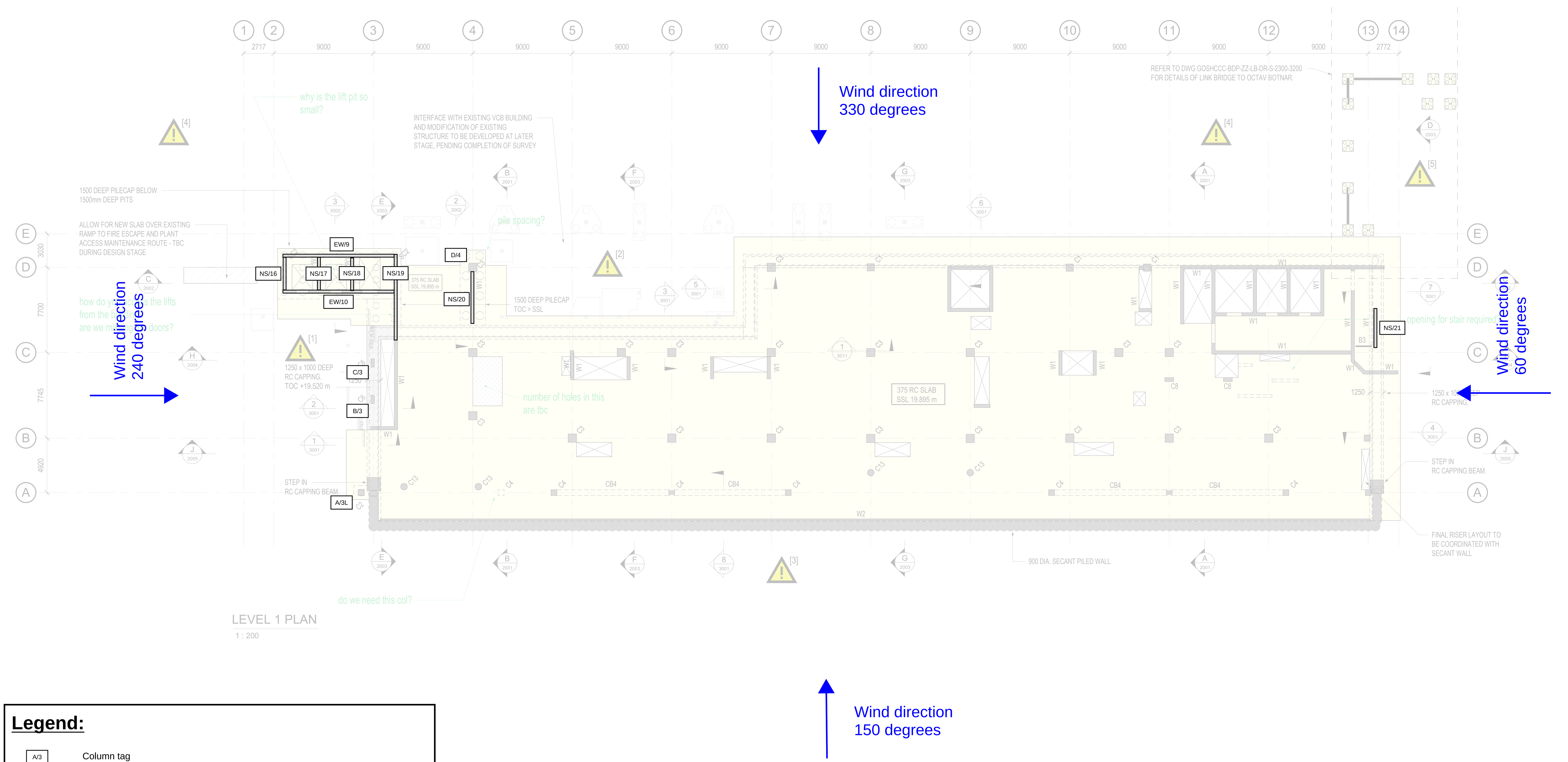
BUILDING DESIGN PARTNERSHIP SHALL HAVE NO RESPONSIBILITY FOR ANY USE MADE OF THIS DOCUMENT OTHER THAN FOR THAT WHICH IT WAS PREPARED AND ISSUED.

ALL DIMENSIONS SHOULD BE CHECKED ON SITE.

DO NOT SCALE FROM THIS DRAWING

ANY DRAWING ERRORS OR DIVERGENCIES SHOULD BE BROUGHT TO THE ATTENTION OF BUILDING DESIGN PARTNERSHIP AT THE ADDRESS SHOWN BELOW.

DRAWINGS SHALL BE READ IN CONJUNCTION WITH THE FOLLOWING BEFORE WORK COMMENCES:
- THE CDM DESIGN ISSUES REGISTER
- THE BDP RISK SERIES OF DRAWINGS
- THE PROJECT CDM RISK REGISTER




## NOTES

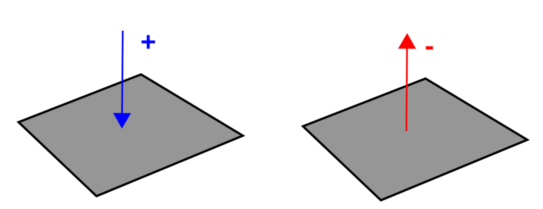
1. DESIGN AND COORDINATION IS ONGOING. THIS IS A WORK IN PROGRESS DRAWING AND MEMBER SIZES OR LOCATIONS MAY CHANGE AS THE DESIGN DEVELOPS DURING STAGE 3.
2. ALL INFORMATION IS INDICATIVE - SPECIALIST INPUT REQUIRED FROM CONTRACTORS TO FULLY DEVELOP DETAILS IN FUTURE STAGES.
3. LOCATION AND SIZE OF RISERS AND OTHER SERVICE OPENINGS TO BE CONFIRMED DURING THE DESIGN STAGE
4. OPENINGS IN CORE WALLS NOT SHOWN, TO BE COORDINATED DURING THE DESIGN STAGE
5. INTUMESCENT PAINT REQUIRED FOR ALL STEEL BEAMS AND COLUMNS TO ACHIEVE A 90 MIN FIRE RATING TYPICALLY.
6. EXTERNAL STEEL ELEMENTS SUCH AS PLANT SCREEN STEELWORK AND OTHER ITEMS AT ROOF LEVEL TO BE GALVANSIED OR STAINLESS STEEL.
7. ASSUMED THAT ALL STAIRS PRECAST CONCRETE TO SUBCONTRACTOR DESIGN
8. FOR MATERIAL GRADES PLEASE REFER TO STRUCTURAL OUTLINE SPECIFICATION GOSHCCC-BDP-ZZ-ZZ-SP-2000-3001
9. SECONDARY STEELWORK IS CURRENTLY BEING DEVELOPED AND IS NOT NECESSARILY COVERED DRAWINGS. PLANT SCREEN STEELWORK CAN BE FOUND ON THE DRAWINGS AND SECONDARY STEELWORK FOR THE CHIMNEYS CAN BE FOUND IN THE SKETCHBOOKS. OTHER ITEMS SUCH AS SECONDARY STEELWORK FOR THE FACADE AND PLANT SUPPORTS WILL BE DEVELOPED AS FURTHER INFORMATION BECOMES AVAILABLE DURING THE DESIGN STAGE.
10. SITE INVESTIGATIONS REQUIRED TO CONFIRM FOUNDATIONS AND STRUCTURE OF EXISTING ADJACENT BUILDINGS. SUITABLE ASSUMPTIONS HAVE BEEN MADE WHERE INFORMATION IS NOT AVAILABLE.
11. STEPS IN SLAB LEVELS TO SUIT EXTERNAL GARDEN AREAS TO BE CONFIRMED BY LANDSCAPE AND ARCHITECT
12 ALL TEMPORARY WORKS TO NEW STRUCTURE AND EXISTING STRUCTURES WHERE REQUIRED TO CONTRACTOR DESIGN
13. ALL STEEL TO STEEL AND STEEL TO CONCRETE CONNECTIONS TO SUBCONTRACTOR DESIGN
14. EXACT SIZE AND DEPTH OF RECESS FOR ATTENUATION TANKS TBC PENDING FURTHER INFORMATION ON SIZE AND LOCATION OF EXISTING DRAINAGE.
15. ALLOWANCE TO BE MADE FOR FILLING VAULTS ALONG GREAT ORMOND STREET WITH FOAMED CONCRETE TO FACILITATE CONSTRUCTION OF THE SECANT WALL
16. PILE NUMBERS ARE SHOWN INDICATIVELY AND ARE TBC ONCE FINAL SITE INVESTIGATION INFORMATION HAS BEEN RECIEVED
17. SIZES IN SKETCHBOOKS TAKE PRIORITY OVER PROFILE SIZES IN GAs & DETAILS

## Legend:

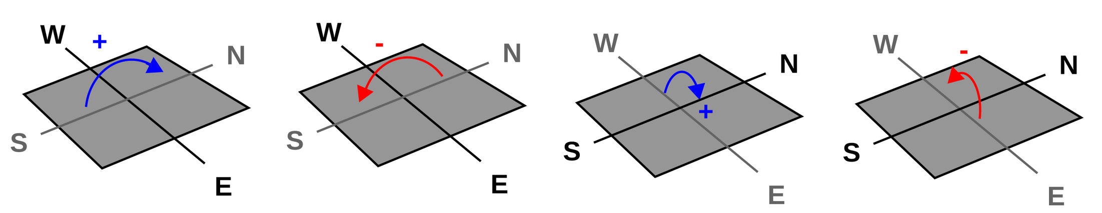
| | |
|---|---|
| A/3 | Column tag |
| NS/1 | Wall tag - Wall resisting wind action from 330 and 150 degrees. |
| EW/1 | Wall tag - Wall resisting wind action from 60 and 240 degrees. |

## Sign convention:

Axial force:



Moment:




### CDM RISK SCHEDULE

| DESCRIPTION |
|---|
| INSTALLATION OF NEW STAIR AND LIFT CORES IN CLOSE PROXIMITY TO EXISTING RETAINED STRUCTURES. |
| CREATION OF NEW BASEMENT AND INSTALLTION OF SECANT PILED WALL IN CLOSE PROXIMITY TO EXISTING RETAINED STRUCTURES. |
| DEEP EXCAVATION FOR BASEMENT REQUIRES SUITABLE EDGE PROTECTION TO PREVENT FALLS |
| CONSTRUCTION OF NEW FOUNDATIONS IN CLOSE PROXIMITY TO SUBSTRUCTURE OF EXISTING ADJACENT BUILDINGS |
| EXISTING SERVICES TRENCH IN YARD. NEW FOUNDATIONS TO AVOID TRENCH OR SERVICES TO BE DIVERTED PRIOR TO CONSTRUCTION. |
| LIFTING OF HEAVY ITEMS INCLUDING TRUSS IN CLOSE PROXIMITY TO EXISTING ADJACENT BUILDINGS. |
| INSTALLATION OF NEW STRUCTURE ON EXISTING VCB ROOF. |

### RC COLUMN SCHEDULE

| MARK | TYPE |
|---|---|
| C1 | 650 x 650 |
| C2 | 550 x 550 |
| C3 | 750 x 750 |
| C4 | 525 x 525 |
| C5 | 700 x 700 |
| C6 | 300 x 750 |
| C7 | 300 x 525 |
| C8 | 350 x 800 |
| C9 | 350 x 350 |
| C11 | 775 DIA. |
| C12 | 750 DIA. |
| C13 | 600 DIA |
| C14 | 525 DIA. |

### RC BEAM SCHEDULE

| MARK | TYPE |
|---|---|
| CB1 | 1250x1000 DEEP CAPPING BEAM |
| CB2 | 500x750 DEEP RC DOWNSTAND |
| CB3 | 650x800 DEEP RC DOWNSTAND |
| CB4 | 500x800 DEEP RC DOWNSTAND |

### RC WALL SCHEDULE

| MARK | TYPE |
|---|---|
| W1 | 300 RC WALL |
| W2 | 200 RC LINER WALL |
| W3 | 250 RC WALL |

### STEEL COLUMN SCHEDULE

| MARK | TYPE |
|---|---|
| C1 | 650 x 650 |
| C2 | 550 x 550 |
| C3 | 750 x 750 |
| C4 | 525 x 525 |
| C5 | 700 x 700 |
| C6 | 300 x 750 |
| C7 | 300 x 525 |
| C8 | 350 x 800 |
| C9 | 350 x 350 |
| C11 | 775 DIA. |
| C12 | 750 DIA. |
| C13 | 600 DIA |
| C14 | 525 DIA. |

### STEEL BEAM SCHEDULE

| MARK | TYPE |
|---|---|
| B1 | UKC254x254x89 |
| B2 | UKC305x305x198 |
| B3 | UKC254x254x107 |
| B4 | UKB356x171x57 |
| B5 | UKB203x133x30 |
| B6 | UKB178x102x19 |
| B7 | UKB457x152x74 |
| B8 | UKC305x305x137 |
| B9 | UKC305x305x158 |
| B10 | UKC152x152x23 (DIAGONAL) |
| B11 | UKC356x406x235 (DIAGONAL) |
| B12 | 305SFB198x15 |
| B13 | 356SFB177x15 |
| B14 | SHS 150x150x10 |
| B15 | RHS 200x100x10 |
| B16 | CHS88.9x5 CROSS BRACING |
| B17 | UKPFC150x90x24 |
| B18 | UKC356x406x551 |
| B19 | UKC254x254x167 |
| B20 | UKC305x305x240 |

### LEGEND

- CDM RISK, REFER TO SCHEDULE
- IN SITU CONCRETE IN SECTION
- IN SITU CONCRETE SURFACE
- STEEL SURFACE
- STEEL BEAM - STICK DIAGRAM
- MOMENT CONNECTION
- THERMAL BREAK CONN ISOTEC OR SIMILAR.
- DENOTES SPAN OF 200 WITH 1.25mm GAUGE C
- DENOTES SPAN OF 160 WITH 1.25mm GAUGE C
- DENOTES SPAN OF 150 WITH 1.25mm GAUGE C

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SK_S_xxx - LEVEL 1

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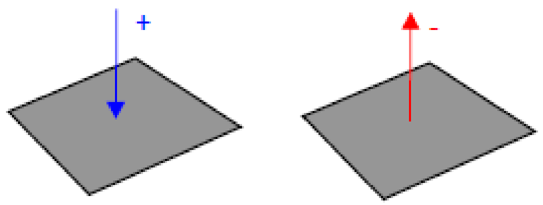
| | | | |
|---|---|---|---|
| Client : | SISK | Project No: 2007598 | Sheet 1 of 4 |
| Project : | GOSH CCC | Calc By: RC | Date: 07/01/2022 |
| Element : | Actions on raft / secant wall | Chkd By: - | Date: |

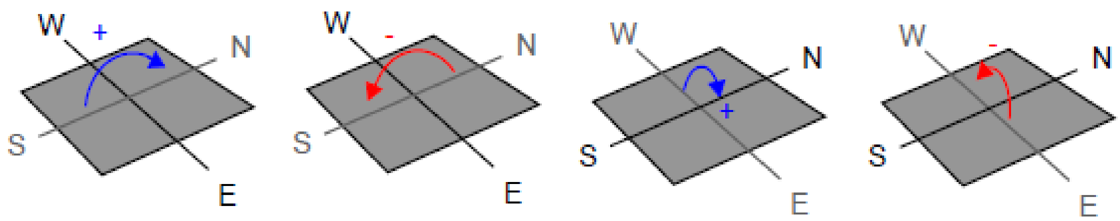
**Notes**

1. All actions (forces/moments) are unfactored.
2. Actions for the walls are total loads over the whole length.
3. Sign convention as presented below.

Axial force:




Moment:



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| | | | |
|---|---|---|---|
| Client : SISK | Project No: 2007598 | Sheet 2 of 4 | |
| Project : GOSH CCC | Calc By: RC | Date: 07/01/2022 | |
| Element : Actions on raft / secant wall | Chkd By: - | Date: | |

| Column / Wall Ref. | | Permanent load | Imposed load |
|---|---|---|---|
| | | kN | kN |
| A | 3L | 1620 | 300 |
| A | 3R | 1570 | 405 |
| A | 4 | 2645 | 715 |
| A | 5 | 3405 | 805 |
| A | 6 | 4290 | 960 |
| A | 7 | 3120 | 705 |
| A | 8 | 2575 | 675 |
| A | 9 | 2530 | 650 |
| A | 10 | 3240 | 725 |
| A | 11 | 4495 | 1000 |
| A | 12 | 3435 | 855 |
| A | 13 | 1180 | 320 |
| B | 3 | 1650 | 190 |
| B | 4 | 5105 | 1545 |
| B | 4R | 490 | 225 |
| B | 5 | 6235 | 2105 |
| B | 6 | 5990 | 2055 |
| B | 7 | 6800 | 2395 |
| B | 8 | 7400 | 2205 |
| B | 9 | 6620 | 1880 |
| B | 10 | 6020 | 2020 |
| B | 11 | 5825 | 1990 |
| B | 12 | 6055 | 2120 |
| B | 13 | 2245 | 760 |
| C | 3 | 1650 | 190 |
| C | 4 | 1675 | 560 |
| C | 4R | 190 | 85 |
| C | 6 | 3165 | 1100 |
| C | 7 | 5840 | 2470 |
| C | 8 | 8120 | 3455 |
| C | 9 | 5445 | 2120 |
| C | 11 | 2105 | 735 |
| C | 11S | 2920 | 1155 |
| C | 12 | 2500 | 920 |
| D | 4 | 2475 | 790 |
| D | 7 | 5495 | 2050 |
| D | 8 | 4215 | 1560 |
| D | 10 | 3140 | 1030 |

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|---|---|---|---|
| Client : SISK | Project No: 2007598 | Sheet 3 of 4 |
| Project : GOSH CCC | Calc By: RC | Date: 07/01/2022 |
| Element : Actions on raft / secant wall | Chkd By: - | Date: |

| Column / Wall Ref. | | Permanent load | Imposed load | Wind load (330) | | Wind load (150) | | Wind (60) | Wind (240) |
|---|---|---|---|---|---|---|---|---|---|
| | | kN | kN | N (kN) | M (kNm) | N (kN) | M (kNm) | N (kN) | N (kN) |
| NS | 1 | 4785 | 970 | 595 | -585 | -600 | 590 | -20 | 45 |
| NS | 2 | 4460 | 1465 | 50 | -5 | -55 | 5 | 0 | 0 |
| NS | 3 | 6210 | 2240 | -10 | -5 | 10 | 5 | 0 | 0 |
| NS | 4 | 4665 | 1705 | 5 | -20 | -5 | 20 | 5 | -5 |
| NS | 5 | 5255 | 2000 | 10 | -20 | -10 | 20 | -5 | 5 |
| NS | 6 | 2800 | 860 | 35 | -320 | -35 | 315 | 20 | -35 |
| NS | 7 | 2790 | 855 | -10 | -330 | 10 | 325 | -20 | 35 |
| NS | 8 | 5500 | 2115 | 5 | -35 | -5 | 35 | 0 | 0 |
| NS | 9 | 4685 | 1790 | 5 | -35 | -5 | 35 | 5 | -5 |
| NS | 10 | 3295 | 540 | 50 | -480 | -55 | 465 | 90 | -145 |
| NS | 11 | 5660 | 970 | 280 | -1530 | -270 | 1470 | 135 | -225 |
| NS | 12 | 3110 | 440 | -130 | -360 | 125 | 345 | 20 | 30 |
| NS | 13 | 3195 | 450 | -175 | -340 | 165 | 325 | -20 | 35 |
| NS | 14 | 3160 | 455 | -230 | -280 | 220 | 270 | -55 | 90 |
| NS | 15 | 7575 | 1465 | 40 | -2150 | -25 | 2045 | -130 | 220 |
| NS | 16 | 1645 | 105 | -95 | -215 | 100 | 215 | 105 | 220 |
| NS | 17 | 1800 | 135 | -115 | -280 | 115 | 285 | 45 | -80 |
| NS | 18 | 1840 | 155 | -195 | -310 | 200 | 310 | -10 | 15 |
| NS | 19 | 6920 | 1260 | -180 | -1725 | 175 | 1735 | -150 | 305 |
| NS | 20 | 8905 | 2775 | -70 | -1470 | 70 | 1470 | -5 | 5 |
| NS | 21 | 2615 | 300 | 50 | -840 | -45 | 795 | -20 | 30 |

| Column / Wall Ref. | | Permanent load | Imposed load | Wind load (60) | | Wind load (240) | | Wind (330) | Wind (150) |
|---|---|---|---|---|---|---|---|---|---|
| | | kN | kN | N (kN) | M (kNm) | N (kN) | M (kNm) | N (kN) | N (kN) |
| EW | 1 | 1465 | 295 | -5 | 0 | 10 | 5 | 215 | -220 |
| EW | 2 | 2510 | 735 | -10 | -15 | 20 | 25 | -340 | 330 |
| EW | 3 | 3075 | 980 | 10 | -20 | -20 | 25 | 370 | -360 |
| EW | 4 | 2070 | 555 | 10 | 0 | -15 | 0 | -20 | 20 |
| EW | 5 | 2280 | 810 | 15 | 0 | -20 | 0 | 15 | -15 |
| EW | 6 | 11290 | 1440 | -50 | -960 | 100 | 1555 | -1800 | 1715 |
| EW | 7 | 7125 | 1160 | 40 | -265 | 65 | 430 | 385 | -375 |
| EW | 8 | 9650 | 2170 | 65 | -460 | -115 | 770 | 1270 | -1210 |
| EW | 9 | 2785 | -155 | 35 | -470 | -85 | 980 | -1380 | 1390 |
| EW | 10 | 7085 | 960 | 25 | -465 | -35 | 955 | 295 | -300 |
| EW | 11 | 1465 | 550 | -5 | -5 | 5 | 5 | -5 | 5 |

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|---|---|---|---|
| Client : SISK | Project No: 2007598 | Sheet 4 of 4 | |
| Project : GOSH CCC | Calc By: RC | Date: 07/01/2022 | |
| Element : Actions on raft / secant wall | Chkd By: - | Date: | |

| Column / Wall Ref. | | Length |
|---|---|---|
| | | mm |
| NS | 1 | 8160 |
| NS | 2 | 4460 |
| NS | 3 | 2400 |
| NS | 4 | 2100 |
| NS | 5 | 2000 |
| NS | 6 | 3800 |
| NS | 7 | 3800 |
| NS | 8 | 2230 |
| NS | 9 | 2230 |
| NS | 10 | 5125 |
| NS | 11 | 7700 |
| NS | 12 | 4250 |
| NS | 13 | 4250 |
| NS | 14 | 4250 |
| NS | 15 | 10676 |
| NS | 16 | 3260 |
| NS | 17 | 3260 |
| NS | 18 | 3260 |
| NS | 19 | 7445 |
| NS | 20 | 4740 |
| NS | 21 | 3590 |
| EW | 1 | 1475 |
| EW | 2 | 3800 |
| EW | 3 | 3800 |
| EW | 4 | 1160 |
| EW | 5 | 1160 |
| EW | 6 | 17070 |
| EW | 7 | 9850 |
| EW | 8 | 12600 |
| EW | 9 | 10075 |
| EW | 10 | 10075 |
| EW | 11 | 1460 |

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