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London, NW6
Structural Report

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1. CONTENTS

2. SCOPE AND GENERAL INFORMATION

Entuitive were asked to advise on the structural engineering part of the BIA associated with the proposed works at 13 Kylemore Road NW6 2PS.

This document describes the engineering assumptions made in the design of the new basement at 13 Kylemore Road. It also describes a possible construction sequence. It does not address the works above ground floor.

3. SITE AND DEVELOPMENT APPRAISAL

3.1. Existing building and location

Kylemore Road is a residential street located in Camden Borough of London.

13 Kylemore Road lies on the eastern side of Kylemore Road approximately half way down the street and shares party walls with residential properties, 11 and 15 Kylemore Road, to the north and south. It is also bounded to the east by no. 17 Glayds Road. The building is not located in any Lambeth Conservation Areas. Please refer to the relevant extracts which are provided in Appendix A.

Historic maps of this area indicate that the site was developed around the end of the 1800s to early 1900s. There is no record of significant bomb damage to the site. Please refer to the relevant extracts which are provided in Appendix A.

The Lost Rivers map indicates that a tributary of the historical River Westbourne may have passed some 85m southeast of the site. For the purposes of this report the front door of the house is assumed to face directly west onto Kylemore Road.

The house is a terraced building over three storeys, including a single below ground storey of reduced head height. There is also a three storey rear addition to the back of the main house. At some point in the past a single-storey extension has been added to the rear.

The soil investigation was carried out in October 2016. The investigation included four trial pits and two boreholes located at the front and to the rear of the building. The results of the investigation are shown in the report No. CG/18952 rev 2 prepared by Card Geotechnics Ltd.

It is assumed that the existing house has loadbearing masonry walls, a suspended timber floors throughout with a ground bearing slab in the reduced height basement and loadbearing brick and masonry and timber internal walls. The roof is of timber construction with a slate finish.

3.2. Proposed Development

The proposed alterations involve increasing the headroom within the existing basement under the main house and forming a new light well, at basement level to the front. We propose that this work be undertaken via the formation of the reinforced concrete underpins constructed in a hit and miss sequence.

The building is currently divided into two separate flats and as part of these works it is proposed to revert the property to a single ownership.

The scheme design for the alterations to the substructure is illustrated in sketches in Appendix C.

3.3. Existing Ground Conditions

For the purpose of the planning application, a site investigation has been carried out and the results are given in the report No CG/18952 rev 2 prepared by Card Geotechnics Ltd. This allowed us to develop the scheme with some certainty for this stage of the project.

For the purpose of this report, we have taken the site specific geotechnical investigation results which are shown in the aforementioned report. The house is underlain by made ground of a depth varying from 0.5m – 3.22m over Weathered London Clay formation to a proved depth of 8.45m below ground level.

3.4. Site Hydrogeology

From the knowledge of the site and the local conditions, the following was encountered:

Standing water depths of around 2.3m below ground level were recorded in the back garden during monitoring visits. This is anticipated to be representative of perched water within the London Clay, possibly as a result of inflow from ground level, and is not considered to be indicative of a continuous groundwater body.

There remains the possibility that perched water bodies above the water table may develop from time to time during heavy precipitation, leading to groundwater ingress above the standing groundwater table. In such circumstances, or where surface water run-off enters into excavations, it is expected that water could be adequately managed by natural drainage or pumping from sumps.

The site does not lie within the designated floodplain of the River Thames, nor is it located within a Groundwater Vulnerability Zone or located within a groundwater source protection zone as defined by the Environment Agency.

The Environment Agency mapping indicates that the site is not located within a zone at risk of flooding by rivers, seas or reservoirs. It does however have a recorded medium risk of surface water flooding; this is defined as a 1% to 3.3% chance of flooding to a depth of 300mm annually. The flood maps included within CGL's report show that groundwater flood and sewer flood incidents have occurred in the area, however it is not clear on the exact locations which were affected, nor the time period over which the data was taken. It is anticipated that the surface water and foul flood maps in CGL's report relate to the 1975 flood event and according to other maps in CGL's report Kylemore Road, was not affected by the flood event.

Based on the available information, it is considered that the risk due to surface and foul water flooding is relatively low.

3.5. Slope Stability

The existing site is generally level and the new landscaping will not change the site slopes, as such no issues relating to slope stability need to be addressed.

3.6. Surface Flow and Flooding

From a review of the Environmental Agency surface water flood maps it would appear that the property is near an area at risk of flooding from surface water (see surface water flood map in Appendix A). With the proposed introduction of a modest sized basement lightwell to the front of the property the resultant surface water runoff will need to be adequately drained and increase the current volume of water entering the public sewer. The below ground drainage design strategy will incorporate the requirements for SUDS in the form of permeable paving where the surface water runoff, from the new basement lightwell will drain away. The below ground foul water drainage design will incorporate enlarged foul water manhole, to take the waste water from the basement extension only and incorporate pumps to deliver the foul water to the public sewers. The rising foul main pipe would discharge into the last manhole, within the property's boundary before it enters the public sewer, and then fall under gravity to the public sewer. The foul drainage pipe will be fitted at the end with a non-return valve to minimise the risk of the water back flowing up through our drainage system if the public sewers are in flood.

4. PERMANENT WORKS

4.1. Foundations in General

The underlying strata will provide a suitable bearing stratum for the support of the proposed new basement. The design of the basement will be driven by the stability of the London Clay Formation and maintaining the stability of existing walls, adjacent land and properties and any existing buried services.

4.2. Basement Construction

The increased height basement will be formed by extending downwards below the existing brick walls with approximately 1.2m deep in reinforced concrete underpinning to the party walls and c.1.6m to the rear wall. The internal face of the underpinning will form part of the new floor slab and will have the reinforced concrete basement slab cast against it and into new in the centre of the floor plan following a sequence as outlined on our drawings.

The formation level of the underpins, at 1.1m below the proposed finished floor level, will be lower than the formation level of the existing front wall of the property, at c.1.0m below the proposed finished floor level, as a result the underpins will founded within the London Clay Formation. Likewise the underpin walls to the front lightwell will be about 2.4m deep amd founded at c.1.2m, below the proposed finished floor level, within the London Clay Formation below the formation level of the foundation to the front masonry wall.

The reinforced concrete underpinning will be brought up to the undersides of the original brickwork wall foundations to ensure that the load has not increased on the existing walls of the building. The reinforced concrete underpins will have 75mm minimum thickness of dry packing rammed tight in-between the top of the underpin and the underside of the existing brick foundation.

The scheme for the basement and temporary works is illustrated in sketches in Appendix D. An indicative sequence of works is provided later in this report.

4.3. Impact on Adjacent Structures and Services

Both adjacent buildings affected by these works directly adjoin No. 13.

With good construction practice, actual settlements should be kept within the 'Negligible to Very Slight' range in the Classification of damage visible in walls (refer to Appendix B). We would recommend to mitigate against any movement in the facades, of the existing building and adjacent property no. 15 that a trial pit be dug to expose the formation level of the front facade to no. 15. From the results of the ground movement analysis presented in CGL's report we would expect that the front lightwell to no.13, where proposed the underpins are up to 2.4m deep, is where greatest risk of movement could occur. However we understand from the trial pit undertaken adjacent to the front wall to no.13 that the formation level of the front wall coincides with the formation level of the proposed front lightwell extension. We expect that the formation level of the front wall to no. 15 will be at the same depth as the no. 13 as a result the expected movement as outlined in CGL's report may not transpire. If the neighbour at no.15 is not happy for the trial pit to be undertaken then we would suggest that a short length of sheet pile be installed by the contractor prior to digging out the lightwell underpin section adjacent to the boundary with no. 15.

Monitoring points will be installed and continually monitored by the contractor as the basement extension works progresses. The contractor will follow the 'traffic light' trigger values as outlined in Table 17 of CGL's report. If any cracks develop in the structure of the adjacent buildings then normal Party Wall procedures provide a mechanism for completing any repairs. Also as part of the Party Wall procedures it is likely and highly recommended that condition surveys will be undertaken on the adjacent properties to record the condition of neighbouring properties prior to the commencement of the works at no.13

In view of the depth to the foundations, fine grained London Clay Formation soils are plastic and specific precautions are considered to be required with respect to protecting foundations from the effects of seasonal soil heave/ shrinkage induced by trees. This will need to be taken into account during the final design. During the next phase of the project trial pits will be undertaken to confirm the depth of the existing foundations below the party walls on either side of the building. These works were not undertaken with the other trial pits with CGL's report due to access restrictions.

An analysis of the predicted vertical displacement in the existing footing has been undertaken by CGL in their SI report and it is noted that there will not be any significant damage to adjacent properties as a result of the proposed works. The risk of damage to the adjacent buildings will be mitigated by a regime of monitoring to be undertaken by the contractor as outlined above.

It is not anticipated that the work will have an impact on buried services passing across the site e.g. sewers, cables etc. Detailed searches into the locations of any mains services will be carried out in due course, but at this stage there are no known services in the vicinity of the basement excavation. In the course of the normal design development these will be considered and appropriate designs developed for rerouting or protection should it be required.

During the demolition and excavation of the works the contractor will ensure that all works are carried out safely and in such a manner that it will not inconvenience pedestrians or other road users, and with a positive consideration to the needs of the local residents, site personnel and

visitors as well as the general public. Airborne dust will be dealt with by dampening down areas with water prior to the works being undertaken.

Public footways and carriageways will be kept tidy, in safe condition and regularly inspected and washed down. Hoardings, safety barriers, lights and other features will be maintained in a safe and tidy condition. The site is to be kept clean and in good order at all times with surplus materials and rubbish controlled within the site and not allowed to spill over into the surroundings.

In addition to this, working times as stipulated within the contract particulars will be complied with and contractor would look to discuss with London Borough of Camden these times as a proactive approach to control of noise emissions from the site.

As the proposed works will directly affect the foundations to the adjoining properties the works will be notifiable under Sections 3 and 6 of the Party Wall etc Act 1996. We understand that our client has been in contact with his neighbours at no.s 11 & 15 to discuss the extent of his works through the submission details and active dialogue.

4.4. Basement Water tightness

It is expected that the basement will need to meet a minimum level of Grade 3 water-tightness in accordance with BS8007 and BS 8102. Grade 3 implies full water and vapour tightness within the useable space.

We recommend that the basement design will incorporate the use of a drained cavity construction for the perimeter walls and slab. This is a system of drainage blankets, slots and sumps used to control and discharge any below ground water leakage, via burst pipe, through the retaining structure.

For an additional level of security, water resisting concrete admixtures in addition to a drained cavity may be considered. Final design of the waterproofing should be carried out by the architect in due course.

4.5. Historical defects within property

We understand from a structural report compiled by MW Design & Consulting in August 2014 that there are may be some defects within the existing house that need to be addressed as part of the basement extension works. During the next phase of the project we will undertake an inspection following investigative opening up works to record the current extent of defects within the building and compile a schedule of remedial repairs for a competent contractor to undertake.

5. TEMPORARY WORKS

5.1. Responsibilities

The following is a suggested construction sequence that would allow the proposals to be built safely. It must be recognised that the contractor will be responsible for determining the actual construction sequence, designing the necessary temporary works and correctly executing the works.

A detailed method statement will be required from the contractor even if the contractor chooses to follow this suggested construction sequence. Should the contractor follow this suggested construction sequence it in no way relieves them of the responsibility to ensure the stability of the building and neighbouring structures during construction stage.

5.2. Groundwater Control

The Contractor will provide any necessary small temporary sump points to control water ingress during the excavation works.

6. SUGGESTED CONSTRUCTION SEQUENCE

6.1. Casting Perimeter Walls to the basement

The perimeter of the basement and light well should be constructed in an underpinning sequence as shown on sketches SK-PL-01 & 02. The excavations for each pin will generally be in excess of 1.0m high and approximately 1.0m wide. The base of the pin formed each time should be wide enough to support the vertical loads from above, refer to the sketches SK-PL-01 & 02.

Although this process will form a reinforced retaining wall, the portion of the base that projects beyond the assumed party wall line will be unreinforced so that it may be broken off with relative ease should future works below the neighbouring properties require this in the future.

The contractor should start with pins marked as pins 1. Each pin should be backfilled with well compacted arising soil following the installation of the dry packing between the top of the pin and the underside of the existing foundation. By backfilling, following the completion of underpins, the lateral stability of perimeter walls will be maintained as the construction progresses around the perimeter of the basement.

Steel reinforcing bars should be left protruding from the sides of each cast underpin section to lap with subsequent underpin wall slab pours. Prior to the casting of adjacent wall sections the contractor must ensure that there is hydrophilic strip, or similar approved placed into all construction joints.

Following the installation of all the pins the contractor should install the temporary horizontal steel beams as shown on the basement floor plan appended to the report. See the appendix C. These beams will ensure that the lateral stability to the below ground walls will be maintained while the basement slab is lowered to the new level.

6.2. Casting the walls to the light well

Similar to the underpins below the house the excavations for each pin to the light well will generally be in excess of 3.0m high and approximately 1.0m wide. The base of the pin formed each time should be wide enough to support the vertical loads from above, refer to the sketches SK-PL-01 & 02.

Although this process will form a reinforced retaining wall, the portion of the base that projects beyond the assumed party wall line will be unreinforced so that it may be broken off with relative ease should future works below the neighbouring properties require this in the future.

The contractor should start with pins marked as pins 1a. Each pin should be backfilled with well compacted arising soil following the installation of the dry packing between the top of the pin and the underside of the existing foundation. By backfilling, following the completion of each underpin, the lateral stability of perimeter walls will be maintained as the construction progresses around the perimeter of the light well.

Following the installation of all the pins the contractor should install the temporary horizontal steel beams as shown on the basement floor plan appended to the report. See the appendix C. These beams will ensure that the lateral stability to the below ground walls will be maintained while the light well basement slab is constructed.

6.3. Cast basement slab

The basement should be excavated to formation level following the sequence outlined on drawing SK-PL-01 and the new basement slab cast with dowel bars fixed into the side of the underpin walls. Steel reinforcing bars should be left protruding from the end of the cast basement slab to lap reinforcement in the subsequent basement slab pours. Prior to the casting of the basement slab the contractor must ensure that there is hydrophilic strip, or similar approved placed into all construction joints.

6.4. Remove propping

Once the basement slab has reached its design strength, as verified by testing of concrete cubes, the temporary lateral propping may be removed.

7. ASSESSMENT OF KEY SAFETY ISSUES

The following issues will require further consideration in order to mitigate or eliminate inherent risks:

- Underground Services- A detailed survey of the existing services will have to be undertaken. All existing services will need to be terminated prior to any excavation.
- Intrusive Structural Survey– investigation will be needed to ensure that assumptions about the existing structure can be verified.
- Construction workers in direct contact with the made ground risk of ingestion and inhalation. With the level of contaminants present in the made ground the SI report highlights that this has a medium risk rating and the risk will be mitigated through the use of appropriate site practices and using full PPE.
- Bulk Deliveries- Delivery and handling of large or heavy structural elements (e.g. reinforcement bars) from the main road entrance. Reinforcement can be detailed to provide smaller bars at more regular centres, which will help reduce the weight of hand-lifted elements. However parking licences maybe required from the local council for the delivery trucks.
- Excavation in confined spaces - Normal protection measures to be taken whilst excavating in confined spaces.
- Detailed Temporary Works Design with Site Monitoring– the sequence of work needs to be developed in detail by an experienced professional engineer, and regular site visits and reports made to ensure that site operatives understand and follow the designed sequence. The contractor will undertake a regime of site monitoring to record any movements in the façade of the building and the adjacent structures.
- An outline construction programme has been included in Appendix C however this should not be relied upon the appointed contractor will produce their own programme for these works following their appointment.

8. CONCLUSIONS

Our judgment based upon the investigations carried out, the geological records and our experience of basement developments in similar conditions in London is as follows:

a. The development will maintain the structural stability of the existing building and neighbouring properties in the temporary and permanent stages. The engineering of basements of this kind is well understood and there are no difficult or peculiar issues that arise in this case.

b. The development will have no adverse effects on drainage, run-off or hydrogeology. We do not consider that this site raises any unusual or adverse groundwater or drainage issues.

John Maguire

BSc Eng CEng MIStructE

Entuitive

August 2017

APPENDIX A – DESK MAPS

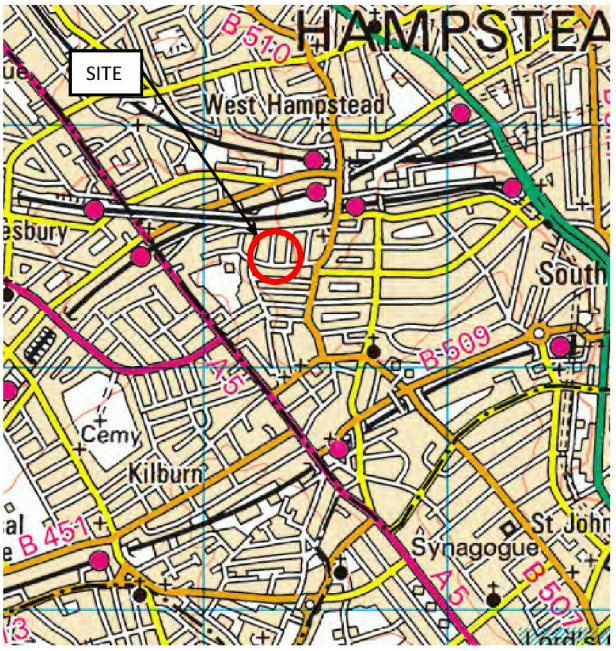


Image of 13 Kylemore Road

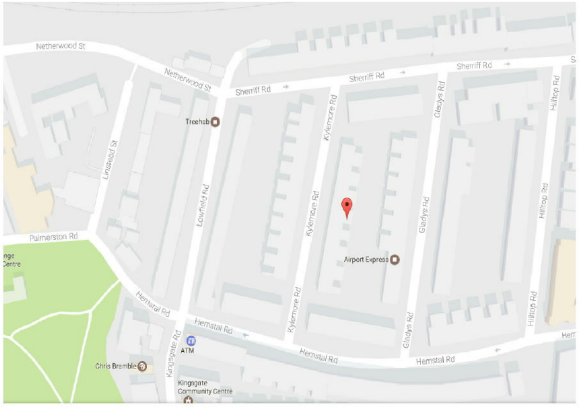


Image of 13 Kylemore Road from Google maps

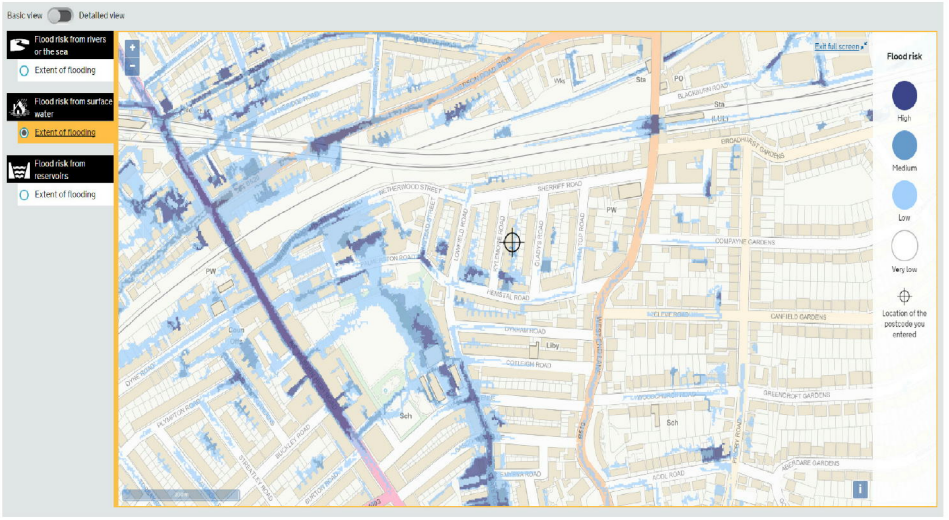
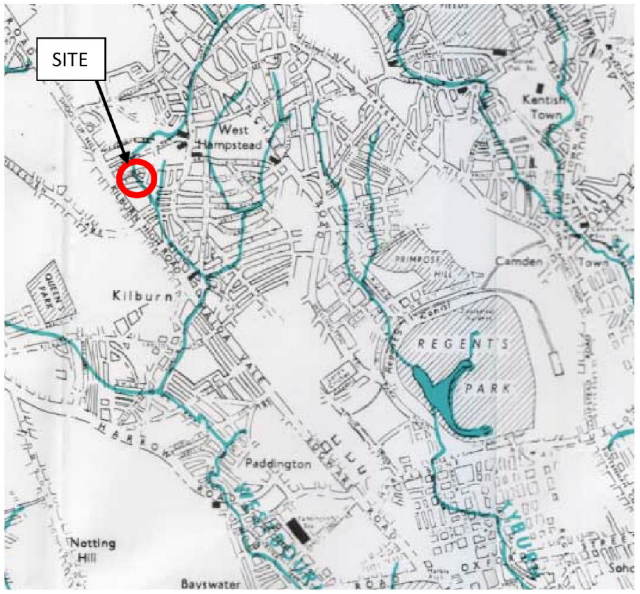


Image of 13 Kylemore Road from the Environmental Agency surface water flood map that appears to show that the property is close to an area at risk of surface water flooding

Bomb map of the local area



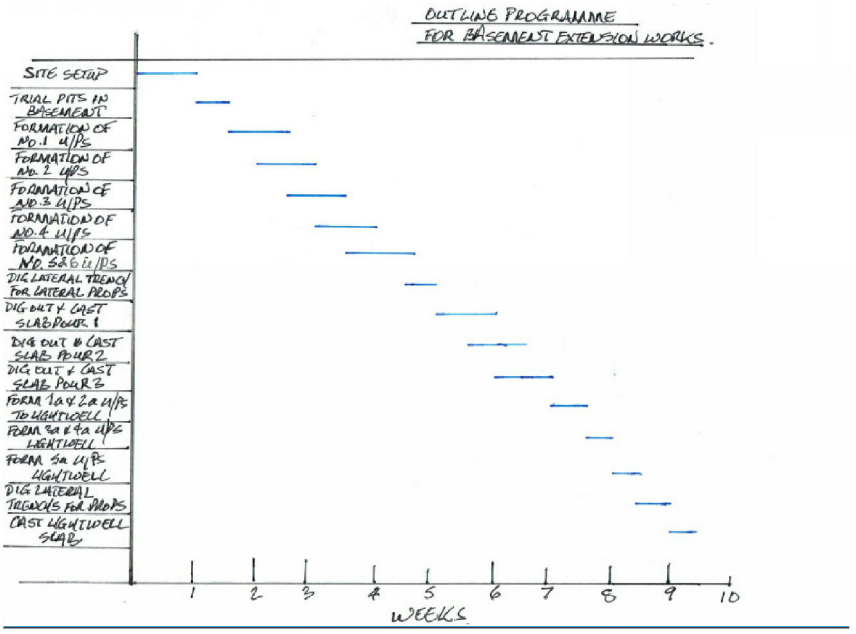
Lost river of London Map

APPENDIX B – BRE DAMAGE CLASSIFICATION TABLE

BRE classification table of visible damage to walls with particular reference to ease of repair of plaster and brickwork or masonry

Category of damage	Degree of damage	Description of typical damage [ease of repair]	Approximate crack width [mm]
0	Negligible	Hairline cracks of less than about 0.1 mm width are classified as negligible	Up to 0.1 mm
1	Very slight	Fine cracks which can easily be treated during normal decoration. Perhaps isolated slight fracturing in building. Cracks rarely visible in external brickwork	Up to 1 mm
2	Slight	Cracks easily filled. Re-decoration probably required. Recurrent cracks can be masked by suitable linings. Cracks not necessarily visible externally; [some external repointing may be required to ensure weather tightness]. Doors and windows may stick slightly.	Up to 5 mm
3	Moderate	The cracks require some opening up and can be patched by a mason. Repointing of external brickwork and possibly a small amount of brickwork to be replaced. Doors and windows sticking. Sertvice pipes may fracture. Weather tightness often impaired.	5 to 15 mm [or a number of cracks up to 3]
4	Severe	Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows] Windows and door frames distorted, floor sloping noticeably. Walls leaning or bulging noticeably. Some loss of bearing in beams. Service pipes disrupted.	15-25 mm but also depends on number of cracks
5	Very severe	This requires a major repair job involving partial or complete re-building. Beams lose bearing, walls lean badly and require shoring. Windows broken with distortion. Danger of instability	Usually greater than 25 mm but depends on number of cracks.

APPENDIX C – OUTLINE PROGRAMME FOR THE BASEMENT EXTENSION WORKS



APPENDIX D – STRUCTURAL DRAWINGS AND TEMPORARY WORKS DRAWINGS