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SUBSTRUCTURAL CALCULATIONS

BASEMENT DESIGN PHILOSOPHY

(PREPARED BY JMS CONSULTING ENGINEERS LTD)

19 Rona Rd

Project No: L15/088/04

Revision	Date	Changes
P1	2/12/2015	First issue

SUBSTRUCTURAL
VALUE ENGINEERED DESIGN

T 02076 085740

Job ref	: L15/088/04
Sheet	: **Structure / 2 -**
Made By	:P Manios
Date	**: December 2015**
Revision	: **P1**

General Construction Notes and Guidance on using these Calculations

1. Calculations are not to be used for the purpose of ordering materials and should only be used for Building Regulations submissions. All dimensions should be checked by the contractor on site.

2. All steelwork to be mechanically wire brushed and painted two coats of red oxide. Steelwork located in the cavity or below DPC to be suitably protected with 2 coats of bituminous paint.

3. All steelwork connections to use grade 8.8 bolts unless stated otherwise. These are to be spanner tightened using the appropriate podger spanner (min length 460mm) or suitable power tools in accordance with BS2583. If a torque wrench is used the torque applied should be around 90Nm for M16 bolts, 110Nm for M20 & 130Nm for M24.

4. All timber to be grade C24 (SC4), unless stated otherwise. Preservative treated to Architects details.

5. To be read in conjunction with Architects drawings, any inconsistencies between the drawings should be reported. If any site conditions or existing details are found that may affect the structural design, JMS Consulting Engineers are to be notified immediately.

6. For details of fire protection to steelwork, see Architects drawings.

7. The Contractor is to ensure that all existing construction is adequately supported, using needles and props as required. Where a new beam supports the existing construction, adequate pre-load is to be applied and suitable packs such as driven dry-slate introduced, then pointed up with mortar.

8. All blockwork to be 7.3 N/mm^2 in class III mortar below DPC in accordance with BS 5628 : Part 3 : 2005 or suitable 7.0 N/mm^2 foundation quality blocks in class II mortar in accordance with the manufacturer's instructions. All brickwork below DPC to be Engineering Bricks DPC in accordance with BS 5628 : Part 3 : 2005.

9. The project requires the introduction of heavy structural elements such as steel beams or concrete lintels. Although the Construction (Design and Management) Regulation 1994 would not normally apply to this type of construction, the designer still has an obligation to foresee risks and bring to the attention of the builder such risks. In consequence, the builder is to take into consideration the placement of all structural elements, ensuring that the method of lifting and placement is safely carried out. Responsibility for this element lies with the Contractor. As the existing walls need to be propped in order to introduce some of the lintels, this should also be considered in relationship to the risk assessment of the Contractor. Safe working procedures must be adopted. Responsibility for this element lies with the Contractor. Splice details for long-span beams can often be accommodated if required.

10. All construction products should be CE marked in accordance current legislation. This includes all fabricated structural steelwork in accordance with BS EN 1090-1 and BS EN 1090-2. The consequence class is CC2 unless noted otherwise. The service class is SC1 for all buildings, SC2 for all lifting beams, sculptures & fall arrest systems. Production category will be PC1 unless noted otherwise. All site welded items, S355 steelwork & CHS lattice girders will be PC2. As such the execution class for buildings will be EXC2.

11. CLIMATE CHANGE: The Building Research establishment have produced a document CBG 63 "Climate Change: impact on building design and construction". Part of their recommendations are that designers and builders should give consideration to:
    a. Increased wind loading by providing additional laps and fixings to roof coverings

    b. Consider foundation depth on shrinkable clays and to avoid future problems, increase the depth above standard requirements if there is a risk. This should be in accordance with the NHBC Standards, Chapter 4.2 Guidance on Building near Trees. If the calculations do not specifically design the depths of the foundations to take into account any local trees, then this should be checked and agreed with the Building Inspector on site.

Party Wall etc. Act 1996

If part of the work is adjacent to the boundary, the adjacent neighbours right to support could be affected; the issues associated with Party Wall Act may need to be considered. This may include providing information to the adjoining owner, giving sufficient notice of works in compliance with the Act. If the following list applies to this project then the Party Wall Act will apply. JMS Engineers can act as Party Wall Surveyors in this instance and should be contacted accordingly.

- Installing a new beam into the shared wall between properties
- Demolishing, building or under-pinning an existing shared wall
- Building a new wall at or on the boundary or junction of two properties
- Damp-proofing all the way through a party wall
- Digging foundations that are within 3m of a Party Wall, where the new foundations are deeper than the existing ones
- Where the new foundations are within 6m and lower than a 45° line from the bottom of the existing foundations

SUBSTRUCTURAL
VALUE ENGINEERED DESIGN

T 02076 085740

Job ref	: L15/088/04
Sheet	: **Structure / 3 -**
Made By	:P Manios
Date	**: December 2015**
Revision	: **P1**

JMS Underpinning Specification

1.Codes of Practice

All continuous underpinning is to be carried out strictly in accordance with the requirements of B.S.8004, 1985. The Code of Practice for Foundations. All materials used in the works shall comply with the relevant Codes of Practice.

2. Shoring and propping

It is the Contractor's responsibility to take all necessary steps to ensure that the structure is adequately propped, shored and braced to ensure that during the progress of the works excessive deflections and deformations of the structure do not occur. The Contractor shall discuss with the Engineer any proposals for temporary works. This does not in any way relieve the contractor of his responsibility to ensure that the structure is adequately supported at all times during the progress of the works. It is frequently necessary for the Contractor to brace of prop existing openings so that isolated load bearing piers may be underpinned. The Contracor is to allow in his tender price for all propping, shoring and bracing required to ensure that the works may be safely undertaken with no undue disruption to the structure.

3. Sequence of working

The sequence of working is to be submitted to the Engineer and approved by the Local Authority. This shall be based on a maximum leg length of approximately 1.2m. The agreed sequence of operations shall be strictly adhered to. The Contractor may wish to alter the excavation and concreting sequence but this must be discussed with the Engineer/Local Authority Representative, and no deviation from the sequence of operations shall be permitted unless the Engineer/Local Authority Representative confirms otherwise in writing.

4. Excavation and approval

During excavations the Contractor shall take all necessary steps to prevent softening of the excavation base by ground water. Where necessary the Contractor shall keep excavations free from ground water by pumping. The Contractor shall also ensure that the base of the excavation shall not become contaminated by loose material falling into the excavation. The Contractor shall take steps to ensure that the size of the excavation closely matches the required size agreed with the Engineer/Local Authority Representative. Excessive overbreak will not be permitted, and the Contractor shall provide all necessary trench sheeting and strutting to prevent overbreak. The Contractor may be required to provide sheeting and strutting to prevent any ingress of loose material beneath the existing slab. All underpinning excavations shall be approved by the Local Authority Representative before any concrete is placed.

5. Linking of adjacent legs

Prior to concreting the Contractor shall incorporate shear keys to permit shear transfer between adjacent underpinning legs. Where necessary projecting dowel bars should be cleaned of all loose dirt prior to concreting.

6. Cleaning of existing footings

The underside of all existing footings (where exposed by excavation in preparation for underpinning) shall be cleaned of all loose soil and fragments. Any major projections or inclusions such as bricks broken conrete or boulders shall be broken away from the underside of the existing footing. Prior to concreting the underpinning leg the existing footing should be clean firm and level so the dry packing may be accomplished satisfactorily.

7. Concreting

All concrete shall be strength grade C20 and mixed, delivered, placed and vibrated strictly in accordance with the concrete specification contained in B.S.8110:Part 1:1985. Sulphate resisting cement to be used should site conditions dictate or as directed by Local Building Control Officer. It should be noted that the concrete should be adequately compacted with a vibratory poker to ensure adequate density. The concrete for the underpinning legs should be brought up to 75mm from the underside of the existing footings.

8. Dry packing

Once the concrete in the underpinning legs has set (at least 3 days after concrete placement) the gap between the underside of the exisiting footing and the top of the new footing is to be packed with dry mortar. Mix proportions for the dry mortar are to be by weight 1:3 (cement:zone 2 sharp sand) with Combex non-shrink admixture added in accordance with Manufacturers recommendations. The constituents are to be mixed dry and a small volume of water is to be added such that when compressed, a small bar of the mixture retains its shape. The dry packing concrete is then to be rammed solid into the gap between the underside if the existing footing and the top of the new footing using a steel bar.

9. Curing time

A sufficient time should elapse between the completion of dry packing and the excavation of any underpinning legs in the vicinity. The curing time shall be 24 hours, this being dependent upon the prevailing weather conditions. Vicinity in this context shall be deemed to include all legs adjacent to, or next but one to the leg in question.

10. Provision for existing services

Underpinning legs may be punctured by the services entering the building. The means of "sleeving" these services shall be agreed with the Engineer during the progress of the works. Where existing services interfere with or affect the underpinning excavation these services should be temporarily diverted.

SUBSTRUCTURAL
VALUE ENGINEERED DESIGN
T 02076 085740

Job ref	: L15/088/04
Sheet	: **Structure / 4 -**
Made By	:P Manios
Date	**: December 2015**
Revision	: **P1**

BASEMENT DESIGN PHILOSOPLY

The proposed structure has been designed assuming that all vertical load from the existing foundations is taken down through the new underpinning wall and on to a mass concrete footing of similar dimensions as the existing corbelled brick footing.

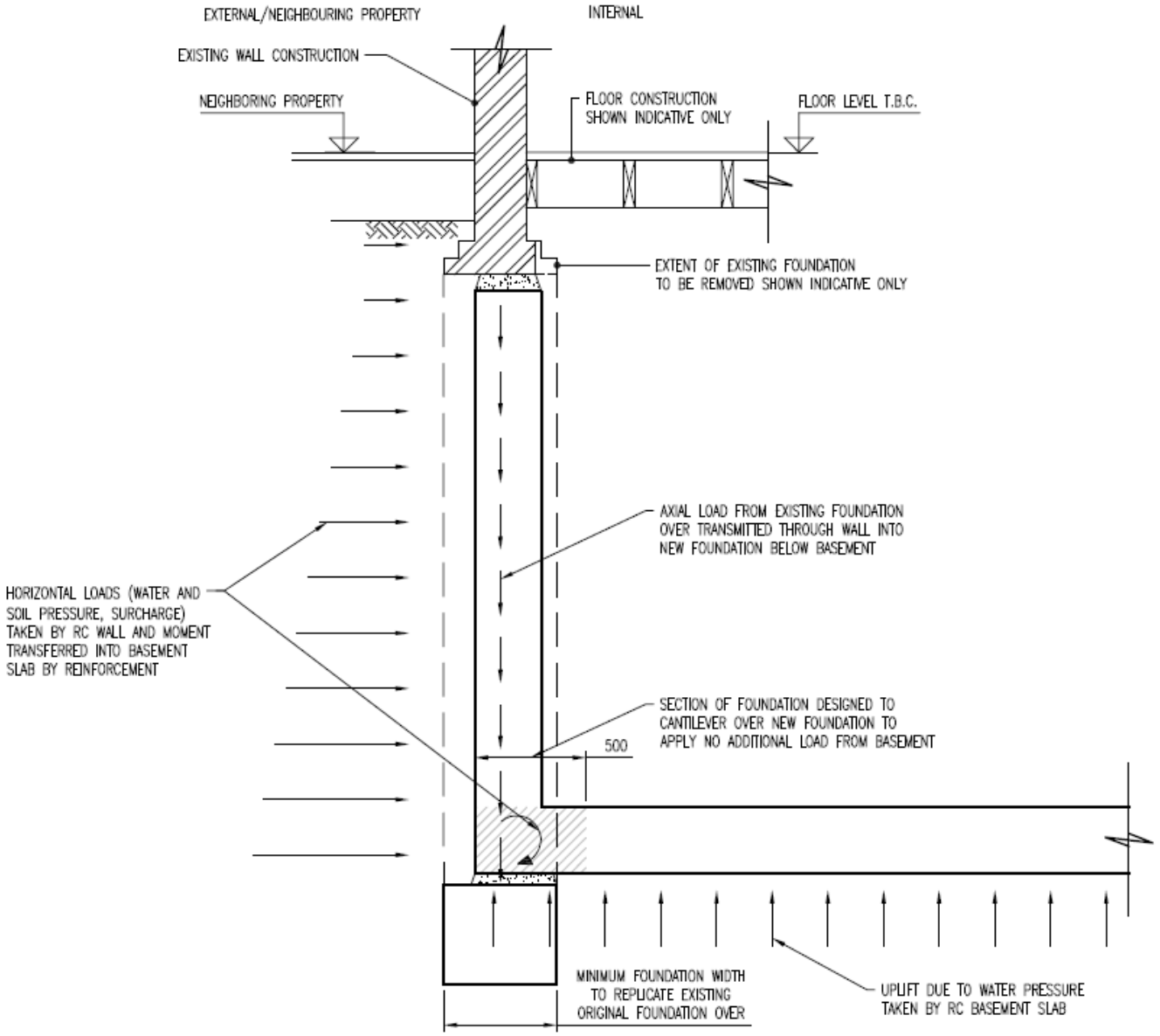

Figure 1: Basement Design Philosophy

SUBSTRUCTURAL
VALUE ENGINEERED DESIGN
T 02076 085740

Job ref	: L15/088/04
Sheet	: **Structure / 5 -**
Made By	:P Manios
Date	**: December 2015**
Revision	: **P1**

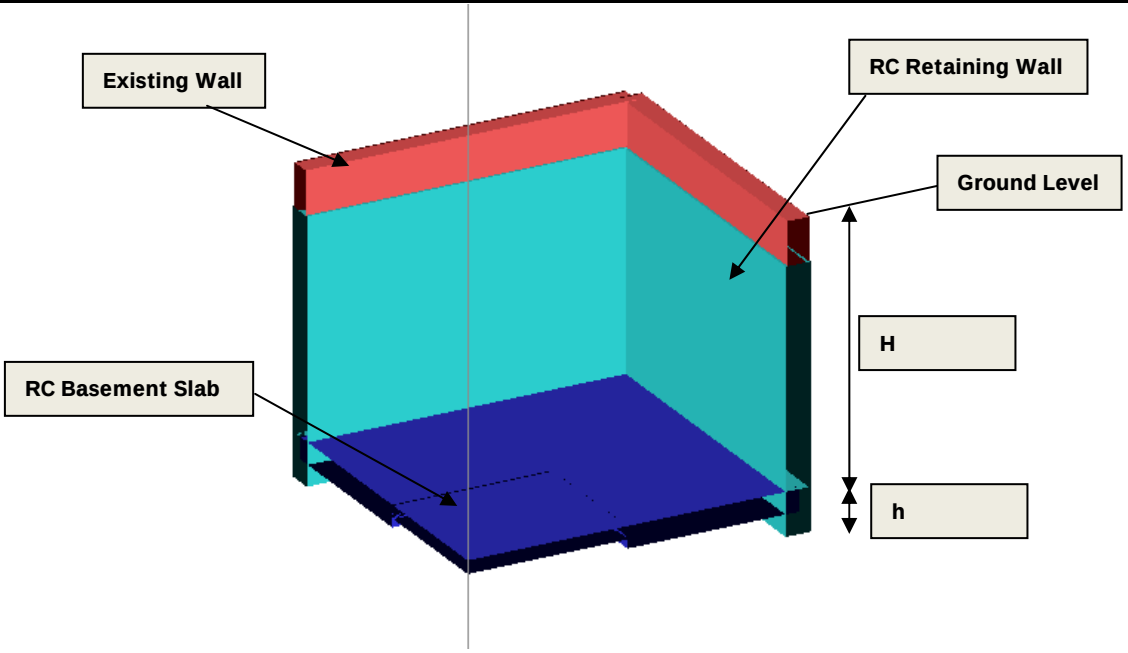

Figure 2: Section of Model

The walls have been designed to take the horizontal load from the retained soils, surcharge and water and are cantilevered from the basement slab presuming no propping force from the ground floor slab.

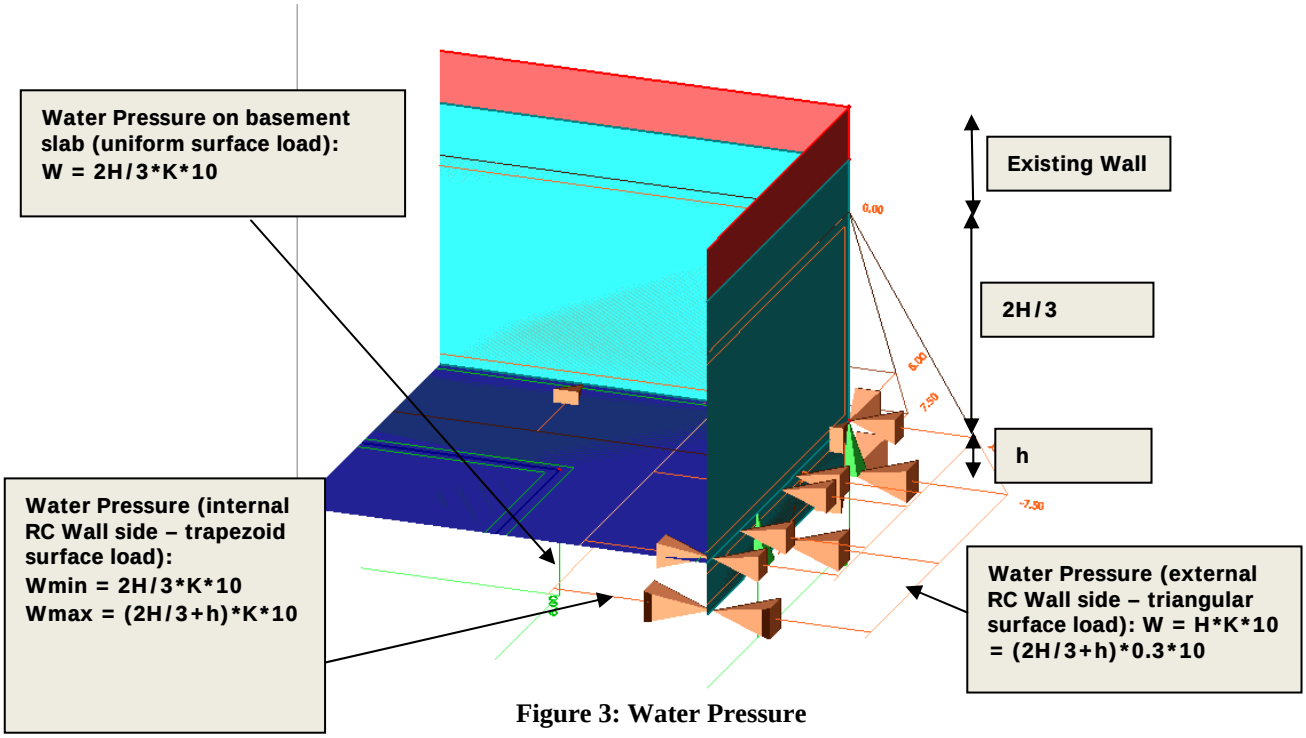

Figure 3: Water Pressure

SUBSTRUCTURAL
VALUE ENGINEERED DESIGN
T 02076 085740

Job ref	: L15/088/04
Sheet	: **Structure / 6 -**
Made By	:P Manios
Date	**: December 2015**
Revision	: **P1**

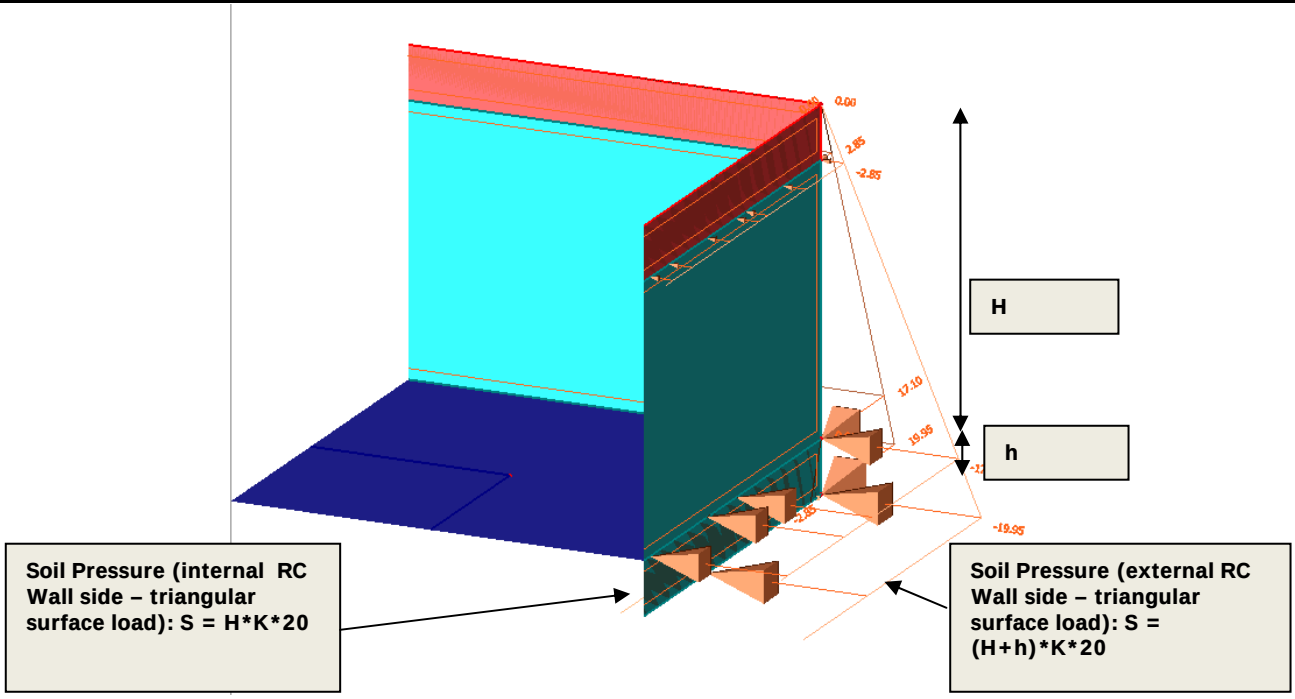

Figure 4: Soil Pressure

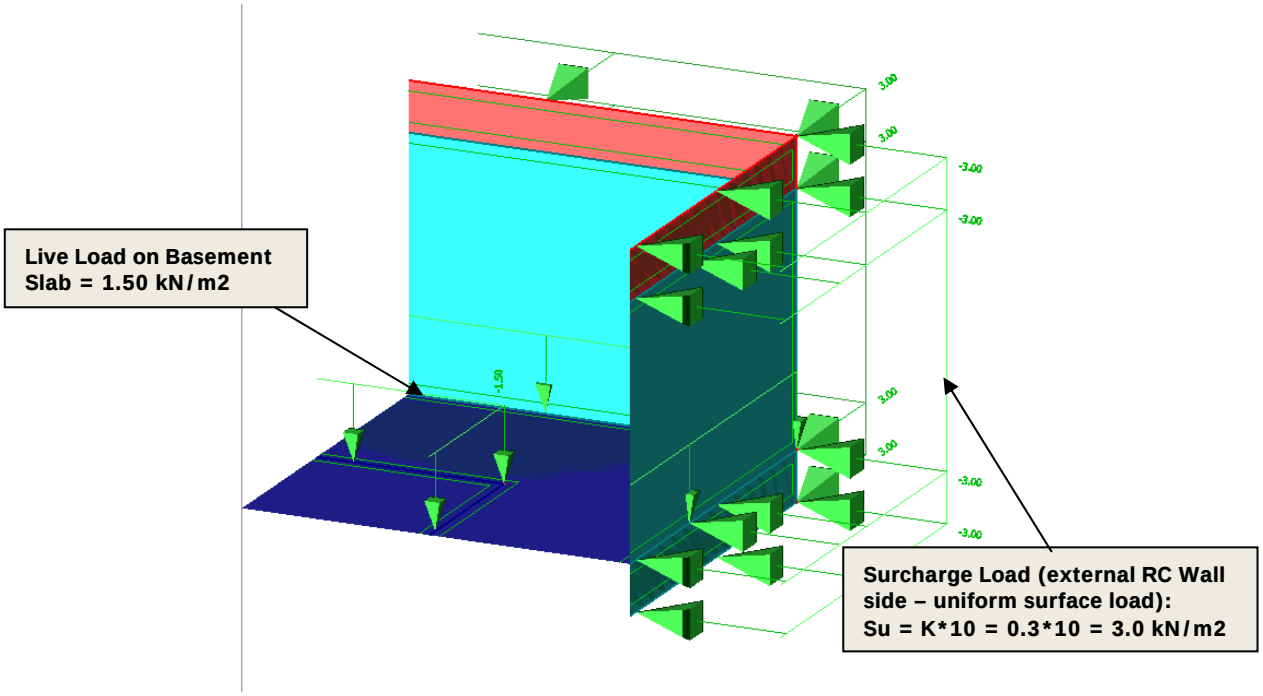

Figure 5: Surcharge (10 kN/m2) and Live Loads

SUBSTRUCTURAL
VALUE ENGINEERED DESIGN
T 02076 085740

Job ref	: L15/088/04
Sheet	: **Structure / 7 -**
Made By	:P Manios
Date	**: December 2015**
Revision	: **P1**

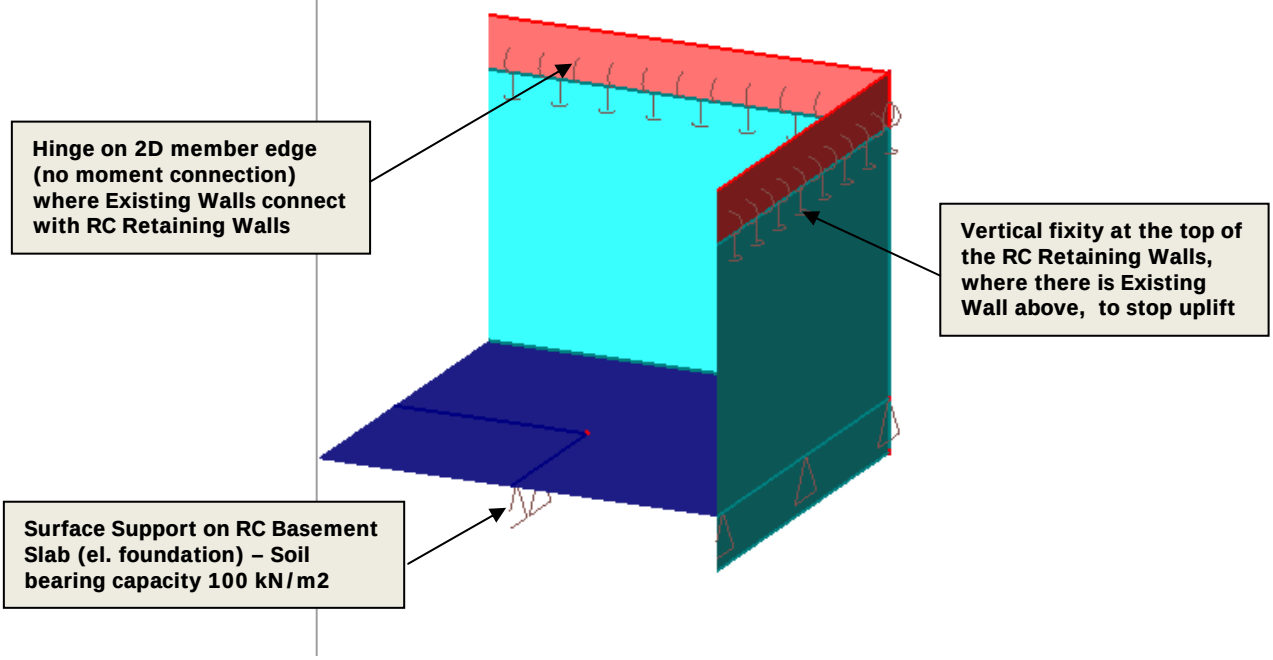

Figure 6: Supports and Restraints

The basement floor slab has been designed to resist the effective uplift pressures from the soil and water with a 500mm strip around the perimeter ignored. In addition, the slab is also designed to resist moments applied from the wall sections.