



Subterranean Construction Methodology



73 – 75 Avenue Road

Rev 00 – 11th December 2018

REVISIONS

Revision 00 – 12th December 2018
Issued for Approval

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1. Introduction

Knight Build Ltd (KBL) has been appointed to complete the primary structural works to 73-75 Avenue Road.

Works include the demolition of the existing structure of 75 Avenue Road, the formation of a basement and the construction of 2 story dwellings above ground.

KBL are the Principal Contractor for the duration of the subterranean, and reinforced concrete structure above.

The existing structure is a detached 3 storey building which occupies the North West Corner of the site with good access off Avenue Road. A secure hoarding shall be installed and access/logistics shall be agreed with the local authority highways department.

To the northern elevation is 77 Avenue Road (77AR). This is a detached property with a single storey garage that has been constructed enclosing on to the garden party wall. The demolition of the existing structure is too carried out prior to KBL taking over the site. These works are to be covered by a separate method statement.

The existing garage to 75AR is to be cut away from the wall and a new single story structure formed adjacent to the party wall in line with Studio indigo and HTS drawings. It is understood that 77AR also have consent to form a basement in the future and the development to 75AR shall not limit or prevent the development of 77AR.

The new proposed basement structure will sit away for the partywall. The closest section of new subterranean structure and piled wall will sit 3m away for the partywall with 77AR.

To the west is the rear garden with a low boundary/party wall to the gardens of 38 Queens Grove and along the southern elevation there is a boundary wall to the pavement of Queens Grove.

There are significant trees around the perimeter of the site with large root protection zones resulting in the new basement footprint being set away from the boundaries of the site with the exception of the boundary with 77AR.

The tree protection zones shall be established prior to commencement.

An open dig approach is proposed for the construction of the new basement.

KBL are extremely experienced in delivering a project of this scale and size and have worked with both the structural engineer (Heyne Tillett Steel) and the Architect (Studio Indigo).

2. Location and Extent of Works

A perimeter piling key plan can be found in appendix B.

Detailed construction Sequence drawing for the sections of basement perimeter wall adjacent to 77AV can be found in appendix G.

Sequence Overview

1. Establish displacement monitoring as detailed in appendix A.
2. Install hoardings and secure site.
3. Install Tree/Root Protection Zones.
4. Establish Welfare.
5. Disconnect services and establish Temporary Builders Supplies.
6. Grub out foundations.
7. Grub out for pile line.
8. Install Pile Mat
9. Install Contiguous Piled Wall.
10. Install internal temporary bearing piles required for propping
11. Excavate to u/s of GF slab.
12. Trim down piles and cast capping beams.
13. Excavate site to 43.300m AOD.
14. Install Temp Propping to 75/77 Piles Wall at 44.5m AOD.
15. Excavate site to 41.000m
16. Install temp propping to 75/77 Piles Wall at 41.900m AOD.
17. Reduce ground to formation level.
18. Install internal bearing piles.
19. Form sub-basement slab.
20. Excavate Car Stacker and Cast base slab.
21. Complete vertical internal structure to basement level.
22. Cast basement slab.
23. Remove temporary propping at 41.900m AOD.
24. Cast vertical structure to GF.
25. Cast GF slab.
26. Remove temporary bearing piles and temporary propping at 44.5m AOD.
27. Complete concrete frame above ground.
28. Fit out and complete external landscaping by Sizebreed Group.

Normal site working hours shall be 0800-1800 Monday to Friday. Work shall be avoided as far as practicable on Saturdays except where programme requirements dictate them necessary. Working hours shall only be between 0800 and 1300 on Saturdays.

3. Securing the Site

A secure hoarding has been installed to the front of the site and to the rear and side garden walls. This shall be maintained throughout the construction period and painted regularly to maintain the appearance of the site. The Hoarding will be a minimum 2.4m in height throughout.

4. Existing Ground Conditions

The 2010 / 2011 investigation confirmed the expected ground conditions, in that, beneath a moderate thickness of made ground, comprising brown silty gravelly clay with brick fragments, which extended to depths of between 0.90 m and 1.40 m, London Clay was encountered and proved to the full depth investigated of 25.45 m. The London Clay initially comprised a naturally reworked layer of brown gravelly clay, extending to depths of 2.9 m and 4.30 m in Borehole Nos 1

and 2 respectively, whereupon firm becoming stiff mottled brown clay was encountered to depths of 7.40 m and 9.40 m respectively. Stiff becoming very stiff grey fissured clay was encountered below the brown clay and extended to the full depth investigated of 25.45 m. A claystone was encountered in Borehole No 1 at 7.40 m.

For the basis of the piles designs the following levels have been assumed:

Top of Made Ground 45.00m AOD

Top of London Clay = 43.60m AOD

The Pile Logs shall be checked whilst undertaking the piling to check the levels established in the borehole. Any discrepancies shall be reported to the adjoining surveyors.

5. Monitoring

Monitoring shall be implemented by Galcross Engineering prior to works commencing in accordance with the Monitoring Proposal in appendix A.

Galcross an independent surveying company and the results shall be issued as soon as possible after the survey has been completed.

6. Piling adjacent to 75/77 Party Wall

Details of the proposed pile designs can be found in appendix E. A Klemm 702 piling rig shall be utilized to install all the contiguous piles within the development and the pile wall section 1 and 2 which are within the closest proximity to the 77 PW (See appendix E for rig details).

All concrete for the project is to be delivered to site ready mixed.

The piles to the contiguous wall are to be formed from 450mm diameter piles in accordance with the approved design.

Methodology

- 1) Track rig into pile positions with mast in rest position.
- 2) Manoeuvre rig as close to required pile position as possible. Shut off/lock track controls.
- 3) Operate hydraulic control and pivot drill mast into vertical mode. Once in vertical position raise/lower drill mast so that mast foot/drill guide is firmly seated on ground.
- 4) Hydraulically adjust rig with rams, or pack to underside of track gear to ensure rig and mast are vertical.
- 5) Check mast foot for adequate bearing on ground.
- 6) Raise rotation gearbox and motors to top of mast (full travel).

- 7) Offer 1.0m section of 508mm temporary casing into clamp guide foot. Lower drilling head into tread and rotate backwards until tight and connected. Rotate backwards and apply downward pressure and drill casing into the soils. Disconnect drilling head by clamping the casing and rotate the drilling head forwards, once disconnected engage lift and pull the gearbox upwards.
- 8) Offer 1.0m section of 450mm auger into clamped casing, lower rotation unit and engage drive flange/spigot into lead auger flight. Insert fail-safe locking pins between drive flange/auger flight. Check mast/augers for verticality. When connecting sectional augers using manual handling techniques.
- 9) Rotate auger flights clockwise at same time as feeding rotation unit downwards and drill auger into casing, this will clear any soils within the steel casing tube.
- 10) Disconnect drive flange from auger and raise drilling head and mast, insert further 1.0 metre sections of auger, insert fail safe locking pin between the 2 sections of auger. Engage drive flange and drilling head, rotate the augers forward and express them into the soils with extreme torque and minimum rotation to prevent flighting of the soils. Disconnect drive head and lift mast and drilling head.

REPEAT THE ABOVE STEPS UNTIL THE PILE IS AUGERED TO THE DESIGN DEPTH.

- 14) Once depth is attained, retrieve augers connect drilling head to augers and lift upwards until 1.0m section of auger is exposed above the installed casing, insert auger retrieval plate, lower drilling head until the weight is carried on the plate and casings, disconnect fail safe locking pin, lift drilling head and remove auger. Repeat this process until all the augers have been retrieved.
- 15) Clear any remaining spoils from around the pile, and remove the piling rig.
- 16) Check depth of pile and record.
- 17) Once the pile depth and verticality has been approved introduce the designed reinforcement into the bore and fix accordingly. Place concrete and fill bore until pile is full to piling platform level. Lower drive head unit, connect to casing and retract the casings rotating backwards. Clamp the now exposed 1.0m section of casing and undo by rotating forwards, disconnect from drive head and remove. Visually inspect that the concrete has not slumped beyond 500mm if it has top the concrete up. Repeat this process until all the casings have been retrieved from the now completed bore. Place protective board over pile head to prevent site personal from coming into contact with pile.
- 18) Track rig onto next pile position. Repeat set up and drilling procedure.

Please note that all of KBL piling rigs are fully compliant with the HSE guidance for Mini-piling. All of our machines have an interlocking safety cage. Once the interlocking cage is opened the rig realises reduced rotating speed, reduced feed speed and a hold to run controls.

The rigs also have Emergency Stop switches fitted. Both the Guard and the switches are tested at the start of every shift to ensure they are in full working order, this is then recorded on the weekly inspection sheet, or if a fault is located it is reported to Head Office immediately, and piling is ceased until the fault is fixed.

When piling adjacent to the garden walls then arisings shall not be allowed to build up against/in front of the wall. Piles shall be completed in a hit and miss sequence with every third pile

INTRODUCTION OF REINFORCEMENT INTO OPEN BORE

- 1) Inform Certified Banks man of which cage needs to be introduced first.
- 2) Connect lifting chains to the top part of the first reinforcement cage.
- 3) Lift Reinforcement cage up via the excavator machine Arm and manoeuvre to the open bore.
- 4) Place the designed spacers onto the helical cage, ensure they are free to move.
- 5) Introduce cage into open bore and lower.
- 6) Place bar across the casing and through the cage to allow disconnection of lifting chains, ensure that the required amount of splice is projecting.
- 7) Man oeuvre certified machine to connect onto additional reinforcement cage.
- 8) Lift cage and manoeuvre over to the exposed splice.
- 9) Very carefully lower reinforcement cage so that splices are joined.
- 10) Connect splice bars together with bull dog grips, torque the nuts so that the cages are tight and prevent any slippage. Offer plastic spacers to the cage to ensure the cage stays central within the bore when lowering.
- 11) Repeat the introduction of reinforcement until the required/designed amount is installed
- 12) Once the last cage has been introduced offer the foam De-bonding to the top bars and secure with cable ties.

Pile Logs and record of reinforcement shall be kept for all piles. All piles are to be integrity tested at cut off level prior to casting the capping beam or slabs.

7. Installation of temporary propping Top Down Piles

The internal piles and the contiguous piled wall shall be installed by the same Klemm 702 piling rig. 6 number temporary internal top down piles shall be installed for existing ground level. The internal piles shall be 450mm in diameter with the contiguous pile wall at 450mm diameter. The internal bearing piles will be installed from lower level once the basement excavation reaches 36.00m.

The piles shall be set out by the engineer before being drilled to full depth. The auger shall then be extracted and the pile formed as outline in section 6 above.

8. Basement Formation

With the piling complete the perimeter piles shall be trimmed down to their cut off levels. The 6 number internal piles utilized for the temporary propping shall be trimmed down to their pile cap level and the pile cap formed. All piles shall be integrity tested at prior to placing reinforcing.

The permanent capping beam to the perimeter contiguous pile wall shall be formed throughout in line with KBL temporary work design attached within appendix D. The capping beam has been design to span between the props in the temporary case to support the top of the piled wall during the basement formation.

The First level of Propping is to be installed to the wall section 1 and 2 (pile design reference within appendix D) adjacent to 77AR at 44.500m AOD. Excavation is to be controlled to ensure that the ground is not over excavated prior to the prop installation. Props are to be supported at top down pile/interface as shown on drawing Kb365-PR-701 within appendix F.

Propping drawings and calculations can be found in appendix F.

The ground can then be reduced to 41.00m AOD and the next level of temporary propping at 41.900m.

The ground can then be reduced to 36.000m AOD to allow the installation of the internal bearing piles. With the piling complete the ground will be reduced to main sub-basement formation at which time the drainage and sumps shall be installed.

With the sub-basement slab cast the Car Stacker pit shall be formed at (35.000m).

The liner walls and internal vertical structure can be completed up to ground floor level in line with the sequence outlines in section 2 above an the detailed KBL construction sequence drawing within appendix G. With the permanent structure formed up to GF level and given sufficient time to cure the high propping just below GF slab will be removed.

The Internal temporary 6 top down piles shall be cut down in small sections and removed from site before making good the basement and sub-basement slab.

9. External Works and Landscaping

With the structure complete the landscaping shall be completed to the rear.

Monitoring shall continue monthly for 3 months until all movement has ceased.

10. Emergency Contacts

Emergency contacts during the development are:

John Knight: 07939 016007
Gabriel Knight: 07961 020975
James Chalmers 07939 015994

APPENDIX A - Monitoring Proposal
Galcross Movement Monitoring Proposal
Rev D 01/11/18



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75 Avenue road monitoring proposal

75 Avenue Road

Monitoring proposal

Issued 01/11/2018

Rev D

Knight Build



1. INTRODUCTION

The purpose of this proposal is to put forward a monitoring system that will measure the effects that the excavation and basement construction activity may have on the neighbouring structures.

The monitoring will consist of the following items:

- 3D Reflective Targets;

2. INSTALLATION

2.1 Control

Monitoring control station will be established around site perimeter, from which the monitoring targets will be surveyed. The coordinate system will be specific to the monitoring, unless instructed otherwise.

Additional survey targets for control will be placed on surrounding structures outside of the site's zone of influence and these points will be accurately fixed in the 3-dimensional plane. Their positions will be determined during the establishment of the primary control. Access and permission to install these points will have to be provided by others.

These targets will be used to establish station coordinates prior the commencement of each survey. Their coordinates will be calculated using the resection method calculated within the instrument. This method of control establishment allows for accurate control to be determined without having to rely on a fixed station position in close proximity to site

Two rounds of readings are to be taking minimum to establish baseline readings before any work commences



2.2 Reflective Targets

Reflective survey targets will be installed as per the drawings issued to Galcross.

Front Elevation





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EXTERNAL WALL



Approximate target locations

Targets are indicative a drawing is to be produced once installed

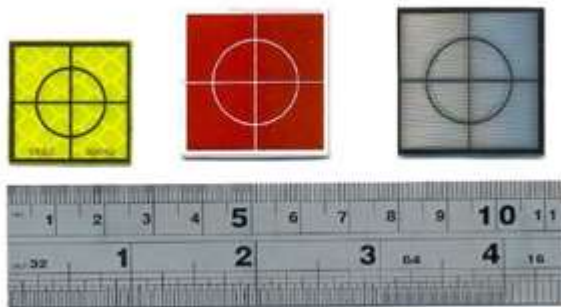
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2.3 Levels

The reflective targets will be giving levels as well as easting and northing values to record the vertical movement in the front and rear facades of the building

Examples of targets to be used



3. MONITORING

3.1 Targets

A resection which shoots a minimum of two points records the angles by a module built into the instrument. The instrument then will display any error on the screen, the targets placed on the building will then be shot using the EDM and the results recorded both on the system and manually

The 3d target monitoring provides a $\pm 1\text{mm}$ accuracy

4. FREQUENCY AND DURATION OF READINGS

The monitoring frequency is set to:



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- weekly – during excavation and basement works (up to and including casting of the ground floor slab)*
- Monthly – after completion of the ground works and basement construction

* During the critical excavation and basement works monitoring readings shall be taken twice weekly if Amber trigger alarm reached

5. TRIGGER VALUES

Trigger values for Vertical movement have been set as follow:

Underpinning

Amber 5mm

Red 10mm

Underpinning to Party Walls:

Amber 5mm

Red 10mm

Temporary Works to superstructure:

Amber 5mm

Red 10mm

Ground Movements during construction:

Amber 5mm

Red 10mm

Trigger values for Lateral movement have been set as follows:

Underpinning

Amber 5mm

Red 10mm

Underpinning to Party Walls:

Amber 5mm

Red 10mm



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Temporary Works to superstructure:

Amber 5mm

Red 10mm

Ground Movements during construction:

Amber 5mm

Red 10mm

6. REPORTS

The measurements are to be taken as per the proposed frequency at regular intervals and the results will be issued to the main contractor every Monday.

The readings are to be put into a table format with graphical data; the report will have the following information:

- Date of survey
- Easting's, northing's and level
- Movement in the easting's northing and levels in mm
- Movement from the baseline
- Movement from the last reading

If a trigger value is reached in the report the following is to happen

Amber - If the Amber trigger level is reached the engineers will attend site to inspect the area locally for signs of new defects such as hairline cracking. If no new defects are reported then work can proceed. Should new defects be visible then the contractor should stop works in these areas, and the defects should be recorded with photos and distributed to the project and checking engineers for comment. The contractor should await instructions prior to proceeding in the associated area.

Red -If the Red trigger level is reached the contractor is to stop works putting in place any measures to prevent further movement. The project and temporary works engineers are to be informed and proposals put forward to limit further movements during the construction



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7. INSTRUMENTATION

Leica 1200+series

Leica TPS1200+ Series



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Leica TPS1200+

Technical specifications and system features



Models and options

	TC	TCI	TCRM	TIA	TCP	TCRA	TCRP
Angle measurement	*	*	*	*	*	*	*
Distance measurement (IR-Mode)	*	*	*	*	*	*	*
PinPoint reflectorless dist. measur. (RL-Mode)		*	*			*	*
Motorized			*	*	*	*	*
Automatic Target Recognition (ATR)				*	*	*	*
PowerSearch (PS)					*	*	*
Guide Light (EGL)	*	*	*	*	*	*	*
Remote Control Unit / Radiohandle	*	*	*	*	*	*	*
GL574 Laser Guide				*		*	
SmartStation (AD1.230+ CR55)	*	*	*	*	*	*	*

* = Standard * = Optional

Angle measurement

		Type 1201+	Type 1202+	Type 1203+	Type 1205+
Accuracy (std.dev. ISO 17123-3)	ls, V	1" (0.3 mgon)	2" (0.6 mgon)	3" (1 mgon)	5" (1.5 mgon)
	Display resolution	0.1" (0.1 mgon)	0.1" (0.1 mgon)	0.1" (0.1 mgon)	0.1" (0.1 mgon)
Method		absolute, continuous, diametrical			
Compensator	Working range	± (0.07 gon)	± (0.07 gon)	± (0.07 gon)	± (0.07 gon)
	Setting accuracy	0.2" (0.2 mgon)	0.3" (0.2 mgon)	1.0" (0.1 mgon)	1.5" (0.3 mgon)
	Method	centralized dual axis compensator			

Distance measurement (IR-Mode)

Range (always atmospheric conditions)	Round prism (CPR1)	3000 m
	300° reflector (CR20)	1500 m
	Mini prism (CM7001)	1200 m
	Reflective tape (60 mm x 60 mm)	250 m
	Shortest measurable distance	1.5 m
Accuracy / Measurement time (standard deviation, ISO 17123-4)	Standard mode	1 mm + 1.5 ppm / App. 2.6 s
	Fast mode	3 mm + 1.5 ppm / App. 0.8 s
	Tracking mode	3 mm + 1.5 ppm / App. < 0.13 s
	Display resolution	0.1 mm
Method	Special phase shift analyzer (cosine, visible red laser)	

PinPoint R400/R1000 reflectorless distance measurement (RL-Mode)

Range (always atmospheric conditions)	PinPoint R400	400 m / 200 m (Kodak Gray Card: 90% reflective / 18% reflective)
	PinPoint R1000	1000 m / 500 m (Kodak Gray Card: 90% reflective / 18% reflective)
	Shortest measurable distance	1.5 m
Accuracy / Measurement time (standard deviation, ISO 17123-4)	Long Range for round prism (CPR1)	1000 m - 7500 m
	Reflectorless < 500 m	2 mm + 2 ppm / App. 3 - 6 s, max. 12 s
	Reflectorless > 500 m	6 mm + 2 ppm / App. 3 - 6 s, max. 12 s
	Long Range	5 mm + 2 ppm / App. 2.5 s, max. 12 s
Laser dot size	At 30 m:	approx. 7 mm x 10 mm



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Automatic Target Recognition (ATR)

	Range ATR mode / LOCK mode (average atmospheric conditions)	Round prism (GPR1): 1000 m / 800 m 360° reflector (GZ26, GZ122): 600 m / 500 m Mini prism (GM1001): 500 m / 400 m Reflective tape (60 mm x 60 mm): 50 m (175 ft) Shortest measurable distance: 1.5 m / 5 m
	Accuracy / Measure time (std. dev. ISO 17123-3)	ATR angle accuracy (az, V): 1" (0.1 mgon) Base positioning accuracy: ± 1mm Measure time for GPR1: 3 - 4 s
	Maximum speed (LOCK mode)	Tangential (standard mode): 5 m / s at 20 m, 25 m / s at 100 m Radial (tracking mode): 4 m / s
	Method	Digital image processing (laser beam)

PowerSearch (PS)

	Range (average atmospheric conditions)	Round prism (GPR1): 300 m 360° reflector (GZ26, GZ122): 300 m (perfectly aligned to instrument) Mini prism (GM1001): 100 m Shortest distance: 3 m
	Search time	Typical search time: < 10 s
	Maximum speed	Rotating speed: 45° / s
Method	Digital signal processing (rotating laser fan)	

Guide Light (EGL)

	Range (average atmospheric conditions)	Working range: 5 m - 100 m
	Accuracy	Positioning accuracy: 5 cm at 100 m

General data

	Telescope		Laser plummet	
	Magnification:	30 x	Centering accuracy:	1.5 mm at 1.5 m
	Eye objective aperture:	40 mm	Laser dot diameter:	2.5 mm at 1.5 m
	Field of view:	1°10' (1.66 gon) / 2.7 m at 100 m	Endless drives	
	Focusing range:	1.7 m to infinity	Number of drives:	1 horizontal / 1 vertical
	Keyboard and Display		Battery (GEB221)	
	Display:	1/4 VGA (320*240 pixels), graphic LCD, colour, illumination, touch screen	Type:	Lithium-ion
	Keyboard:	36 keys (12 function keys, 12 alphanumeric keys), illumination	Voltage:	7.4V
	Angle display:	360° / °, 360° decimal, 600 gon, 4/800 rad, V/N	Capacity:	4.4Ah
	Distance display:	metric, int. ft, int. ft/inch, US ft, US ft/inch	Operating time:	typ. 5 - 8h
	Position:	face / standard / face II optional	Weights	
	Data storage		Total station:	4.8 - 5.5 kg
Internal memory:	256 MB (optional)	Battery (GEB221):	0.2 kg	
Memory card:	CompactFlash cards (256 MB)	Tribrach (GDF121):	0.8 kg	
Number of data records:	1750 / MB	Environmental specifications		
Interfaces:	RS232, Bluetooth® Wireless Technology (optional)	Working temperature range:	-20° C to +50° C	
Circular level		Storage temperature range:	-40° C to +70° C	
Sensitivity:	0 / 2 mm	Dust / water (IP 60529):	IP54	
		Humidity:	95 % non-condensing	

Remote Control Unit (RX1250T/C)

	Communication	Wi integrated radio modem
	Control unit	Display: 1/4 VGA (320*240 pixels), graphic LCD, touch screen, illumination Keyboard: 32 keys (12 function keys, 40 alphanumeric keys), illumination Interface: RS232
Battery (GEB111)	Type:	Lithium-ion
	Voltage:	7.4V
	Capacity:	2.2Ah
	Operating time:	RX1250T: typ. 9h, RX1250Tc: typ. 8h