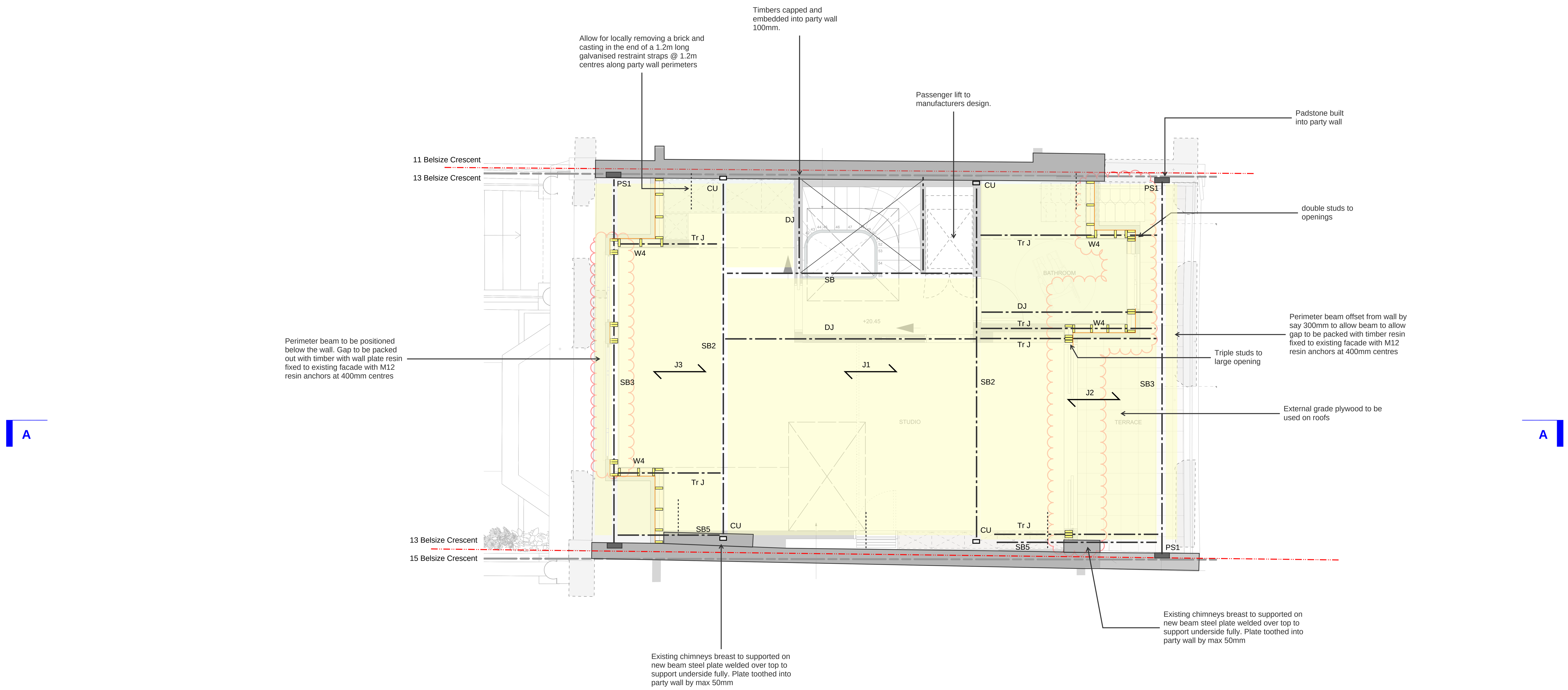
Movement and Tolerance
The architect should allow for :
+ Suspended Concrete floor slabs: 25mm to 30mm vertical deflections (TBC following development of floor finishes)
+ Beams: 20mm to 25mm deflection for total vertical deflections (TBC following development of floor finishes)
+ Floor joists: 10 to 15mm deflection for total vertical settlement (TBC following development of floor finishes)
+/- 10mm for construction tolerance

Assumed Fire Strategy for Structure (TBC by Architect)
+ All steelwork to be intumescent painted to achieve required 30 min fire resistance
+ All concrete will be designed to provide a minimum of 30 minutes
+ Timber joisted floors to be fire protected by boarding - spec to architects details
+ Exposed timber framing to be designed to provide a minimum of 30minute fire resistance through design for charring by SE.



Proposed 3rd Floor Plan

Notes:
1. Do not scale from these drawings
2. All dimensions to be checked on site by contractor
3. Drawing to be read in conjunction with general notes drawing
4. Where discrepancy occurs between specification and drawing, Engineer to be notified immediately
5. Temporary words design, method statement and construction sequence to be determined by contractor
6. Where discrepancy occurs between drawings and findings on site, Engineer to be notified immediately
7. Contractor may allow for splicing of steelwork to aid erection if necessary, final design by contractor, to be coordinated with BC Structural Design.
8. Refer to architects details for fire protection of all elements
9. All foundations assumed to be founded a minimum of 1.0m BGL on natural undisturbed ground – to be checked by Building Control or an Approved Inspector – assumed bearing capacity – 100kN/m2. If adjacent to existing foundation, excavation to be stepped at 45degrees to avoid undermining. Foundations to be 450mm deep MC and a minimum of 450mm wide UNO.
10. All setting out to Architects information

Proposed Member Reference Table:

Beam Schedule (Low Level)
SB1 - 260x90x35 PFC S275
SB2 - 254x254x73 UC S275
SB3 - 254x146x43 UB S275
SB4 - 254x146x31 UB S275
SB5 - 152x89x16UB S275
SB6 - 305x305x118UC S275
TB1 - 3no. 170x47 C24 timbers bolted together w/ M16 @400mm centres
CB1 - 500mm dp x 750mm wide (C40/50)

Lintel & Padstone Schedule
P1 - 330x100x100 concrete padstone

Column and Wall Schedule
SC1 - 160x80x8 RHS S355
SC2 - 254x254x73UC S275

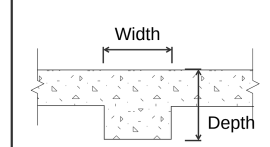
W1 - Min 350mm thk RC retaining wall (C32/40)
W1a - 500mm thk RC retaining wall (C32/40)
W2 - 250mm thick RC liner wall (C32/40)
W3 - 200mm thick RC liner wall (C32/40)
W4 - Cavity wall 100mm block (7.3N), 100mm brick (20N)
Ties in accordance with general notes
W5 - 150x50 C24 timber studs @ 400mm centres
All stud walls to have 12mm ply board to external face

Floor Schedule
J1 - 225x50 C24 timber joists @ 350mm centres
J2 - 225x50 C24 timber joists @ 400mm centres
J3 - 175x50 C24 timber joists @ 400mm centres
J4 - 150x50 C25 timber joists @ 400mm centres
All floor joists to have 18mm ply over.

S1 - 300mm thick Water resistant RC slab (Sika additive or similar approved) (C32/40)
S2 - 460mm thick Water resistant RC slab (Sika additive or similar approved) (C32/40)
S3 - 500mm thick Water resistant RC slab (Sika additive or similar approved) (C32/40)
S4 - 200mm thick RC slab (C32/40)

Symbols Key
Denotes moment connection
Denotes floor span
Denotes rafter span

Denotes use of Cordex Cellcore HSx Heave Protection - 160mm thk - below basement slab



Typical Downstand Beam Dimension

Abbreviations
J"x" - Timber Joist Floor
DJ - Double Joists bolted together
TrJ - Triple Joists bolted together
TB"x" - Timber Beam
TC"x" - Timber Column
S"x" - Floor Slab
W"x" - Wall type
SB"x" - Steel Beam
SC"x" - Steel Column
CB"x" - Concrete Beam
CC"x" - Concrete Column
L"x" - Lintel over
PS"x" - Concrete padstone
CU - Column Under

BAKER STRUCTURAL DESIGN CHATTERTON

Email:
Alex@BCStructural.co.uk
Dylan@BCStructural.co.uk

WEB:
www.BCStructural.co.uk

Project:
13 Belsize Crescent

Drawing Title:
Proposed 3rd Floor Plan

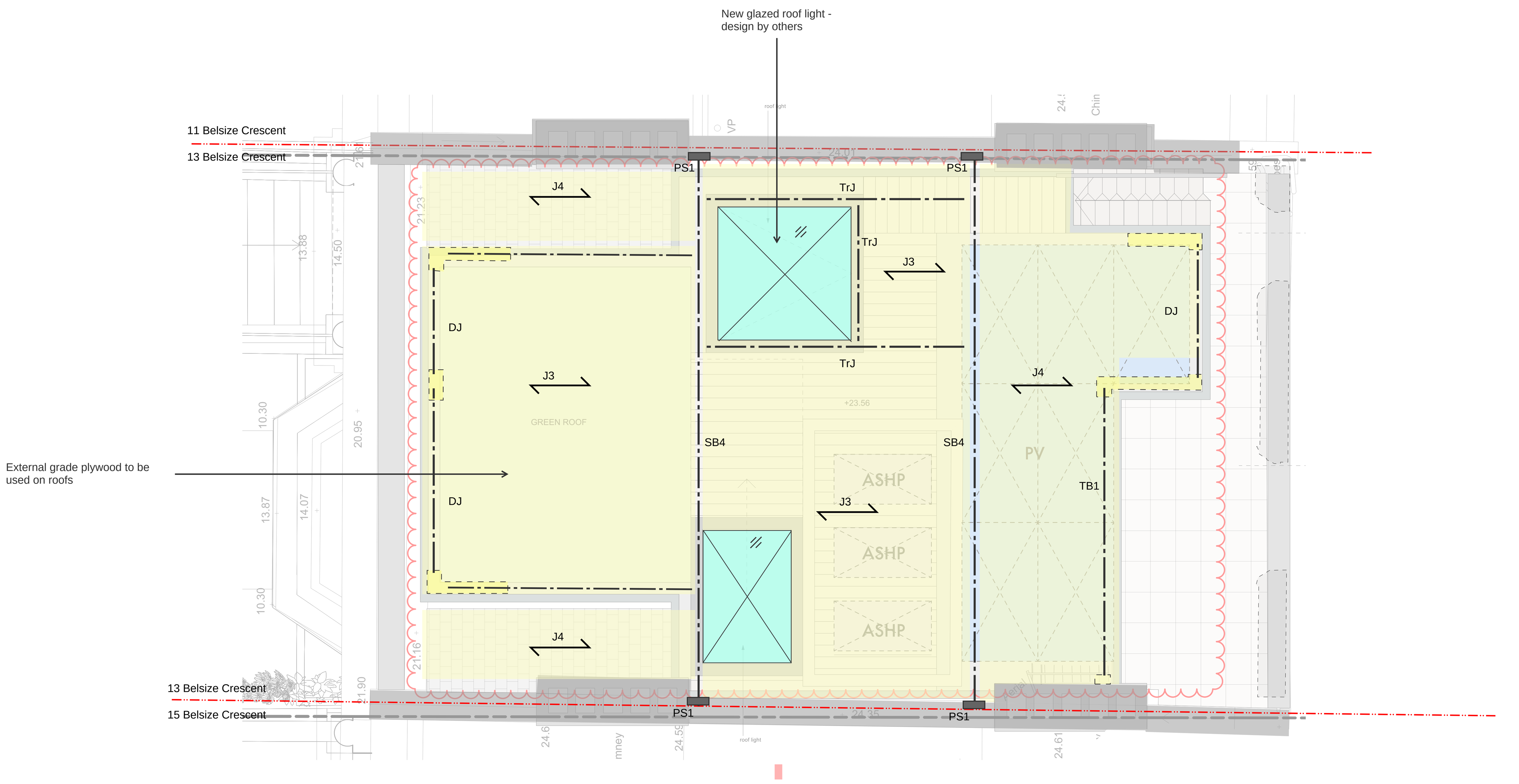
Drawing Number:
J225-BC-SK-3130

Issued: **03.23** Drawn by: **DJC**

Rev: **P4** Scale: **NTS**

Movement and Tolerance
The architect should allow for :
+ Suspended Concrete floor slabs: 25mm to 30mm vertical deflections (TBC following development of floor finishes)
+ Beams: 20mm to 25mm deflection for total vertical deflections (TBC following development of floor finishes)
+ Floor joists: 10 to 15mm deflection for total vertical settlement (TBC following development of floor finishes)
+/- 10mm for construction tolerance

Assumed Fire Strategy for Structure (TBC by Architect)
+ All steelwork to be intumescent painted to achieve required 30 min fire resistance
+ All concrete will be designed to provide a minimum of 30 minutes
+ Timber joisted floors to be fire protected by boarding - spec to architects details
+ Exposed timber framing to be designed to provide a minimum of 30minute fire resistance through design for charring by SE.



Proposed Roof Plan

Notes:
1. Do not scale from these drawings
2. All dimensions to be checked on site by contractor
3. Drawing to be read in conjunction with general notes drawing
4. Where discrepancy occurs between specification and drawing, Engineer to be notified immediately
5. Temporary words design, method statement and construction sequence to be determined by contractor
6. Where discrepancy occurs between drawings and findings on site, Engineer to be notified immediately
7. Contractor may allow for splicing of steelwork to aid erection if necessary, final design by contractor, to be coordinated with BC Structural Design.
8. Refer to architects details for fire protection of all elements
9. All foundations assumed to be founded a minimum of 1.0m BGL on natural undisturbed ground – to be checked by Building Control or an Approved Inspector – assumed bearing capacity – 100kN/m2. If adjacent to existing foundation, excavation to be stepped at 45degrees to avoid undermining. Foundations to be 450mm deep MC and a minimum of 450mm wide UNO.
10. All setting out to Architects information

Proposed Member Reference Table:

Beam Schedule (Low Level)
SB1 - 260x90x35 PFC S275
SB2 - 254x254x73 UC S275
SB3 - 254x146x43 UB S275
SB4 - 254x146x31 UB S275
SB5 - 152x89x16UB S275
SB6 - 305x305x118UC S275
TB1 - 3no. 170x47 C24 timbers bolted together w/ M16 @400mm centres
CB1 - 500mm dp x 750mm wide (C40/50)

Lintel & Padstone Schedule
P1 - 330x100x100 concrete padstone

Column and Wall Schedule
SC1 - 160x80x8 RHS S355
SC2 - 254x254x73UC S275

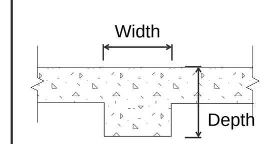
W1 - Min 350mm thk RC retaining wall (C32/40)
W1a - 500mm thk RC retaining wall (C32/40)
W2 - 250mm thick RC liner wall (C32/40)
W3 - 200mm thick RC liner wall (C32/40)
W4 - Cavity wall 100mm block (7.3N), 100mm brick (20N)
Ties in accordance with general notes
W5 - 150x50 C24 timber studs @ 400mm centres
All stud walls to have 12mm ply board to external face

Floor Schedule
J1 - 225x50 C24 timber joists @ 350mm centres
J2 - 225x50 C24 timber joists @ 400mm centres
J3 - 175x50 C24 timber joists @ 400mm centres
J4 - 150x50 C25 timber joists @ 400mm centres
All floor joists to have 18mm ply over.

S1 - 300mm thick Water resistant RC slab (Sika additive or similar approved) (C32/40)
S2 - 460mm thick Water resistant RC slab (Sika additive or similar approved) (C32/40)
S3 - 500mm thick Water resistant RC slab (Sika additive or similar approved) (C32/40)
S4 - 200mm thick RC slab (C32/40)

Symbols Key
Denotes moment connection
Denotes floor span
Denotes rafter span

Denotes use of Cordex Cellcore HSx Heave Protection - 160mm thk - below basement slab



Typical Downstand Beam Dimension

Abbreviations
J"x" - Timber Joist Floor
DJ - Double Joists bolted together
TrJ - Triple Joists bolted together
TB"x" - Timber Beam
TC"x" - Timber Column
S"x" - Floor Slab
W"x" - Wall type
SB"x" - Steel Beam
SC"x" - Steel Column
CB"x" - Concrete Beam
CC"x" - Concrete Column
L"x" - Lintel over
PS"x" - Concrete padstone
CU - Column Under

BAKER CHATTERTON STRUCTURAL DESIGN

Email:
Alex@BCStructural.co.uk
Dylan@BCStructural.co.uk

WEB:
www.BCStructural.co.uk

Project:
13 Belsize Crescent

Drawing Title:
Proposed Roof Plan

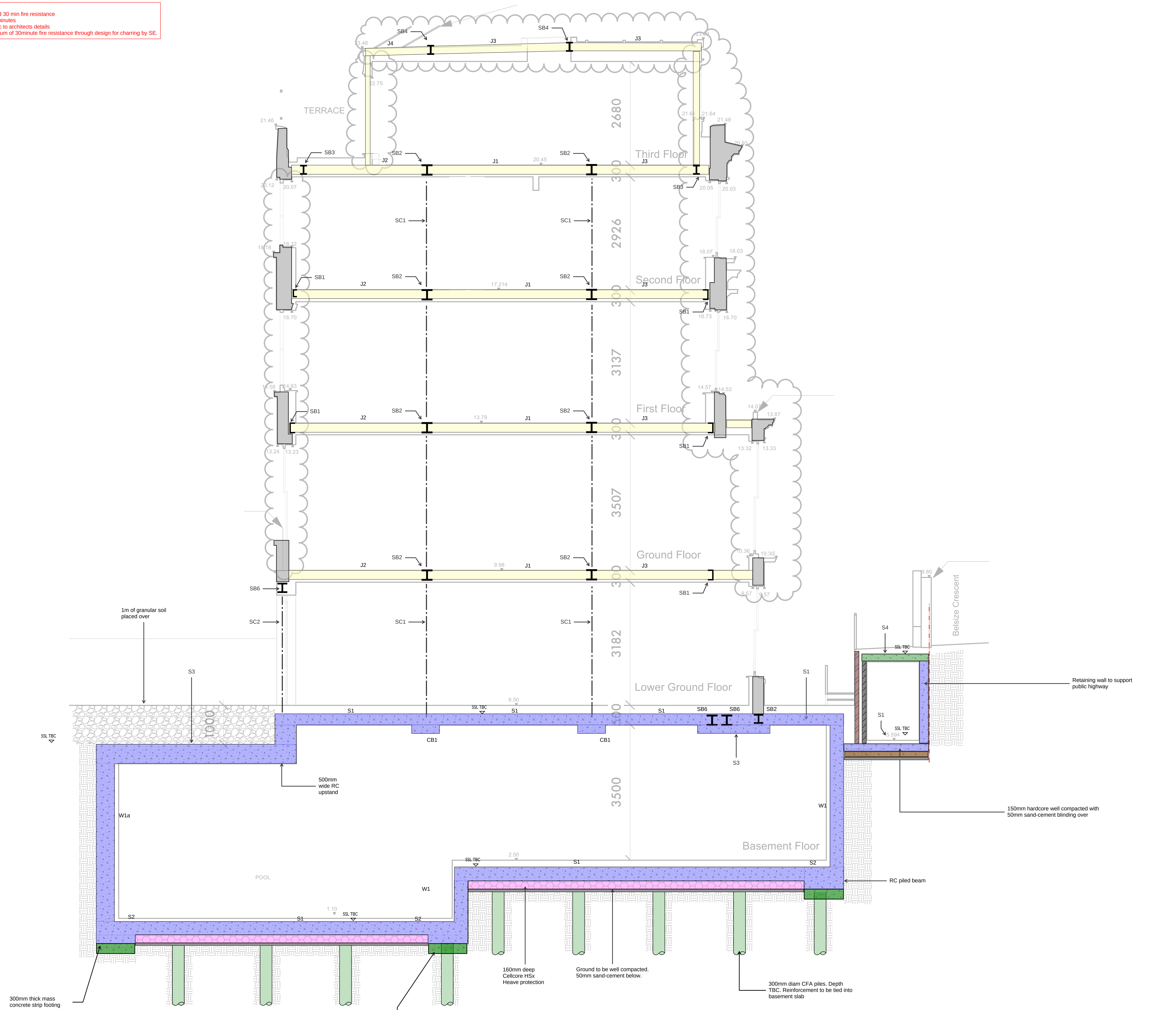
Drawing Number:
J225-BC-SK-3140

Issued: **03.23** Drawn by: **DJC**

Rev: **P4** Scale: **NTS**

Movement and Tolerance
The architect should allow for :
+ Suspended Concrete floor slabs: 25mm to 30mm vertical deflections (TBC following development of floor finishes)
+ Beams: 20mm to 25mm deflection for total vertical deflections (TBC following development of floor finishes)
+ Floor joists: 10 to 15mm deflection for total vertical settlement (TBC following development of floor finishes)
+/- 10mm for construction tolerance

Assumed Fire Strategy for Structure (TBC by Architect)
+ All steelwork to be intumescent painted to achieve required 30 min fire resistance
+ All concrete will be designed to provide a minimum of 30 minutes
+ Timber joisted floors to be fire protected by boarding - spec to architects details
+ Exposed timber framing to be designed to provide a minimum of 30minute fire resistance through design for charring by SE.



Proposed Section A-A

Notes:
1. Do not scale from these drawings
2. All dimensions to be checked on site by contractor
3. Drawing to be read in conjunction with general notes drawing
4. Where discrepancy occurs between specification and drawing, Engineer to be notified immediately
5. Temporary words design, method statement and construction sequence to be determined by contractor
6. Where discrepancy occurs between drawings and findings on site, Engineer to be notified immediately
7. Contractor may allow for splicing of steelwork to aid erection if necessary, final design by contractor, to be coordinated with BC Structural Design.
8. Refer to architects details for fire protection of all elements
9. All foundations assumed to be founded a minimum of 1.0m BGL on natural undisturbed ground – to be checked by Building Control or an Approved Inspector – assumed bearing capacity – 100kN/m2. If adjacent to existing foundation, excavation to be stepped at 45degrees to avoid undermining. Foundations to be 450mm deep MC and a minimum of 450mm wide UNO.
10. All setting out to Architects information

Proposed Member Reference Table:

Beam Schedule (Low Level)
SB1 - 260x90x35 PFC S275
SB2 - 254x254x73 UC S275
SB3 - 254x146x43 UB S275
SB4 - 254x146x31 UB S275
SB5 - 152x89x16UB S275
SB6 - 305x305x118UC S275
TB1 - 3no. 170x47 C24 timbers bolted together w/ M16 @400mm centres
CB1 - 500mm dp x 750mm wide (C40/50)

Lintel & Padstone Schedule
P1 - 330x100x100 concrete padstone

Column and Wall Schedule
SC1 - 160x80x8 RHS S355
SC2 - 254x254x73UC S275

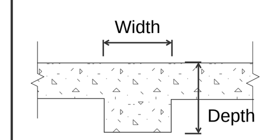
W1 - Min 350mm thk RC retaining wall (C32/40)
W1a - 500mm thk RC retaining wall (C32/40)
W2 - 250mm thick RC liner wall (C32/40)
W3 - 200mm thick RC liner wall (C32/40)
W4 - Cavity wall 100mm block (7.3N), 100mm brick (20N)
Ties in accordance with general notes
W5 - 150x50 C24 timber studs @ 400mm centres
All stud walls to have 12mm ply board to external face

Floor Schedule
J1 - 225x50 C24 timber joists @ 350mm centres
J2 - 225x50 C24 timber joists @ 400mm centres
J3 - 175x50 C24 timber joists @ 400mm centres
J4 - 150x50 C25 timber joists @ 400mm centres
All floor joists to have 18mm ply over.

S1 - 300mm thick Water resistant RC slab (Sika additive or similar approved) (C32/40)
S2 - 460mm thick Water resistant RC slab (Sika additive or similar approved) (C32/40)
S3 - 500mm thick Water resistant RC slab (Sika additive or similar approved) (C32/40)
S4 - 200mm thick RC slab (C32/40)

Symbols Key
Denotes moment connection
Denotes floor span
Denotes rafter span

Denotes use of Cordex Cellcore HSx Heave Protection - 160mm thk - below basement slab



Typical Downstand Beam Dimension

Abbreviations
J"x" - Timber Joist Floor
DJ - Double Joists bolted together
TrJ - Triple Joists bolted together
TB"x" - Timber Beam
TC"x" - Timber Column
S"x" - Floor Slab
W"x" - Wall type
SB"x" - Steel Beam
SC"x" - Steel Column
CB"x" - Concrete Beam
CC"x" - Concrete Column
L"x" - Lintel over
PS"x" - Concrete padstone
CU - Column Under

BAKER CHATTERTON STRUCTURAL DESIGN

Email:
Alex@BCStructural.co.uk
Dylan@BCStructural.co.uk

WEB:
www.BCStructural.co.uk

Project:
13 Belsize Crescent

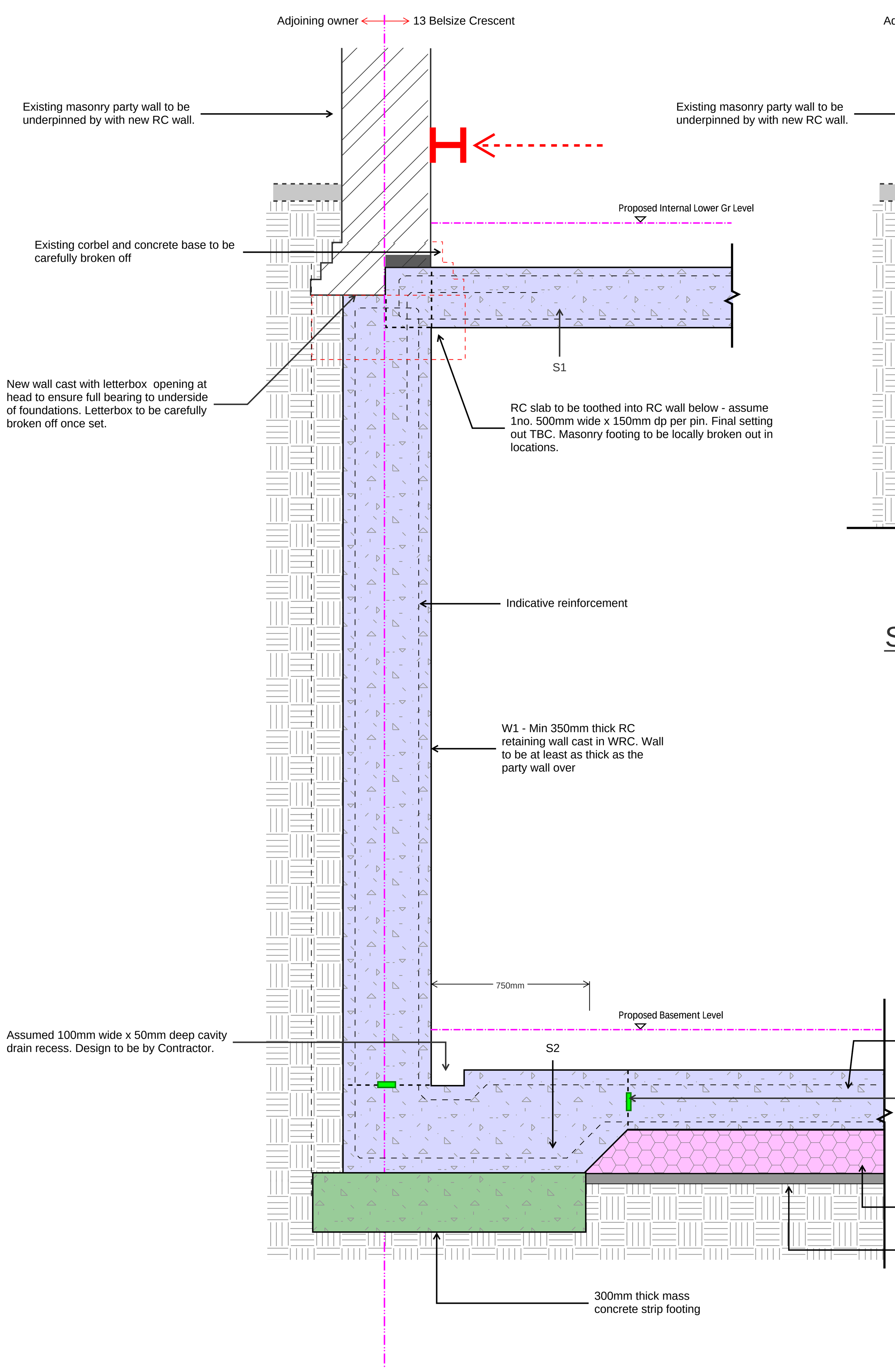
Drawing Title:
Proposed Section A-A

Drawing Number:
J225-BC-SK-3200

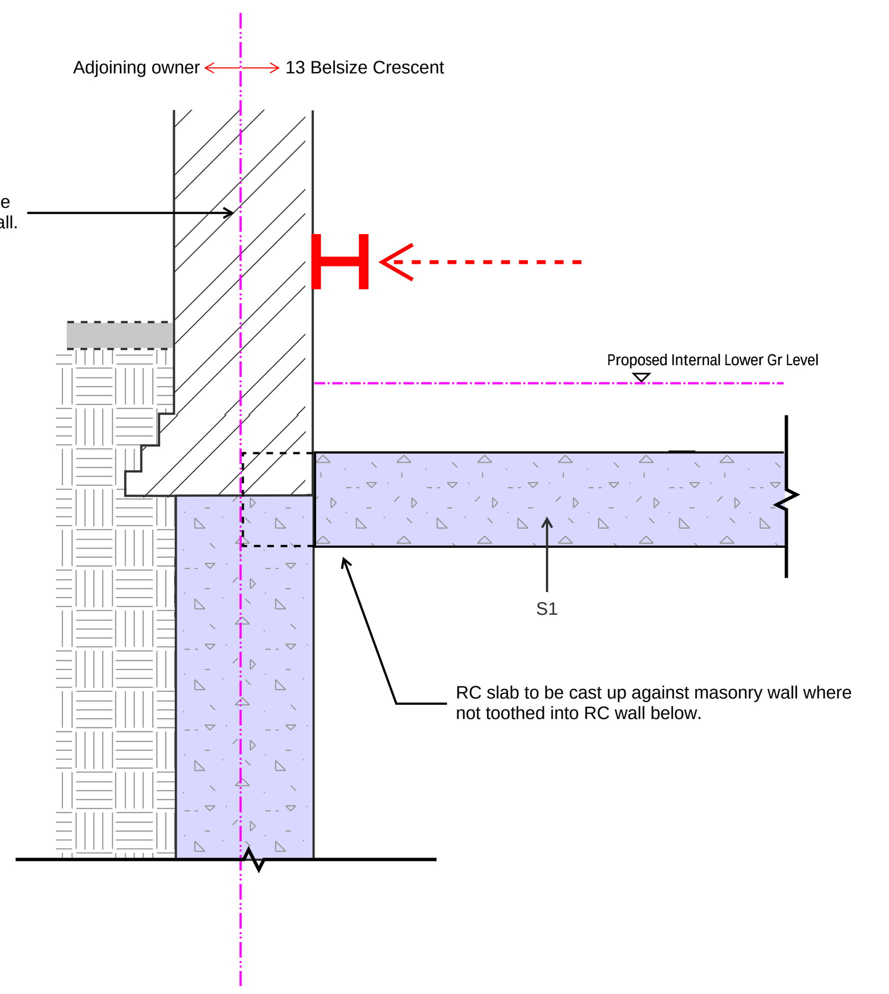
Issued: **03.23** Drawn by: **DJC**

Rev: **P4** Scale: **NTS**

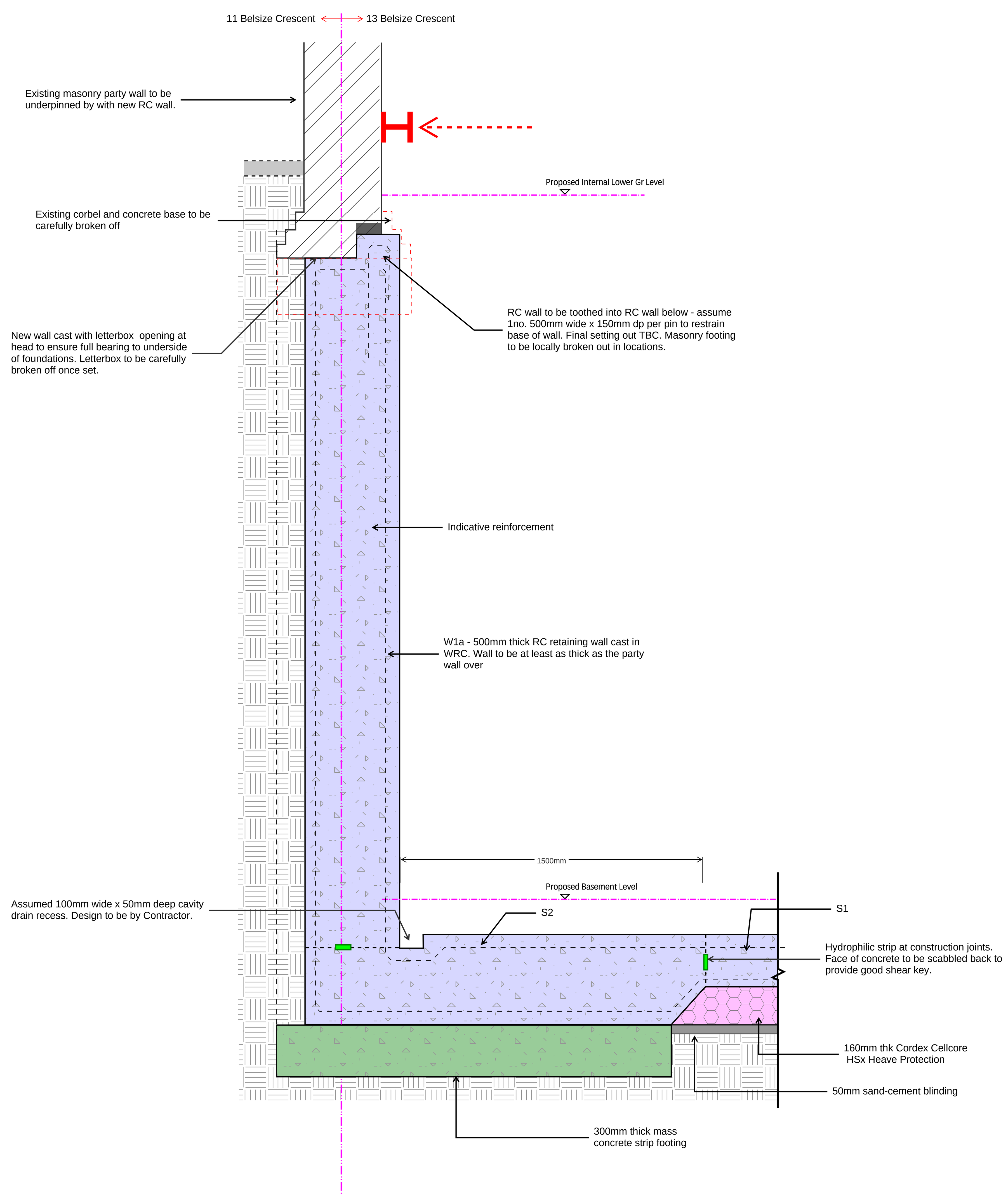
Existing structure assumptions based on limited opening up works. Existing structure to be verified on site. Contractor to notify engineer if the existing arrangements vary from that shown.



Section 1 - Typical Party Wall Section



Section 1a - Typical Pocket Detail



Section 2 - Party Wall Section Thru Stair

Notes:
1. Do not scale from these drawings
2. All dimensions to be checked on site by contractor
3. Drawing to be read in conjunction with general notes drawing
4. Where discrepancy occurs between specification and drawing, Engineer to be notified immediately
5. Temporary words design, method statement and construction sequence to be determined by contractor
6. Where discrepancy occurs between drawings and findings on site, Engineer to be notified immediately
7. Contractor may allow for splicing of steelwork to aid erection if necessary, final design by contractor, to be coordinated with BC Structural Design.
8. Refer to architects details for fire protection of all elements
9. All foundations assumed to be founded a minimum of 1.0m BGL on natural undisturbed ground – to be checked by Building Control or an Approved Inspector – assumed bearing capacity – 100kN/m2. If adjacent to existing foundation, excavation to be stepped at 45degrees to avoid undermining. Foundations to be 450mm deep MC and a minimum of 450mm wide UNO.
10. All setting out to Architects information

Proposed Member Reference Table:

Beam Schedule (Low Level)
SB1 - 260x90x35 PFC S275
SB2 - 254x254x73 UC S275
SB3 - 254x146x43 UB S275
SB4 - 254x146x31 UB S275
SB5 - 152x89x16UB S275
SB6 - 305x305x118UC S275
TB1 - 3no. 170x47 C24 timbers bolted together w/ M16 @400mm centres
CB1 - 500mm dp x 750mm wide (C40/50)

Lintel & Padstone Schedule
P1 - 330x100x100 concrete padstone

Column and Wall Schedule
SC1 - 160x80x8 RHS S355
SC2 - 254x254x73UC S275

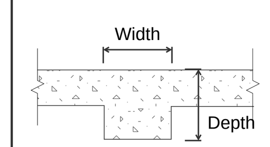
W1 - Min 350mm thk RC retaining wall (C32/40)
W1a - 500mm thk RC retaining wall (C32/40)
W2 - 250mm thick RC liner wall (C32/40)
W3 - 200mm thick RC liner wall (C32/40)
W4 - Cavity wall 100mm block (7.3N), 100mm brick (20N)
Ties in accordance with general notes
W5 - 150x50 C24 timber studs @ 400mm centres
All stud walls to have 12mm ply board to external face

Floor Schedule
J1 - 225x50 C24 timber joists @ 350mm centres
J2 - 225x50 C24 timber joists @ 400mm centres
J3 - 175x50 C24 timber joists @ 400mm centres
J4 - 150x50 C25 timber joists @ 400mm centres
All floor joists to have 18mm ply over.

S1 - 300mm thick Water resistant RC slab (Sika additive or similar approved) (C32/40)
S2 - 460mm thick Water resistant RC slab (Sika additive or similar approved) (C32/40)
S3 - 500mm thick Water resistant RC slab (Sika additive or similar approved) (C32/40)
S4 - 200mm thick RC slab (C32/40)

Symbols Key
Denotes moment connection
Denotes floor span
Denotes rafter span

Denotes use of Cordex Cellcore HSx Heave Protection - 160mm thk - below basement slab



Typical Downstand Beam Dimension

Abbreviations
J"x" - Timber Joist Floor
DJ - Double Joists bolted together
TrJ - Triple Joists bolted together
TB"x" - Timber Beam
TC"x" - Timber Column
S"x" - Floor Slab
W"x" - Wall type
SB"x" - Steel Beam
SC"x" - Steel Column
CB"x" - Concrete Beam
CC"x" - Concrete Column
L"x" - Lintel over
PS"x" - Concrete padstone
CU - Column Under

BAKER CHATTERTON STRUCTURAL DESIGN

Email:
Alex@BCStructural.co.uk
Dylan@BCStructural.co.uk

WEB:
www.BCStructural.co.uk

Project:
13 Belsize Crescent

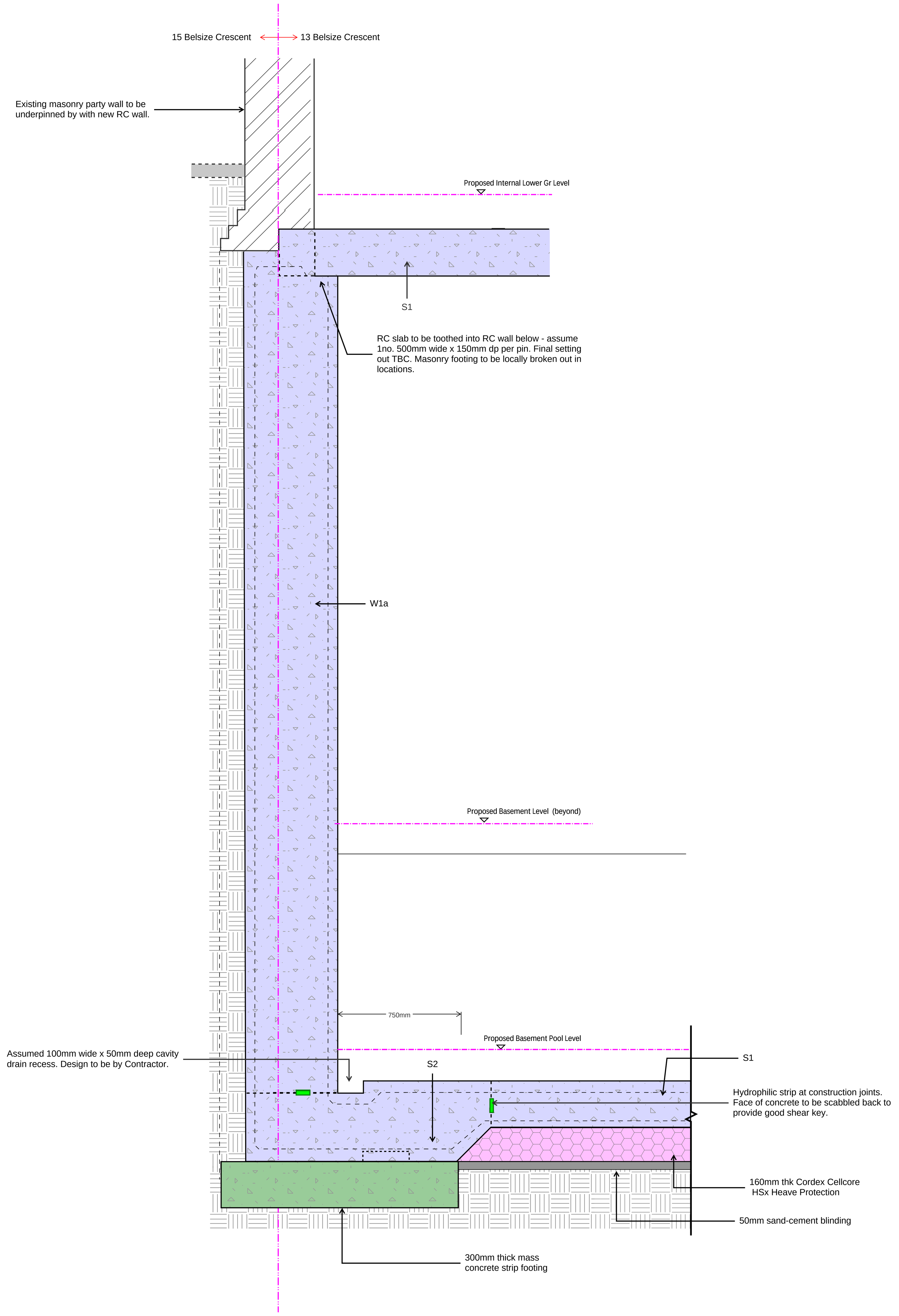
Drawing Title:
Proposed Details Sheet 01

Drawing Number:
J225-BC-SK-3301

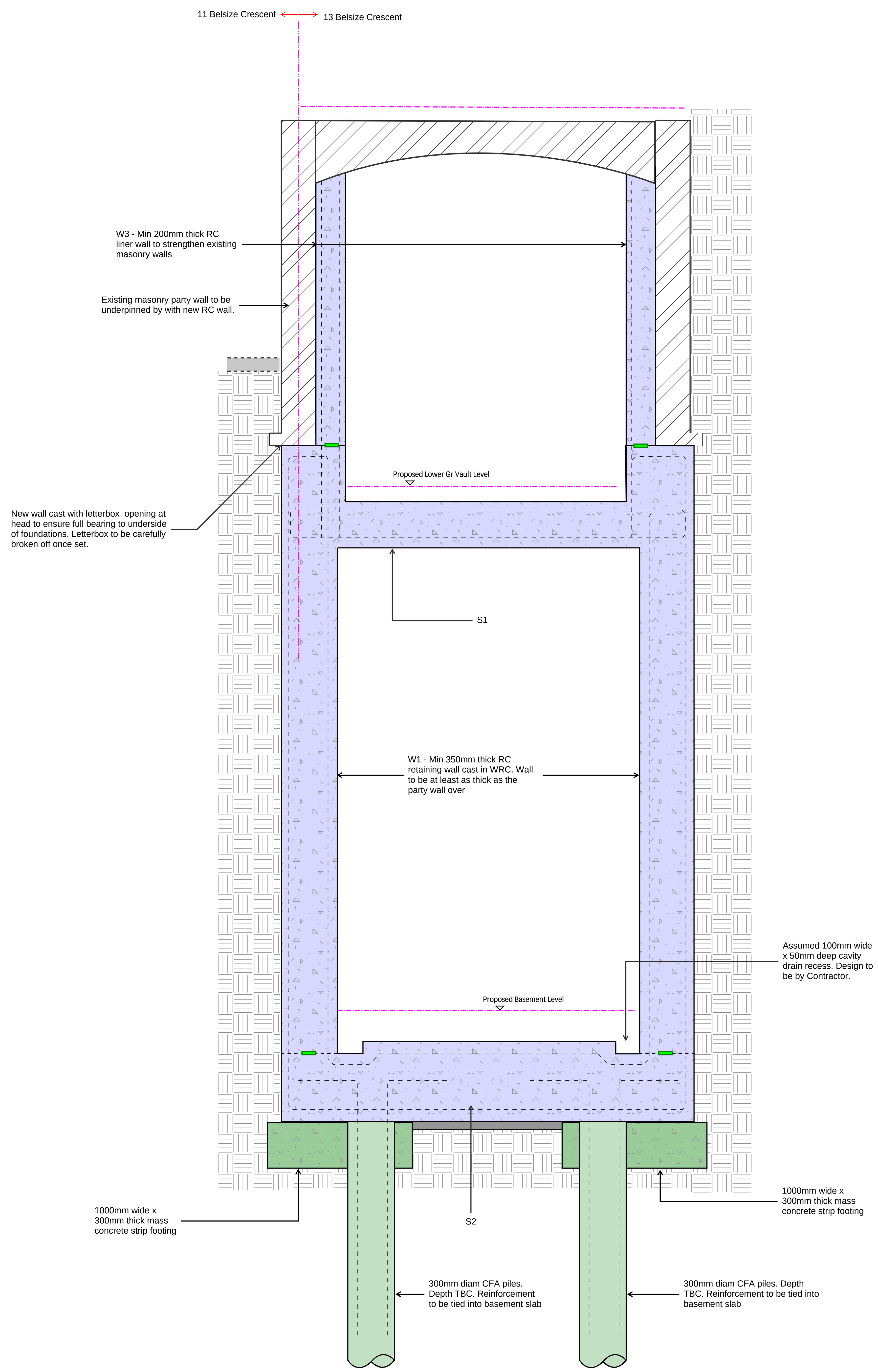
Issued: **03.23** Drawn by: **DJC**

Rev: **P4** Scale: **NTS**

Existing structure assumptions based on limited opening up works. Existing structure to be verified on site. Contractor to notify engineer if the existing arrangements vary from that shown.



Section 3 - Party Wall Section Thru Lowered Slab



Section 4 - Party Wall Section Thru Vault Boundary with 11 Belsize Crescent

Notes:

1. Do not scale from these drawings
2. All dimensions to be checked on site by contractor
3. Drawing to be read in conjunction with general notes drawing
4. Where discrepancy occurs between specification and drawing, Engineer to be notified immediately
5. Temporary words design, method statement and construction sequence to be determined by contractor
6. Where discrepancy occurs between drawings and findings on site, Engineer to be notified immediately
7. Contractor may allow for splicing of steelwork to aid erection if necessary, final design by contractor, to be coordinated with BC Structural Design.
8. Refer to architects details for fire protection of all elements
9. All foundations assumed to be founded a minimum of 1.0m BGL on natural undisturbed ground – to be checked by Building Control or an Approved Inspector – assumed bearing capacity – 100kN/m2. If adjacent to existing foundation, excavation to be stepped at 45degrees to avoid undermining. Foundations to be 450mm deep MC and a minimum of 450mm wide UNO.
10. All setting out to Architects information

Proposed Member Reference Table:

Beam Schedule (Low Level)
SB1 - 260x90x35 PFC S275
SB2 - 254x254x73 UC S275
SB3 - 254x146x43 UB S275
SB4 - 254x146x31 UB S275
SB5 - 152x89x16UB S275
SB6 - 305x305x118UC S275
TB1 - 3no. 170x47 C24 timbers bolted together w/ M16 @400mm centres
CB1 - 500mm dp x 750mm wide (C40/50)

Lintel & Padstone Schedule
P1 - 330x100x100 concrete padstone

Column and Wall Schedule
SC1 - 160x80x8 RHS S355
SC2 - 254x254x73UC S275

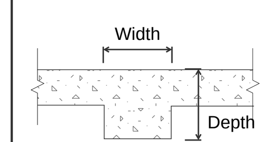
W1 - Min 350mm thk RC retaining wall (C32/40)
W1a - 500mm thk RC retaining wall (C32/40)
W2 - 250mm thick RC liner wall (C32/40)
W3 - 200mm thick RC liner wall (C32/40)
W4 - Cavity wall 100mm block (7.3N), 100mm brick (20N)
Ties in accordance with general notes
W5 - 150x50 C24 timber studs @ 400mm centres
All stud walls to have 12mm ply board to external face

Floor Schedule
J1 - 225x50 C24 timber joists @ 350mm centres
J2 - 225x50 C24 timber joists @ 400mm centres
J3 - 175x50 C24 timber joists @ 400mm centres
J4 - 150x50 C25 timber joists @ 400mm centres
All floor joists to have 18mm ply over.

S1 - 300mm thick Water resistant RC slab (Sika additive or similar approved) (C32/40)
S2 - 460mm thick Water resistant RC slab (Sika additive or similar approved) (C32/40)
S3 - 500mm thick Water resistant RC slab (Sika additive or similar approved) (C32/40)
S4 - 200mm thick RC slab (C32/40)

Symbols Key
Denotes moment connection
Denotes floor span
Denotes rafter span

Denotes use of Cordex Cellcore HSx Heave Protection - 160mm thk - below basement slab



Typical Downstand Beam Dimension

Abbreviations
J"x" - Timber Joist Floor
DJ - Double Joists bolted together
TrJ - Triple Joists bolted together
TB"x" - Timber Beam
TC"x" - Timber Column
S"x" - Floor Slab
W"x" - Wall type
SB"x" - Steel Beam
SC"x" - Steel Column
CB"x" - Concrete Beam
CC"x" - Concrete Column
L"x" - Lintel over
PS"x" - Concrete padstone
CU - Column Under

BAKER CHATTERTON STRUCTURAL DESIGN

Email:
Alex@BCStructural.co.uk
Dylan@BCStructural.co.uk

WEB:
www.BCStructural.co.uk

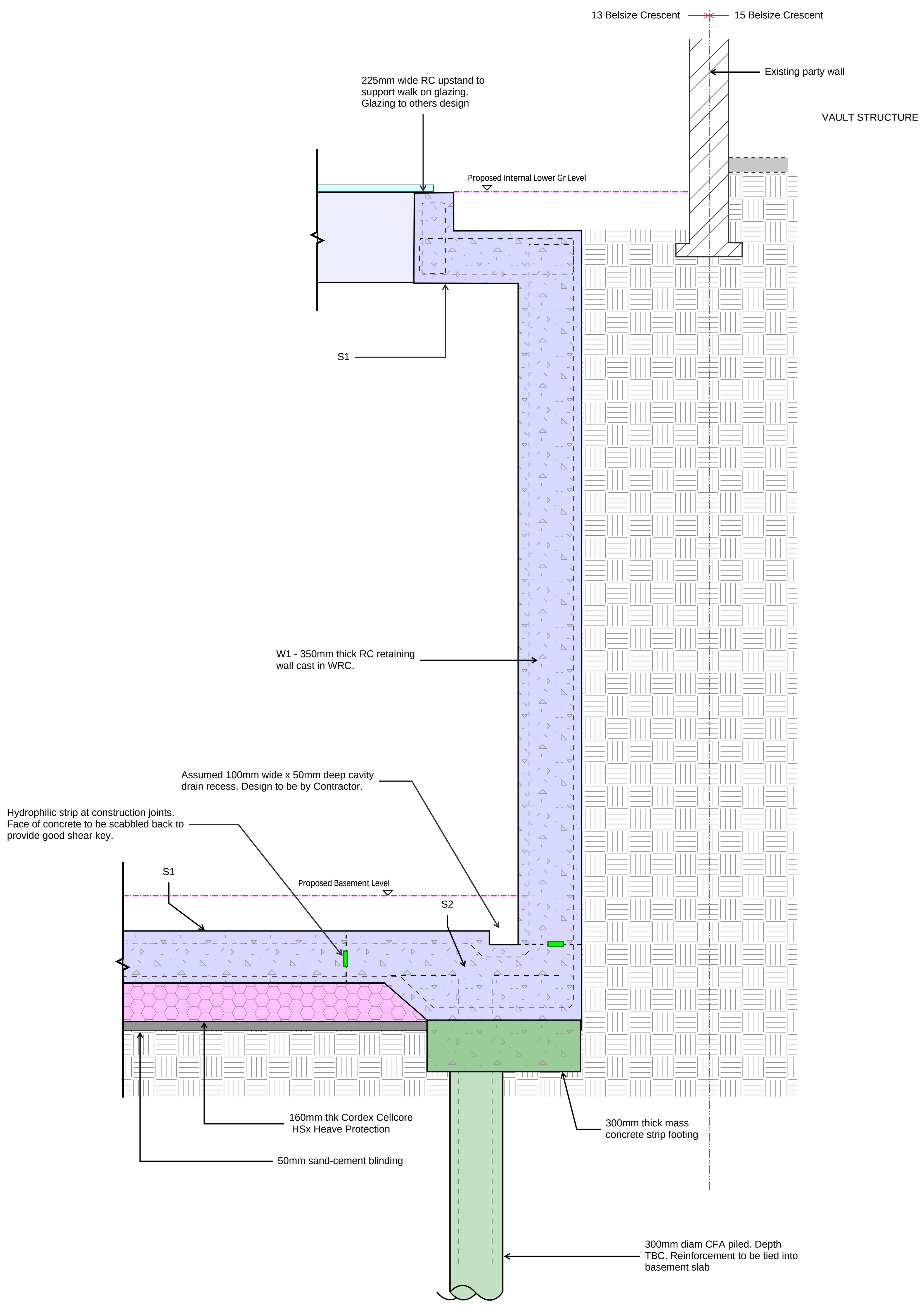
Project:
13 Belsize Crescent

Drawing Title:
Proposed Details Sheet 02

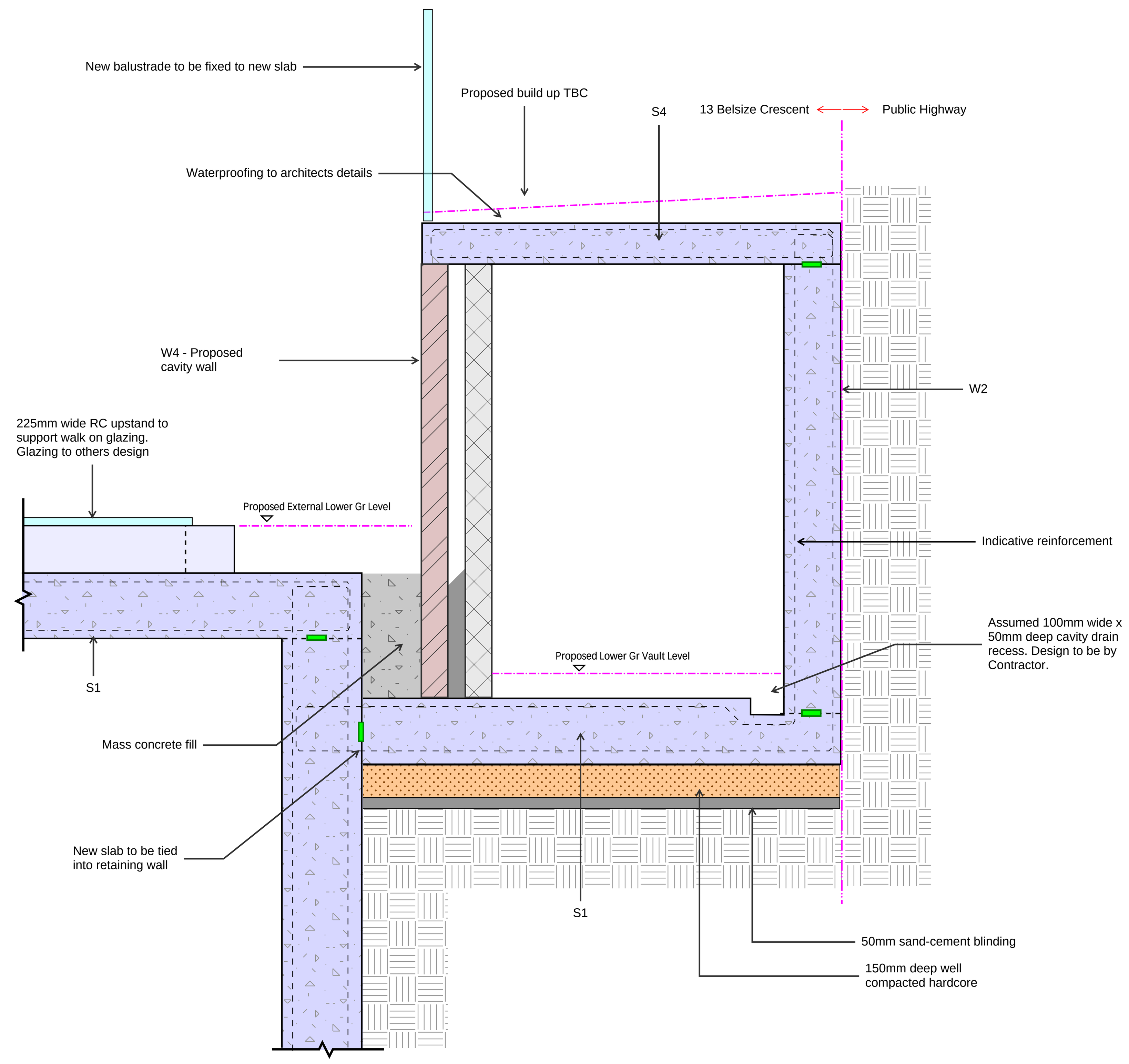
Drawing Number:
J225-BC-SK-3302

Issued: **03.23** Drawn by: **DJC**

Rev: **P4** Scale: **NTS**



Section 5
Stepped Back Boundary Wall with 15 Belsize Crescent



Section 6
Highways Retaining Wall Detail

Notes:
1. Do not scale from these drawings
2. All dimensions to be checked on site by contractor
3. Drawing to be read in conjunction with general notes drawing
4. Where discrepancy occurs between specification and drawing, Engineer to be notified immediately
5. Temporary words design, method statement and construction sequence to be determined by contractor
6. Where discrepancy occurs between drawings and findings on site, Engineer to be notified immediately
7. Contractor may allow for splicing of steelwork to aid erection if necessary, final design by contractor, to be coordinated with BC Structural Design.
8. Refer to architects details for fire protection of all elements
9. All foundations assumed to be founded a minimum of 1.0m BGL on natural undisturbed ground – to be checked by Building Control or an Approved Inspector – assumed bearing capacity – 100kN/m2. If adjacent to existing foundation, excavation to be stepped at 45degrees to avoid undermining. Foundations to be 450mm deep MC and a minimum of 450mm wide UNO.
10. All setting out to Architects information

Proposed Member Reference Table:

Beam Schedule (Low Level)
SB1 - 260x90x35 PFC S275
SB2 - 254x254x73 UC S275
SB3 - 254x146x43 UB S275
SB4 - 254x146x31 UB S275
SB5 - 152x89x16UB S275
SB6 - 305x305x118UC S275
TB1 - 3no. 170x47 C24 timbers bolted together w/ M16 @400mm centres
CB1 - 500mm dp x 750mm wide (C40/50)

Lintel & Padstone Schedule
P1 - 330x100x100 concrete padstone

Column and Wall Schedule
SC1 - 160x80x8 RHS S355
SC2 - 254x254x73UC S275

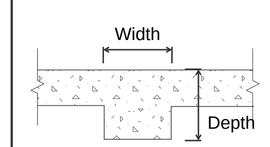
W1 - Min 350mm thk RC retaining wall (C32/40)
W1a - 500mm thk RC retaining wall (C32/40)
W2 - 250mm thick RC liner wall (C32/40)
W3 - 200mm thick RC liner wall (C32/40)
W4 - Cavity wall 100mm block (7.3N), 100mm brick (20N)
Ties in accordance with general notes
W5 - 150x50 C24 timber studs @ 400mm centres
All stud walls to have 12mm ply board to external face

Floor Schedule
J1 - 225x50 C24 timber joists @ 350mm centres
J2 - 225x50 C24 timber joists @ 400mm centres
J3 - 175x50 C24 timber joists @ 400mm centres
J4 - 150x50 C25 timber joists @ 400mm centres
All floor joists to have 18mm ply over.

S1 - 300mm thick Water resistant RC slab (Sika additive or similar approved) (C32/40)
S2 - 460mm thick Water resistant RC slab (Sika additive or similar approved) (C32/40)
S3 - 500mm thick Water resistant RC slab (Sika additive or similar approved) (C32/40)
S4 - 200mm thick RC slab (C32/40)

Symbols Key
Denotes moment connection
Denotes floor span
Denotes rafter span

Denotes use of Cordex Cellcore HSx Heave Protection - 160mm thk - below basement slab



Typical Downstand Beam Dimension

Abbreviations
J"x" - Timber Joist Floor
DJ - Double Joists bolted together
TrJ - Triple Joists bolted together
TB"x" - Timber Beam
TC"x" - Timber Column
S"x" - Floor Slab
W"x" - Wall type
SB"x" - Steel Beam
SC"x" - Steel Column
CB"x" - Concrete Beam
CC"x" - Concrete Column
L"x" - Lintel over
PS"x" - Concrete padstone
CU - Column Under

BAKER CHATTERTON STRUCTURAL DESIGN

Email:
Alex@BCStructural.co.uk
Dylan@BCStructural.co.uk

WEB:
www.BCStructural.co.uk

Project:
13 Belsize Crescent

Drawing Title:
Proposed Details Sheet 03

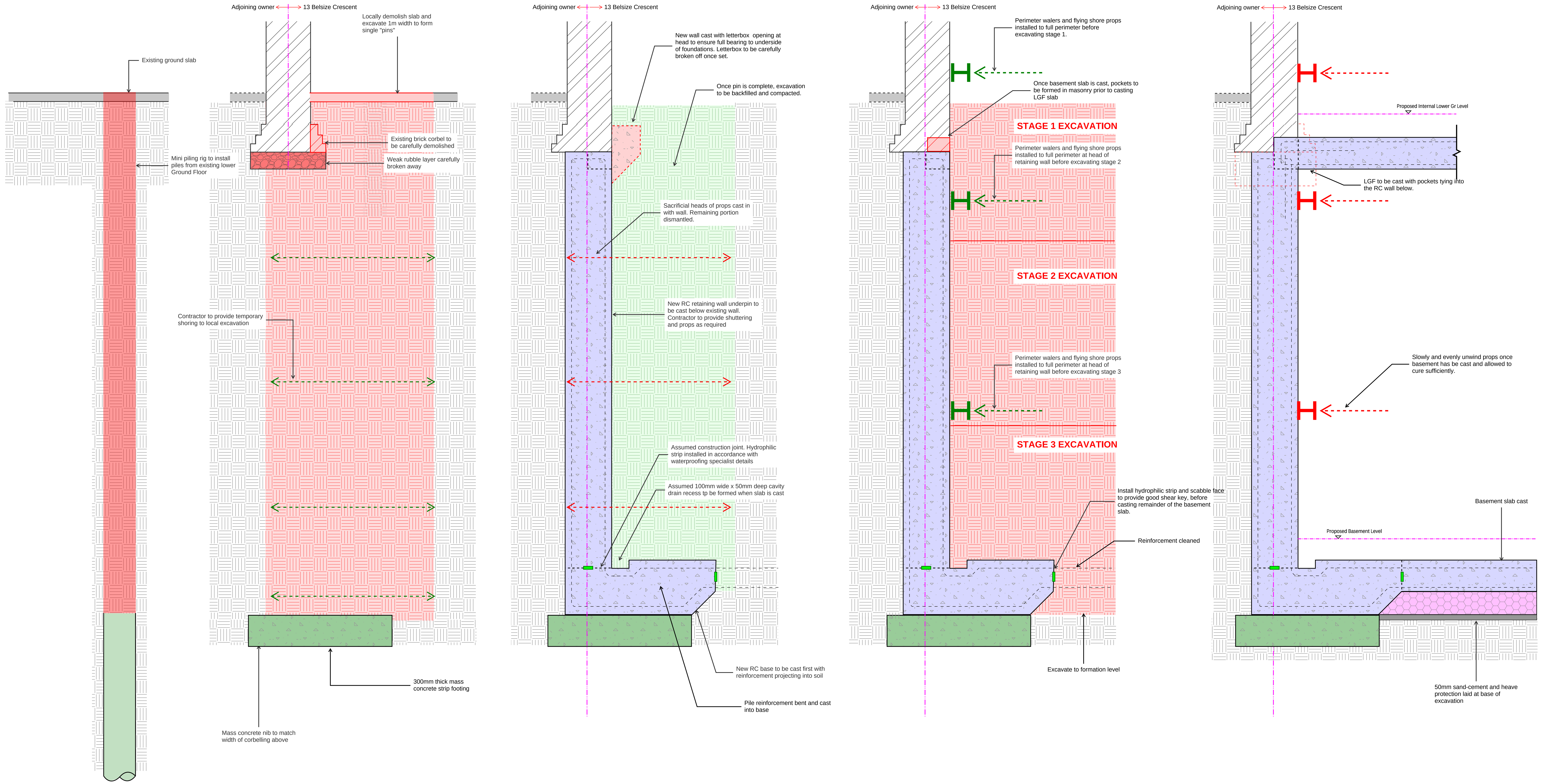
Drawing Number:
J225-BC-SK-3303

Issued: **03.23** Drawn by: **DJC**

Rev: **P4** Scale: **NTS**

Appendix B – Indicative Sequence of Works Drawings

Existing structure assumptions based on limited opening up works. Existing structure to be verified on site. Contractor to notify engineer if the existing arrangements vary from that shown.



Phase 1

1.1 - Install pile foundations from LGF at locations indicated on plan

Phase 2

2.1 - Excavate pin, installing temporary props as you go
2.2 - Demolish the corbel and remove concrete/rubble base
2.3 - Cast mass concrete strip footing

Phase 3

3.1 - Install reinforcement for base and cast
3.2 - Install reinforcement for retaining wall and cast
3.3 - Break back the letter box overpour
3.4 - Backfill excavation compacting and removing props as you go

Phase 4

4.1 - Install walers and shores to masonry wall
4.2 - Excavate Stage 1 and install the next row of temporary props
4.3 - Excavate Stage 2 and install the next row of temporary props
4.4 - Excavate Stage 3 to formation level
4.5 - Break out pockets for LGF slab within party wall

Phase 5

5.1 - Install reinforcement to remaining basement slab and cast
5.2 - Install reinforcement to LGF slab with backpropping off of LGF slab
5.3 - Once cured slowly unwind temporary propping to perimeter walls.

Proposed Underpinning Sequence To Party Walls

All final temporary works designs and methodologies to be the responsibility of the chosen Contractor.

Notes:
1. Do not scale from these drawings
2. All dimensions to be checked on site by contractor
3. Drawing to be read in conjunction with general notes drawing
4. Where discrepancy occurs between specification and drawing, Engineer to be notified immediately
5. Temporary words design, method statement and construction sequence to be determined by contractor
6. Where discrepancy occurs between drawings and findings on site, Engineer to be notified immediately
7. Contractor may allow for splicing of steelwork to aid erection if necessary, final design by contractor, to be coordinated with BC Structural Design.
8. Refer to architects details for fire protection of all elements
9. All foundations assumed to be founded a minimum of 1.0m BGL on natural undisturbed ground – to be checked by Building Control or an Approved Inspector – assumed bearing capacity – 100kN/m2. If adjacent to existing foundation, excavation to be stepped at 45degrees to avoid undermining. Foundations to be 450mm deep MC and a minimum of 450mm wide UNO.
10. All setting out to Architects information

Proposed Member Reference Table:

Beam Schedule (Low Level)
SB1 - 260x90x35 PFC S275
SB2 - 254x254x73 UC S275
SB3 - 254x146x43 UB S275
SB4 - 254x146x31 UB S275
SB5 - 152x89x16UB S275
SB6 - 305x305x118UC S275
TB1 - 3no. 170x47 C24 timbers bolted together w/ M16 @400mm centres
CB1 - 500mm dp x 750mm wide (C40/50)

Lintel & Padstone Schedule
P1 - 330x100x100 concrete padstone

Column and Wall Schedule
SC1 - 160x80x8 RHS S355
SC2 - 254x254x73UC S275

W1 - Min 350mm thk RC retaining wall (C32/40)
W1a - 500mm thk RC retaining wall (C32/40)
W2 - 250mm thick RC liner wall (C32/40)
W3 - 200mm thick RC liner wall (C32/40)
W4 - Cavity wall 100mm block (7.3N), 100mm brick (20N)
Ties in accordance with general notes
W5 - 150x50 C24 timber studs @ 400mm centres
All stud walls to have 12mm ply board to external face

Floor Schedule
J1 - 225x50 C24 timber joists @ 350mm centres
J2 - 225x50 C24 timber joists @ 400mm centres
J3 - 175x50 C24 timber joists @ 400mm centres
J4 - 150x50 C25 timber joists @ 400mm centres
All floor joists to have 18mm ply over.

S1 - 300mm thick Water resistant RC slab (Sika additive or similar approved) (C32/40)
S2 - 460mm thick Water resistant RC slab (Sika additive or similar approved) (C32/40)
S3 - 500mm thick Water resistant RC slab (Sika additive or similar approved) (C32/40)
S4 - 200mm thick RC slab (C32/40)

BAKER CHATTERTON STRUCTURAL DESIGN

Email:
Alex@BCStructural.co.uk
Dylan@BCStructural.co.uk

WEB:
www.BCStructural.co.uk

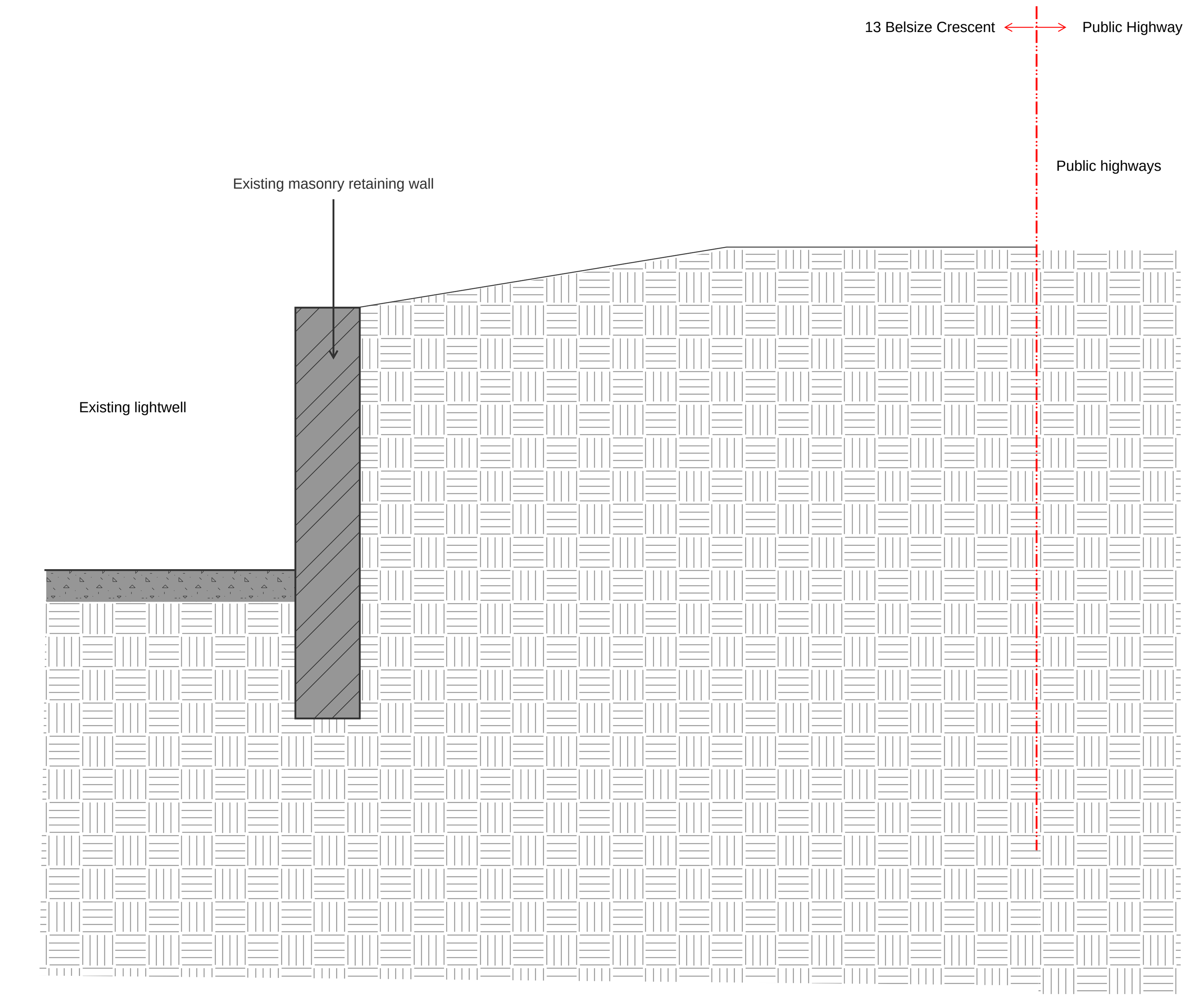
Project:
13 Belsize Crescent

Drawing Title:
Indicative Underpinning Sequence

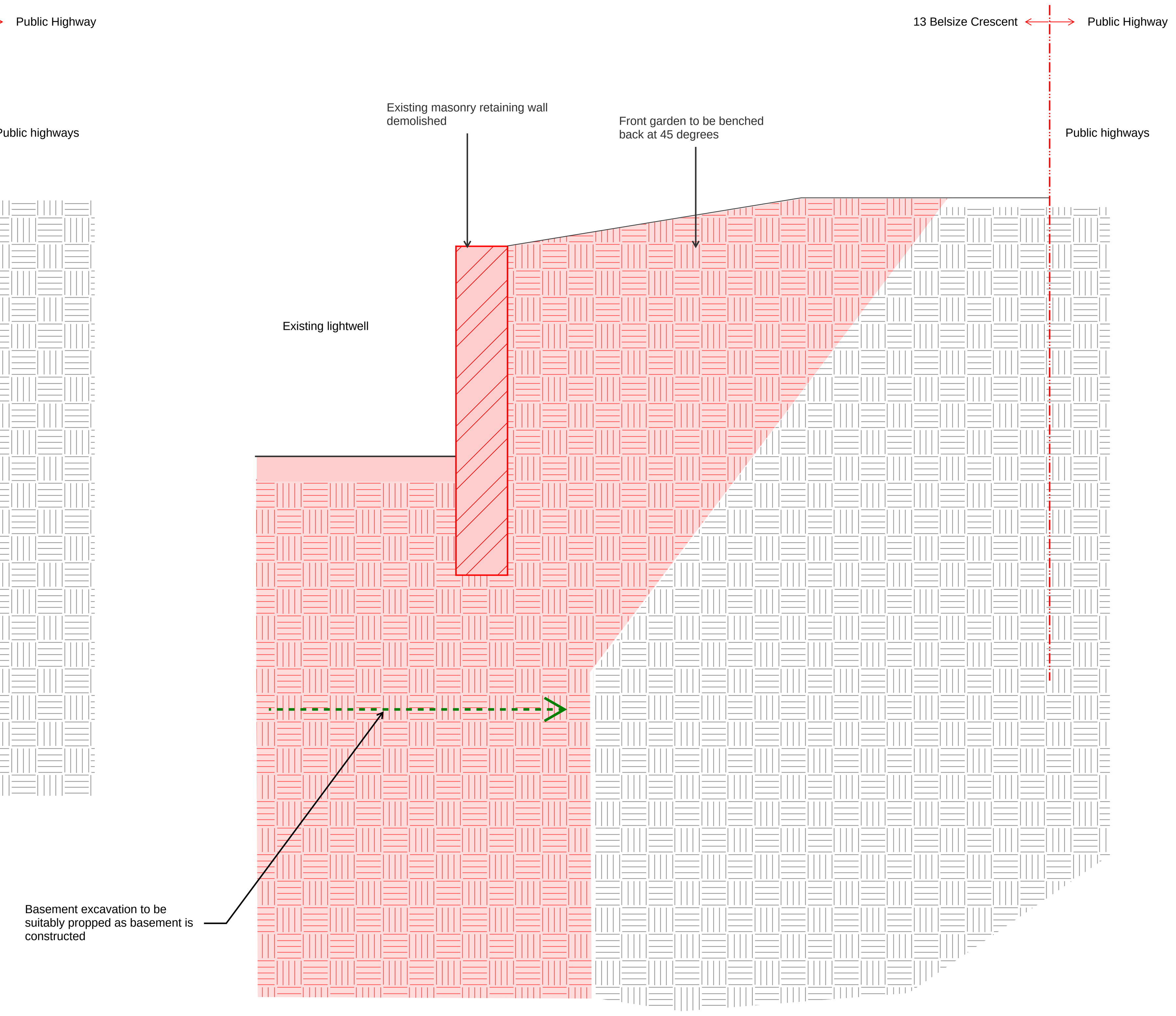
Drawing Number:
J225-BC-SK-3401

Issued: **03.23** Drawn by: **DJC**

Rev: **P4** Scale: **NTS**

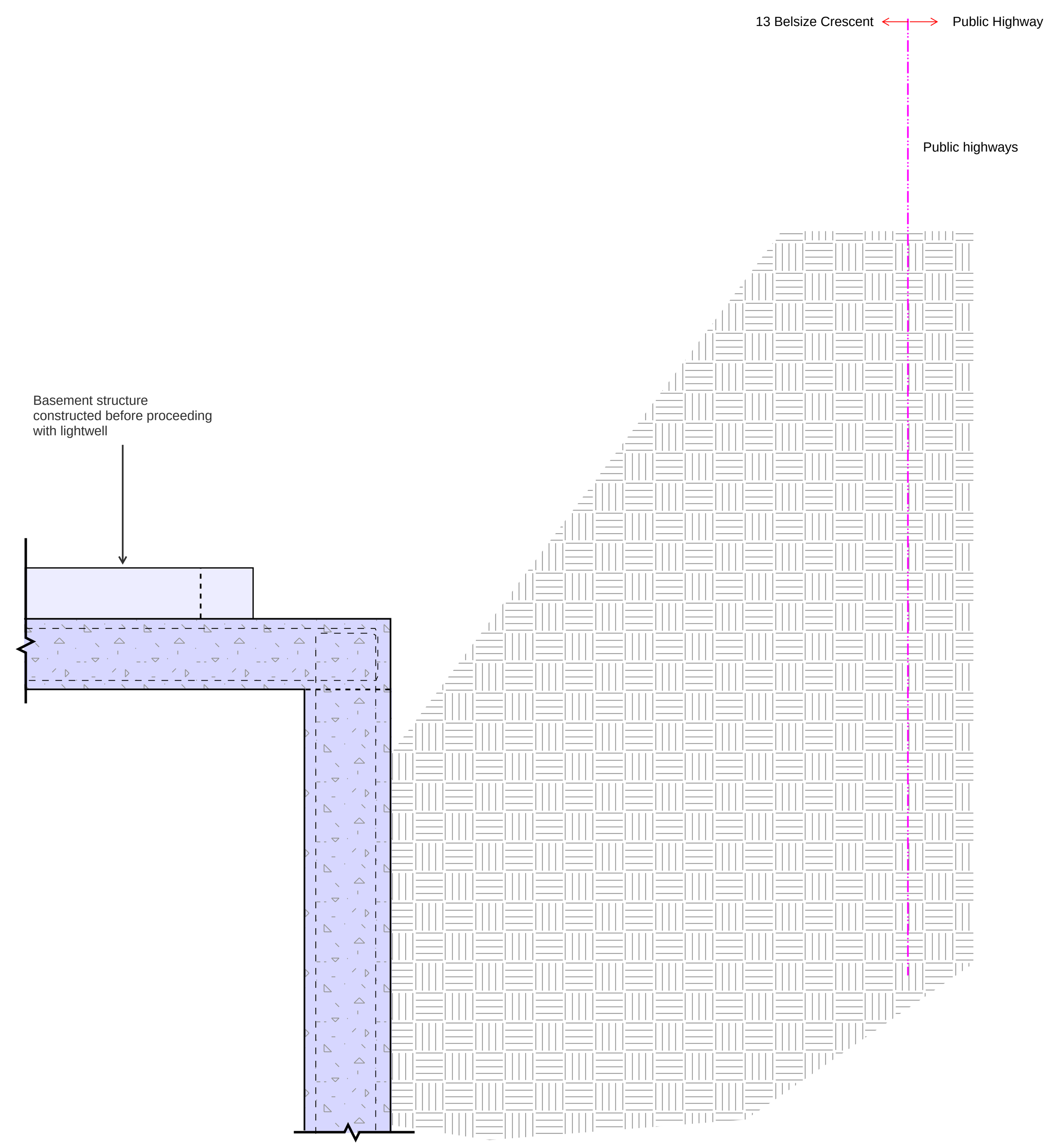


Existing



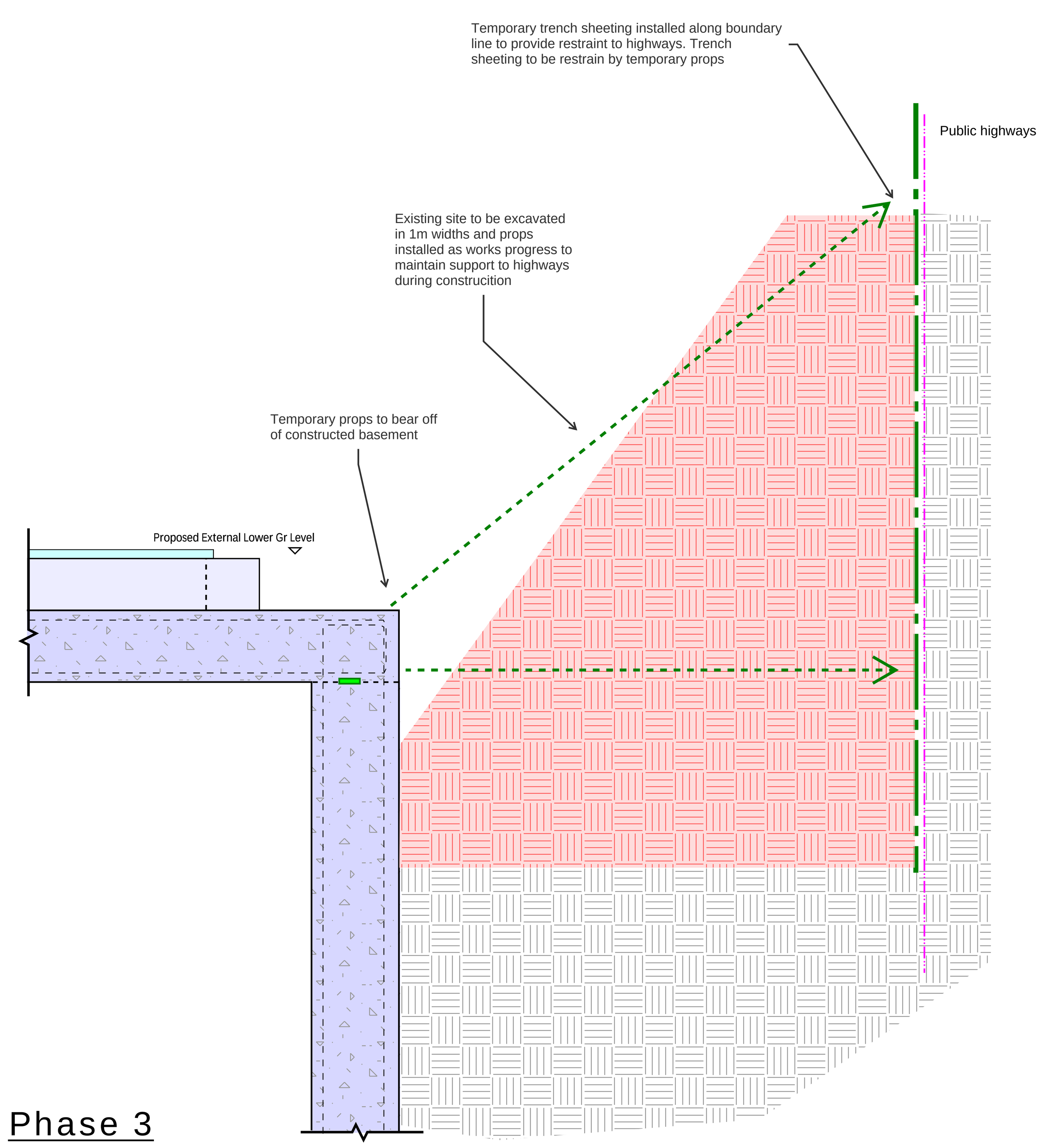
Phase 1

1.1 -Contractor to locally break out existing lightwell retaining wall and slab.
1.2 - Soil benched back to maintain restraint to highway.



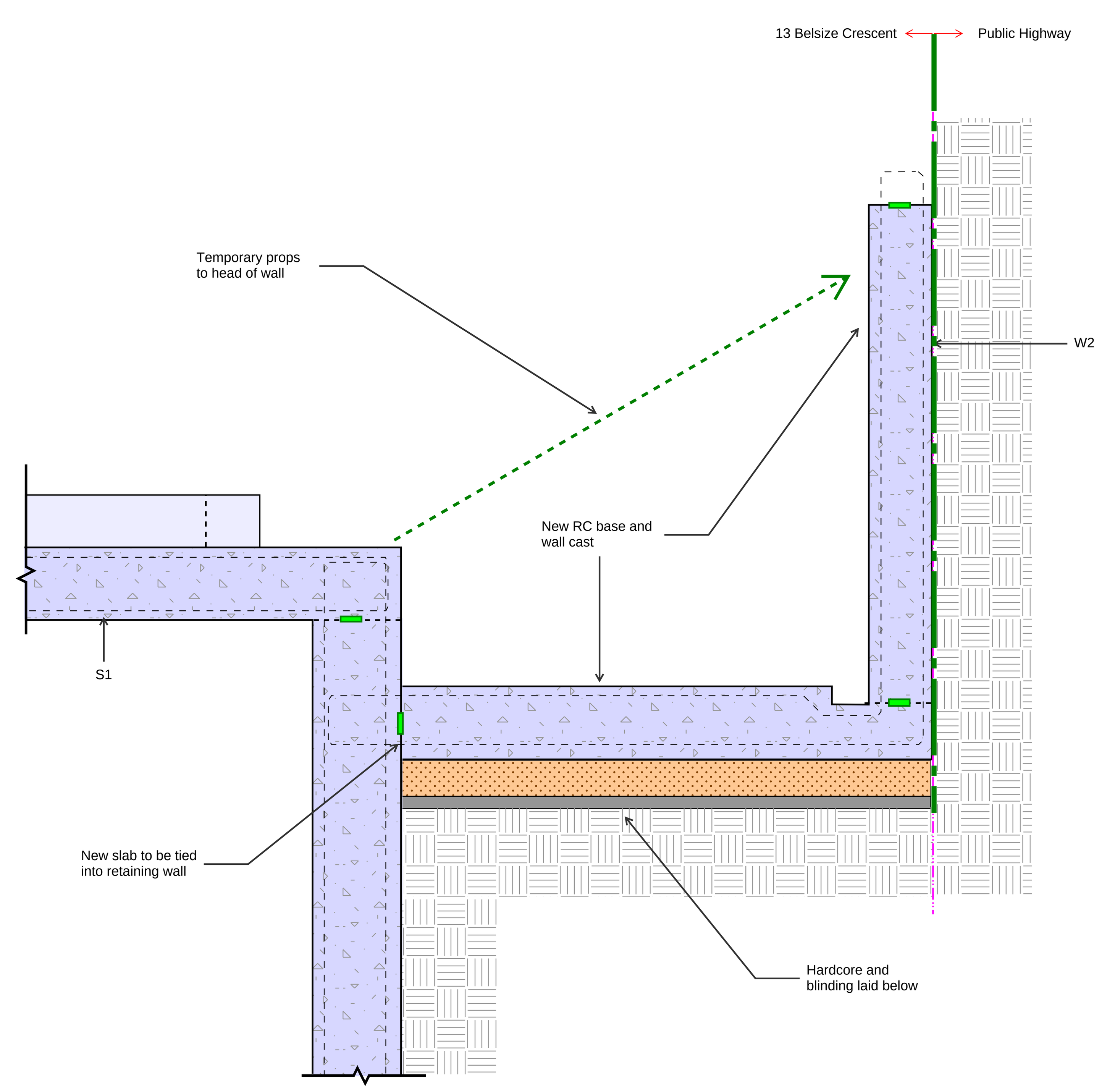
Phase 2

2.1 - Basement structure is constructed in line with noted sequence



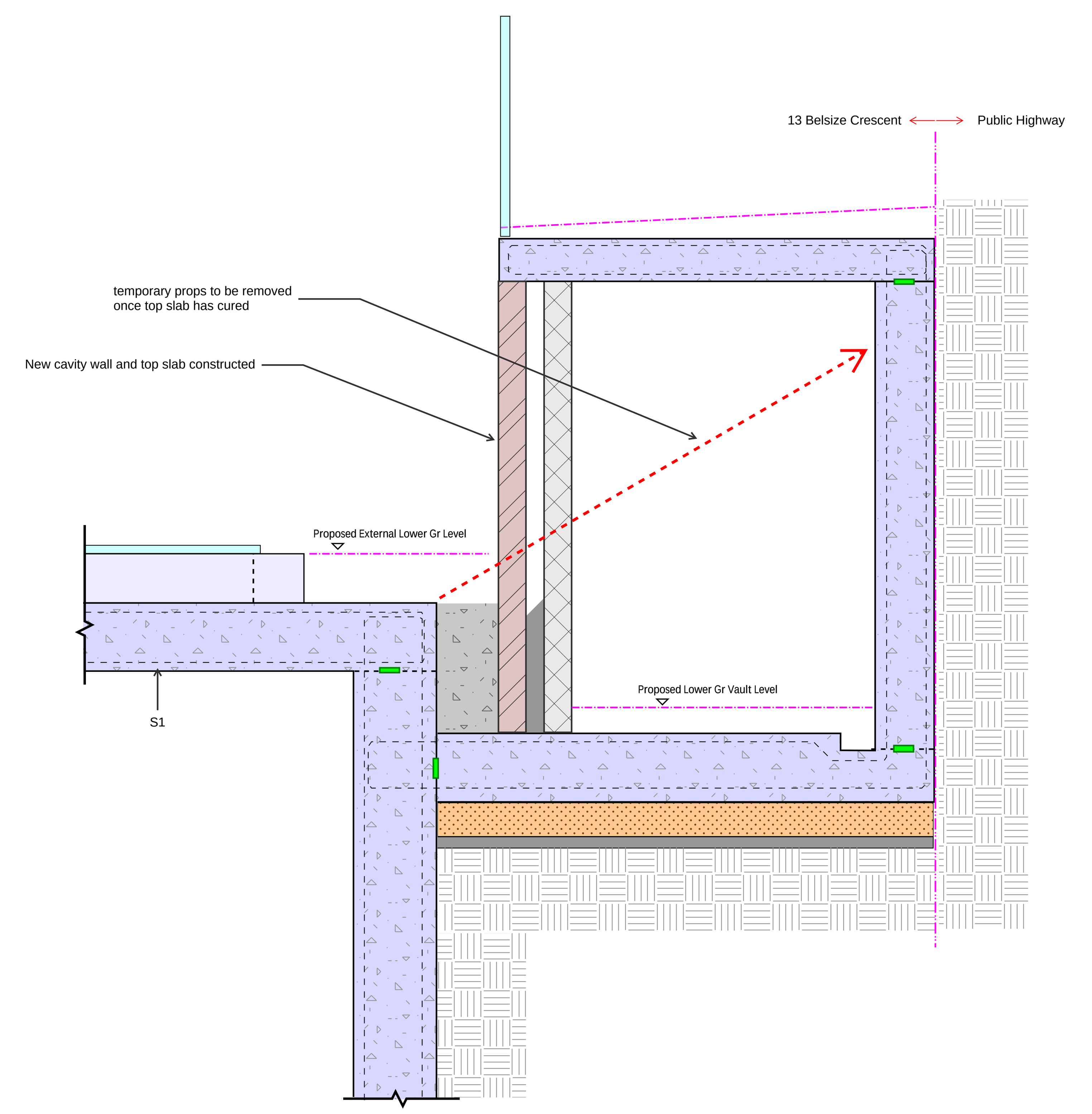
Phase 3

3.1 - Trench sheets installed along highways boundary line
3.2 - Excavate 1m widths of the benched soil and install temporary props to trench sheeting. Propos to bear off new basement construction.
Continue until front lightwell is fully excavated.



Phase 4

4.1 -Prepare formation level and install reinforcement to base and stem of wall.
4.2 - Wall stem and base to be cast, leaving pockets around the temporary props.
4.3 - Allow to cure for a minimum of 14 days, before shifting the props onto the RC wall and infilling the pockets



Phase 5

5.1 - New cavity wall to be constructed off new RC base
5.2 - New RC slab cast off proposed cavity wall.

Proposed Installation Sequence of Highways Retaining Wall

All final temporary works designs and methodologies to be the responsibility of the chosen Contractor.

Notes:
1. Do not scale from these drawings
2. All dimensions to be checked on site by contractor
3. Drawing to be read in conjunction with general notes drawing
4. Where discrepancy occurs between specification and drawing, Engineer to be notified immediately
5. Temporary words design, method statement and construction sequence to be determined by contractor
6. Where discrepancy occurs between drawings and findings on site, Engineer to be notified immediately
7. Contractor may allow for splicing of steelwork to aid erection if necessary, final design by contractor, to be coordinated with BC Structural Design.
8. Refer to architects details for fire protection of all elements
9. All foundations assumed to be founded a minimum of 1.0m BGL on natural undisturbed ground – to be checked by Building Control or an Approved Inspector – assumed bearing capacity – 100kN/m2. If adjacent to existing foundation, excavation to be stepped at 45degrees to avoid undermining. Foundations to be 450mm deep MC and a minimum of 450mm wide UNO.
10. All setting out to Architects information

Proposed Member Reference Table:

Beam Schedule (Low Level)
SB1 - 260x90x35 PFC S275
SB2 - 254x254x73 UC S275
SB3 - 254x146x43 UB S275
SB4 - 254x146x31 UB S275
SB5 - 152x89x16UB S275
SB6 - 305x305x118UC S275
TB1 - 3no. 170x47 C24 timbers bolted together w/ M16 @400mm centres
CB1 - 500mm dp x 750mm wide (C40/50)

Lintel & Padstone Schedule
P1 - 330x100x100 concrete padstone

Column and Wall Schedule
SC1 - 160x80x8 RHS S355
SC2 - 254x254x73UC S275

W1 - Min 350mm thk RC retaining wall (C32/40)
W1a - 500mm thk RC retaining wall (C32/40)
W2 - 250mm thick RC liner wall (C32/40)
W3 - 200mm thick RC liner wall (C32/40)
W4 - Cavity wall 100mm block (7.3N), 100mm brick (20N)
Ties in accordance with general notes
W5 - 150x50 C24 timber studs @ 400mm centres
All stud walls to have 12mm ply board to external face

Floor Schedule
J1 - 225x50 C24 timber joists @ 350mm centres
J2 - 225x50 C24 timber joists @ 400mm centres
J3 - 175x50 C24 timber joists @ 400mm centres
J4 - 150x50 C25 timber joists @ 400mm centres
All floor joists to have 18mm ply over.

S1 - 300mm thick Water resistant RC slab (Sika additive or similar approved) (C32/40)
S2 - 460mm thick Water resistant RC slab (Sika additive or similar approved) (C32/40)
S3 - 500mm thick Water resistant RC slab (Sika additive or similar approved) (C32/40)
S4 - 200mm thick RC slab (C32/40)

BAKER STRUCTURAL DESIGN **CHATTERTON**

Email:
Alex@BCStructural.co.uk
Dylan@BCStructural.co.uk

WEB:
www.BCStructural.co.uk

Project:
13 Belsize Crescent

Drawing Title:
Indicative Highways Wall Sequence

Drawing Number:
J225-BC-SK-3402

Issued: **03.23** Drawn by: **DJC**

Rev: **P4** Scale: **NTS**

Appendix C – Retaining Wall Designs

Basement Assessment

It is proposed to construct a new basement floor below the existing Lower Ground Floor Level
The basement is to extend beyond the front and rear elevations
The basement will also include an internal swimming pool, which will be set a lower level - approx 1.4m below the proposed basement.

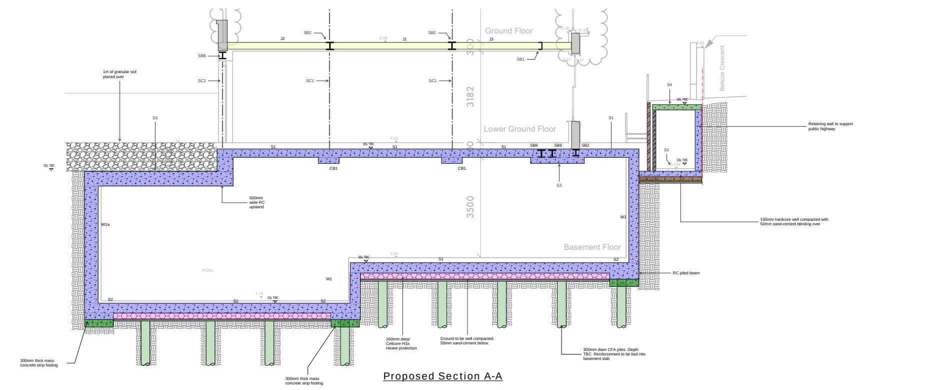
On site soil investigations have been undertaken by A2 who have provided an interprative report with findings
The basement structure will be located within London Clay strata - heave forces from the unloading of consolidted soil have been provided by A2
As per A2's report - long term heave forces will only be considered in ULS/Geo design and not uplift checks.
On site investigations confirmed that the existing water table currently sits 17m BGL. For ULS assessment, the water table will be taken as acting 1m BGL.
Soil parameters have been provided by A2 - design values noted below
Ka values will be considered within ULS design, while Ko will be used to assess SLS, where the structure will not yet have yielded

The basement will be formed from a reinforced concrete "box"
The basemenent slab will be treated as suspended, with heave deck below the central span to reduce uplift forces.
The basement slab will be designed as single spanning between side wall footings and central piled footing .
The basement retaining walls will be designed as propped cantilevers typically, or as a pure cantilever. No lateral spanning has been assumed, as continuity across pin reinforcement not expected
Thus the walls have all been treated as spanning vertically only.

The new reinforced conrete suspended lower ground floor slab will span between the retaining walls and act as a prop to the walls.
The slab will be approximately level with the basee of the existing footings and so it will be "toothed" in to the head of RC walls, with local pockets broken out of masonry corbels
The slab over the rear garden will be designed to support 1m of soil (saturated) as well as paved finishes

The structures will be assessed as one-way spanning 1-d elements using GSA oasys software

Tension piles are proposed where required to resist uplift forces arising from water pressures and heave pressures
Heave board will be used to limit heave pressures



Proposed Section A-A

Design Parameters

Soil paratemeters -

Angle of shear resistance -	25	degrees	*0.43633*	rad
Ka -	0.41			
Ko -	1.2	as per A2's report		
Soil density	20	kN/m3 (saturated)		
Allowable Bearing Pressure	250	kN/m2		
Water table -	1	m BGL		
uplift main level	35	kN/m2		
uplift pool level	50	kN/m2		
Clay heave - long term				
Uplift main level	30	kN/m2		
Uplift pool level	35	kN/m2		
Heave deck uplift limit	13	kN/m2	based on a plasticity index of 23% as calculated by A2 - refer to IR and use of Cordex Cellcore heave protection board	

Table Two:

Cellcore HX Grade *	Safe Load (kN/m2)	Fail Load (kN/m2)	Maximum Concrete Depth ** (mm)
7/10	7	10	220
9/13	9	13	300
13/18	13	18	460

Concrete parameters

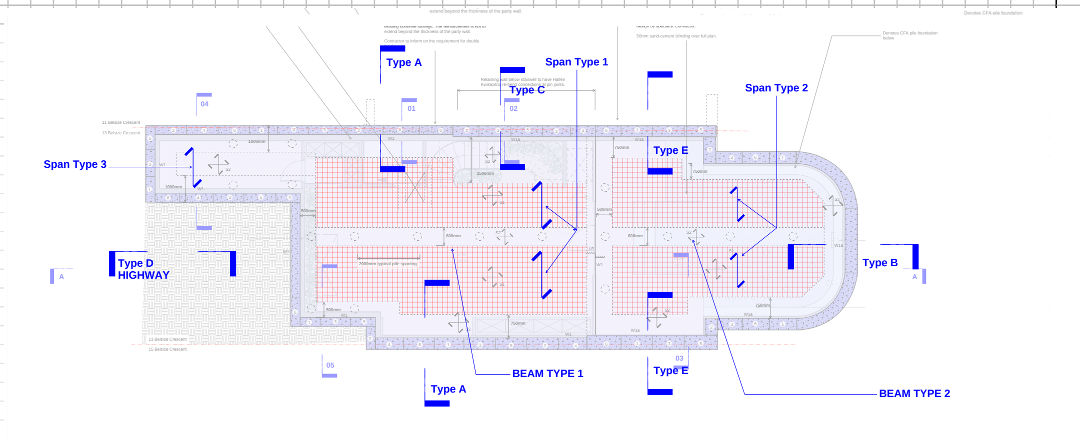
All concrete to be C32/40
Long term effective stiffness (EI) to be taken conservatively as 25% to account for long term creep and cracking of slab

Basement Assessment

The different span types for the basement slab and retaining walls are given in the diagram below
Vertical loads acting on the retianing walls from the above structure are not being considered within this assessment, as they will reduce peak moments at base of walls

The calculations on the basement are ordered as follows:

1. Basement slab
2. Retaining walls



Reference locations

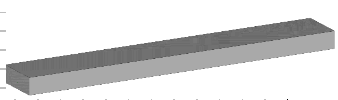
BAKER STRUCTURAL DESIGN CHATTERTON

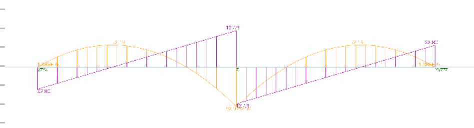
Basement Suspended Slab - Span Type 1

A new one way spanning slab spanning between retaining walls and central beam strip
Slab to resist uplift from heave and water pressures - worst case
All dead load treated as favourable

Slab span = 3.4 m

width	1.00		width	1.00		width	1.00	
Floor			**Water uplift**			**soil heave**		
Super imposed Dead Load =	2.00	kN/m2	Dead Load =	35	kN/m2	Dead Load =	18	kN/m2
Slab slef weight =	7.50	kN/m2	Imposed Load =	0.00	kN/m2	Imposed Load =	0.00	kN/m2





Forces

Moments, M,ed = 100.00 kNm/m
Shear, V,ed = 140.00 kN/m
Shear at edge of thickening = 115.29 kN/m

Concrete Section Design

Output from GSA

Concrete grade C 32 /40
Reinforcement grade B 500 B

width =	1000	mm
Depth of section =	300.0	mm
Cover =	40.0	mm
Effective Depth =	260.0	
k =	0.04623	<0.167
Z =	247	mm
As,req =	931	mm2
As, prov:	**1347**	**mm2**
No. of bars =	6.7	
Diameter	16	mm

conservative as max forces act at slab thickenings

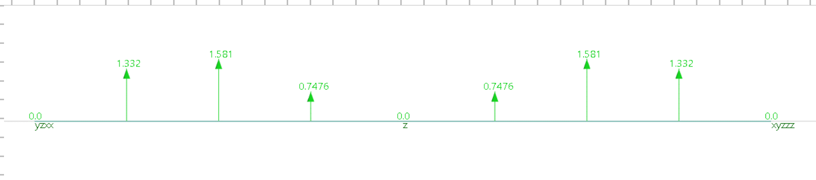
Effective depth of section at support =	404.0	mm	Effective depth of section at support =	260.0	mm
Shear Stress V,ed =	0.38504	N/mm2	Shear Stress V,ed =	0.49271	N/mm2
Vrd,max =	4.63	N/mm2	Vrd,max =	4.63	N/mm2
V,rd,c =	0.51319		**V,rd,c =**	**0.59432**	**N/mm2**
% reinforcement provided =	0.4%		% reinforcement provided =	0.6%	
k=	1.87706		k=	1.87706	
spacing of links =	0	mm	spacing of links =	0	mm
Min Shear reinforcement =	0	mm2	Min Shear reinforcement =	0	mm2
Asw, prov:	**0**	**mm2**	**Asw, prov:**	**0**	**mm2**
No. of legs =			No. of legs =		
Diameter =	8	mm	Diameter =	8	mm

Therefore, okay in shear

Deflections

Long term deflection for cracked concrete = 1.5 mm

Span/250 = 13.6 mm therefore,okay



Global Uplift
Global uplift is to be resisted by piled foundations through the central beam, and through a combination of piles and self weight around the perimeter
Final pile designs are to be carried out by specialists

Basement Suspended Slab - Cnentral Beam Type 1

A RC beam will span the uplift slab loads between the piled foundations
Slab to resist uplift from heave and water pressures - worst case
All dead load treated as favourable

Slab span = 2 m assuming piles spaced at max 2m

loads taken from slab type 1 G
W,ULS = 280 kN/m

Forces

Moments, M,ed = 93.33 kNm
Shear, V,ed = 560.00 kN

Concrete Section Design

Output from GSA

Concrete grade C 32 /40
Reinforcement grade B 500 B

width =	600	mm	
Depth of section =	460.0	mm	conservative as max forces act at slab thickenings
Cover =	50.0	mm	
Effective Depth =	410.0		
k =	0.02892	<0.167	
Z =	389.5	mm	
As,req =	551	mm2	
As, prov:	**1571**	**mm2**	
No. of bars =	5		
Diameter	20	mm	
Effective depth of section at support =	550.0	mm	thicken slab by 160mm at edges
Shear Stress V,ed =	1.88552	N/mm2	
Vrd,max =	4.63	N/mm2	
V,rd,c =	0.44101		
% reinforcement provided =	0.3%		
k=	1.69843		
spacing of links =	200	mm	
Min Shear reinforcement =	208	mm2	
Asw, prov:	**236**	**mm2**	
No. of legs =	3		
Diameter =	10	mm	

Therefore, okay in shear

Deflections

Long term deflection for cracked concrete = 1.7 mm

Span/250 = 8 mm therefore,okay

Uplift reaction on piled foundations

Piles designed for a ULS tension load of 560.00 kN
designed by specialist

Basement Suspended Slab - Span Type 2

A new one way spanning slab spanning between retaining walls. Slab considered to be cranked when subject to full uplift loads
Slab to resist uplift from heave and water pressures - worst case
All dead load treated as favourable

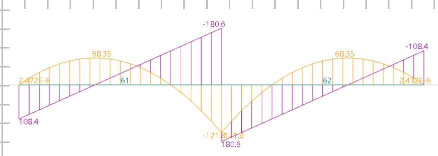
Slab span = 3.4 m

width	1.00		width	1.00		width	1.00	
Floor			**Water uplift**			**soil heave**		
Super imposed Dead Load =	2.00	kN/m2	high level	-35	kN/m2	high level	-18	kN/m2
Slab slef weight =	7.50	kN/m2	low level	-50	kN/m2	low level	-18	kN/m2

Forces

Moments, M,ed = w x l^2 / 8 = 125.00 kNm/m
Shear, V,ed = w x l / 2 = 181.00 kN/m
Shear at edge of thickening = 149.06 kN/m

Concrete Section Design



Concrete grade C 32 /40
Reinforcement grade B 500 B

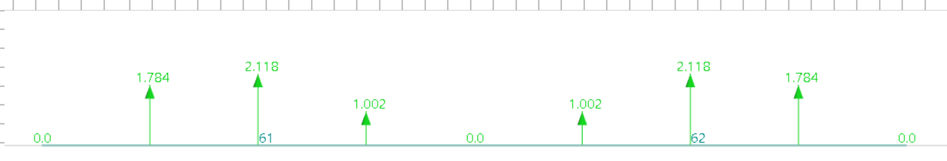
width =	1000	mm
Depth of section =	300.0	mm
Cover =	40.0	mm
Effective Depth =	260.0	
k =	0.05778	<0.167
Z =	245.986	mm
As,req =	1168	mm2
As, prov:	**2105**	**mm2**
No. of bars =	6.7	
Diameter	20	mm

Effective depth of section at support =	420.0	mm	Effective depth of section at support =	260.0	mm
Shear Stress V,ed =	0.47884	N/mm2	Shear Stress V,ed =	0.637	N/mm2
Vrd,max =	4.63	N/mm2	Vrd,max =	4.63	N/mm2
V,rd,c =	**0.52921**	**N/mm2**	**V,rd,c =**	**0.68954**	**N/mm2**
% reinforcement provided =	0.6%		% reinforcement provided =	0.9%	
k=	1.69007		k=	1.87706	
spacing of links =	0	mm	spacing of links =	0	mm
Min Shear reinforcement =	0	mm2	Min Shear reinforcement =	0	mm2
Asw, prov:	**0**	**mm2**	**Asw, prov:**	**0**	**mm2**
No. of legs =			No. of legs =		
Diameter =	8	mm	Diameter =	8	mm

Deflections

Long term deflection for cracked concrete = 2.1 mm

Span/250 = 11.6 mm therefore,okay



Global Uplift
Global uplift is to be resisted by piled foundations through the central beam, and through a combination of piles and self weight around the perimeter
Final pile designs are to be carried out by specialists

Basement Suspended Slab - Central Beam Type 2

A RC beam will span the uplift slab loads between the piled foundations
Slab to resist uplift from heave and water pressures - worst case
All dead load treated as favourable

Slab span = 2 m

loads taken from slab type 2 GSA output
W,ULS = 360 kN/m

Forces

Moments, M,ed =	120.00	kNm
Shear, V,ed =	720.00	kN

Concrete Section Design

Output from GSA

Concrete grade C 32 /40
Reinforcement grade B 500 B

width =	600	mm	
Depth of section =	460.0	mm	conservative as max forces act at slab thickenings
Cover =	50.0	mm	
Effective Depth =	410.0		
k =	0.03718	<0.167	
Z =	389.5	mm	
As,req =	708	mm2	
As, prov:	**1571**	**mm2**	
No. of bars =	5		
Diameter	20	mm	
Effective depth of section at support =	550.0	mm	thicken slab by 160mm at edges
Shear Stress V,ed =	2.42424	N/mm2	
Vrd,max =	4.63	N/mm2	
V,rd,c =	0.44101		
% reinforcement provided =	0.3%		
k=	1.69843		
spacing of links =	200	mm	
Min Shear reinforcement =	268	mm2	
Asw, prov:	**339**	**mm2**	
No. of legs =	3		
Diameter =	12	mm	
			Therefore, okay in shear

Deflections

Long term deflection for cracked concrete =	2.2	mm	
Span/250 =	8	mm	therefore,okay

Uplift reaction on piled foundations

Piles designed for a ULS tension load of 720.00 kN
designed by specialist

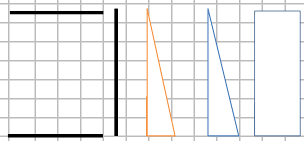
Project name:	**13 Belsize Crescent**			
Project Number:	**J225**	**Sheet:**	**Revision:**	**C1**
Date:	**17/03/2023**	**Engineer:** DJC	**Checked:**	**AB**
Location:				

BAKER CHATTERTON STRUCTURAL DESIGN

<u>Retaining Wall - Type A - Propped Cantilever (Front elevation and sides)</u>

A new RC concrete retaining wall with fixity at the base and pinned support at head
Retaining wall to span between LGF and main basement level

Wall height =	4.5	m
retained soil height =	4.5	m
Base support condition	Fixed	
top support condition	pinned	



<u>Soil Properties</u>

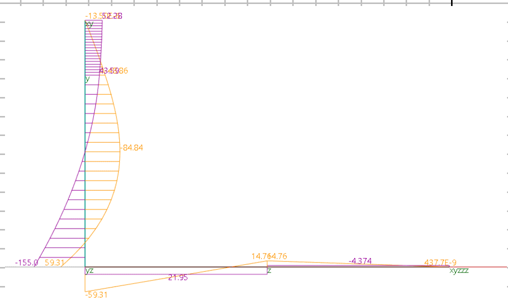
Soil behind wall =	Clay		
Soil Density =	20	kN/m3	
Ko =	1.2		For SLS
Ka =	0.41		For ULS

Height of water table below Ground = 1 m water table below proposed 1m below exiting ground level -

<u>Loading</u>

	At Depth 0 m BGL ko	ka		Depth 1 m BGL ko	ka		Depth 4.5 m BGL ko	ka	
F, Earth pressure =	**0.0**	**0.0**	**kN/m**	**24.0**	**8.2**	**kN/m**	**108.0**	**36.9**	**kN/m**
F, Water pressure @depth x =	**0.0**	**0.0**	**kN/m**	**0.0**	**0.0**	**kN/m**	**35.0**	**35.0**	**kN/m**
Surcharge at Ground =	*5.0*	*5.0*	*kN/m2*	*5.0*	*5.0*	*kN/m2*	*5.0*	*5.0*	*kN/m2*
F, Surcharge pressure at base =	**6.0**	**2.1**	**kN/m**	**6.0**	**2.1**	**kN/m**	**6.0**	**2.1**	**kN/m**

<u>Forces</u>
Taken from GSA output of retaining wall



Moments, M,ed =	85.00	kNm/m
Shear at base, V,ed =	156.00	kN/m

Concrete Section Design

Concrete grade C 32 /40
Reinforcement grade B 500 B

width =	1000	mm
Depth of section =	350.0	mm
Cover =	40.0	mm
Effective Depth =	310.0	
k =	0.02764	
Z =	294.5	mm
As,req =	664	mm2
As, prov:	**2105**	**mm2**
No. of bars =	6.7	
Diameter	20	mm
Shear Stress V,ed =	0.529711	N/mm2
Vrd,max =	4.63	N/mm2
V,rd,c =	**0.613583**	**N/mm2**
% reinforcement provided =	0.7%	
k=	1.803219	
spacing of links =	0	mm
Min Shear reinforcement =	0	mm2
Asw, prov:	**0**	**mm2**
No. of legs =		
Diameter =	8	mm

therefore, okay

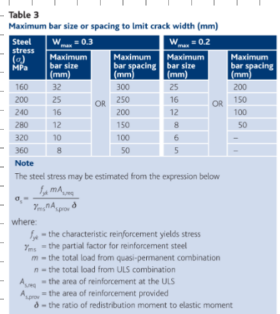


Table 3
Maximum bar size or spacing to lmit crack width (mm)

Steel stress (σ_s) MPa	W_{max} = 0.3 Maximum bar size (mm)		W_{max} = 0.3 Maximum bar spacing (mm)	W_{max} = 0.2 Maximum bar size (mm)		W_{max} = 0.2 Maximum bar spacing (mm)
160	32	OR	300	25	OR	200
200	25		250	16		150
240	16		200	12		100
280	12		150	8		50
320	10		100	6		–
360	8		50	5		–

Note
The steel stress may be estimated from the expression below

$$\sigma_s = \frac{f_{yk}\, m A_{s,req}}{\gamma_{ms} n A_{s,prov}\, \delta}$$

where:
f_{yk} = the characteristic reinforcement yields stress
γ_{ms} = the partial factor for reinforcement steel
m = the total load from quasi-permanent combination
n = the total load from ULS combination
$A_{s,req}$ = the area of reinforcement at the ULS
$A_{s,prov}$ = the area of reinforcement provided
δ = the ratio of redistribution moment to elastic moment

Cracking
Limited to W,max =0.3

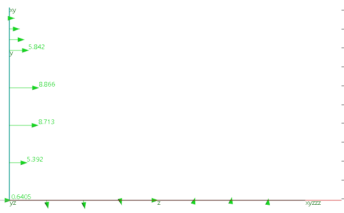
f,yk =	**500.00**	
M,quasi =	62.00	
Mquasi / MULS =	1.00	
redistribution factor =	0.85	
Stress in bars =	137.05	N/mm2

b16 - OKAY

Deflections
Assuming 25% of section stiffness for long term cracked concrete - conservative

Long term deflection for cracked concrete =	8.9	mm
Span/500 =	9.00	mm

therefore, okay

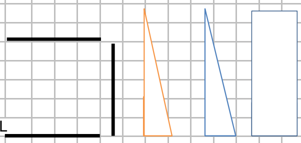


Retaining Wall - Type B - Propped Cantilever (Pool)

A new RC concrete retaining wall will form the lowered pool area
The RC wall forms part of the cranked slab
Worst case retaining wall forces occur at edge of garden where full depth of excavatation exerting pressures - wall treated as pinned at main basement level

Wall height =	5	m
retained soil height =	4.5	m
Base support condition	Fixed	
top support condition	pinned	
middle supprot	pinned	

1m BGL



6.0m BGL

Soil Properties

Soil behind wall =	made ground		
Soil Density =	20	kN/m3	
Ko =	1.2		For SLS
Ka =	0.41		For ULS

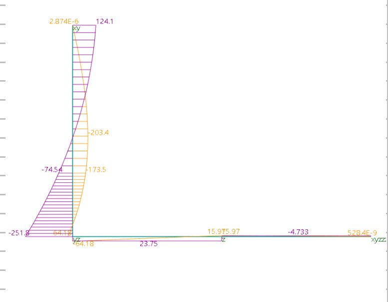
Height of water table below Ground = 1 m water table below proposed SSL - only consider in ULS condition as acting at existing ground level

Loading

	At Depth 0 m BGL (SLS)	(ULS)		Depth 1 m BGL (SLS)	(ULS)		Depth 6 m BGL (SLS)	(ULS)	
F, Earth pressure =	**0.0**	**0.0**	**kN/m**	**24.0**	**0.0**	**kN/m**	**144.0**	**49.2**	**kN/m**
F, Water pressure @depth x =	**0.0**	**0.0**	**kN/m**	**0.0**	**0.0**	**kN/m**	**50.0**	**50.0**	**kN/m**
Surcharge at Ground =	*5.0*	*5.0*	*kN/m2*	*5.0*	*5.0*	*kN/m2*	*5.0*	*5.0*	*kN/m2*
F, Surcharge pressure at base =	**6.0**	**2.1**	**kN/m**	**6.0**	**2.1**	**kN/m**	**6.0**	**2.1**	**kN/m**

Forces

Moments, M,ed = w x l^2 / 8 = 210.00 kNm/m Based on this the ULS condition is the most onerous
Shear, V,ed = w x l / 2 = 260.00 kN/m



Concrete Section Design

Concrete grade	C	32	/40		
Reinforcement grade	B	500	B		
			width =	1000	mm
			Depth of section =	500.0	mm
			Cover =	60.0	mm
			Effective Depth =	440.0	
			k =	0.033897	
			Z =	418	mm
			As,req =	1155	mm2
			As, prov:	**4084**	**mm2**
			No. of bars =	13	
			Diameter	20	mm

bars a
double bars at base to ensure shears working without links

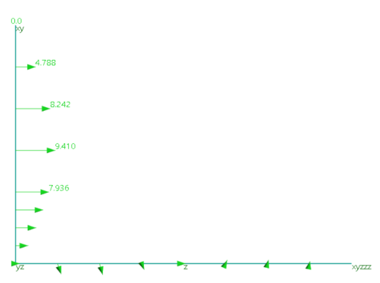
Shear Stress V,ed =	0.62201	N/mm2
Vrd,max =	4.63	N/mm2
V,rd,c =	**0.632187**	**N/mm2**
% reinforcement provided =	1.0%	
k=	1.6742	
spacing of links =	0	mm
Min Shear reinforcement =	0	mm2
Asw, prov:	**0**	**mm2**
No. of legs =		
Diameter =	8	mm

Cracking
Limited to W,max =0.3

f,yk =	**500.00**	
M,quasi =	150.00	
Mquasi / MULS =	0.71	
redistribution factor =	0.85	
Stress in bars =	87.82	N/mm2
	b16 - OKAY	

Deflections
Assuming 25% of section stiffness for long term cracked concrete - conservative

Long term deflection for cracked concrete =	9.4	mm
Span/500 =	10.00	mm
		therefore, okay



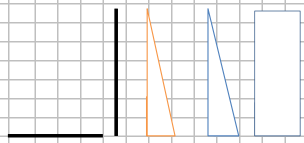
Project name:	13 Belsize Crescent				
Project Number:	J225	Sheet:		Revision:	C1
Date:	17/03/2023	Engineer:	DJC	Checked:	AB
Location:					

BAKER STRUCTURAL DESIGN CHATTERTON

Retaining Wall - Type C - Full Cantilever, No prop at Head (Over stair void)

A new RC concrete retaining wall with fixity at the base and free at head
Retaining wall to span between LGF and main basement level

Wall height = 4.5 m
retained soil height = 4.5 m
Base support condition Fixed
top support condition free



Soil Properties

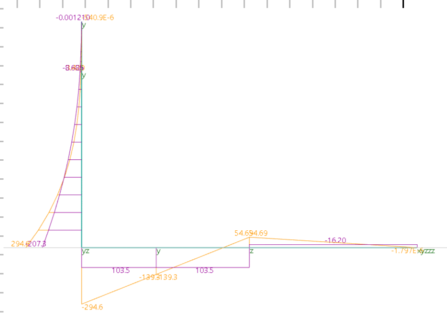
Soil behind wall = Clay
Soil Density = 20 kN/m3
Ko = 1.2 ignore as cantilever will allow a portion of movement under SLS
Ka = 0.41 For SLS and ULS

Height of water table below Ground = 1 m water table below proposed 1m below exiting ground level -

Loading	At Depth			Depth			Depth		
	0 m BGL			1 m BGL			4.5 m BGL		
	ko	ka		ko	ka		ko	ka	
F, Earth pressure =	**0.0**	**0.0**	**kN/m**		**8.2**	**kN/m**		**36.9**	**kN/m**
F, Water pressure @depth x =	**0.0**	**0.0**	**kN/m**		**0.0**	**kN/m**		**35.0**	**kN/m**
Surcharge at Ground =	*5.0*	*5.0*	*kN/m2*		*5.0*	*kN/m2*		*5.0*	*kN/m2*
F, Surcharge pressure at base =	**6.0**	**2.1**	**kN/m**		**2.1**	**kN/m**		**2.1**	**kN/m**

Forces

Moments, M,ed = 295.00 kNm/m
Shear at base, V,ed = 210.00 kN/m



Concrete Section Design

Concrete grade C 32 /40
Reinforcement grade B 500 B

width = 1000 mm
Depth of section = 500.0 mm
Cover = 60.0 mm
Effective Depth = 440.0
k = 0.047618
Z = 418 mm

As,req = 1622 mm2

As, prov: 3289 mm2
No. of bars = 6.7
Diameter 25 mm

Shear Stress V,ed = 0.502392 N/mm2
Vrd,max = 4.63 N/mm2
V,rd,c = 0.588204 N/mm2
% reinforcement provided = 0.8%
k= 1.6742
spacing of links = 0 mm
Min Shear reinforcement = 0 mm2

Asw, prov: 0 mm2
No. of legs =
Diameter = 8 mm

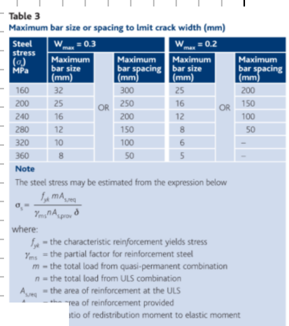


Table 3
Maximum bar size or spacing to limit crack width (mm)

Steel stress (σ_s) MPa	W_{max} = 0.3 Maximum bar size (mm)		W_{max} = 0.3 Maximum bar spacing (mm)	W_{max} = 0.2 Maximum bar size (mm)		W_{max} = 0.2 Maximum bar spacing (mm)
160	32	OR	300	25	OR	200
200	25		250	16		150
240	16		200	12		100
280	12		150	8		50
320	10		100	6		–
360	8		50	5		–

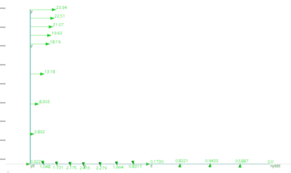
Note
The steel stress may be estimated from the expression below

$$\sigma_s = \frac{f_{yk} m A_{s,req}}{\gamma_{ms} n A_{s,prov} \delta}$$

where:
f_{yk} = the characteristic reinforcement yields stress
γ_{ms} = the partial factor for reinforcement steel
m = the total load from quasi-permanent combination
n = the total load from ULS combination
$A_{s,req}$ = the area of reinforcement at the ULS
...rea of reinforcement provided
...tio of redistribution moment to elastic moment

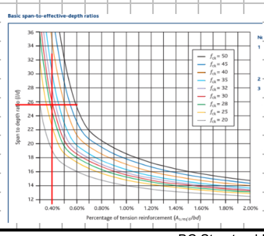
Cracking
Limited to W,max =0.3

f,yk = 500.00
M,quasi = 216.00
Mquasi / MULS = 0.73
redistribution factor = 0.85
Stress in bars = 157.04 N/mm2
b25 - OKAY



Deflections
Assuming 25% of section stiffness for long term cracked concrete - conservative
Long term deflection for cracked concrete = 24 mm
Span/250 for cantilever = 18.00 mm
proposed deflections equate to = Span / 187.50 *consider span/depth assessment taking account of rebar*

F1 = 1.00 mm
F2 = 1.00 mm
F3 = 1.97
Span to effective depth = 25.60
cantilever reduction factor 0.40
basic span to depth = 10.24
Allowable span to depth = 20.21
Actual span to depth ratio = 10.23 therefore, okay



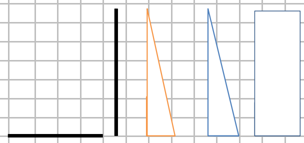
Project name:	13 Belsize Crescent				
Project Number:	J225	Sheet:		Revision:	C1
Date:	17/03/2023	Engineer:	DJC	Checked:	AB
Location:					

BAKER STRUCTURAL DESIGN CHATTERTON

Retaining Wall - Type D - Full Cantilever, No prop at Head (Highways Retaining Wall)

A new RC concrete retaining wall with fixity at the base and pinned support at head
Retaining wall to span between external GF and Internal Vault LGF level
water table taken as external lighwell level as a conservative approach

Wall height =	2.5	m
retained soil height =	2.5	m
Base support condition	Fixed	
top support condition	free	



Soil Properties

Soil behind wall =	Clay		
Soil Density =	20	kN/m3	
Ko =	1.2		ignore as cantilever will allow a portion of movement under SLS
Ka =	0.41		For SLS and ULS

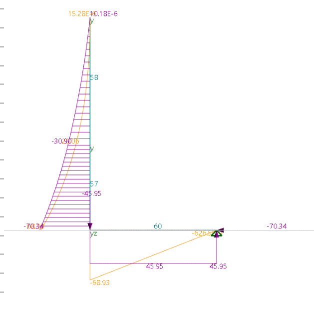
Height of water table below Ground =	1.5	m	water table below proposed 1m below exiting ground level -

Loading

	At Depth			Depth			Depth		
	0	m BGL		1.5	m BGL		2.5	m BGL	
	ko	ka		ko	ka		ko	ka	
F, Earth pressure =	**0.0**	**0.0**	**kN/m**		**12.3**	**kN/m**		**20.5**	**kN/m**
F, Water pressure @depth x =	**0.0**	**0.0**	**kN/m**		**0.0**	**kN/m**		**10.0**	**kN/m**
Surcharge at Ground =	*20.0*	*20.0*	*kN/m2*		*5.0*	*kN/m2*		*5.0*	*kN/m2*
F, Surcharge pressure at base =	**24.0**	**8.2**	**kN/m**		**2.1**	**kN/m**		**2.1**	**kN/m**

Forces

Moments, M,ed =	70.00	kNm/m
Shear at base, V,ed =	70.00	kN/m



Concrete Section Design

Concrete grade	C	32	/40
Reinforcement grade	B	500	B

width =	1000	mm
Depth of section =	250.0	mm
Cover =	60.0	mm
Effective Depth =	190.0	
k =	0.060596	
Z =	179.229	mm
As,req =	898	mm2
As, prov:	**1347**	**mm2**
No. of bars =	6.7	
Diameter	16	mm
Shear Stress V,ed =	0.390562	N/mm2
Vrd,max =	4.63	N/mm2
V,rd,c =	**0.692043**	**N/mm2**
% reinforcement provided =	0.8%	
k=	2	
spacing of links =	0	mm
Min Shear reinforcement =	0	mm2
Asw, prov:	**0**	**mm2**
No. of legs =		
Diameter =	8	mm

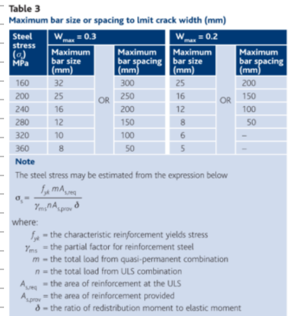


Table 3
Maximum bar size or spacing to lmit crack width (mm)

Steel stress (σ_s) MPa	W_{max} = 0.3 Maximum bar size (mm)		W_{max} = 0.3 Maximum bar spacing (mm)	W_{max} = 0.2 Maximum bar size (mm)		W_{max} = 0.2 Maximum bar spacing (mm)
160	32	OR	300	25	OR	200
200	25		250	16		150
240	16		200	12		100
280	12		150	8		50
320	10		100	6		–
360	8		50	5		–

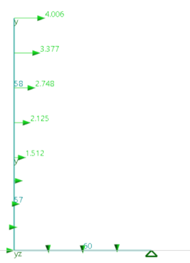
Note
The steel stress may be estimated from the expression below

$$\sigma_s = \frac{f_{yk}\, m A_{s,req}}{\gamma_{ms} n A_{s,prov}\, \delta}$$

where:
f_{yk} = the characteristic reinforcement yields stress
γ_{ms} = the partial factor for reinforcement steel
m = the total load from quasi-permanent combination
n = the total load from ULS combination
$A_{s,req}$ = the area of reinforcement at the ULS
$A_{s,prov}$ = the area of reinforcement provided
δ = the ratio of redistribution moment to elastic moment

Cracking
Limited to W,max =0.3

f,yk =	**500.00**	
M,quasi =	49.00	
Mquasi / MULS =	0.70	
redistribution factor =	0.85	
Stress in bars =	202.85	N/mm2
	b25 - OKAY	



Deflections
Assuming 25% of section stiffness for long term cracked concrete - conservative

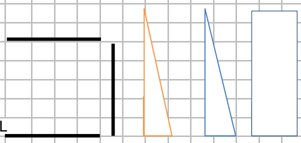
Long term deflection for cracked concrete =	4	mm
Span/250 for cantilever =	18.00	mm
		okay

Retaining Wall - Type E - Propped Cantilever Below Party Wall in Deeper Pool Area

A new RC concrete retaining wall will form the lowered pool area
The RC wall forms part of the cranked slab
Worst case retaining wall forces occur at edge of garden where full depth of excavatation exerting pressures - wall treated as pinned at main basement level

Wall height =	6	m
retained soil height =	6	m
Base support condition	Fixed	
top support condition	pinned	
middle supprot	pinned	

0m BGL



6.0m BGL

Soil Properties

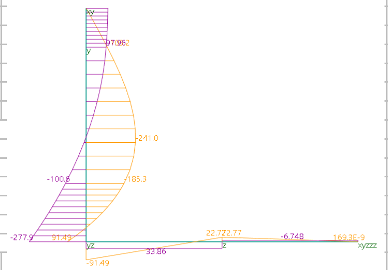
Soil behind wall =	made ground		
Soil Density =	20	kN/m3	
Ko =	1.2		For SLS
Ka =	0.41		For ULS

Height of water table below Ground = 1 m water table below proposed SSL - only consider in ULS condition as acting at existing ground level

Loading	At Depth 0 m BGL (SLS)	(ULS)		Depth 1 m BGL (SLS)	(ULS)		Depth 6 m BGL (SLS)	(ULS)	
F, Earth pressure =	0.0	0.0	kN/m	24.0	0.0	kN/m	144.0	49.2	kN/m
F, Water pressure @depth x =	0.0	0.0	kN/m	0.0	0.0	kN/m	50.0	50.0	kN/m
Surcharge at Ground =	*5.0*	*5.0*	*kN/m2*	*5.0*	*5.0*	*kN/m2*	*5.0*	*5.0*	*kN/m2*
F, Surcharge pressure at base =	6.0	2.1	kN/m	6.0	2.1	kN/m	6.0	2.1	kN/m

Forces

Moments, M,ed = w x l^2 / 8 = 241.00 kNm/m Based on this the ULS condition is the most onerous
Shear, V,ed = w x l / 2 = 280.00 kN/m



Concrete Section Design

Concrete grade	C	32	/40		
Reinforcement grade	B	500	B		
			width =	1000	mm
			Depth of section =	500.0	mm
			Cover =	60.0	mm
			Effective Depth =	440.0	
			k =	0.038901	
			Z =	418	mm
			As,req =	1325	mm2
			As, prov:	**6381**	**mm2**
			No. of bars =	13	
			Diameter	25	mm

B20 bars at 150mm centres at centre span - 2042mm2 - okay
double bars at base to ensure shears working without links

Shear Stress V,ed =	0.669856	N/mm2
Vrd,max =	4.63	N/mm2
V,rd,c =	**0.733479**	**N/mm2**
% reinforcement provided =	1.5%	
k=	1.6742	
spacing of links =	0	mm
Min Shear reinforcement =	0	mm2
Asw, prov:	**0**	**mm2**
No. of legs =		
Diameter =	8	mm

Cracking
Limited to W,max =0.3

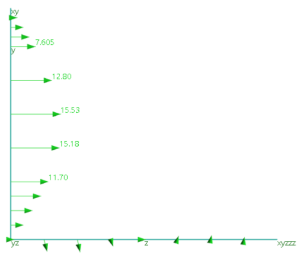
f,yk =	**500.00**	
M,quasi =	150.00	
Mquasi / MULS =	0.62	
redistribution factor =	0.85	
Stress in bars =	56.21	N/mm2

Deflections
Assuming 25% of section stiffness for long term cracked concrete - conservative

Long term deflection for cracked concrete =	15	mm
Span/500 =	12.00	mm

Section to be analysed in detail for long te
movement accounting for reinforcement
at detailed design phase

Okay for now as deflections are still
small



Load Take Down Review and Review of Uplift Forces

The existing structure has been proven to be supported on shall strip footings located <1m below the existing lower ground floor.
The existing structure has load bearing internal walls that have similar strip footings at lower ground level that spreads the loads onto the strata below

It is proposed to remove all internal load bearing walls and construct a new basement below the existing lower ground floor.

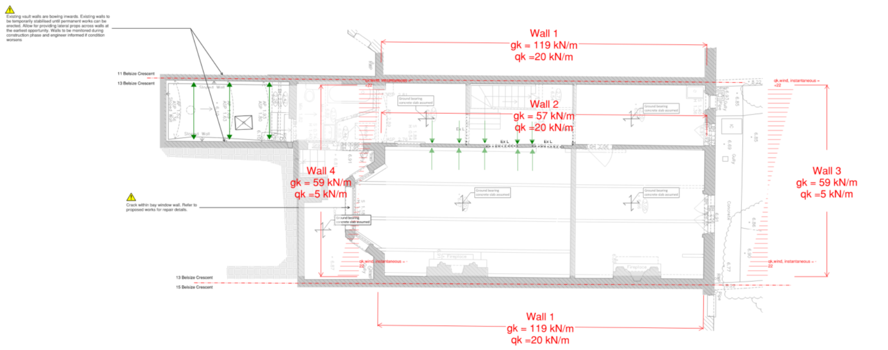
The new upperfloor infill structure will spread load onto a combination of the masonry party walls and new vertical steel framing
All load above will be transferred into the new RC retaining walls that will underpin the existing masonry

The retaining walls will be supported on new concrete strip footings at basement level.
The strip footings will be eccentric to the boundary wall to avoid extending into neighbours property.
The moments caused by the eccentric moment will be transferred through the basement slab in bending/shear to the "centre" of the footing
Thus the footings will only be subject to vertical loads.

The following calculations assess the existing load on the existing walls (to be retained) and then a look at the proposed loadings across the new foundations

The allowable bearing pressures for the new foundations has been taken as 250kN/m2, in accordance with A2 report

Existing Loads



Existing Load-Bearing Walls - Load Take Downs

Existing loads acting on the load bearing and party walls to be determined as part of the Ground Movement Assessment

Wall 1 - Party Wall with 11 and 15 Belsize Cres - Existing

									*** SLS
Floor	Height of Wall (m)	wall thk mm	**Dead kN/m**	Width of Floor	Dead kN/m2	Imposed kN/m2	**G,k kN/m**	**Q,k kN/m**	Cumalitive **kN/m**
			0						
roof			**0**	3.4	0.9	0.6	3.1	2.0	**4.5**
3	3	215	**12.9**	3.4	0.5	2	1.7	6.8	**19.4**
2	3.3	215	**14.19**	3.4	0.5	2	1.7	6.8	**25.1**
1	3.6	330	**23.76**	3.4	0.5	2	1.7	6.8	**55.4**
G	3.9	330	**25.74**	3.4	0.5	2	1.7	6.8	**87.6**
LG	3.3	440	**29.04**						**116.6**
							115.5	20.5	assumes redution in imposed load of 0.7

Wall 2 - External boundary Wall to front elevation - Existing

									*** SLS
Floor	Height of Wall (m)	wall thk mm	**Dead kN/m**	Width of Floor	Dead kN/m2	Imposed kN/m2	**G,k kN/m**	**Q,k kN/m**	Cumalitive **kN/m**
roof			**0**				0.0	0.0	**0.0**
3			**0**				0.0	0.0	**0.0**
2			**0**				0.0	0.0	**0.0**
1			**0**				0.0	0.0	**0.0**
G			**0**	1.2	5	2	6.0	2.4	**7.7**
LG	3.3	215	**14.19**						**21.9**
							20.2	2.4	

Wall 3 - Internal Wall - Existing

									*** SLS
Floor	Height of Wall (m)	wall thk mm	**Dead kN/m**	Width of Floor	Dead kN/m2	Imposed kN/m2	**G,k kN/m**	**Q,k kN/m**	Cumalitive **kN/m**
roof			**0**	3.4	0.9	0.6	3.1	2.0	**4.5**
3	3	100	**6**	3.4	0.5	2	1.7	6.8	**12.5**
2	3.3	100	**6.6**	3.4	0.5	2	1.7	6.8	**17.5**
1	3.6	100	**7.2**	3.4	0.5	2	1.7	6.8	**31.2**
G	3.9	100	**7.8**	3.4	0.5	2	1.7	6.8	**45.5**
B	3.3	100	**6.6**						**52.1**
							44.1	20.5	assumes redution in imposed load of 0.7

Wall 4 (rear Elevation) - Existing

							**		SLS
Floor	Height of Wall (m)	wall thk mm	**Dead kN/m**	Width of Floor	Dead kN/m2	Imposed kN/m2	**G,k kN/m**	**Q,k kN/m**	Cumalitive **kN/m**
			0						
roof			**0**	0.4	0.9	0.6	0.4	0.2	**0.5**
3	1	215	**3.01**	0.4	0.5	2	0.2	0.8	**3.8**
2	3.3	215	**9.933**	0.4	0.5	2	0.2	0.8	**11.2**
1	3.6	215	**10.836**	0.4	0.5	2	0.2	0.8	**22.8**
G	3.9	330	**18.018**	0.4	0.5	2	0.2	0.8	**41.6**
B	3.3	330	**15.246**						**56.8**
							58.2	3.4	

Wall 4 front elevation- Existing

							**		SLS
Floor	Height of Wall (m)	wall thk mm	**Dead kN/m**	Width of Floor	Dead kN/m2	Imposed kN/m2	**G,k kN/m**	**Q,k kN/m**	Cumalitive **kN/m**
Wall ext			0.0						
roof			**0**	0.4	0.9	0.6	0.4	0.2	**0.5**
3	1	215	**3.01**	0.4	0.5	2	0.2	0.8	**3.8**
2	3.3	215	**9.933**	0.4	0.5	2	0.2	0.8	**11.2**
1	3.6	215	**10.836**	0.4	0.5	2	0.2	0.8	**22.8**
G	3.9	330	**18.018**	0.4	0.5	2	0.2	0.8	**41.6**
B	3.3	330	**15.246**						**56.8**
							58.2	2.4	

Project name:	**13 Belsize Crescent**			
Project Number:	**J225**	**Sheet:**		**Revision:** C1
Date:	**17/03/2023**	**Engineer:**	**DJC**	**Checked:** AB
Location:				

BAKER STRUCTURAL DESIGN CHATTERTON

Proposed Load-Bearing Walls - Load Take Downs and EQUILIBRIUM UPLIFT

A review of the proposed loads acting on walls to detemrine minimum footign widths and
a look at whether the total vertical dead loads arae larger than uplift forces - if so no tension piles assumed

Wall 1 - Party Wall with 11 and 15 Belsize Cres - Proposed

	wall length	11	m	ADJACENT PROPERTY			13 BELSIZE CRES			**		*** SLS
	Height of	wall thk	**Dead**	Width of	Dead	Imposed	Width of	Dead	Imposed	**G,k**	**Q,k**	Cumalitive
Floor	Wall (m)	mm	**kN/m**	Floor	kN/m2	kN/m2	Floor	kN/m2	kN/m2	**kN/m**	**kN/m**	**kN/m**
			0									
roof			**0**	1.7	0.9	0.6	3.4	1.6	0.6	7.0	3.1	9.1
3	3	215	**12.9**	1.7	0.5	2	3.4	1.25	2	5.1	10.2	25.1
2	3.3	215	**14.19**	1.7	0.5	2	3.4	1.25	2	5.1	10.2	35.5
1	3.6	330	**23.76**	1.7	0.5	2	3.4	1.25	2	5.1	10.2	71.5
G	3.9	330	**25.74**	1.7	0.5	2	3.4	1.25	2	5.1	10.2	109.5
LG	3.3	440	**29.04**				3.4	10	2	34.0	6.8	177.3
B	4.5	440	**49.5**				1.7	10	2	17.0	3.4	246.2
Foundation										233.5	54.1	**246.2**

kN/m2 Proposed bearing pressure

ABP = 250.0 kN/m2
Min footing width per meter = 1.0 m
Provide 1.2 m width

Uplift Reaction (from GSA) = 73.0 kN/m — and 94kN/m at the lower level
0.9 x Gk = 194.9 kN/m — uplift is < down force
no tension piles required along party wal

Wall 2 - Wall below front garden and front arch - Porposed

	wall length	3.5	m	ADJACENT PROPERTY			13 BELSIZE CRES			**		*** SLS
	Height of	wall thk	**Dead**	Width of	Dead	Imposed	Width of	Dead	Imposed	**G,k**	**Q,k**	Cumalitive
Floor	Wall (m)	mm	**kN/m**	Floor	kN/m2	kN/m2	Floor	kN/m2	kN/m2	**kN/m**	**kN/m**	**kN/m**
			0									
roof			**0**							0.0	0.0	0.0
3			**0**							0.0	0.0	0.0
2			**0**							0.0	0.0	0.0
1			**0**							0.0	0.0	0.0
G			**0**				1.2	5	1.5	6.0	1.8	7.3
LG	3.3	215	**14.19**				1.2	8.25	2	9.9	2.4	33.0
B	4.5	350	**39.375**				1.2	10	2	12.0	2.4	86.1
Foundation										81.5	6.6	**86.1**

ABP = 250.0 kN/m2
Min footing width per meter = 0.3 m
Provide 0.5 m width

Uplift Reaction (from GSA) = 106.0 kN/m
0.9 x Gk = 62.5 kN/m — uplift is > than down force, therefore
tension piles required to perimeter

Wall 3 - Wall below rear garden

	wall length	1	m							**		*** SLS
	Height of	wall thk	**Dead**				Width of	Dead	Imposed	**G,k**	**Q,k**	Cumalitive
Floor	Wall (m)	mm	**kN/m**				Floor	kN/m2	kN/m2	**kN/m**	**kN/m**	**kN/m**
			0									
roof			**0**							0.0	0.0	0.0
3			**0**							0.0	0.0	0.0
2			**0**							0.0	0.0	0.0
1			**0**							0.0	0.0	0.0
G			**0**							0.0	0.0	0.0
LG	0	350	**0**				1.75	35	5	61.3	8.8	67.4
B	5.5	500	**68.75**				1	10	2	10.0	2.0	147.5
Foundation										140.0	10.8	**147.5**

ABP = 250.0 kN/m2
Min footing width per meter = 0.6 m
Provide 0.75 m width

Uplift Reaction (from GSA) = 95.0 kN/m — uplift is < down force
0.9 x Gk = 117.0 kN/m — **no tension piles required**
around pool below garden

Wall 4 - Wall below Pool

	wall length	1	m							**		*** SLS
	Height of	wall thk	**Dead**				Area of	Dead	Imposed	**G,k**	**Q,k**	Cumalitive
Floor	Wall (m)	mm	**kN/m**				Floor	kN/m2	kN/m2	**kN/m**	**kN/m**	**kN/m**
			0									
roof			**0**							0.0	0.0	0.0
3			**0**							0.0	0.0	0.0
2			**0**							0.0	0.0	0.0
1			**0**							0.0	0.0	0.0
G			**0**							0.0	0.0	0.0
LG	0		**0**				1	10	5	10.0	5.0	13.5
B	1.5	350	**13.125**				1.2	10	15	12.0	18.0	51.2
Foundation										35.1	23.0	**51.2**

ABP = 250.0 kN/m2
Min footing width per meter = 0.2 m
Provide 0.75 m width

Uplift Reaction = 70.0 kN/m
0.9 x Gk = 20.8 kN/m — uplift is > than down force, therefore
tension piles required to perimeter

Project name:	**13 Belsize Crescent**				
Project Number:	**J225**	**Sheet:**		**Revision:**	**C1**
Date:	**17/03/2023**	**Engineer:**	**DJC**	**Checked:**	**AB**
Location:					

BAKER STRUCTURAL DESIGN CHATTERTON

Proposed Load-Bearing Walls - Load Take Downs

Wall 5 - Front Lightwell Wall

	wall length			ADJACENT PROPERTY			13 BELSIZE CRES			**		*** SLS	
	Height of	wall thk	**Dead**	Width of	Dead	Imposed	Width of	Dead	Imposed	**G,k**	**Q,k**	Cumalitive	
Floor	Wall (m)	mm	**kN/m**	Floor	kN/m2	kN/m2	Floor	kN/m2	kN/m2	**kN/m**	**kN/m**	**kN/m**	
			0										
roof			**0**							0.0	0.0	0.0	
3			**0**							0.0	0.0	0.0	
2			**0**							0.0	0.0	0.0	
1			**0**							0.0	0.0	0.0	
G			**0**							0.0	0.0	0.0	
LG	0	350	**0**				1	10	2	10.0	2.0	11.4	
B	4.5	350	**39.375**				1	15	2	15.0	2.0	67.2	
Foundation										64.4	4.0	**67.2**	kN/m2 Proposed bearing pressure
											ABP =	250.0	kN/m2
											Min footing width per meter =	**0.3**	**m**
											Provide	0.9	m width
											Uplift Reaction (from GSA) =	130.0	kN/m
											0.9 x Gk =	**44.4**	**kN/m** uplift is < down force

Appendix C: Ground Movement and Damage Assessment

A2 Site Investigation

13 Belsize Crescent

Building Damage Ground Movement Assessment

March 2023

24022-A2SI-XX-XX-RP-Y-0004-01

Project Name	13 Belsize Crescent
Project Number	24022
Client	Edmund Lehmann and Jennifer Nguyen
Document Name	Building Damage Ground Movement Assessment

A2 Site Investigation Limited
One Westminster Bridge Rd
London, SE1 7XW

020 7021 0396
contact@a2-si.com
www.a2-si.com

Prepared by	Checked by	Approved by
Shengbin. Cui BEng(Hons), MSc, DIC Graduate Engineer	Rauan Saturin BEng(Hons), MSc, DIC Engineer	Alex Nikolic BEng(Hons), MSc, DIC, CEng, MICE, MSt(Cantab) Director

Document Reference	Status	Notes	Revision	Issued by	Date
24022-A2SI-XX-XX-RP-Y-0004-00	First Issue	First Issue	00	SC	13/03/2023
24022-A2SI-XX-XX-RP-Y-0004-01	Second Issue	Updated Loading	01	SC	31/03/2023

Contents

1.	Introduction	1
2.	The Site and Proposed Development	2
3.	Geology	4
4.	Impact Assessment Evaluation	5
5.	Ground Movement Assessment Results	10
6.	Conclusion	13

Appendices

Appendix A: Selected Supporting Information

1. Introduction

A2 Site Investigation Limited (A2SI) has been engaged by Edmund Lehmann and Jennifer Nguyen to prepare a ground movement assessment (GMA) for the proposed development at 13 Belsize Crescent, London.

1.1. Study Aims and Objectives

A ground movement and impact assessment has been carried out in order to estimate the potential damage induced by the proposed redevelopment on the neighbouring properties.

The assessment encompasses properties located within the *zone of influence* of the proposed scheme. The GMA is based on *greenfield* ground movements and *unlikely to be exceeded* ground movements. 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 on ground movements induced by the proposed works on adjacent properties.
- Inform Party Wall awards.
- 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.

1.2. Information Sources

- *Phase I Desk Study* prepared by A2SI, dated December 2022 (ref: 24022-A2SI-XX-XX-RP-Y-0001-00).
- *Interpretive Report* prepared by A2SI, dated January 2023 (ref: 24022-A2SI-XX-XX-RP-Y-0003-00).
- *Factual Report* prepared by A2SI, dated January 2023 (ref: 24022-A2SI-XX-XX-RP-X-0001-01).
- *Structural Engineers Report prepared* by Baker Chatterton Structural Design Ltd, dated March 2023 (ref: J225-S-RP-001).
- *Structural Planning Drawings* by Baker Chatterton Structural Design Ltd, dated March 2023 (ref: J225-BC).
- *Foundation Loads Existing and Proposed* prepared by Baker Chatterton Structural Design Ltd, dated March 2023 (ref: J225-BC-SK).

Information available in the public domain:

- British Geological Survey online database (various sources).
- Google Earth Pro.

2. The Site and Proposed Development

2.1. Development Site and Current Site Use

The development site is located at 13 Belsize Crescent, London, NW3 5QY, as shown in Figure 2.1. The approximate National Grid reference for the site is 526790, 184970 and the site footprint covers approximately 0.02 hectares. The approximate ground surface elevation at the site is 69.0m above Ordnance Datum (mOD) and ground surface levels in the surrounding area fall towards the south. The development site falls within the administrative boundaries of the London Borough of Camden and currently includes a four-storey residential property including a lower ground floor and associated private front and rear gardens.

The existing structure is anticipated to be of traditional masonry construction supported by masonry strip foundations.

Figure 2.1 Location of the proposed development (red line reflects the site boundary used for this assessment)

2.2. Proposed Development

The scheme for the proposed development comprises partial demolition of internal superstructure elements. The lower ground floor will be extended and a large single-storey basement will be constructed, extending beyond the footprint of the existing building to include a swimming pool, gym and bathrooms. The house will be accessible with an external platform lift to the lower ground floor and a small internal lift to all floors will be installed.

It is anticipated that the existing structure will be supported on a shallow underpin foundation during construction, and by an in-situ cast reinforced concrete raft in the permanent case.

An indicative section of the proposed development is shown in Figure 2.2.

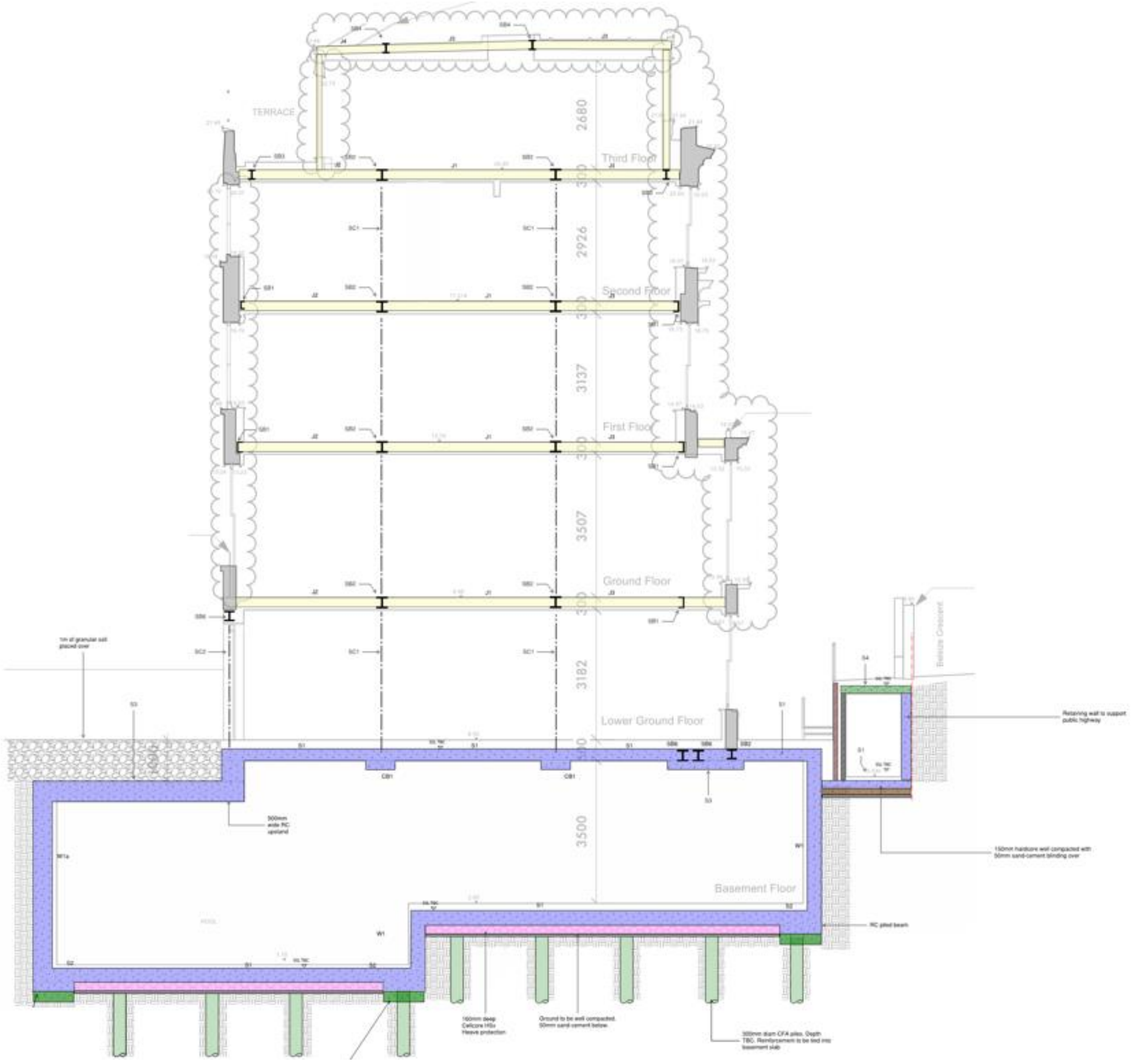


Figure 2.2 Section view of the proposed development

3. Geology

Site specific ground investigation works have been carried out on the project site. The information contained in this section has been obtained from the ground investigation carried out in September 2022 together with the desk-based review of the site.

The ground conditions were found to comprise the following (in order of succession):

- Made Ground – Soft, brown, slightly gravelly, slightly sandy, silty CLAY. Sand is fine to coarse. Gravel is fine to medium, sub-angular brick, with occasional concrete, flint and mortar.
- London Clay Formation – Firm, orangish brown mottled light grey CLAY. Occasional pockets of silt and coarse selenite crystals.

The above includes the strata of engineering interest and significance, taking cognisance of the scale of the proposed development and zone of influence. The stratigraphic profile and geotechnical parameters used for the assessment are provided in Table 3.1.

Table 3.1 Ground model and geotechnical parameters adopted for the ground movement assessment

Stratum	Top of stratum (mOD)	Thickness (m)	Undrained Young's Modulus, E_u [2] (MPa)	Drained Young's Modulus, E' [2] (MPa)
Made Ground	7.0[4]	1.5	-	10.0
London Clay	5.5	> 20	2.0 + 2.7z	2.5+3.4z

[1] The ground model and geotechnical parameters have been derived solely for the purposes of this assessment.

[2] The stiffness data (Eu and E') has been evaluated empirically taking into consideration the nature of the geotechnical/soil-structure interaction mechanisms and level of anticipated strain within the soil mass.

[3] Rigid boundary assumed at approximately -3.0mOD for analytical purposes.

[4] Top of Made Ground stratum taken at street level.

[5] z refers to metres below top of stratum.

4. Impact Assessment Evaluation

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 superstructure elements and excavation process will induce ground movements arising from the overburden removal. The transfer of the building loading to lower strata by the underpins and construction of the new superstructure will partially reinstate a portion of the removed overburden, yielding settlements across areas of the foundation system. The induced ground movements will extend over a given zone of influence surrounding the building/basement footprint.

A series of three-dimensional models of the proposed scheme have been developed in Oasys XDisp/PDisp software 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 ground movements

A Demolition and excavation (short-term).

Group B – CIRIA-based ground movements

B1. Underpin installation and excavation (short-term).
B2. Underpin installation and excavation and 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 unloading processes. The PDisp model geometry is presented in Figure 4.2.

The pressure arising from the demolition of several structural elements is assumed to be 5kPa and the proposed loading pressures have been determined from load take down information provided by Backer Chatterton Structural Design Ltd. and have been applied as uniformly distributed unloading and loading pressures, as shown in Figure 4.1. For modelling purposes, all footings have an assumed width for which the bearing pressure is less than 250kPa.

The excavation unloading pressure has been modelled as an unloading pressure of 115.2kPa applied at the excavation formation level (equating to the removal of 5.9m of soil).

The Group B assessments adopt the normalised ground displacement curves reported in CIRIA C760 to assess the impact of retention system installation works and the excavation. The following CIRIA C760 normalised ground movement curves were adopted to assess ground movements due to retention system installation and excavation works:

- *Underpin installation*: Installation of planar diaphragm wall in stiff clay.
- *Excavation to formation*: Excavation in front of a high stiffness wall in stiff clay.

The empirical data set for diaphragm wall installation is not strictly compatible with the construction technologies adopted in underpinning. However, it is assessed that the ground movement mechanisms are reasonably well-matched and, in lieu of better empirical relationships, the diaphragm wall curves are considered to provide a satisfactory and conservative approximation.

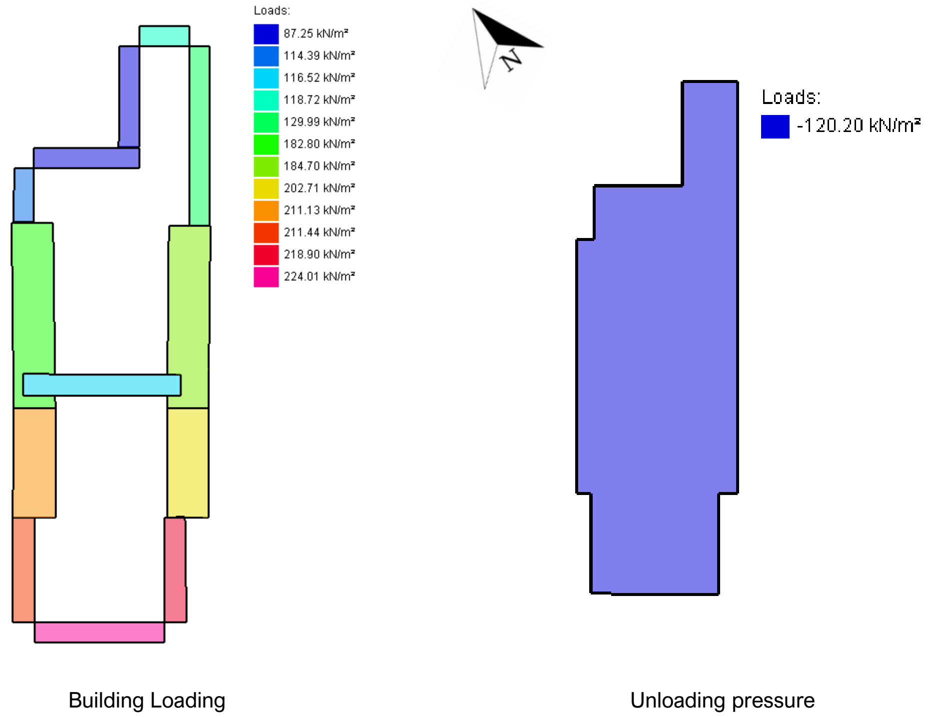


Figure 4.1 Modelled loading patches in PDisp

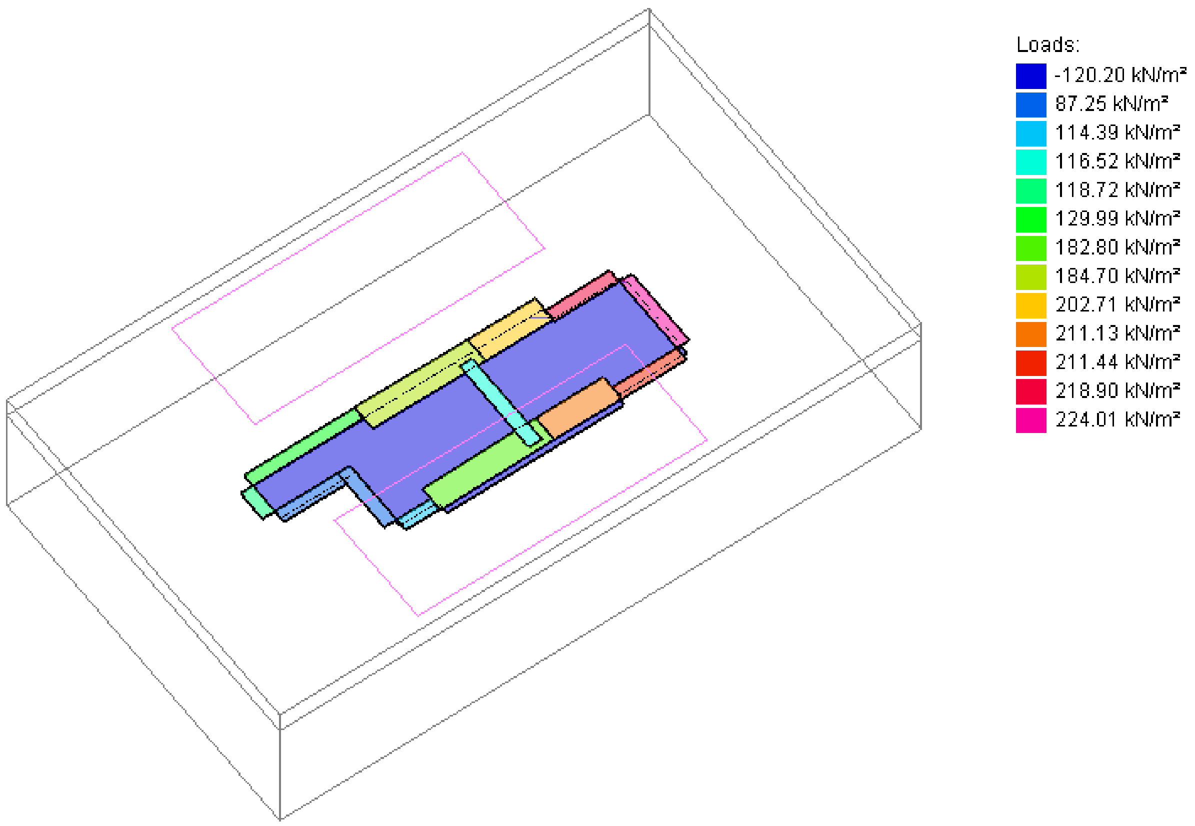


Figure 4.2 Oasys PDisp model geometry (example long-term scenario - A2)

The two groups of analyses enabled the production of an envelope of damage classification results – with the worst-case results presented herein. A representative geometry has been adopted for defining the excavation/installation geometry implemented in the 3D modelling efforts. An indicative plot of the analytical model is presented below in Figure 4.3 showing the excavation area and the adjacent properties included in the damage assessment.

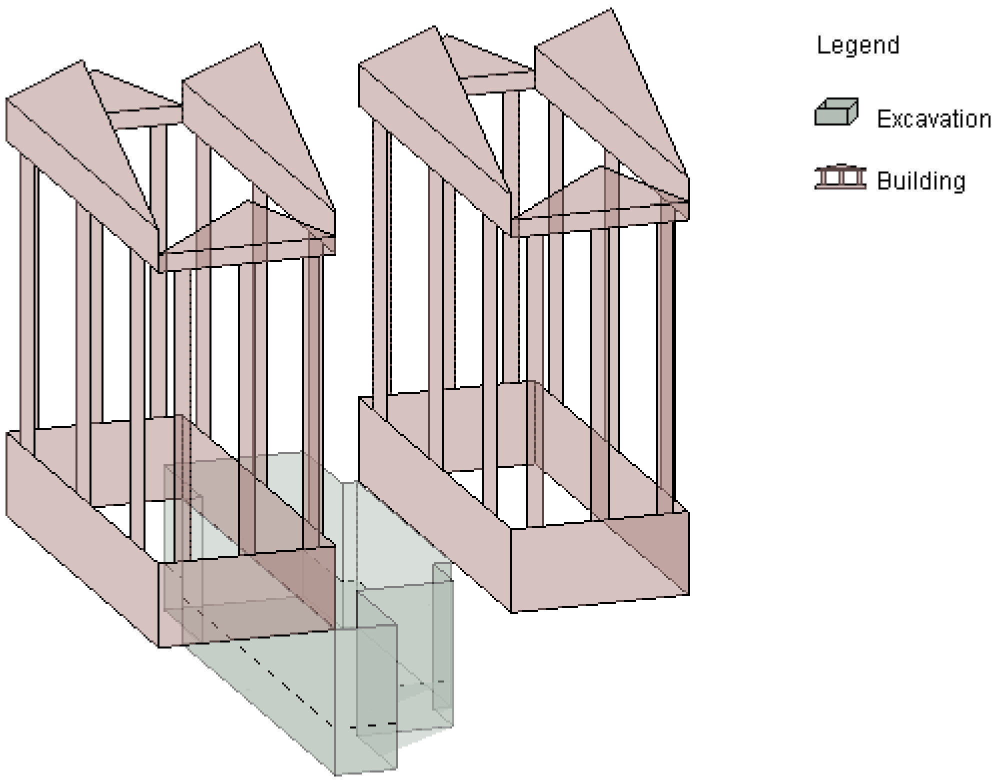


Figure 4.3 Indicative plot of three-dimensional analytical model using the Oasys XDisp software suite (soil removed for clarity of presentation)

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 based on the calculated ground movement fields. The masonry walls of concern are shown in Figure 4.4, 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 basement (covering the key deformation mechanisms). The façades of the neighbouring buildings considered for the current study are grouped in the following manner:

- B1 - B4: 11BS :11Belsize Crescent
- B5 – B8: 15BS :15 Belsize Crescent

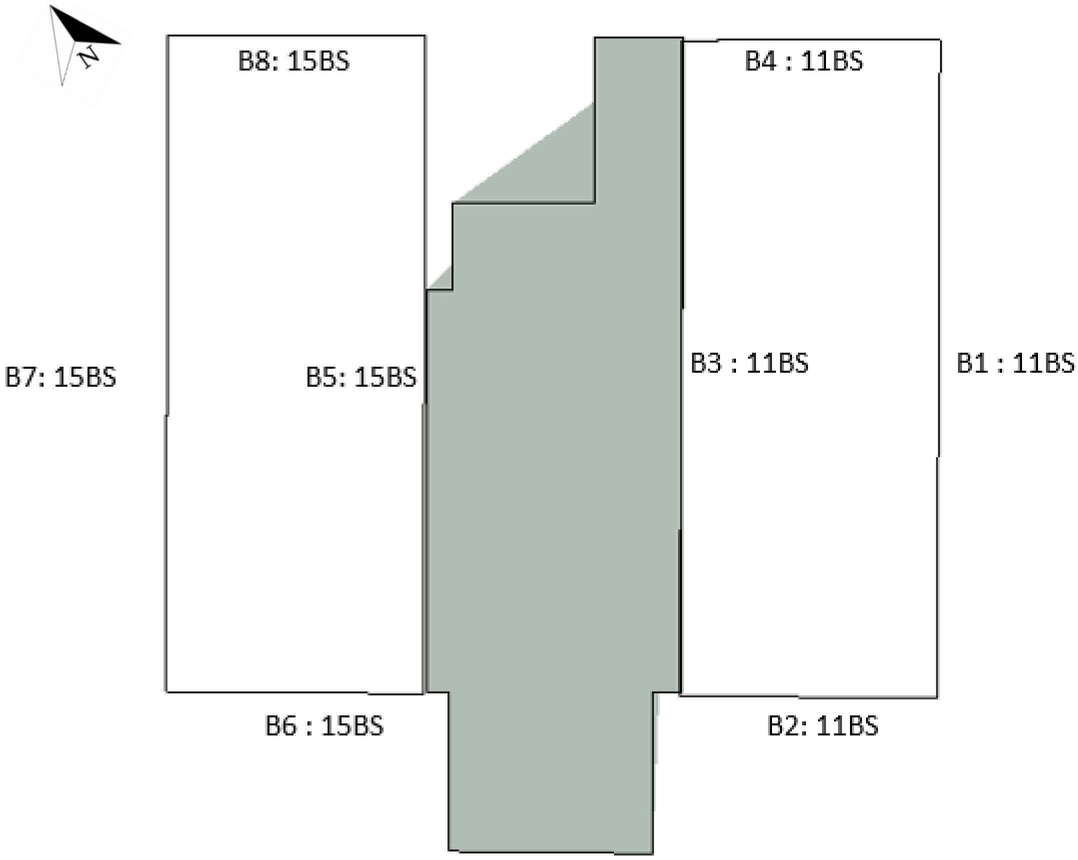


Figure 4.4 Simplified scheme and nomenclature for each building façade/masonry wall element

Each wall has been assumed to behave as an equivalent beam subject to a bending and extension/compression deformation mechanisms, 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 4.5 and Figure 4.6. 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).

Category of damage	Description of typical damage (ease of repair is underlined)	Approximate crack width (mm)	Limiting tensile strain ε_{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	<u>Fine cracks that can easily be treated during normal decoration.</u> Perhaps isolated slight fracture in building. Cracks in external brickwork visible on inspection.	< 1	0.05–0.075
2 Slight	<u>Cracks easily filled. Redecoration probably required.</u> Several slight fractures showing inside of building. Cracks are visible externally and <u>some repointing may be required externally</u> to ensure weathertightness. Doors and windows may stick slightly.	< 5	0.075–0.15
3 Moderate	<u>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.</u> 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	<u>Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows.</u> 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	<u>This requires a major repair involving partial or complete rebuilding.</u> Beams lose bearings, walls lean badly and require shoring. Windows broken with distortion. Danger of instability.	usually > 25 but depends on number of cracks.	

Figure 4.5 **Building damage classification, after Burland et al. 1977, Boscardin and Cording 1989 and Burland 2001 - relationship between category of damage and limiting strain ε_{lim}**

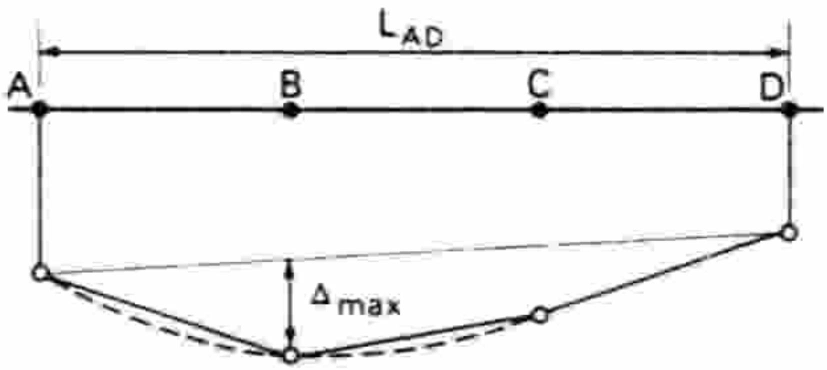


Figure 4.6 **Definition of relative deflection Δ and deflection ratio Δ/L**

5. Ground Movement Assessment Results

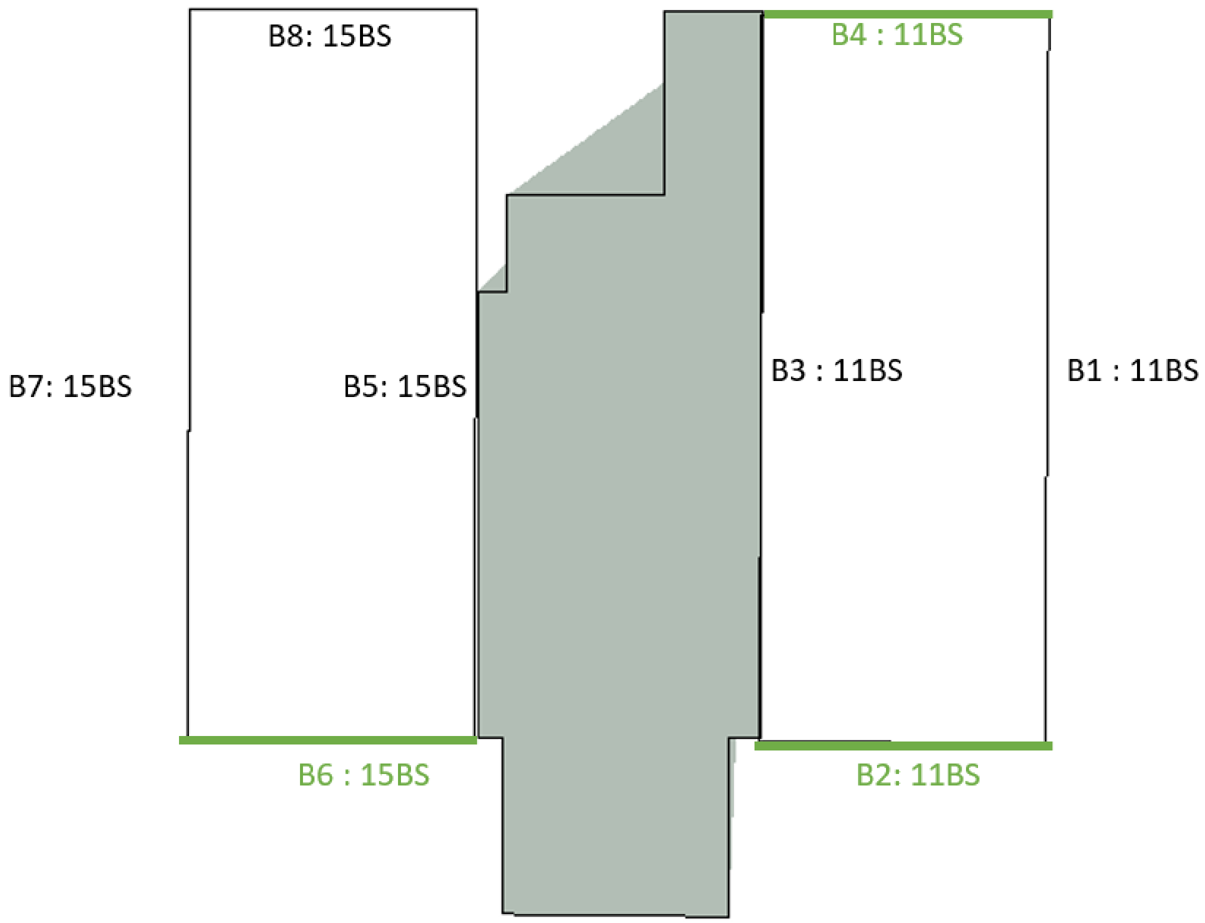
5.1. Façade Damage Categories

The results of the assessment are presented in Table 5.1. It is noted that the results presented in this table represent the worst case resulting from all analysis runs. Damage category results are presented in Figure 5.1 for the affected façades. Figure 5.2 and Figure 5.3 depict the vertical and horizontal displacements, respectively from analysis scenario B2.

Table 5.1 Evaluated damage categories from XDisp

Façade Reference	Analysis Scenario		
	A	B1	B2
B1: 11BS	Category 0 – Negligible	Category 0 – Negligible	Category 0 – Negligible
B2: 11BS	Category 0 – Negligible	Category 0 – Negligible	Category 1 – Very Slight
B3: 11BS	Category 0 – Negligible	Category 0 – Negligible	Category 0 – Negligible
B4: 11BS	Category 0 – Negligible	Category 0 – Negligible	Category 1 – Very Slight
B5: 15BS	Category 0 – Negligible	Category 0 – Negligible	Category 0 – Very Slight
B6: 15BS	Category 0 – Negligible	Category 0 – Negligible	Category 1 – Very Slight
B7: 15BS	Category 0 – Negligible	Category 0 – Negligible	Category 0 – Negligible
B8: 15BS	Category 0 – Negligible	Category 0 – Negligible	Category 0 – Negligible

Refer to Figure 4.4 for building/wall nomenclature.



Green – Category 1 (Very Slight), Yellow – Category 2 (Slight) All remaining facades – Category 0 (Negligible)

Figure 5.1 Affected façades after all scenarios

5.2. Basement Excavation Criteria

The results of this analysis show that all buildings will fall within the acceptable damage classification (i.e. not exceeding Category 1 – Very Slight), if the ground movements caused by the wall installation, excavation and scheme construction are limited to the values presented in Table 5.2. It is 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.

Table 5.2 Maximum Cumulative Ground Movement from XDisp

Stage	Maximum Cumulative Ground Movement (mm)	
	Vertical	Horizontal
A	4	0
B1	5	0
B2	14	13