Peter Law
BE M Eng Sc MIEAust

Maurice J. Dawson
B Sc(Eng) MIEAust CPEng NER

Law & Dawson Pty Ltd
Consulting Structural & Civil Engineers
A.B.N. 97003 543 913

STRUCTURAL REPORT

for the garage at 81 Sydney Road, MANLY.

Reference Number:	*RD: 2018/114-STR-RPT.1*
Date Inspected:	*Monday 16th July 2018*
Date Prepared:	*Wednesday 1st August 2018* *Amended Friday 26th October 2018*
Prepared for:	*Link Housing*
Prepared by:	*Law & Dawson Pty Ltd* *Consulting Structural & Civil Engineers*
Contact details	
Address	*Suite 3 (1st Floor)* *448 Pacific Highway* *ARTARMON NSW 2064*
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Law & Dawson Pty Ltd
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1. INTRODUCTION

We advise that an inspection of the existing garage was carried out by the undersigned on Monday 16th July 2018, in the presence of Keith Stephens, Jonathan Rhule and Djamel Boukerche of Link Housing and Warren Welsh, with a view to:

i) Comment on the damaged masonry walls to the garage
ii) Comment on the removal of the palm tree, which is leaning against the garage.

The garage is located in front of and partially below the masonry flat building, with a portion of the flat building sitting on top of the existing garage concrete roof slab.

There is palm tree on the eastern side of the garage which abuts the garage masonry wall.

The east and west masonry walls to the garage are only 110mm thick, yet they retain up to 1.3 metres height of soil externally.

Photographs were taken and are included in Appendix 'B' of this report and rectification drawings 1 and 2 are included in Appendix 'A'.

2. DEFECTS OBSERVED

We identified the following defects at our inspection, namely:

2.1 East wall to garage

Photo Number	Description
1,2,3,4,5,6,8,9,18,19,20, 21,22,23,25,26,38,39,40	Cracks in wall
1,6,14,41	Corroded steel beams
7,8	Damaged render to roof slab

2.2 West wall to garage

Photo Number	Description
10,11,12,13,14,15,16,17	Cracks in wall

2.3 East landing retaining wall

Photo Number	Description
24	Cracks in wall
25	Pavers have settled

2.4 Other

Photo Number	Description
18,26,27,28	Tree against garage wall
29,30	Structure above garage slab
31,32,33,34,35	Sandstone foundation wall to building, at rear of garage
36,37	Street elevation

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3. COMMENTS & CAUSE OF DEFECTS

We offer the following comments:

i) The rear eastern masonry wall adjacent to the palm tree has suffered cracking and has an excessive 'bow' inwards. This 'bow' and localised masonry stepped cracking mid height in the wall is obviously caused by the roots of the palm tree applying lateral pressures against the masonry wall – refer to photos 18, 19, 21, 26, 27, 28, 39, 40. Structural integrity rating = 1.0.

The existing 110mm thick masonry wall, with an engaged pier, is structurally inadequate to support this lateral loading.

ii) The eastern and western garage masonry walls retain soil between 800mm and 1,300mm high. This soil pressure loading has caused masonry cracking in the masonry walls – refer to photos 1, 2.

In our opinion, the existing 110mm thick masonry wall is structurally inadequate to support the lateral soil pressure loadings. Structural integrity rating = 1.0.

iii) The eastern retaining wall has also suffered horizontal cracking at the top of the wall, which appears to be the result of corrosion of the centre and front steel beams where they are embedded in the masonry wall – refer to photos 1, 2, 3, 4, 5, 6, 7, 18, 38, 41.

The existing steel beams are untreated and they are embedded in an external 'wet' masonry wall.

This corrosion has cracked and raised the masonry wall and garage roof slab by approximately 10mm – refer to photo 41. Structural integrity rating = 2.2.

iv) The western garage wall has similar masonry cracking which is also due to its corrosion of the steel beams where they are embedded in the masonry wall. Refer to photos 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 23. Structural integrity rating = 2.2.

v) The steel beam which is located above the garage door has suffered extensive corrosion along its length due to its exposure to the elements, and it not being appropriately treated against corrosion. Structural integrity rating = 2.2.

vi) The existing walls are founded on bedrock which is exposed beneath the rear eastern garage wall. Consequently, foundation settlement is not a cause of any of the defects.

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4. RISKS ARISING FROM DEFECTS & MITIGATION MEASURES

In our opinion, the rear eastern garage wall is unstable and this wall and the garage roof slab should be temporary propped urgently, to prevent a collapse of the roof slab. We refer to our emails and sketches of 18th July 2018 and 6th August 2018. Copies are attached to appendix 'C' of this report.

The corroded steel beams will continue to deteriorate and further damage the structure, until they are replaced. Photos of the completed temporary propping was provided to us on 6th August 2018.

5. RECTIFICATION WORKS

In our opinion, both the eastern and western garage walls should be demolished and re-constructed using reinforced concrete (or reinforced blockwork) walls to resist the soil pressure loading.

The palm tree can then be removed, which will most probably require the removal of the brickwork retaining walls and paving to the landing adjacent to the tree.

This landing can probably be re-built using timber framed construction.

As previously advised, the steel beams which support the concrete roof slab have suffered extensive corrosion where they are embedded into the existing masonry external garage walls.

Therefore, these beams will need to be removed and replaced with similar steel beams appropriately treated and protected from the elements, to prevent corrosion.

Alternatively, an insitu reinforced concrete beam to engineers details in lieu of the steel beam, could be adopted above the garage door opening.

We confirm the lateral restraint of the garage structure will be provided by the reinforced concrete wall, re-bars and non-shrink grout into the existing concrete roof slab.

Structural drawings detailing the required rectification works, namely, 2018/114-1'A' and 2'A' are attached to appendix 'A' of this report.

Should you have any queries in regards to the above, please do not hesitate to contact the undersigned.

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Maurice J Dawson
Director
Chartered Professional Engineer
B.Sc.(Eng), MIEAust, CPEng, NER
Law & Dawson Pty Ltd

APPENDIX 'A'

Rectification Drawings

GENERAL

G1 These drawings shall be read in conjunction with all architectural and other consultants' drawings and specifications and with such other written instructions as may be issued during the course of the contract.

G2 All workmanship and materials shall be in accordance with these notes unless specified otherwise on drawings.

G3 Any discrepancies shall be referred to the Architect for a decision before proceeding with the work.

G4 Dimensions shall not be obtained by scaling the structural drawings.

G5 "Set out" dimensions shown on the drawings shall be verified by the builder.

G6 During construction the builder shall maintain the structure in a stable condition and no part shall be overstressed.

FOUNDATIONS

F1 All foundations shall carry down to undisturbed material. Foundation bearing pressures are noted on the relevant plans. This material shall be approved by the engineer prior placing the reinforcement or concrete.

F2 All concrete shall be placed 'in the dry'.

F3 Any overexcavation shall be backfilled with concrete.

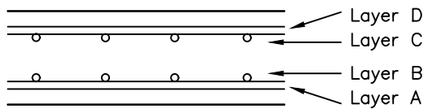
REINFORCEMENT

R1 All workmanship and materials shall be in accordance with AS 3600 and other relevant codes.

R2 Reinforcing steel quality

Reinforcement type	Grade	SAA code	Symbol
Tempcore	D500N	AS1302	N
Plain round bars	R250N	AS1302	R
Welded wire fabric	D500SL	AS1304	SL

R3 Order of laying slab reinforcement



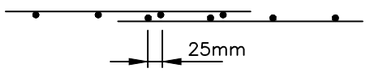
R4 Reinforcement is represented diagrammatically : it is not necessarily shown in true projection.

R5 Splices in reinforcement shall be made only in the position shown. The approval of the Engineer shall be obtained for any other splice.

R6 Welding of reinforcement will not be permitted unless shown on the structural drawings, or with Engineer's approval.

R7 All reinforcement shall be securely tied and positioned accurately by means of plastic tipped steel or plastic chairs or other approved accessories. Masonry blocks will not be permitted.

R8 Fabric splice detail.



CONCRETE

C1 All workmanship and materials shall be in accordance with AS 3600 and other relevant codes.

C2 Concrete quality:

Element	AS3600 F'c	Max. Size Aggregate	Recommended Slump
Footings	20MPa	20mm	80mm
R.C. Walls	32MPa	20mm	80mm

C3 No admixtures shall be used in concrete unless approved in writing.

C4 Clear concrete cover to reinforcement shall be as follows:

Element	Cast Against Form Complying with AS3610		Cast Against other Formwork or the Ground
	In Sheltered Locations	Exposed to Ground,Water or Weather	
Footings			50mm
R.C. Walls	20mm	65mm	

C5 Sizes of concrete elements do not include thickness of applied finishes.

C6 Construction joints where not shown shall be located to the approval of the Engineer.

C7 No holes or chases other than those shown on the structural drawings shall be made in concrete members without the prior approval of the Engineer.

STRUCTURAL STEEL

S1 All workmanship and materials shall be in accordance with AS 4100 and AS 1554 except where varied by the contract documents.

S2 Unless otherwise noted, all steel shall be in accordance with:
AS 3678 for hot–rolled plates, floor plates and slabs
AS 3679.1 for hot–rolled bars and sections
AS 3679.2 for welded sections
AS 1163 for hollow sections

S3 Connections shall be provided to carry the reactions noted, unless otherwise detailed.

S4 The builder shall prepare workshop drawings and shall submit three copies of each drawing for approval. Fabrication shall not commence until approval has been received.

S5 Welds shall be 6mm continuous fillet, all bolts 20mm 8.8/S diameter. No bolt threads will be permitted within the bearing length. All gusset plates 10mm thick unless otherwise noted.

S6 Butt welds where indicated in the drawing are to be complete penetration butt welds as defined in AS 1554.

S7 High strength friction grip bolts, nuts and washers shall comply with the relevant requirements of AS 1252 shall be installed in accordance with AS 4100 and shall be tightened to the correct tension using approved load indicating washers. Contact surfaces of all high strength friction grip bolted connections shall be left unpainted.

S8 Concrete encased steelwork shall be wrapped with W5 wire at 150mm centres and shall have a minimum of 50mm clear cover unless noted otherwise.

S9 Structural steelwork shall have the following surface treatment in accordance with the specification.

Element	Surface Cleaning	Priming
Protected Steel work	Wire brush	2 Coats R.O.Z.C.
Exposed Steel work	Pickling	Hot dip galvanised

S10 The builder shall provide all cleats and drill all holes necessary for fixing steel to steel and timber to steel whether or not detailed in the drawings.

CONCRETE MASONRY

M1 All workmanship and materials shall be in accordance with AS 3700 and AS 3600.

M2 Concrete block quality: GRADE 12.

M3 Mortar mix 1: 1/4: 3 (cement:lime:sand)

M4 Core filling concrete: F'c =20MPa
Max. aggregate =10mm
Recommended slump =150mm

M5 Mortar fins protruding more than 10 mm from joints shall be removed before pouring core filling concrete.

M6 Clean out openings shall be provided at the bases of walls and columns in the cores to be filled.

M7 Vibrators or other approved means shall be used to ensure that cores are properly filled.

M8 A total cover of 65 mm from outside of blockwork to the reinforcement is required.

BRICKWORK

B1 All workmanship and materials to be in accordance with AS 3700 and other relevant codes.

B2 Structural bricks to have a characteristic unconfined compressive strength of F'uc = 12 MPa.

B3 Mortar mix 1:1:6 (cement:lime:sand)

TIMBER

T1 All workmanship and materials shall be in accordance with AS 1720 and other relevant codes.

T2 Timber Quality : (Unless Otherwise Noted)
Oregon – F7 Stress Grade
Pine – MGP10 Grade

T3 All bolts shall be 20mm diameter black bolts unless otherwise noted.

T4 Timbers exposed to weather to be durability class 1 or 2, with sapwood removed, or preservative treated to H3. (AS1683.2)

No.	Date	Revision	App'd
A	02.08.18	ISSUED FOR REPORT	

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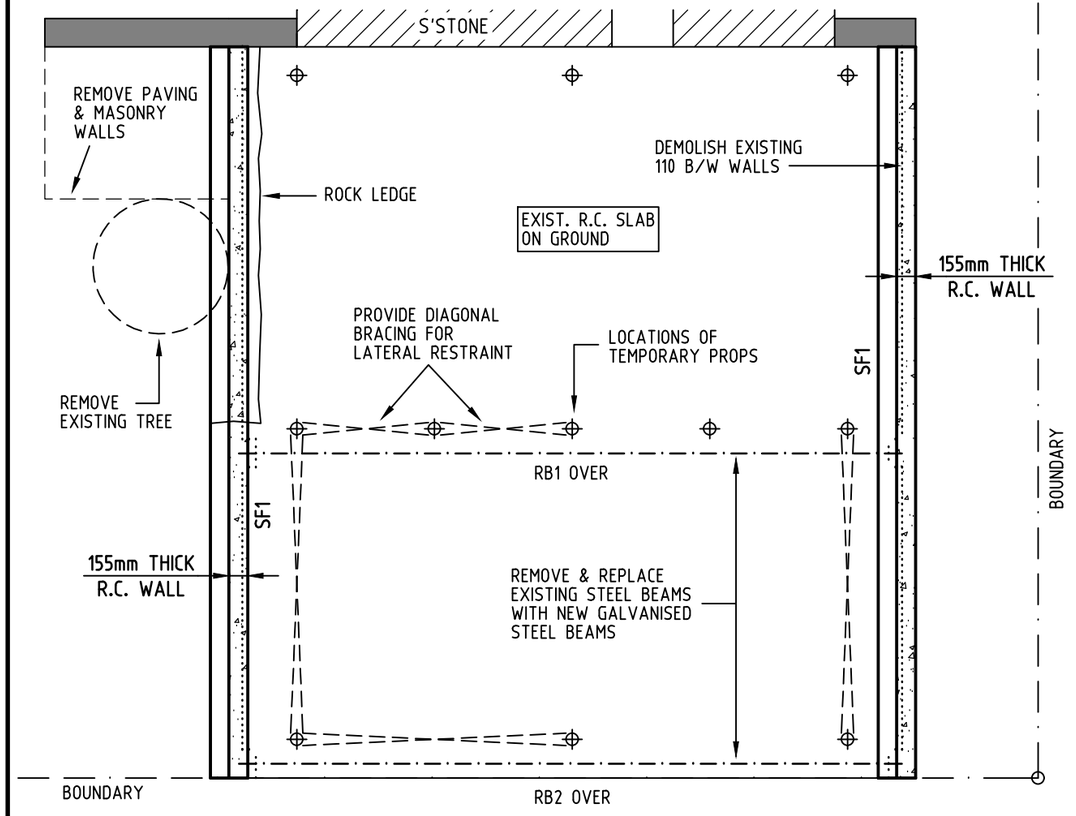
Client : LINK HOUSING

Project : NEW GARAGE WALLS AT 81 SYDNEY ROAD, MANLY.

Title : GENERAL NOTES

Date	Scale	Project Number	Revision No.
JULY '18	-	2018/114-1	A
Checked	Approved		

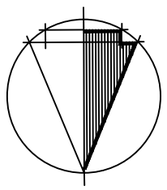


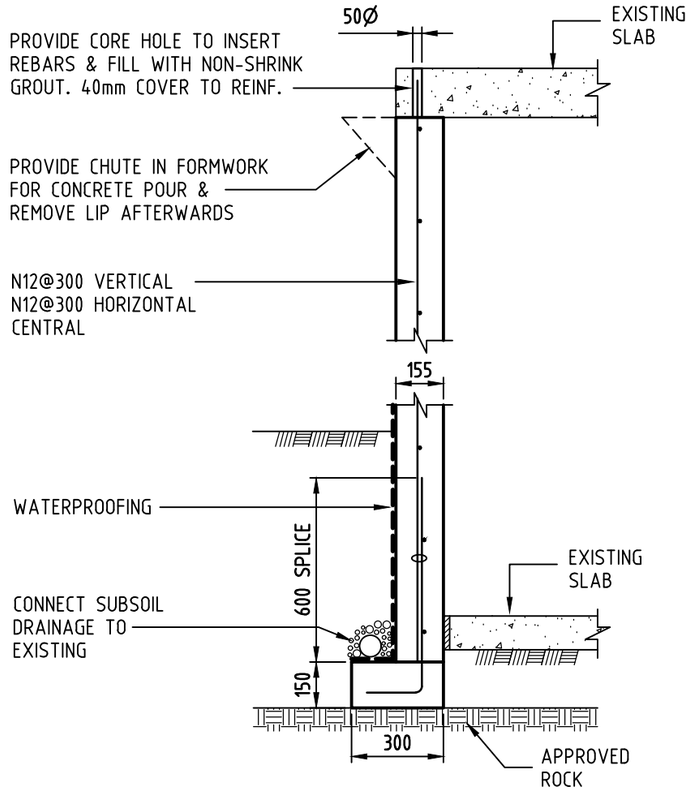
GARAGE FOOTING/FLOOR PLAN SCALE 1:50

FOOTINGS HAVE BEEN DESIGNED IN ACCORDANCE WITH THE RESIDENTIAL SLABS & FOOTING CODE. SITE CLASSIFICATION "A" - STABLE ROCK.

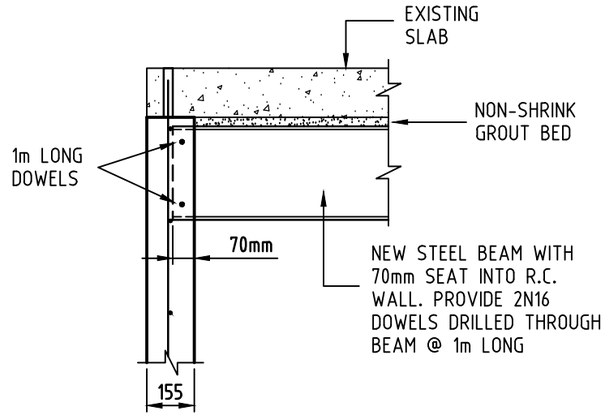
R.C. WALL F'c = 32 mPa

RB1,RB2 ... NEW GALVANUSED 310UB 40.4 TO SUPPORT EXISTING ROOF SLAB





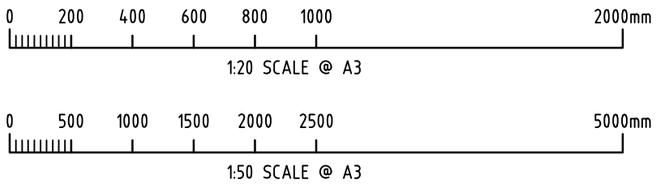
SECTION A 1:20



BEAM SEAT DETAIL 1:20

BEAM INSTALLATION PROCEDURE

1. INSTALL TEMPORARY PROPS & DIAGONAL BRACING TO SUPPORT EXISTING ROOF SLAB. BUILDER TO ENSURE STABILITY OF STRUCTURE BEFORE REMOVING EXISTING WALLS.
2. FORM NEW R.C. WALLS & INSTALL & TEMPORARILY SUPPORT NEW STEEL BEAMS.
3. POUR R.C. WALLS, GROUT REO BARS & ALLOW 14 DAYS FOR CONCRETE TO CURE.
4. REMOVE BEAM SUPPORTS & PRE-DEFLECT BEAMS WITH STEEL FOX WEDGES BETWEEN TOP OF BEAMS & SLAB OVER.
5. DRY PACK NON-SHRINK GROUT BETWEEN BEAMS & ROOF SLAB FOR FULL LENGTH OF STEEL BEAMS.
6. ALLOW 48 HOURS TO DRY BEFORE REMOVING TEMPORARY PROPS FROM ROOF SLAB.



No.	Date	Revision	App'd
A	02.08.18	ISSUED FOR REPORT	

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Client : LINK HOUSING

Project : NEW GARAGE WALLS AT 81 SYDNEY ROAD, MANLY.

Title : GARAGE FOOTING/FLOOR PLAN & DETAILS

Date	Scale	Project Number	Revision No.
JULY '18	1:50, 1:20	2018/114-2	A
Checked	Approved		

APPENDIX 'B'

Photographs

Photo (1):

Photo (2):

Photo (3):

Photo (4):

Photo (5):

Photo (6):

Photo (7):

Photo (8):

Photo (9):

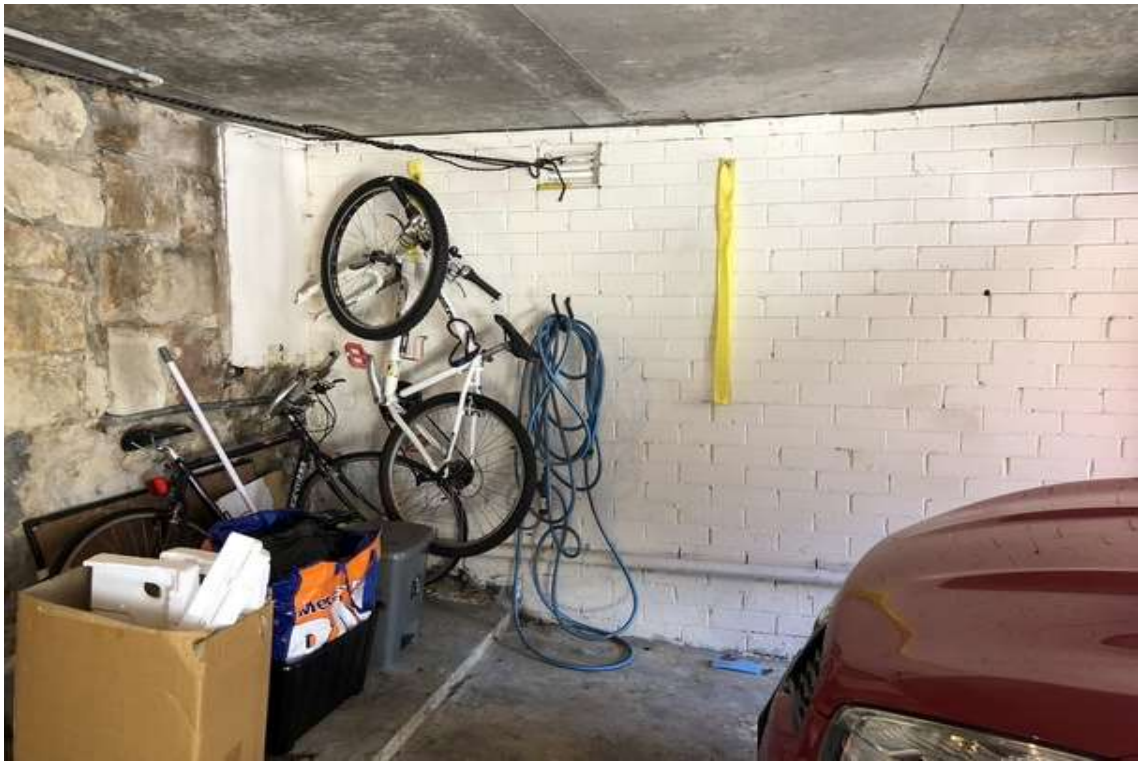

Photo (10):

Photo (11):

Photo (12):

Photo (13):

Photo (14):

Photo (15):

Photo (16):

Photo (17):

TOP

Photo (18):

Photo (19):

Photo (20):

Photo (21):

Photo (22):

Photo (23):

Photo (24):

Photo (25):

TOP

Photo (26):

TOP

Photo (27):

TOP

Photo (28):

TOP

Photo (29):

TOP

Photo (30):

Photo (31):

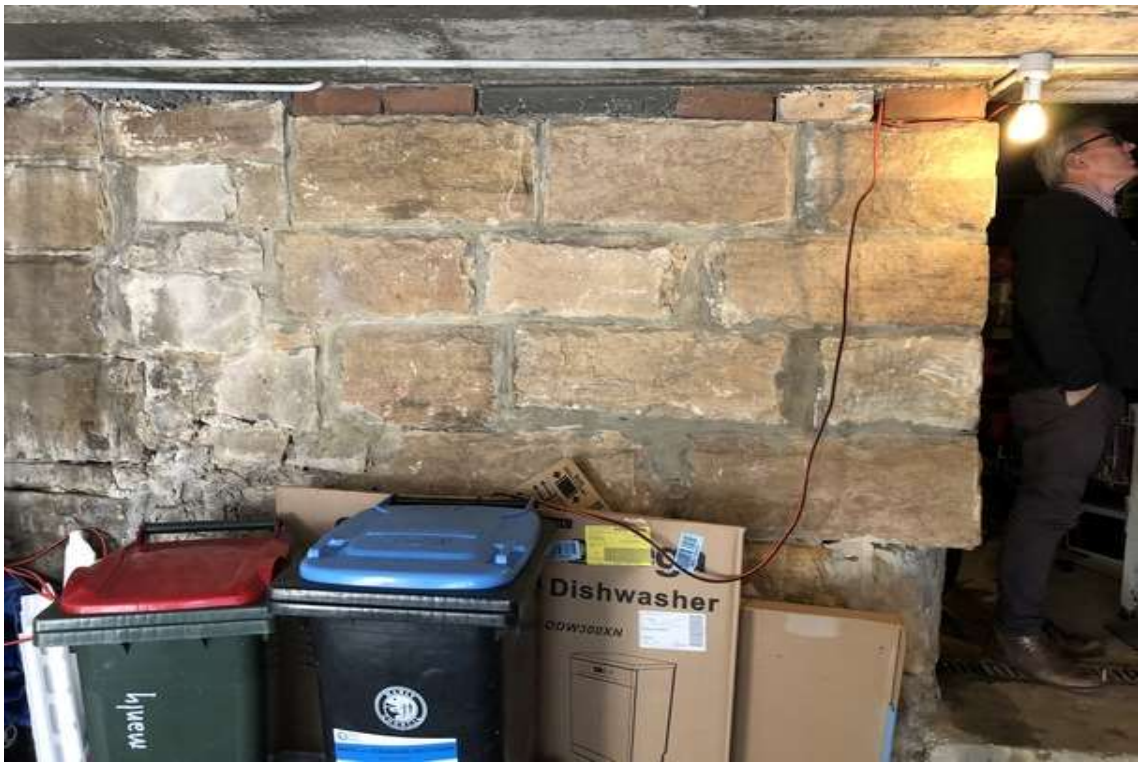

Photo (32):

Photo (33):

Photo (34):

TOP

Photo (35):

Photo (36):

Photo (37):

TOP

Photo (38):

Photo (39):

Photo (40):

Photo (41):

APPENDIX 'C'

Emails and sketches of 18th July 2018 and 6th August 2018

Maurice Dawson

From: Maurice Dawson
Sent: Wednesday, 18 July 2018 3:55 PM
To: 'Keith Stephens'
Subject: RE: Engineers Report 81 Sydney Rd Manly
Attachments: DOC180718.pdf

Hi Keith,

As discussed on site on 16th July, we recommend that the existing garage roof slab be temporary propped and the 'bowed' wall temporary propped as soon as practicable – refer to the attached sketch.

The stability of the eastern brick wall is of concern, due to the adverse effects of the soil pressure loading and the existing tree.

We will prepare a structural report to address all the issues with this structure.

Regards,

Maurice J. Dawson
B Sc(Eng) MIEAust CPEng NER

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Email: maurice@lawdawson.com.au
Web: www.lawdawson.com

From: Keith Stephens <Keith.Stephens@linkhousing.org.au>
Sent: Tuesday, 10 July 2018 9:57 AM
To: Maurice Dawson (maurice@lawdawson.com.au) <maurice@lawdawson.com.au>
Cc: Jonathan Rhule <Jonathan.Rhule@linkhousing.org.au>
Subject: Engineers Report 81 Sydney Rd Manly

Hi Maurice,
Hope you are well.
Could you please advise of availability to conduct an inspection of the above property with a view to removing a palm tree in close proximity to the brick wall of garage which supports a concrete balcony.
Please see attached photos.
Regards

Keith Stephens | Technical Officer
Link Housing Limited - "A better future for those in need, through safe, affordable housing"

Project : 81 SYDNEY ROAD, MANLY

Page : BR1.

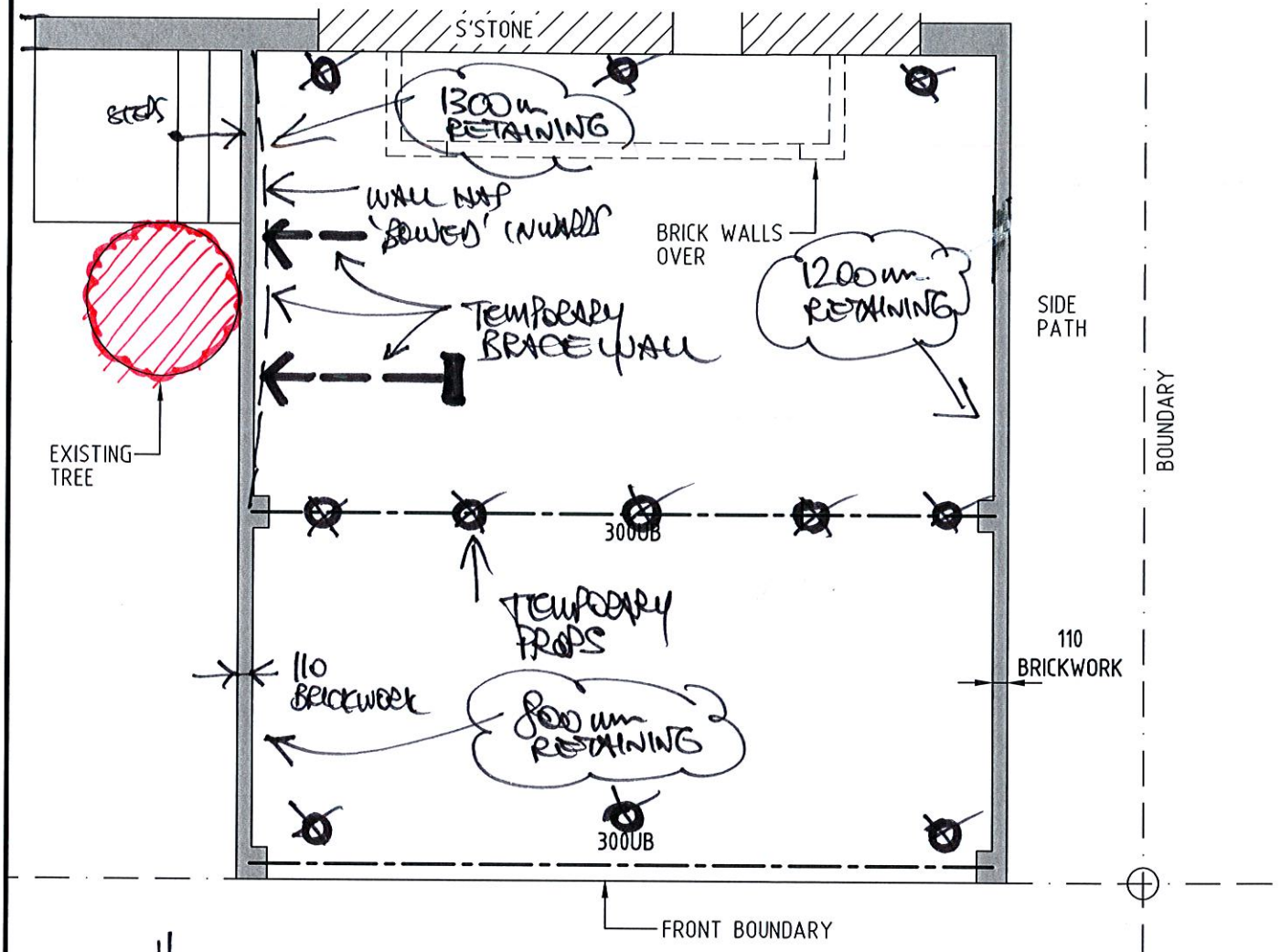
Job No : 2018/114

Title : GARAGE FLOOR PLAN – TEMPORARY PROPS & BRACING

Date : JULY '18

Drawn :

Law & Dawson Pty Ltd
Consulting Structural & Civil Engineers
A.C.N. 003 543 913



NORTH

GARAGE FLOOR PLAN

SCALE 1:50

WITH ROOF BEAMS INDICATED

(1) PROVIDE TEMPORARY PROPS TO SUPPORT EXISTING BEAM & ROOF SUBS. (20kN CAPACITY PROPS EACH)

(2) TEMPORARY BRACE 'BOWED' WALL WITH 20kN CAPACITY PROPS & WALL PLATE BOLTED TO BRICK WALL & SUBS.

0 500 1000 1500 2000 2500 5000mm

1:50 SCALE @ A4

Suite 3 (1st floor) 448 Pacific Hwy., Artarmon N.S.W. 2064 . Tel: (02) 9419 3511 . Fax: (02) 9419 6040 . Email: enquiries@lawdawson.com.

Maurice Dawson

From: Maurice Dawson
Sent: Monday, 6 August 2018 3:55 PM
To: 'Keith Stephens'
Cc: 'Jonathan Rhule'
Subject: RE: 81 Sydney Rd Manly
Attachments: DOC060818-006.pdf; 2018-114-STR-RPT.pdf

Hi Keith,

I have attached the instruction, as discussed.

I have also attached our structural report, as requested.

gards,

Maurice J. Dawson
B Sc(Eng) MIEAust CPEng NER

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Email: maurice@lawdawson.com.au
Web: www.lawdawson.com

ɔm: Keith Stephens <Keith.Stephens@linkhousing.org.au>
Sent: Monday, 6 August 2018 9:48 AM
To: Maurice Dawson (maurice@lawdawson.com.au) <maurice@lawdawson.com.au>
Cc: Jonathan Rhule <Jonathan.Rhule@linkhousing.org.au>
Subject: FW: 81 Sydney Rd Manly

Hi Maurice,
Could you please advise from the attached photos if the make safe is adequate. The plywood against the wall is 25mm thick & the Acro props are rated at 29KN
Thanks

Keith Stephens | Technical Officer
Link Housing Limited - "A better future for those in need, through safe, affordable housing"
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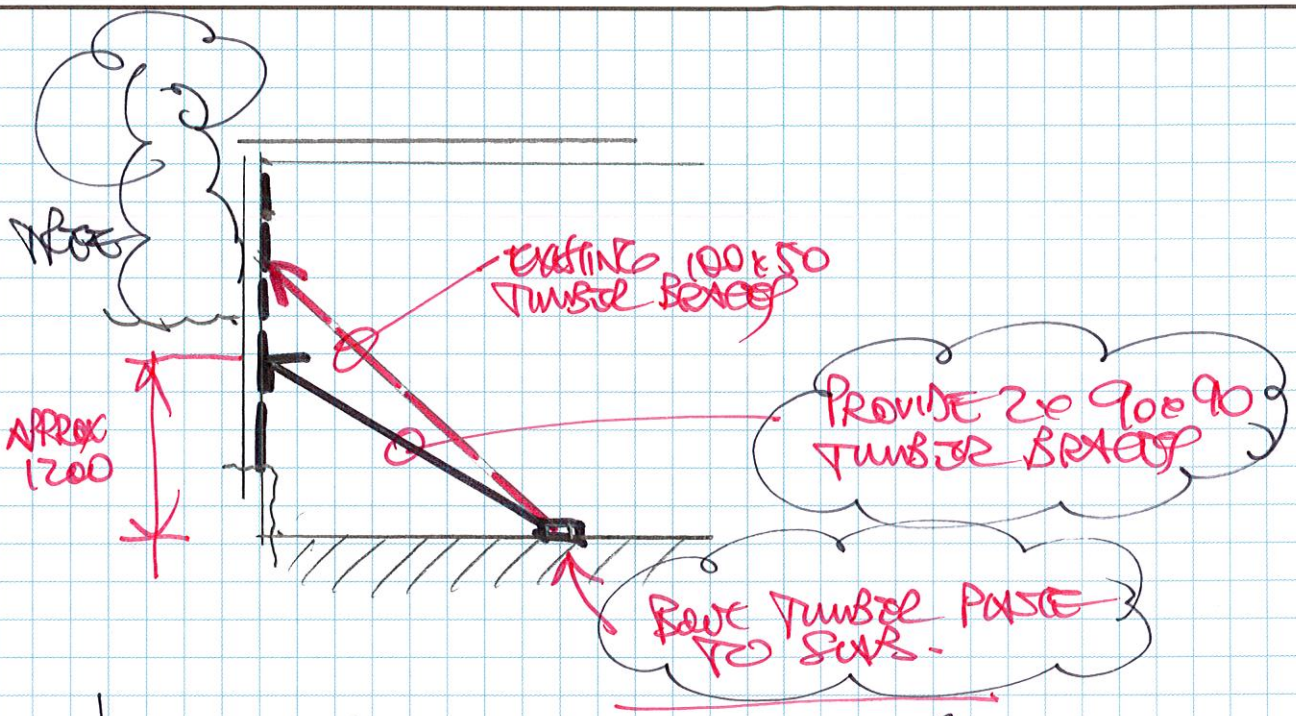
Level 12, 815 Pacific Highway, Chatswood NSW 2067
P O Box 5124, Chatswood West NSW 2067

SITE INSTRUCTION

81 SYDNEY ROAD, MANLY

#2018/114 6/8/18

Law & Dawson Pty Ltd
Consulting Structural & Civil Engineers



SECTION OF TEMPORARY BRACING

WE REFER TO EMAIL & PHOTOS RECEIVED ON 6/8/18.

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