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Sydney NSW 2000
02 9241 4188
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ABN 81 094 433 100

14 Dec 2022

Ref: SY211516-00-REL012
Matt Seelin
Built.
mattseelin@built.com.au
Level 4/185 Clarence Street
Sydney NSW 2000

Dear Matt,

Re: Heritage Engineering at Lands Building –Ceiling Condition based on available inspections

We write regarding the status of Investigations of the existing lath and plaster ceilings at the Department of Lands Building. As outlined in our 'Preliminary Report on Permanent Stabilisation Detail of Timber and Metal Lath Ceilings' and our 50% AFC submission, Northrop have inspected all ceilings that were accessible on site during Phase 1 of the project.

Several rooms were inaccessible as the Phase 1 scope was limited to certain areas and levels. This prevented Northrop from inspecting the rooms with either temporary ceiling stabilisation installed or where the existing floor build up was retained. These rooms are identified in our drawings SH-1001 – SH-1004 (refer to pages 3-5 of this document). For the ceilings yet to be inspected, based on the consistency of condition in the areas we have inspected to date, it is anticipated that the ceiling condition are likely to be of a similar condition to those inspected. Theses areas will be verified by detailed inspection when the ceilings become accessible in Phase 2.

Appended to this letter is a matrix (refer to page 2 of this document) which outlines a room-by-room condition assessment and an assumed failure mechanism for the ceilings that were accessible. In all cases, this is based on a visual inspection only.

Based on the above assumption, we believe it likely that our current ceiling stabilisation details as shown on SH-2001 (refer to page 6 of this document) will need to be performed on all existing lath and plaster ceilings within the building.

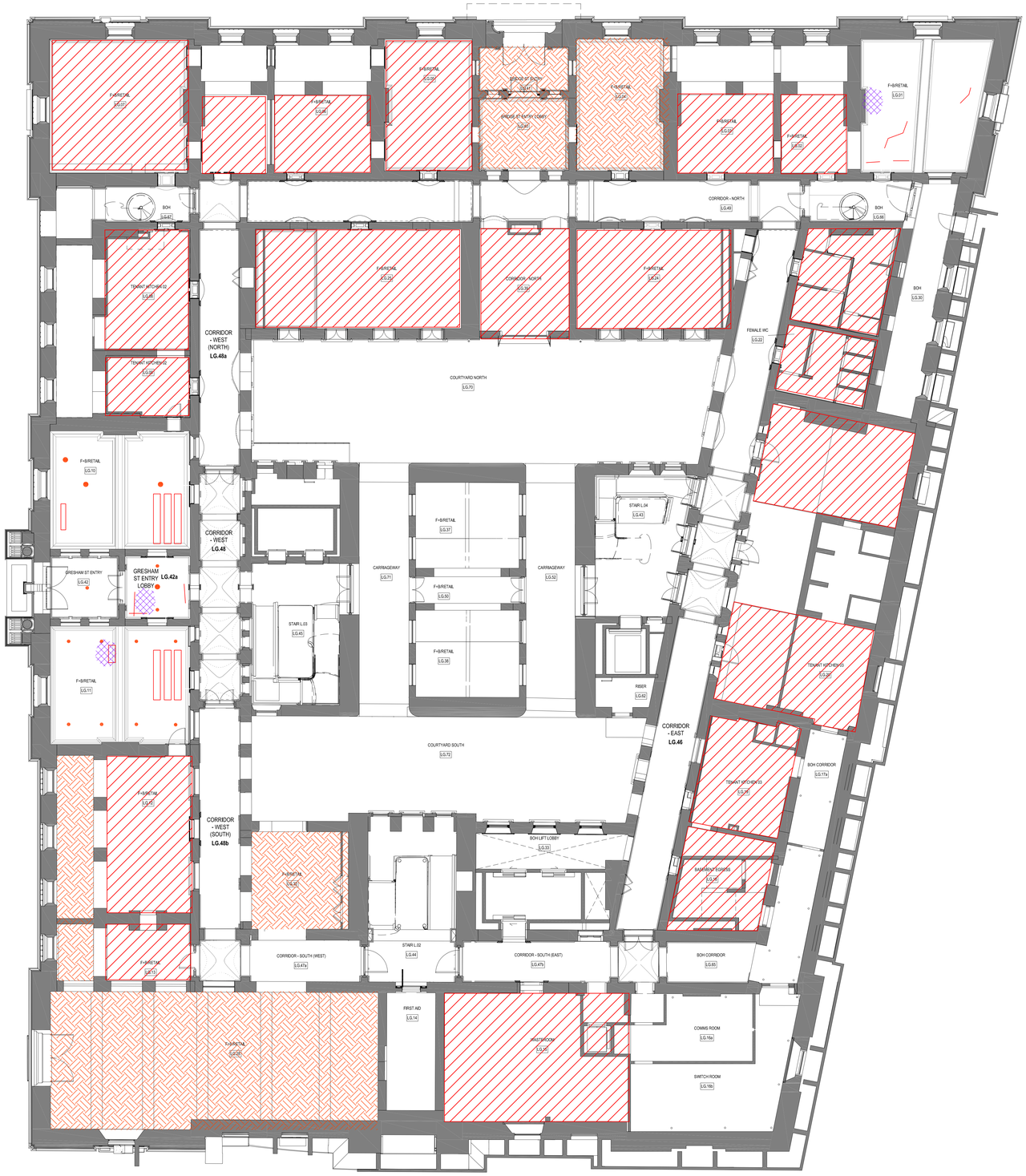
Yours sincerely,

Robert Furney

Rob Furney
Remedial Engineer
BEng

Project:	Sandstone Precinct. Department of Lands Project
Title:	Heritage Ceiling Matrix
Revision:	MOD18

				Completed by Northrop			Completed by Northrop					
Details & Existing Configuration				**Inspection Record**			**Ceiling Condition**					
Room #	Room Name	Building Class	Existing Ceiling Type	Face side of ceiling inspected	Rear side of ceiling inspected	Unable to be Inspected (incl reason)	No visual defects observed	Good	Minor visual defects	Poor	Very Poor	Failure mechanism
1.01	Heritage Suite	Class 9b	L&P - Timber	✓		Floorboards Over	✓					Key failure, corroded fixings
1.02	Suite	Class 9b	L&P - Timber	✓		Floorboards Over				✓		Moisture damage, key failure, corroded fixings
1.03	Suite	Class 9b	L&P - Timber	✓		Floorboards Over				✓		Moisture damage, key failure, corroded fixings
1.04	Suite	Class 9b	L&P - Timber	✓		Floorboards Over					✓	Ceiling Collapse
1.05	Meeting Room	Class 9b	L&P - Timber	✓	✓					✓		Movement, key failure, corroded fixings
1.06	Meeting Room	Class 9b	L&P - Timber	✓	✓					✓		Moisture damage, key failure, corroded fixings
1.07	Heritage Suite	Class 9b	L&P - Timber	✓	✓					✓		Moisture damage, key failure, corroded fixings
1.09	Suite	Class 9b	L&P - Timber	✓	✓					✓		Key failure, corroded fixings
1.10	Meeting Room	Class 9b	L&P - Timber	✓	✓				✓			Key failure, corroded fixings
1.11	Suite	Class 9b	L&P - EMF	✓	✓						✓	Moisture damage, key failure
1.12	Suite	Class 9b	L&P - EMF	✓	✓				✓			Moisture damage
1.15	Library	Class 9b	L&P - EMF	✓		Floorboards Over			✓			Moisture damage
1.17	Meeting Room	Class 9b	L&P - EMF	✓		Floorboards Over			✓			Moisture damage
1.18	Suite	Class 9b	L&P - EMF	✓		Floorboards Over				✓		Moisture damage, key failure
1.19	Suite	Class 9b	L&P - EMF	✓	✓					✓		Moisture damage, key failure
1.20	Meeting Room	Class 9b	L&P - Timber	✓		Floorboards Over				✓		Moisture damage, key failure, corroded fixings
1.21	Meeting Room	Class 9b	L&P - Timber	✓		Floorboards Over				✓		Moisture damage, key failure, corroded fixings
G.01	Heritage Suite	Class 9b	L&P - Timber			Ceiling Protection Installed u/s Floorboards Over						Assumed to be consistent with failure mechanism of the inspected ceilings. Ie key failure, corroded fixings, etc.
G.02	Heritage Reception	Class 9b	L&P - Timber			Ceiling Protection Installed u/s Floorboards Over						Assumed to be consistent with failure mechanism of the inspected ceilings. Ie key failure, corroded fixings, etc.
G.03	Suite	Class 9b	L&P - Timber			Ceiling Protection Installed u/s Floorboards Over						Assumed to be consistent with failure mechanism of the inspected ceilings. Ie key failure, corroded fixings, etc.
G.04	Suite	Class 9b	L&P - Timber			Ceiling Protection Installed u/s Floorboards Over						Assumed to be consistent with failure mechanism of the inspected ceilings. Ie key failure, corroded fixings, etc.
G.05	Meeting Room	Class 9b	L&P - Timber	✓	✓					✓		Moisture damage, key failure, corroded fixings
G.06	Meeting Room	Class 9b	L&P - Timber	✓	✓					✓		Shearing of keys, corroded fixings
G.07	Minister's Room (Suite)	Class 9b	L&P - Timber	✓	✓					✓		Key failure, corroded fixings
G.08	Suite	Class 9b	L&P - Timber	✓	✓						✓	Key failure, corroded fixings
G.09	Meeting Room	Class 9b	L&P - Timber	✓	✓						✓	Key failure, corroded fixings
G.10	Lounge	Class 9b	L&P - EMF	✓	✓						✓	Shearing of keys
G.11	F&B /Retail	Class 6	L&P - EMF	✓	✓				✓			Moisture Damage, key failure
G.13	F&B /Retail	Class 6	L&P - EMF			Ceiling Protection Installed u/s Floorboards Over						Assumed to be consistent with failure mechanism of the inspected ceilings. Ie key failure, corroded fixings, etc.
G.15	F&B /Retail	Class 6	L&P - EMF			Ceiling Protection Installed u/s Floorboards Over						Assumed to be consistent with failure mechanism of the inspected ceilings. Ie key failure, corroded fixings, etc.
G.17	F&B /Retail	Class 6	L&P - EMF			Ceiling Protection Installed u/s Floorboards Over						Assumed to be consistent with failure mechanism of the inspected ceilings. Ie key failure, corroded fixings, etc.
G.18	F&B /Retail	Class 6	L&P - EMF			Ceiling Protection Installed u/s Floorboards Over						Assumed to be consistent with failure mechanism of the inspected ceilings. Ie key failure, corroded fixings, etc.
G.19	F&B /Retail	Class 6	L&P - EMF			Ceiling Protection Installed u/s Floorboards Over						Assumed to be consistent with failure mechanism of the inspected ceilings. Ie key failure, corroded fixings, etc.
G.20	Suite	Class 9b	L&P - EMF			Ceiling Protection Installed u/s Floorboards Over						Assumed to be consistent with failure mechanism of the inspected ceilings. Ie key failure, corroded fixings, etc.
G.21	Club Sound	Class 9b	L&P - Timber			Ceiling Protection Installed u/s Floorboards Over						Assumed to be consistent with failure mechanism of the inspected ceilings. Ie key failure, corroded fixings, etc.
G.22	Club Sound	Class 9b	L&P - Timber			Ceiling Protection Installed u/s Floorboards Over						Assumed to be consistent with failure mechanism of the inspected ceilings. Ie key failure, corroded fixings, etc.
G.24	Wellness	Class 9b	L&P - Timber	✓	✓						✓	Key failure, corroded fixings
G.36	Loftus St Entry	Class 9b	L&P - EMF			Ceiling Protection Installed u/s Floorboards Over						Assumed to be consistent with failure mechanism of the inspected ceilings. Ie key failure, corroded fixings, etc.
G.37	Bent Street Entry	Class 6	L&P - EMF	✓		Floorboards Over				✓		Moisture damage , key failure
LG.01	F&B /Retail	Class 6	L&P - Timber	✓		Floorboards Over			✓			Moisture damage, key failure, corroded fixings
LG.04	F&B /Retail	Class 6	L&P - Timber			Ceiling Protection Installed u/s Floorboards Over						Assumed to be consistent with failure mechanism of the inspected ceilings. Ie key failure, corroded fixings, etc.
LG.10	F&B /Retail	Class 6	L&P - EMF	✓	✓				✓			Moisture damage, discontinuos EMF
LG.11	F&B /Retail	Class 6	L&P - EMF	✓	✓				✓			Moisture damage, discontinuos EMF
LG.40	Bridge St Entry Lobby	Class 6	L&P - Timber			Ceiling Protection Installed u/s Floorboards Over						Assumed to be consistent with failure mechanism of the inspected ceilings. Ie key failure, corroded fixings, etc.
LG.41	Bridge St Entry	Class 6	L&P - Timber			Ceiling Protection Installed u/s Floorboards Over						Assumed to be consistent with failure mechanism of the inspected ceilings. Ie key failure, corroded fixings, etc.
LG.42a	Gresham St Entry Lobby	Class 6	L&P - EMF	✓	✓					✓		Corroded fixings
LG42	Gresham St Entry	Class 6	L&P - EMF	✓	✓					✓		Moisture damage, key failure



1 LOWER GROUND FLOOR
1:100

LEGEND

- Light and Service Penetration
- Cracking to Plaster Ceiling
- Flaking Paint
- No Access
- Penetration or Exposed Lath
- Evidence of water ingress
- Hairline cracking to decorative cornice
- Collapsed Ceiling
- PROPOSED EXTENT OF CEILING (OTHER THAN CONCRETE ARCH) TO BE DEMOLISHED

NOTES

1. FOR GENERAL PROJECT NOTES REFER TO NORTHROP DWG SH-0001
2. DEFECT ASSESSMENTS ARE BASED ON VISUAL INSPECTION ONLY.
3. CEILINGS PROPOSED FOR DEMOLITION HAVE NOT BEEN ASSESSED.

DRAWN LS DESIGNED RF JOB MANAGER LS VERIFIER LS

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	PRELIMINARY ISSUE	CJF	IK	IM	09/03/22
2	GENERAL UPDATE	LS	IM	IM	09/05/22
3	ISSUE FOR 50% AFC	RF	LS	LS	27/06/22

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE

CLIENT Built
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ARCHITECT Hassell

ALL SETOUT TO ARCHITECT'S DRAWINGS. DIMENSIONS TO BE VERIFIED WITH THE ARCHITECT AND ON SITE BEFORE MAKING SHOP DRAWINGS OR COMMENCING WORK. NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY

PLANS 1:100@A0 0 1 2 3 4 5m
PLANS 1:100@A0 0 1 2 3 4 5m

NORTHROP
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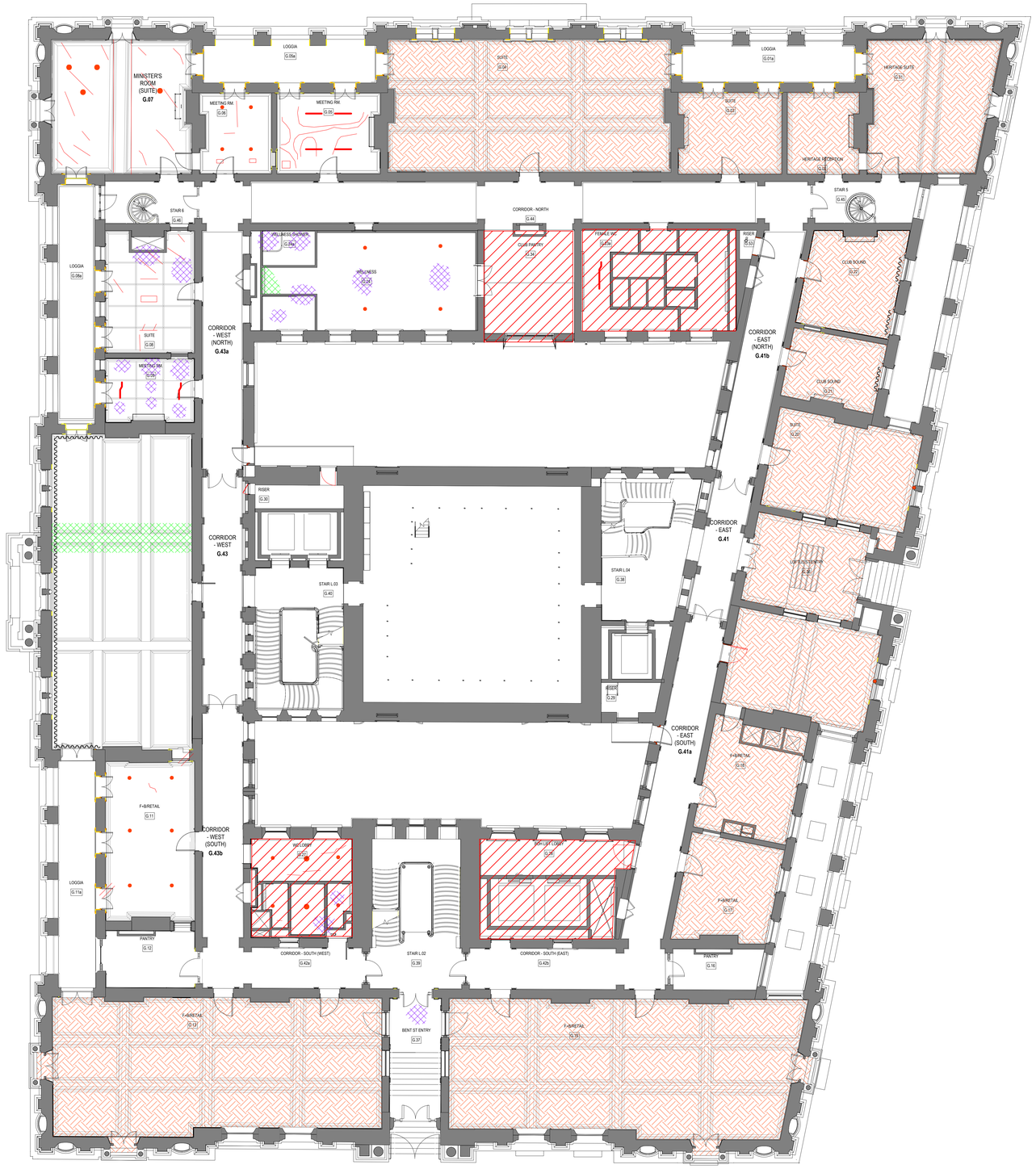
Email sydney@northrop.com.au ABN 81 094 433 100

PROJECT
SANDSTONE PRECINCT
LANDS BUILDING
23-39 BRIDGE STREET, SYDNEY 2000, AUSTRALIA

DRAWING TITLE
LATH AND PLASTER CEILING DEFECT PLAN
LOWER GROUND FLOOR

JOB NUMBER S211516
DRAWING NUMBER SH-1001
REVISION 4
DRAWING SHEET SIZE = A0



1 GROUND FLOOR
1:100

LEGEND

- Light and Service Penetration
- Cracking to Plaster Ceiling
- Flaking Paint
- No Access
- Penetration or Exposed Lath
- Evidence of water ingress
- Hairline cracking to decorative cornice
- Collapsed Ceiling
- PROPOSED EXTENT OF CEILING (OTHER THAN CONCRETE ARCH) TO BE DEMOLISHED

NOTES

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1	PRELIMINARY ISSUE	CJF	IK	IM	09/03/22
2	GENERAL UPDATE	LS	IM	IM	09/05/22
3	ISSUE FOR 50% AFC	RF	LS	LS	27/06/22

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE

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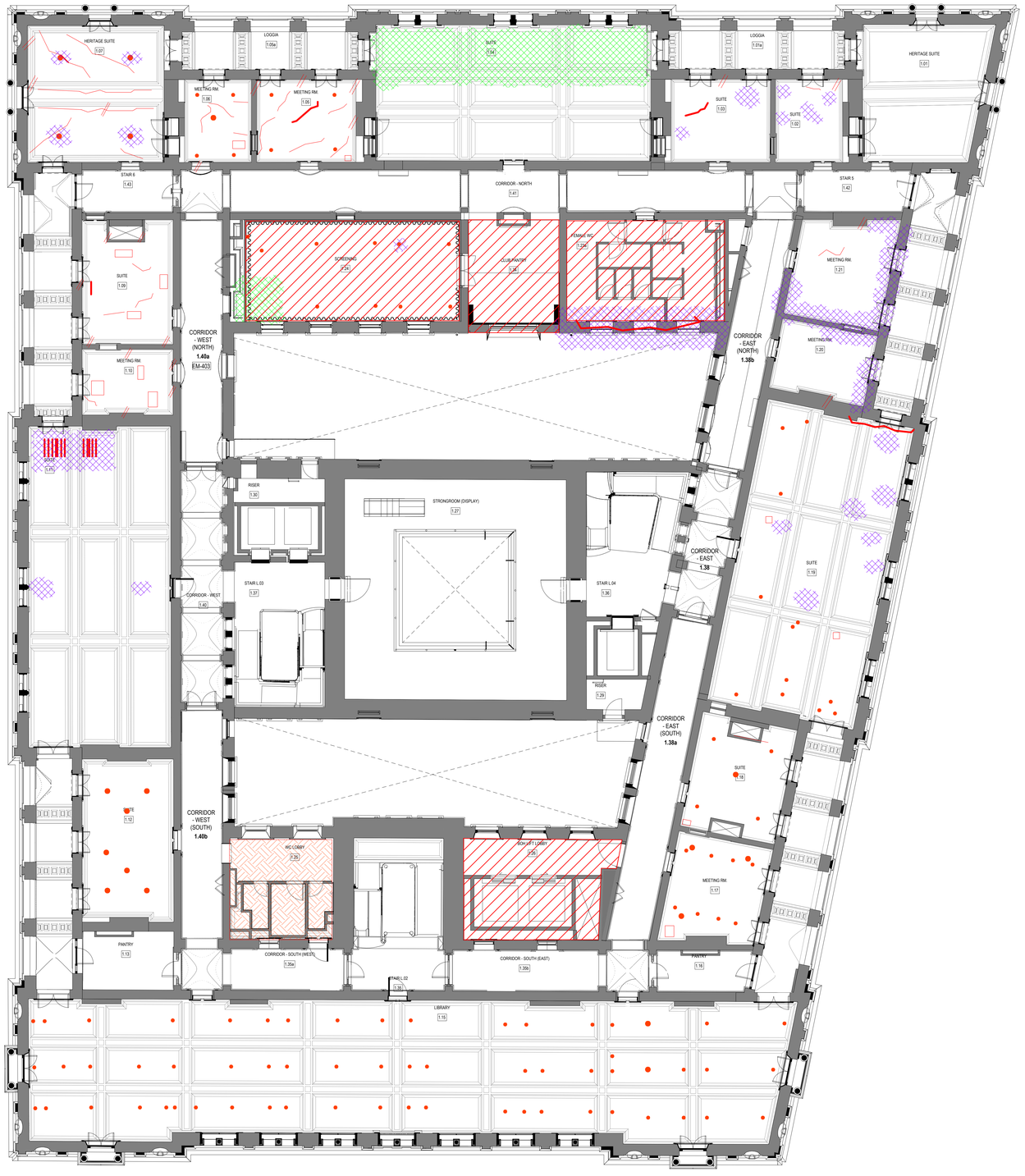
PROJECT
SANDSTONE PRECINCT
LANDS BUILDING
23-39 BRIDGE STREET, SYDNEY 2000, AUSTRALIA

DRAWING TITLE
LATH AND PLASTER CEILING DEFECT PLAN
GROUND FLOOR

JOB NUMBER S211516
DRAWING NUMBER SH-1003
REVISION 3
DRAWING SHEET SIZE = A0



1 LEVEL 1
1:100

LEGEND

- Light and Service Penetration
- Cracking to Plaster Ceiling
- Flaking Paint
- No Access
- Penetration or Exposed Lath
- Evidence of water ingress
- Hairline cracking to decorative cornice
- Collapsed Ceiling
- PROPOSED EXTENT OF CEILING (OTHER THAN CONCRETE ARCH) TO BE DEMOLISHED

NOTES

1. FOR GENERAL PROJECT NOTES REFER TO NORTHROP DWG SH-0001
2. DEFECT ASSESSMENTS ARE BASED ON VISUAL INSPECTION ONLY.
3. CEILINGS PROPOSED FOR DEMOLITION HAVE NOT BEEN ASSESSED.

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PROJECT
SANDSTONE PRECINCT
LANDS BUILDING
23-39 BRIDGE STREET, SYDNEY 2000, AUSTRALIA

DRAWING TITLE
LATH AND PLASTER CEILING DEFECT PLAN
LEVEL 1

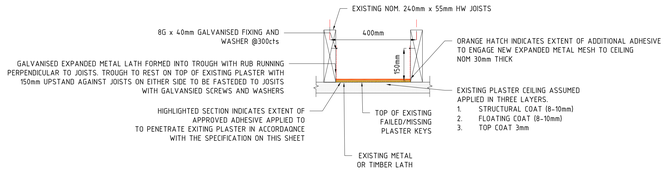
JOB NUMBER **S211516**
DRAWING NUMBER **SH-1004**
REVISION **2**
DRAWING SHEET SIZE = A0

METHODOLOGY A

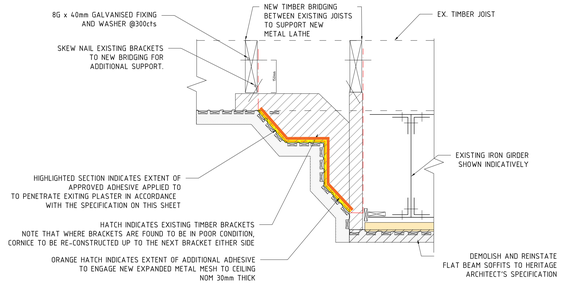
1. METHODOLOGY A APPLIED GENERALLY TO EXISTING LATH AND PLASTER CEILINGS AS SHOWN ON NORTHROP DRAWINGS ST1001 THROUGH SH 1004. REFER DETAIL A1 ON THIS SHEET FOR DETAILS
2. VISUAL INSPECTION OF CEILING BY ENGINEER FROM ABOVE & BELOW REQUIRED FOR ALL AREAS BEFORE PROCEEDING
3. IDENTIFY AREAS WHERE THE LATH KEYS ARE IN POOR CONDITION, MISSING OR DAMAGED.

HOLD POINT:
SUPERVISING ENGINEER TO ADVISE APPROPRIATE REPAIR METHODOLOGY

4. ALL CRACKS ARE TO BE TREATED USING SPECIAL ADHESIVE ("WESTOX RAP" THICKENED OR AN APPROVED ALTERNATIVE) ADHESIVE INJECTED INTO THE CRACKS DIRECTLY EVERY 150mm. CRACK TO BE PLUGGED WITH MODELLING CLAY PRIOR TO COMMENCING INJECTION TO PREVENT LEAKING. APPLICATION TO BE IN ACCORDANCE WITH SUPPLIERS SPECIFICATION.
5. METHODOLOGY A WILL REQUIRE THE LATH AND PLASTER CEILINGS TO BE INSPECTED CLOSELY AS PART OF AN ONGOING MAINTENANCE REGIME. INSPECTIONS OF THE CEILING SOFFIT WILL NEED TO OCCUR EVERY 12 MONTHS BY A QUALIFIED ENGINEER. IF DURING THE VISUAL INSPECTIONS CRACKING OR WATER DAMAGE IS IDENTIFIED, SEEK ADVICE FROM A STRUCTURAL ENGINEER.
6. THOROUGHLY CLEAN THE CEILING CAVITY OF ALL DUST, GREASE, LAITANCE AND OTHER CONTAMINATION THAT MIGHT PREVENT ADEQUATE BOND OF THE ADHEISIVE TO PLASTER/LATH. ENGINEER TO INSPECT.
7. TROUGH TO BE FORMED BY AN APPROVED EXPANDED MESH LATH (RENDALOK GALVANISED EXPANDED METAL OR AN APPROVED EQUIVALENT) WITH RIBS RUNNING PERPENDICULAR TO JOISTS. TROUGH TO RUN 175mm UP AGAINST JOISTS ON EITHER SIDE AND TO BE FIXED WITH 8G X 40mm WITH GALVANISED FIXINGS AND WASHER AT 300mm C/C. FIXINGS MUST BE AT TOP OF AN INTERSTICE TO PREVENT SLIPPING.
8. PRIME THE CEILING SURFACE BY APPLYING WESTOX RAP PRIMER AT THE APPROXIMATE COVERAGE OF 0.75L/M2, UNTIL THE FULL SURFACE IS COVERED. THE PRIMER MAY BE APPLIED USING A MECHANICAL OR HAND PUMP SPRAY UNIT. ALLOW 24 HOURS TO CURE. IF THE PLASTER IS RESISTING ABSORPTION OF THE PRIMER, THE CONTRACTOR MUST ALLOW FOR THE POSSIBILITY OF RE-APPLICATION OF THE PRIMER, AND DRILLING 6MM HOLES INTO THE PLASTER TO ENCOURAGE ABSORPTION. THE CONTRACTOR SHALL ACHIEVE FULL PENETRATION AS REQUIRED BY WESTOX WITH NO VARIATION.
9. APPLY WESTOX RAP ADHESIVE AT THE APPROXIMATE COVERAGE OF 0.75L/M2, UNTIL THE FULL SURFACE IS COVERED. THE ADHEISVE MAY BE APPLIED USING A MECHANICAL OR HAND PUMP SPRAY UNIT.
10. FOR ANY CRACKS OVER 1MM WIDTH, GOUGES, VOIDS ETC IN THE PLASTER, PACK WITH WESTOX RAP THICKENED ADHESIVE USING A SPATULA.
11. PLEASE NOTE: ALL PENETRATIONS THROUGH JOISTS ARE TO BE CONFIRMED BY THE BASE STRUCTURAL ENGINEER.
12. FLAT BEAM SOFFITS ARE TO BE DEMOLISHED AND REINSTATED TO NORTHROP DWG SH-2002 FOR DETAILS
13. IF CEILING IS PROPPED, DO NOT REMOVE PROPS BEFORE 7 DAYS AFTER APPLYING ADHESIVE.

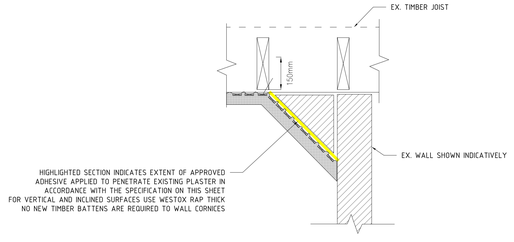


1 DETAIL A1 - FLAT CEILING DETAIL - OPTION 1 ADDITIONAL ADHESIVE
1:10



2 DETAIL A2 - BEAM CORNICE DETAIL - OPTION 1 ADDITIONAL ADHESIVE
1:10

NB: SIMILAR DETAIL APPLIES BOTH SIDES OF BEAM



3 DETAIL A3 - TYPICAL WALL CORNICE DETAIL
1:10

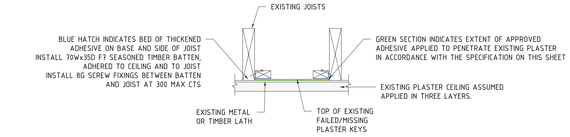
NB: SIMILAR DETAIL APPLIES BOTH SIDES OF BEAM

METHODOLOGY A

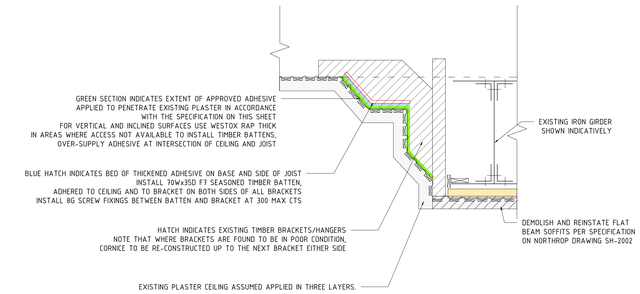
1. METHODOLOGY A APPLIED GENERALLY TO EXISTING LATH AND PLASTER CEILINGS AS SHOWN ON NORTHROP DRAWINGS SH1001 THROUGH SH1004. REFER DETAIL A1 ON THIS SHEET FOR DETAILS
2. VISUAL INSPECTION OF CEILING BY ENGINEER FROM ABOVE & BELOW REQUIRED FOR ALL AREAS BEFORE PROCEEDING
3. IDENTIFY AREAS WHERE THE LATH KEYS ARE IN POOR CONDITION, MISSING OR DAMAGED.

HOLD POINT:
SUPERVISING ENGINEER TO ADVISE APPROPRIATE REPAIR METHODOLOGY

4. ALL CRACKS ARE TO BE TREATED USING SPECIAL ADHESIVE ("WESTOX RAP" THICKENED OR AN APPROVED ALTERNATIVE) ADHESIVE INJECTED INTO THE CRACKS DIRECTLY EVERY 150mm. CRACK TO BE PLUGGED WITH MODELLING CLAY PRIOR TO COMMENCING INJECTION TO PREVENT LEAKING. APPLICATION TO BE IN ACCORDANCE WITH SUPPLIERS SPECIFICATION.
5. METHODOLOGY A WILL REQUIRE THE LATH AND PLASTER CEILINGS TO BE INSPECTED CLOSELY AS PART OF AN ONGOING MAINTENANCE REGIME. INSPECTIONS ON THE CEILING SOFFIT WILL NEED TO OCCUR EVERY 12 MONTHS BY A QUALIFIED ENGINEER. IF DURING THE VISUAL INSPECTIONS CRACKING OR WATER DAMAGE IS IDENTIFIED, SEEK ADVICE FROM A STRUCTURAL ENGINEER.
6. THOROUGHLY CLEAN THE CEILING CAVITY OF ALL DUST, GREASE, LAITANCE AND OTHER CONTAMINATION THAT MIGHT PREVENT ADEQUATE BOND OF THE ADHEISIVE TO PLASTER/LATH. ENGINEER TO INSPECT.
7. PRIME THE CEILING SURFACE BY APPLYING WESTOX RAP PRIMER AT THE APPROXIMATE COVERAGE OF 0.75L/M2, UNTIL THE FULL SURFACE IS COVERED. THE PRIMER MAY BE APPLIED USING A MECHANICAL OR HAND PUMP SPRAY UNIT. ALLOW 24 HOURS TO CURE. IF THE PLASTER IS RESISTING ABSORPTION OF THE PRIMER, THE CONTRACTOR MUST ALLOW FOR THE POSSIBILITY OF RE-APPLICATION OF THE PRIMER, AND DRILLING 6MM HOLES INTO THE PLASTER TO ENCOURAGE ABSORPTION. THE CONTRACTOR SHALL ACHIEVE FULL PENETRATION AS REQUIRED BY WESTOX WITH NO VARIATION.
8. APPLY WESTOX RAP ADHESIVE AT THE APPROXIMATE COVERAGE OF 0.75L/M2, UNTIL THE FULL SURFACE IS COVERED. THE ADHEISVE MAY BE APPLIED USING A MECHANICAL OR HAND PUMP SPRAY UNIT.
9. FOR ANY CRACKS OVER 1MM WIDTH, GOUGES, VOIDS ETC IN THE PLASTER, PACK WITH WESTOX RAP THICKENED ADHESIVE USING A SPATULA.
10. INSTALL NEW TIMBER BATTEN ALONG EACH SIDE OF EACH JOIST BY CREATING A THICK BED OF WESTOX RAP THICKNED ADHESIVE ALONG THE LENGTH OF THE JOIST, FOR THE WIDTH OF THE NEW BATTEN. CONTINUE THE ADHESIVE BED UP THE SIDE OF THE JOIST TO THE TOP OF WHERE THE BATTEN WILL BE INSTALLED.
11. BED THE NEW TIMBER BATTEN IN THE THICKENED ADHESIVE, ENSURING CONTACT WITH ADHESIVE ON CEILING AND ADHESIVE ON JOIST.
12. INSTALL SKEW SCREWS BETWEEN BATTEN AND JOISTS AS SHOWN ON THE DETAILS.
13. IF CEILING IS PROPPED, DO NOT REMOVE PROPS BEFORE 7 DAYS AFTER APPLYING ADHESIVE.
14. PLEASE NOTE: ALL PENETRATIONS THROUGH JOISTS ARE TO BE CONFIRMED BY THE BASE STRUCTURAL ENGINEER.
15. FLAT BEAM SOFFITS ARE TO BE DEMOLISHED AND REINSTATED REFER NORTHROP DWG SH-2002 FOR DETAILS

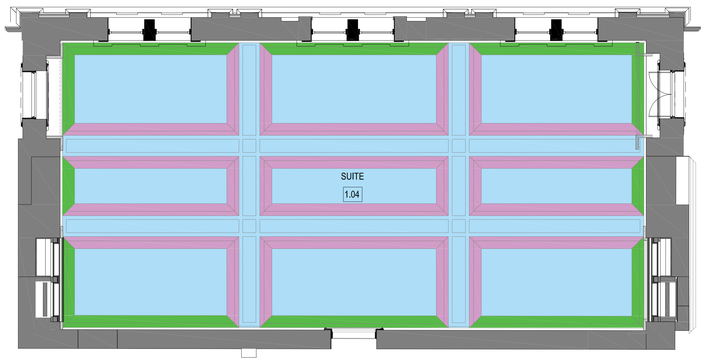


1 DETAIL A1 - FLAT CEILING DETAIL - OPTION 2 TIMBER BLOCK ATTACHMENT
1:10



2 DETAIL A2 - BEAM CORNICE DETAIL - OPTION 2 TIMBER BLOCK ATTACHMENT
1:10

NB: SIMILAR DETAIL APPLIES BOTH SIDES OF BEAM



TYPICAL CORNICE LAYOUT
REFLECTED CEILING PART PLAN

= EXISTING CORNICE AT WALLS
= EXISTING CORNICE AT BEAMS

NOTES

1. FOR GENERAL CONSTRUCTION NOTES REFER TO NORTHROP DRAWING SH-0001
2. ALL LATH AND PLASTER WORK MUST BE PERFORMED BY AN EXPERIENCED CONTRACTOR WHO HAS WORKED EXTENSIVELY WITH SIMILAR MATERIALS.
3. THE CONTRACTOR MUST ALLOW TO STRIP ALL EXISTING PAINT FROM THE UNDERSIDE OF CEILINGS WHERE INTUMESCENT PAINT IS TO BE APPLIED.

DRAWN IA | DESIGNED RF | JOB MANAGER LS | VERIFIER LS

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	PRELIMINARY ISSUE	IK	IK	IM	18/03/22
2	GENERAL UPDATE	IM	LS	IM	04/05/22
3	GENERAL UPDATE	LS	IM	IM	09/05/22
4	ISSUE FOR 50% AFC	LS	LS	LS	27/06/22

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE

CLIENT: Built

ARCHITECT: Hassell

DETAILS 15@A0 0 50 100 150 200 250
DETAILS 15@A0 0 50 100 150 200 250

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NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY

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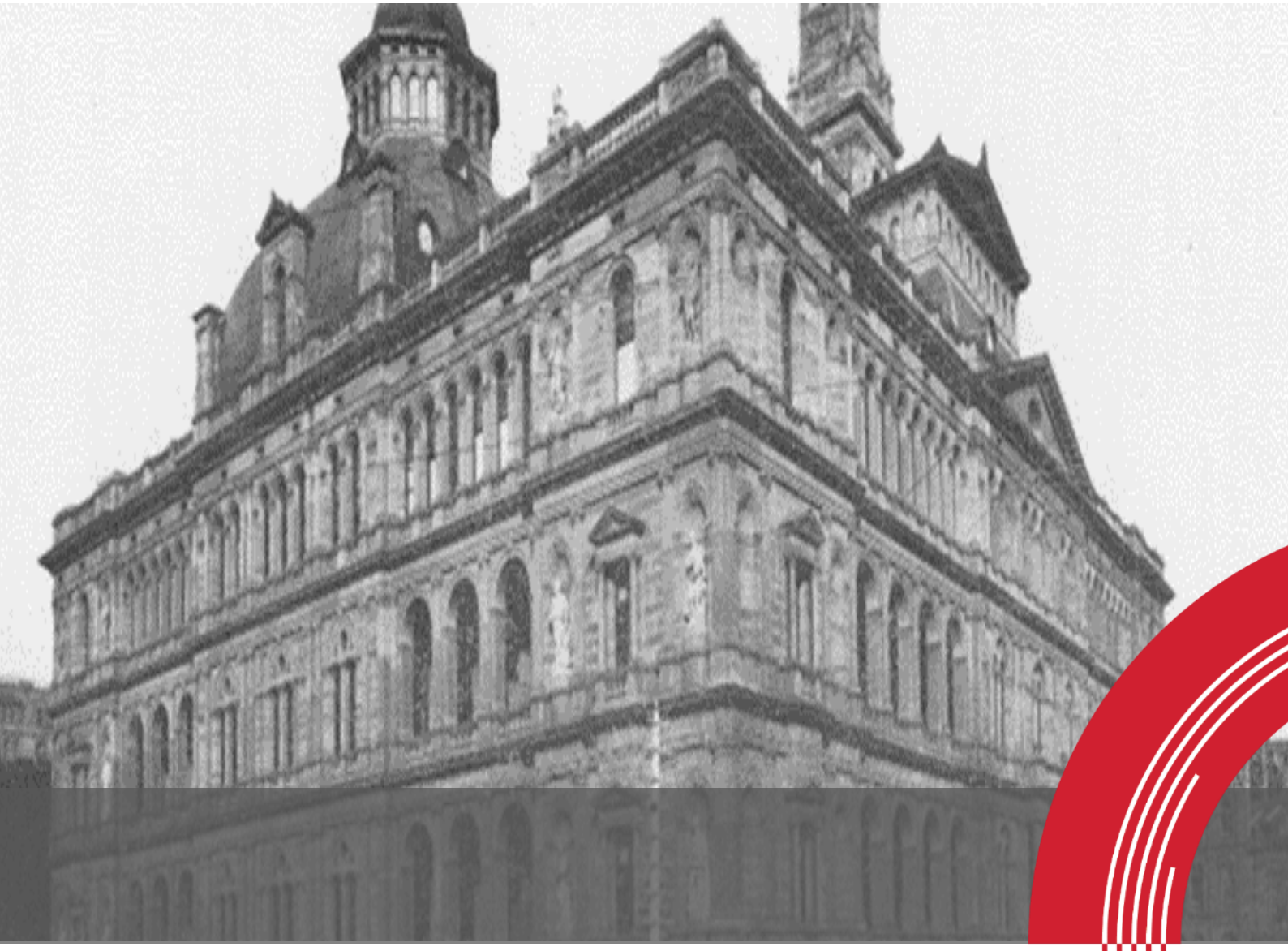
LANDS BUILDING
23-39 BRIDGE STREET, SYDNEY 2000, AUSTRALIA

DRAWING TITLE
LATH AND PLASTER TYPICAL PERMANENT STABILISATION DETAILS
LG TO LEVEL 1

JOB NUMBER: S211516
DRAWING NUMBER: SH-2001
REVISION: 4
DRAWING SHEET SIZE = A0



Preliminary Report on Permanent Stabilisation Detail of Lath and Plaster Ceiling at Department of Lands Building

Report prepared for Built

Revision Information

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	B	04/05/2022	I McDaid	L Sacco	DRAFT
	C	10/05/2022	L Sacco	I McDaid	FOR REVIEW
	D	13/05/2022	L Sacco	I McDaid	FOR REVIEW
	E	16/08/2022	R Furney	L Sacco	FOR REVIEW
	F	29/08/2022	R Furney	L Sacco	ISSUED

Executive Summary

Northrop Consulting Engineers have been engaged by **Built** to review and assess the condition of the lath and plaster ceilings throughout the Department of Lands Building. Based on Northrop's visual inspection, the ceilings have categorised based on defect severity and risk.

In conjunction with a categorised key plan, Northrop have provided a preliminary permanent stabilisation detail that may be used to reduce the risk of a major ceiling collapse of the lath and plaster ceilings.

The details provided within this report are preliminary in nature, a close inspection of each lath and the plaster ceiling will be required to determine if and where a permanent stabilisation detail will be required. Please note as part of this review Northrop have considered some preliminary assumptions that are to be verified by the results obtained by the invasive investigation and testing.

In particular, the design details have been prepared based on the concept of an adhesive to bond a new steel support mesh to the existing lath and plaster. We have proposed a product that is developed specifically for this purpose, Westox RAP. This product has a good reputation but is not backed up by test data or warranties. We have suggested that, unless alternative adhesives can be sourced, testing is undertaken to confirm the capacity of the adhesive.

Site testing of the proposed stabilisation detail (Option A) was conducted and deemed not acceptable due to the height of the keys and uneven topography of the topside of lath and plaster ceiling, preventing a complete connection between the ceiling and new metal mesh being achieved. To address this Northrop:

- Modified Option A to add a layer of cornice cement to bed down and envelop the proposed new mesh
- Developed an alternative stabilisation detail (Option B) that overcomes the existing site conditions and provides the required stabilisation.

The updated details have been included in the 50% AFC drawings.

It is proposed that all ceilings are remediated as part of the initial repair, and their condition is then visually assessed annually.

Table of Contents

1. Introduction

Northrop Consulting Engineers have been engaged by **Built** to review and assess key, retained, heritage, building elements of the Department of Lands Building. These elements include the heritage lath and plaster ceilings from Lower Ground floor to Level 1.

The following report explains the process adopted by Northrop in assessing the existing lath and plaster ceilings, and recommended repair strategies.

Based on Northrop's visual inspection and past assessments of the ceilings undertaken within the department of Lands Building, two types of ceiling have been identified.

2. Assessment Methodology

The following methodology and assumptions were adopted for assessment of the lath and plaster ceilings.

2.1. Lath Ceiling Inspection Methodology

i) Visual inspection of the underside of the lath and plaster ceilings assisted in developing a defect map as attached in ***Appendix A.*** Visual inspections of the top of the plaster ceilings is ongoing as part of Built's ECI works.

ii) Typical defects identified during the visual inspection included:

a. Light and service penetrations
b. Cracking to lath and plaster ceilings
c. Delamination of existing paint system
d. Ceiling penetrations including exposed lath and plaster ceilings
e. Discoloration of the lath ceiling which is suggestive of water ingress
f. Collapsed Ceiling Areas

iii) Based on the defects identified above, each room is categorized with a repair methodology. *Please note rooms that have not been inspected due to the temporary stabilisation detail or lack of access during the site inspections, have been considered high risk.*

iv) Further visual inspection of the ceilings from above will be required to justify the preliminary permanent stabilisation details considered.

2.2. Testing

Two tests have been commissioned:

- An assessment of timber lath battens, including nails used to attach battens to joists, completed by BCRC and dated 14 April 2022.
- Assessment of plaster composition completed by WITT, covered in reports WittC-MISP-L-LG05-LCT01-L-1 (lower ground), WittC-MISP-L-GF10-LCT01-L-1.0 (ground floor), WittC-MISP-L-L104-LCT1-L-1.0 (Level 1).
- Site mock-up of detail A1 Flat Ceiling Detail Preliminary Permanent Stabilisation Detail per Figure 21 on June 22-23, 2022.

2.3. Limitations and Assumptions

Note the following limitations and assumption adopted for this review:

- Visual inspection from the underside provides limited information regarding the formation of adequate lath keys within the ceiling structure.
- Thickness, composition, and build-up of the plaster ceilings to be confirmed as part of the invasive investigation works.
- Thickness of plaster ceilings varies from 20 – 25 mm
- Framing supporting the decorative cornices is based on the measurements obtained from the collapsed ceiling room in L1.04
- Stress Grade of the timber battens to be confirmed by materials specialist
- Metal lath assumed to be galvanised however is to be confirmed by material testing.

2.4. References

The following references were reviewed in development of this report:

TAN 2 – Technical Advice Note 2; Conservation of Plaster Work: Technical Conservation research and education Division

Lath and Plaster Audit by Cityplan Heritage (with Barrie Cooper) February 2016

Northrop (2021), SY211516-RM01 Department of Lands Building – **Building Condition Report**

Northrop (2021), SY21516-SF01 Department of Lands Building – **Level 2 Jack Arch Ceiling Preliminary Condition Report**, issued 03/11/2021.

Westox Spec 117, Restoration and stabilisation of Heritage Ceilings (Lands Dept Building) January 2020

Westox Report “Lands Building Ceilings” (work required to stabilise and prevent loss of ceiling during tunnelling works only) January 2020

3. Condition assessment

3.1. Timber Lath Ceilings - General

Typically, timber lath ceilings consist of a series of sawn softwood laths nailed to the underside of the floor joists. Generally, the timber laths are fixed perpendicular to the floor joists with a small gap in between each lath varying in width from 5-10mm. The plaster ceiling is typically applied in three coats:

1. **Structural Coat** – First coat is applied with force to create plaster “keys” which act as the primary supporting element of the ceilings. The plaster in the first coat typically consists of additives such as horsehair, sand and other materials that are added to improve the curing process, the tensile capacity, or to enhance the overall strength and colour of the plaster finish. Typically, this coat varies in thickness from 8 – 10mm.
2. **Floating Coat –** Second Coat is also known as a floating coat. This layer may also consist of hair like the first coat and is generally used to level and consolidate the ceiling. Typically, the thickness of this coat is similar to the first coat.
3. **Topcoat -** The last coat is generally known as the top or finishing coat. This coat is used to achieve a clean finish to cover any imperfections in the plaster. Gypsum (also known as plaster of Paris) is typically added to improve the final coat to provide a smooth finish and reduce the likelihood of shrinkage cracks. The thickness of this coat is generally around 3mm.

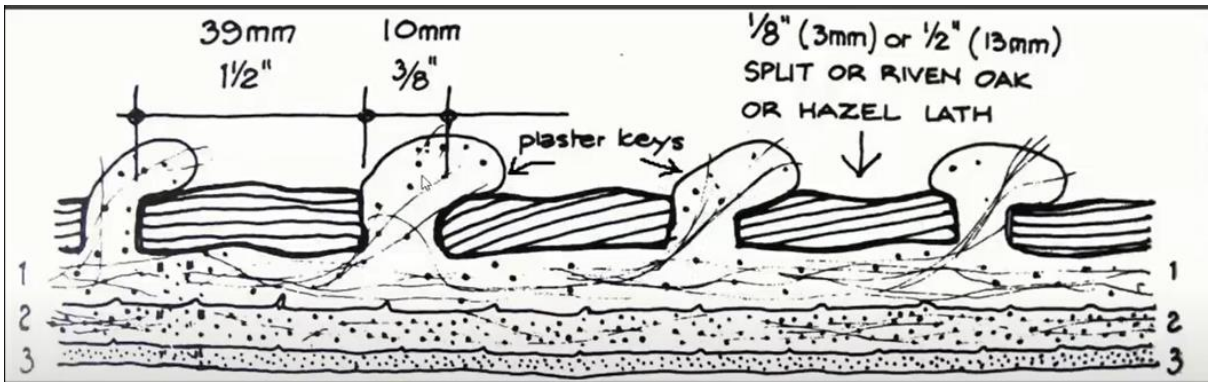


Figure 1 – Typical example of timber lath and plaster ceiling

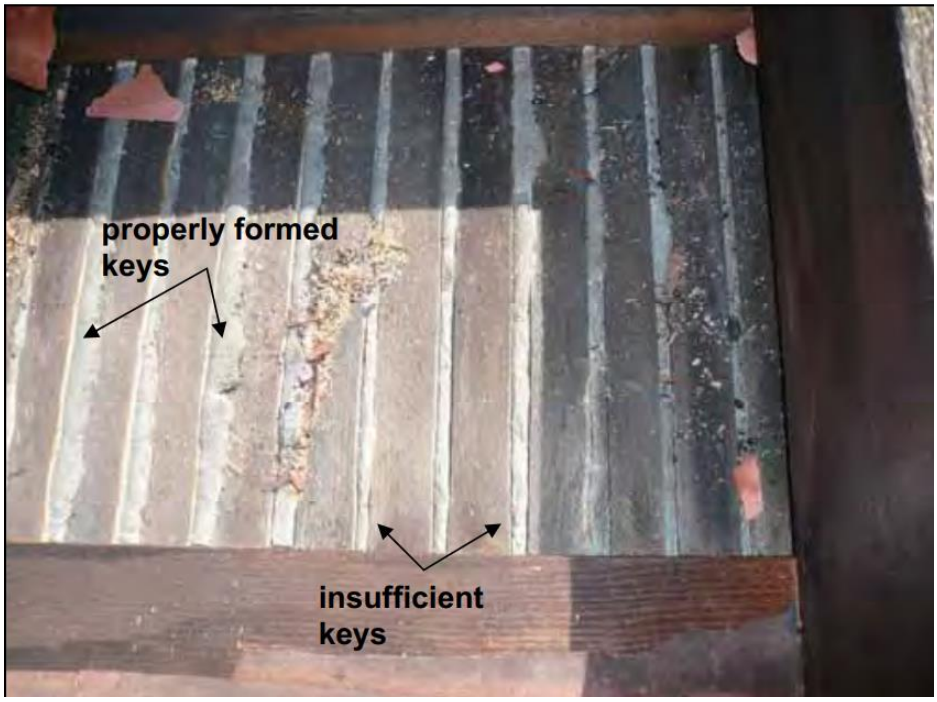


Figure 2 – Example of difference between the timber lath plaster ceiling “keys” (Source: Goeke, 2007)

3.2. Timber Lath Ceilings – Failure mechanisms

Generally, timber lath and plaster ceilings are susceptible to failure when exposed to moisture, vibration, and movement of supporting structural elements (i.e. timber joists and steel beams).

Vibration. Vibration can commonly cause the plaster ‘keys’ holding the ceiling in place to crack. As the keys separate from the timber laths, the additional weight of the failed plaster is distributed to surrounding key joints. The failure of one plaster key can then cause a “domino effect” which significantly increases the chance that adjacent plaster keys will fail.

Building movement. Similarly, given the brittle characteristics of plaster, plaster has a low tolerance for building movement. Additional loading to floor framing will likely cause lath plaster ceilings to shear and fail. Therefore, it is critical the floor loading is controlled.

Moisture. Generally, given the porous properties and characteristics of plaster, it is susceptible to absorbing moisture. Increased moisture content within the plaster can become a significant mode of failure. Excessive water trapped in the plaster matrix weakens the bond between the plaster and the timber laths, and may cause adverse effects to the timber framing such as changes in the material volumes. These changes in the timber frame can lead to failure of the plaster by shearing of the cracks or by debonding of the timber. Further, if the plaster keys are damaged they may not withstand the additional stresses caused by the additional water weight and as a result the keys fail under shear weight load. As the building is of solid masonry construction it is likely, particularly during periods of heavy rainfall, that water will ingress through the sandstone/brickwork solid walls and damage the lath ceilings. Similarly, any damaged or blocked downpipes or gutters along the facades may cause water ingress to the lath and plaster ceilings.

3.3. Timber Lath Ceilings – Visual Inspection

Based on Northrop’s preliminary visual inspection, the timber lath heritage ceilings throughout the Department of Lands Building consist of 30mm x 10mm machine sawn timber, nailed to the underside of the 120mm x 55mm timber joists. The joists appear to span between the primary structural elements at 450mm centres. Northrop’s visual inspection of the collapsed ceiling room (204) on Level 1 identified the thickness of the plaster varied from 18mm – 20mm. Based on typical densities for plaster, this equates to approximately 40 kg/m^2. Similarly, the thickness of the decorative moulding

along the iron girders varies in thickness from 100mm – 140mm. This equates to approximately 35 kg per square meter. Please note these dimensions may vary for each ceiling, as the actual thickness in each area is likely based on the workmanship and materials used at the time of construction.

The decorative timber moulding surrounding the wrought iron beams appear to be framed through a series of timber laths, angles, and timber droppers. Northrop's preliminary visual inspection identified the timber angles are nailed to timber droppers. The timber droppers are fixed to the existing timber joists with a timber plate wedged between the bottom flange and riveted angles of the iron girder. Please refer to Figure 3 – General Illustration of timber lath and framing for decorative moulding surrounding Iron Girder. We would like to advise that *Figure 4* is only a general illustration, please note the iron beam flange and timber framing may vary for each room.

Note: Inspection of lath and plaster ceilings from above is occurring incrementally in areas where Built are removing floorboards in various parts of the building. Inspection of these areas to date has indicated the condition of ceiling is consistent with the assessment made from inspection from below, i.e. plaster keys are in poor condition, and ceilings are at risk of failure generally.

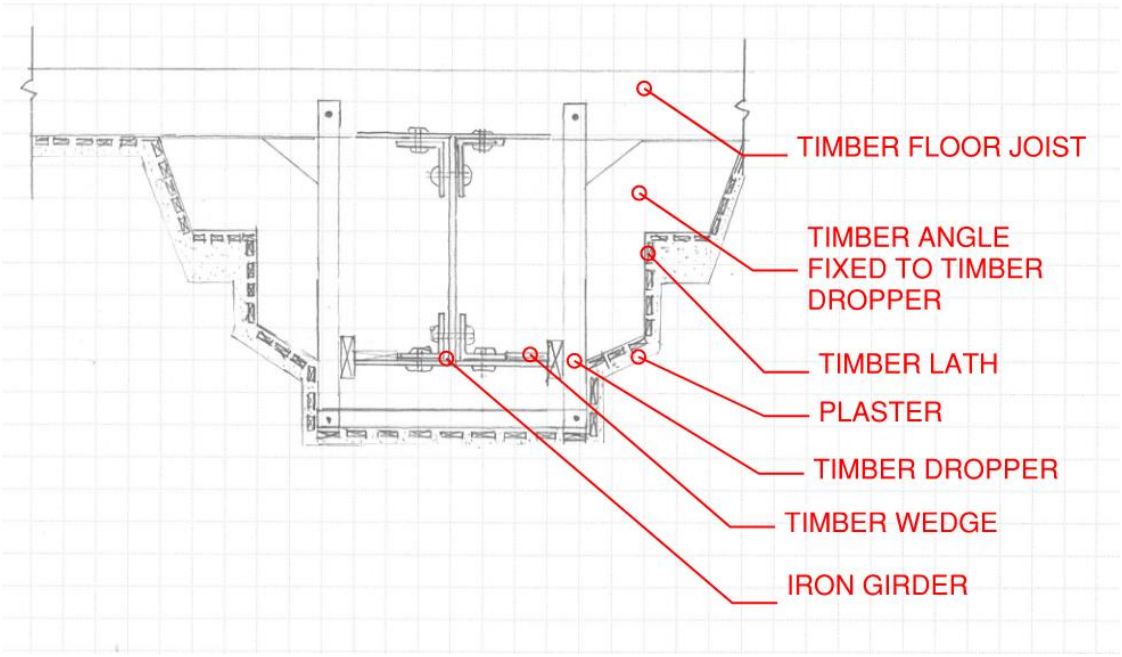


Figure 3 – General Illustration of timber lath and framing for decorative moulding surrounding Iron Girder

3.4. Timber Lath Ceilings – Testing/Investigation

Assessments of lath and plaster ceiling elements were completed by specialist consultants, as follows:

- An assessment of the timber lath elements was completed by durability consultant BCRC and is summarised in their report N10250-4 dated 14 April, 2022. BCRC found that:
    - Laths were from various mixed hardwood species,
    - Laths varied from 4-8mm in thickness, where they were sampled,
    - None of the timber inspected showed signs of rot,
    - BCRC concluded that where failure had occurred in the areas they inspected, the root cause was failure of the nails.
- An assessment of the composition of the plaster component by WITT was undertaken and confirmed the composition of the plaster is similar to what was expected based on the historical review. Plaster was found to be up to 50mm thick,

Photograph 1 – Typical framing for decorative moulding of timber lath and plaster ceilings

Photograph 2 – Close up of decorative plaster framing

Photograph 3 – Typical photo of timber lath and plaster ceilings

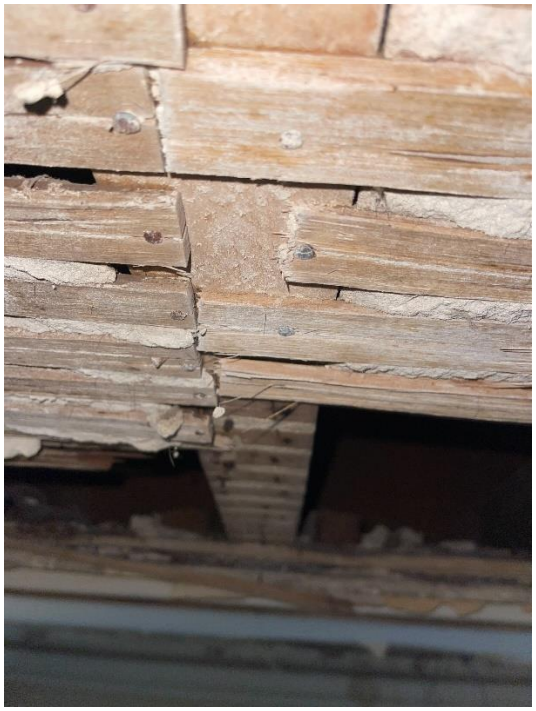
Photograph 4 – Typical thickness of plaster ceiling

3.5. Timber Lath Ceilings - Typical Defect(s)

Northrop's visual assessment of the timber lath ceilings throughout the department of Lands Building identified the following defects:

- Collapsed timber and lath plaster ceilings were identified in several rooms throughout the Department of Lands Building. The ceiling collapse in these areas appears to be consistent with the cause being water ingress, including failure of the nails used to fix the timber laths to the existing floor joists. This is supported by testing from the durability consultant, BCRC, which found that nails were corroded in the areas they assessed (see BCRC report ref N10250-4 dated 14 April 2022).
- Differential displacement cracks along the ceilings were identified
    - Displacement cracks (also known as out-of-plane movement cracks) to the plaster may indicate debonding of the plaster from the timber lath.
- Cracking to the plaster ceilings varying in width from hairline to moderate cracking throughout the plaster ceiling
    - Cracking perpendicular to the joists (may indicate the nails used to fix the timber laths to the underside of the timber joists are failing)
    - Cracking parallel to the timber laths (may indicate that the "key" bond between the timber laths is failing).
- Hairline cracking throughout the decorative moulding/cornice
- Evidence of water ingress and discoloration of the plaster ceiling and moulding/cornice
- Flaking and delamination of existing paint system (refer to WITT report WittC-SP-BUILT-485-L-1.0 dated 29 April 2022)
- Splitting of wooden lath nailed to joist structure
- Frequent loss of keys as observed from above the ceilings with complete section loss in some areas.

Photograph 5 – Typical example of collapsed timber lath and plaster ceiling



Photograph 6 – Typical example of failure of lath and plaster ceilings due to splitting of timber battens. Splitting likely caused by corrosion of iron nails.

Photograph 7 – Typical cracking to decorative moulding, evidence of water damage present

Photograph 8 – Typical cracking to the decorative moulding, parallel to the timber laths, indicative of failure of the lath "key"

Photograph 9 – Typical example of separation of paint from plaster

Photograph 10 – Moisture damage to timber lath and plaster ceiling

Photograph 11 – Typical photo of delaminating paint system

Photograph 12 – Full depth crack to plaster

Photograph 13 – Typical hairline cracking through decorative cornice

Photograph 14 – Ceiling collapse, discoloration of timber laths suggestive of moisture damage. Framing of laths appears to have changed here.

Photograph 15 – Example of missing keys at topside of timber lath ceiling

Photograph 16 – Example of broken key at timber lath ceiling

3.6. Metal Lath Ceilings - General

Most ceilings throughout the Department of Lands building are believed to be constructed of expanded metal lath plaster. Expanded metal lath appeared in the late 19th century, following the patent for expanded metal in 1884. It became increasingly common later as a replacement for traditional timber lath. The metal lath consists of thin sheet metal, forming diamond shape voids through which the plaster is pressed against to form “keys”. One large advantage is that the metal lath can create a greater number of “keys” forming a stronger bond than the original timber lath.

Another advantage of metal lath construction was the quicker and cheaper installation procedure compared to conventional timber lath plaster ceiling. Typically, metal lath ceilings in the early 19th century were not galvanized; however, over time, technology and material improvements have allowed for galvanized laths to be manufactured. The strength grade of the existing metal laths is not clear as there is no historical documentation/literature. During construction, the full extent and exact locations of the metal lath plaster ceilings will need to be verified by removing the timber flooring above the ceilings and the condition of the metal laths will need to be inspected in closer detail.

3.7. Metal Lath Ceilings – Visual Inspection

Northrop’s visual inspection identified areas of metal lath appear to have minor surface corrosion. However, once the coke breeze infill between the floor joists is removed and the top of the metal lath ceilings are exposed, further visual inspection will likely be required to verify the overall condition of the metal lath.

Note: Inspection of lath and plaster ceilings from above is occurring incrementally in areas where Built are removing floorboards in various parts of the building. Inspection of these areas to date has indicated the condition of ceiling is consistent with the assessment made from inspection from below, i.e. plaster keys are in poor condition, and ceilings are at risk of failure generally.

Figure 17 – Example of Metal Lath Ceiling Room 218 Department of Lands Building

Photograph 18 – Example of metal lath ceiling Room 226 ceiling penetration suggests galvanised metal lath ceilings

Photograph 17 - Example of collapsed coke breeze infill concrete Room 226 ceiling penetration

Photograph 20 – Example of damage to keys on metal lath ceiling

3.8. Metal Lath Ceilings – Testing/Investigation

No testing of the metal lath itself has been undertaken, nor is any proposed other than ongoing visual inspection.

For details of testing of the plaster component of the timber ceilings, for which the results are useful in considering the metal lath sections, refer to Section 3.4 of this report.

3.9. Metal Lath Ceilings - Typical Defect(s)

Typical defects throughout the metal lath ceilings include:

- Water Ingress and staining to metal lath and plaster ceilings evident. This may be due to the following:

- Water ingress from damaged water services (i.e. downpipes, gutters etc)
- Water ingress from the external façades
- Condensation from mechanical or other service equipment within the building, or condensation due to poor ventilation and humidity.
- No active leaks were identified during the time of inspection.

- Delamination and flaking of the paint system along the lath ceilings was identified throughout the building. Typically, paints applied to lath and plaster ceilings should consist of a breathable paint system to allow moisture and air to pass through the plaster ceilings. Using acrylic, vinyl emulsion or even lead paints will likely trap moisture between the plaster ceilings and as a result, cause significant debonding of the paint system.
- Frequent loss of keys as observed from above the ceilings with complete section loss in some areas.

Photograph 21 – Evidence of water ingress and staining to metal lath ceiling

Photograph 22 – Delamination and flaking ceiling paint system

Photograph 23 – Evidence of water ingress and staining to lath ceilings

Photograph 24 – Evidence of water ingress and staining to lath ceilings. Likely due to water ingress from façade

4. Repair options

There are various options available for the remediation of the ceilings, as presented below.

4.1. Risk environment

The ceilings inspected have been found to be in various states of disrepair. Regardless of the current condition, the risk of failure of plaster keys, whether or not they have currently failed, is high. The consequence of such a failure is extreme, as it may cause loss of life to building occupants.

4.2. Do nothing

This option would involve no, or little, repair of the ceilings. Based on our assessments, we believe that failure of further sections of ceiling, if left unrepaired, is inevitable and is likely to happen in the near future. Given the high risk of failure, and extreme consequence of failure, Northrop strongly recommends against this option.

4.3. Encapsulate from below

This would involve installation of a sub-frame (e.g. a false ceiling) that could be designed to catch falling plaster so that it does not create a hazard to building occupants. Although this is achievable from a structural perspective, we understand that:

Commercial and heritage considerations preclude this option from being considered,

A false ceiling would necessitate changes to the fire design (which currently involves application of an intumescent paint to the existing plaster).

4.4. Anchor from below

This option would involve the installation of mechanical fasteners throughout the ceiling, to attach paster to the timber lath, and also to attach the lath to timber joists.

Although consideration was given to this option, it is not recommended because:

- The fasteners will create a weak point in the ceiling that may cause cracks to propagate,
- The proposed intumescent paint that will offer protection to the ceiling has not been tested for compatibility with fixings of this nature.

4.5. Monitor and repair as needed

This would involve routine inspections of both the ceiling (from below) and the timber lath and plaster (both from above). The inspections would be intended to identify failed ceiling elements so they may be repaired. We do not recommend this approach because:

- Inspection from above would involve removing floor linings on a regular basis, which is impractical,
- Failure of ceiling elements could still happen between inspections,
- Inspection of some elements will not be possible, e.g. nails that connect the timber laths to the timber joists.

4.6. Full repair

Given the ongoing risk of failure of ceilings, which applies to all lath and plaster ceilings throughout the building, Northrop recommend that all lath and plaster ceilings are stabilised in accordance with the details presented below. This includes the flat ceiling areas, as well as cornices that have also been constructed based on a lath and plaster method.

5. Preliminary Stabilisation Details

5.1. Wire Trough and Adhesive (Option A)

New galvanised screws are used to fix a new metal lath of compatible metal material (e.g. Rendalok, or an approved equivalent) to the timber joists. Once installed, an appropriate adhesive (e.g. Westox RAP primer or an approved equivalent) is applied to the Rendalok metal Lath to cover the back of the existing plaster.

The adhesive is intended to bond both the plaster ceiling and timber laths to the expanded metal. The attachment of the metal to the timber joists then transfers this load to the timber framing.

Note that this approach relies on the integrity of the plaster itself so initial repair, and then ongoing maintenance, of the plaster is necessary.

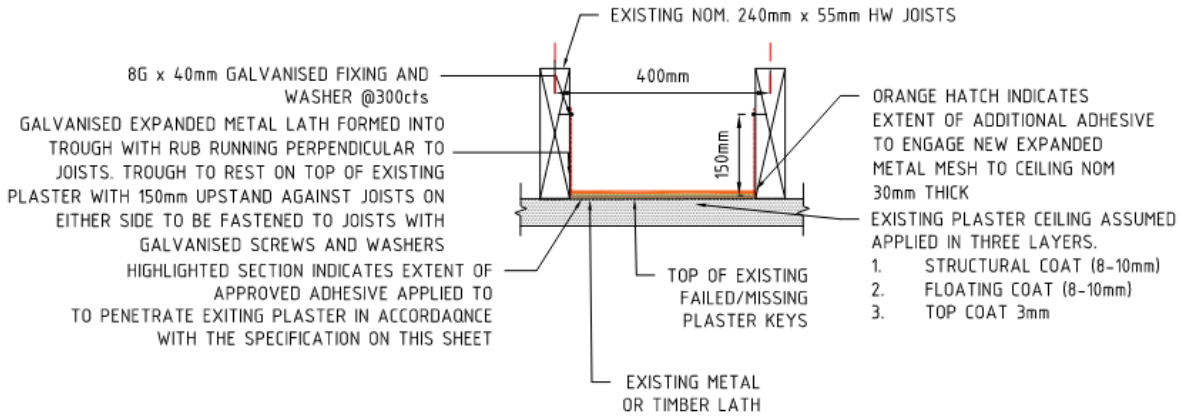


Figure 25 – Flat Ceiling Detail (Option A)

The adhesive bonds to both the lathes and plaster to improve the integrity of the original ceiling. A new layer of expanded metal mesh, bedded in a layer of cornice cement, is then bonded to the original ceiling and mechanically fastened to the existing joists to overcome the existing corroded nails.

This system provides additional support to the plaster keys and provides redundancy to the nailing of the timber lathes.

All works are completed from above and require remove of floorboards over and thorough cleaning of ceiling space.

It is proposed to support beam cornices in a similar fashion.

Beam Cornices

Beam cornices are treated in a similar way with metal lathe folded to the inside cornice profile and an approved adhesive painted on. This will be a laborious task but is the least destructive of available options and maintains the heritage value of the ceilings.

Flat soffit areas of beams are not accessible from above and as such it is not possible to remediate this area without destructive works.

Again, given the age and variability of the ceilings, we recommend that they are locally demolished and reinstated.

Wall Cornices

Wall cornices are proposed to be treated in the same way as beam cornices.

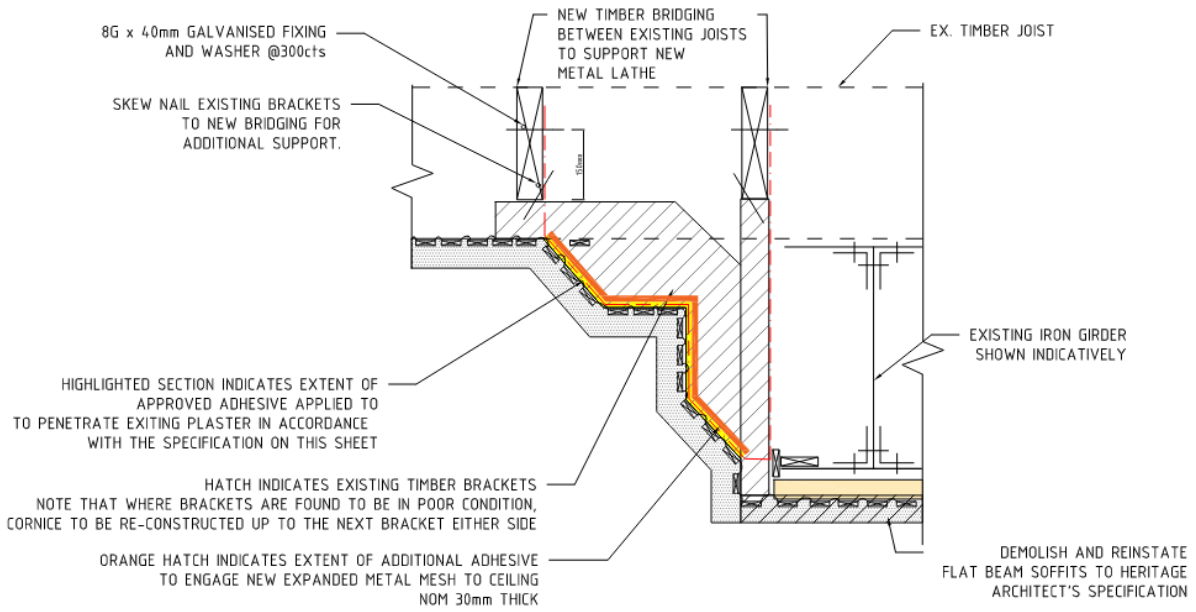


Figure 26 *– Beam Cornice Detail (Option A)*

Further detail is provided in Appendix A.

5.2. Timber Block Attachment and Adhesive (Option B)

The entire topside of the ceiling is treated with Westox primer and adhesive (or approved alternative). The adhesive bonds to both the existing laths and plaster to improve the integrity of the original ceiling.

New timber battens are used to fix the top of the existing lath and plaster ceiling to the existing joists. The new battens are installed along each side of each joist by bedding the batten in a layer of Westox RAP thickened adhesive), continuing the adhesive up the side of the joist to match the batten height which provides adhesion between the ceiling, batten and joists. Along with the chemical adhesion, skew screws are installed between new batten and joist to provide an additional mechanical connection.

Similar to the new mesh in Option A, the battens provide additional support to the ceiling and overcomes the corroded nailing of the existing lathes. As option B does not require any cornice cement, it is a lighter solution and therefore has less impact on the ceilings structurally.

As with the wire trough and adhesive method, note that this approach relies on the integrity of the plaster itself so initial repair, and then ongoing maintenance, of the plaster is necessary.

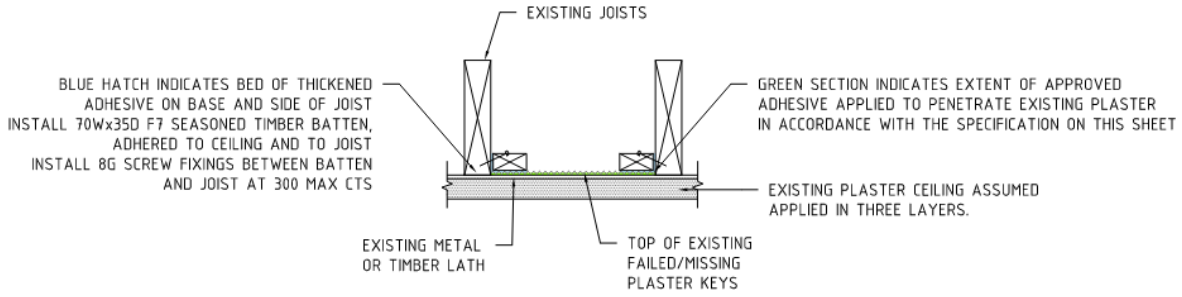


Figure 27 – Flat Ceiling Detail - Option B

All works are completed from above and require the removal of floorboards above and thorough cleaning of the ceiling space.

Beam Cornices

Beam cornices are treated in a similar way to the flat ceiling with an initial primer and adhesive applied to all accessible areas of the interior plaster and lath to improve the overall integrity of the ceiling. A thickened layer of adhesive is applied to the ceiling and up the sides of the joists. A seasoned timber batten, shaped to fit the cornice geometry is imbedded in the thickened adhesive and mechanically fastened to the existing cornice brackets with screw fixings. As with the trough option, this enables the ceiling to be stabilised from above thus lessening the damage to the existing decorative high heritage value elements.

This option does not allow for the stabilisation of flat soffit areas as they are inaccessible from above. It is only possible to remediate this area through destructive works from below.

Given the age and variability of the ceilings, we recommend that they are locally demolished and reinstated.

Wall Cornices

Wall cornices are proposed to be treated in the same way as beam cornices.

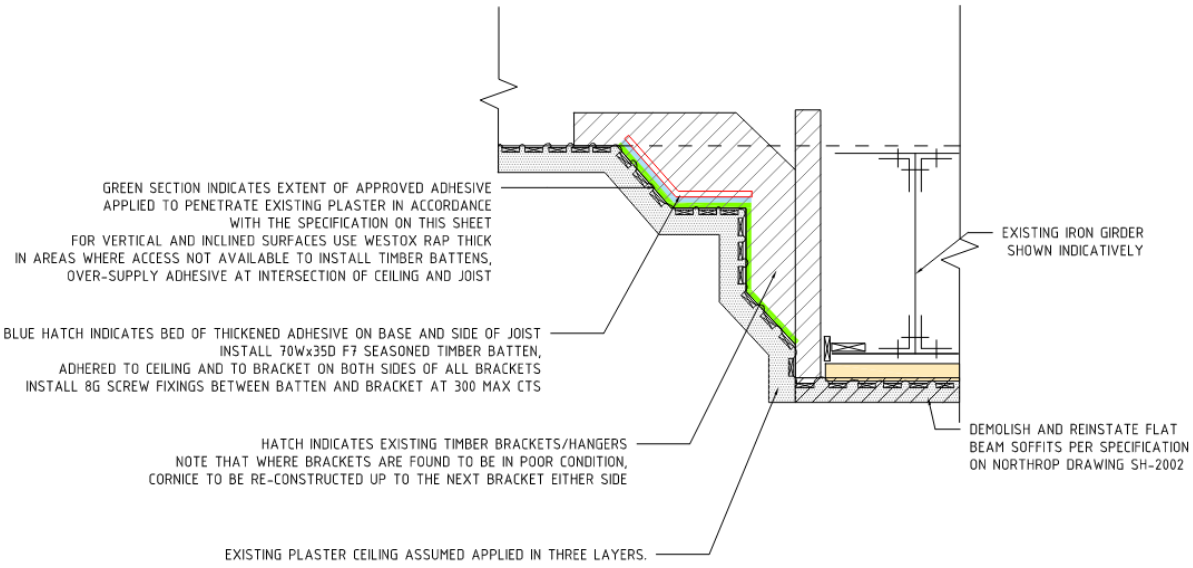


Figure 28 – Beam Cornice Detail - Option B

Further detail is provided in Appendix A.

5.3. Prototype(s)

Before proceeding with implementation of the recommended repair details, we recommend:

- Prototypes should be prepared to test the proposed adhesive that will be used to bind the new metal expanded mesh to the existing lath and plaster. At current the proposed product is an adhesive provided by Westox, which is specifically formulated for the repair of lath and plaster ceilings. Although this product has a good reputation in the industry, the supplier is unable to provide any test data or offer any specific warranty. It would be prudent to test the product in real world conditions. This would involve, at least, testing:
    - an existing (unrepaired) area of timber lath and plaster ceiling,
    - an existing (unrepaired) area of metal lath and plaster ceiling,
    - an area of timber lath and plaster ceiling that has been repaired in accordance with our proposed detail.
    - an area of metal lath and plaster ceiling that has been repaired in accordance with our proposed detail.

  We propose that the test be in the form of a pull-out test, designed to check the overall bond of the plaster ceiling to the supporting elements.

  On June 22nd 2022, a prototype test of the original Option A stabilisation (new expanded mesh but no cornice cement layer) was conducted on site. The option was deemed unsuitable as the topography of the top of ceiling and varying heights of the existing keys prevented a complete connection with the new expanded mesh. To achieve the desired bond, a layer of cornice cement is required to bed down the mesh to provide the required bond with the ceiling. The ceilings are not designed to accommodate this additional weight and as a result, Option A is not a recommended solution for stabilising the ceilings at the Lands Building.

- Assessment is required to ensure adequate bonding of the proposed intumescent paint product to the existing plaster.

6. Conclusions and Recommendations

This preliminary review concluded that:

- The lath and plaster ceilings throughout the Department of Lands Building are generally in poor condition.
- It is not possible to comprehensively assess the condition of nails supporting the timber laths without destructive testing.
- It is not possible to provide certainty regarding the life of the plaster keys due to age and variability.
- We assess that the risk if a collapse is high and consequence extreme, with a realistic risk to life safety.

We propose that all ceilings are remediated:

- Typically using an adhesive (Westox RAP or an approved alternative) and timber battens (Option B) to provide alternate load paths for the ceiling system. Option A is not recommended.
- Noting that the soffit of beams are not accessible, we propose these areas are demolished and rebuilt.
- During the ceiling remediation works (which require access from above) all cornice brackets are to be inspected in detail. Any loose brackets should or reinforced with galvanised straps and re-nailed. The extent of these works cannot be fully established until all access is available from above.
- Any collapsed ceilings are required to be demolished and reinstated.
- We recommend that all lath and plaster ceilings are inspected annually to monitor for signs of cracking or distress. This would involve inspection by an engineer. The engineer would need to make an assessment of any cracks observed, and provide repair details for any sections that are at risk of collapse. Except in areas exhibiting significant cracking, repair is likely to be in the form of injecting cracks from within the room below the ceiling.
- Existing and future water leaks into the building should be addressed as part of ongoing maintenance. Water ingress that reaches plaster ceilings is likely to cause significant damage.
- Continue to coordinate details for service penetrations, fire rating etc.

Appendix A

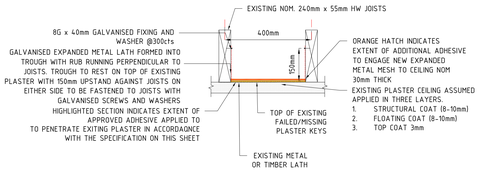
Excerpt from Northrop’s 50% AFC Documents

METHODOLOGY A

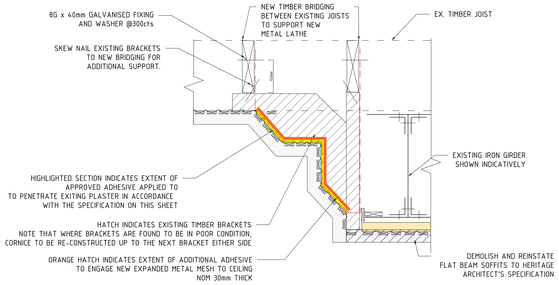
1. METHODOLOGY A APPLIED GENERALLY TO EXISTING LATH AND PLASTER CEILINGS AS SHOWN ON NORTHROP DRAWINGS ST1001 THROUGH SH 1004. REFER DETAIL A1 ON THIS SHEET FOR DETAILS
2. VISUAL INSPECTION OF CEILING BY ENGINEER FROM ABOVE & BELOW REQUIRED FOR ALL AREAS BEFORE PROCEEDING
3. IDENTIFY AREAS WHERE THE LATH KEYS ARE IN POOR CONDITION, MISSING OR DAMAGED.

HOLD POINT:
SUPERVISING ENGINEER TO ADVISE APPROPRIATE REPAIR METHODOLOGY

4. ALL CRACKS ARE TO BE TREATED USING SPECIAL ADHESIVE ("WESTOX RAP" THICKENED OR AN APPROVED ALTERNATIVE) ADHESIVE INJECTED INTO THE CRACKS DIRECTLY EVERY 150mm. CRACK TO BE PLUGGED WITH MODELLING CLAY PRIOR TO COMMENCING INJECTION TO PREVENT LEAKING. APPLICATION TO BE IN ACCORDANCE WITH SUPPLIERS SPECIFICATION.
5. METHODOLOGY A WILL REQUIRE THE LATH AND PLASTER CEILINGS TO BE INSPECTED CLOSELY AS PART OF AN ONGOING MAINTENANCE REGIME. INSPECTIONS OF THE CEILING SOFFIT WILL NEED TO OCCUR EVERY 12 MONTHS BY A QUALIFIED ENGINEER. IF DURING THE VISUAL INSPECTIONS CRACKING OR WATER DAMAGE IS IDENTIFIED, SEEK ADVICE FROM A STRUCTURAL ENGINEER.
6. THOROUGHLY CLEAN THE CEILING CAVITY OF ALL DUST, GREASE, LAITANCE AND OTHER CONTAMINATION THAT MIGHT PREVENT ADEQUATE BOND OF THE ADHEISIVE TO PLASTER/LATH. ENGINEER TO INSPECT.
7. TROUGH TO BE FORMED BY AN APPROVED EXPANDED MESH LATH (RENDALOK GALVANISED EXPANDED METAL OR AN APPROVED EQUIVALENT) WITH RIBS RUNNING PERPENDICULAR TO JOISTS. TROUGH TO RUN 175mm UP AGAINST JOISTS ON EITHER SIDE AND TO BE FIXED WITH 8G X 40mm WITH GALVANISED FIXINGS AND WASHER AT 300mm C/C. FIXINGS MUST BE AT TOP OF AN INTERSTICE TO PREVENT SLIPPING.
8. PRIME THE CEILING SURFACE BY APPLYING WESTOX RAP PRIMER AT THE APPROXIMATE COVERAGE OF 0.75L/M2, UNTIL THE FULL SURFACE IS COVERED. THE PRIMER MAY BE APPLIED USING A MECHANICAL OR HAND PUMP SPRAY UNIT. ALLOW 24 HOURS TO CURE. IF THE PLASTER IS RESISTING ABSORPTION OF THE PRIMER, THE CONTRACTOR MUST ALLOW FOR THE POSSIBILITY OF RE-APPLICATION OF THE PRIMER, AND DRILLING 6MM HOLES INTO THE PLASTER TO ENCOURAGE ABSORPTION. THE CONTRACTOR SHALL ACHIEVE FULL PENETRATION AS REQUIRED BY WESTOX WITH NO VARIATION.
9. APPLY WESTOX RAP ADHESIVE AT THE APPROXIMATE COVERAGE OF 0.75L/M2, UNTIL THE FULL SURFACE IS COVERED. THE ADHEISVE MAY BE APPLIED USING A MECHANICAL OR HAND PUMP SPRAY UNIT.
10. FOR ANY CRACKS OVER 1MM WIDTH, GOUGES, VOIDS ETC IN THE PLASTER, PACK WITH WESTOX RAP THICKENED ADHESIVE USING A SPATULA.
11. PLEASE NOTE: ALL PENETRATIONS THROUGH JOISTS ARE TO BE CONFIRMED BY THE BASE STRUCTURAL ENGINEER.
12. FLAT BEAM SOFFITS ARE TO BE DEMOLISHED AND REINSTATED TO NORTHROP DWG SH-2002 FOR DETAILS
13. IF CEILING IS PROPPED, DO NOT REMOVE PROPS BEFORE 7 DAYS AFTER APPLYING ADHESIVE.

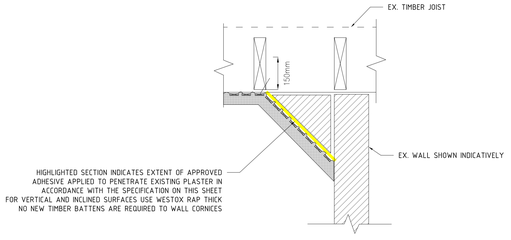


1 DETAIL A1 - FLAT CEILING DETAIL - OPTION A ADDITIONAL ADHESIVE
1:10



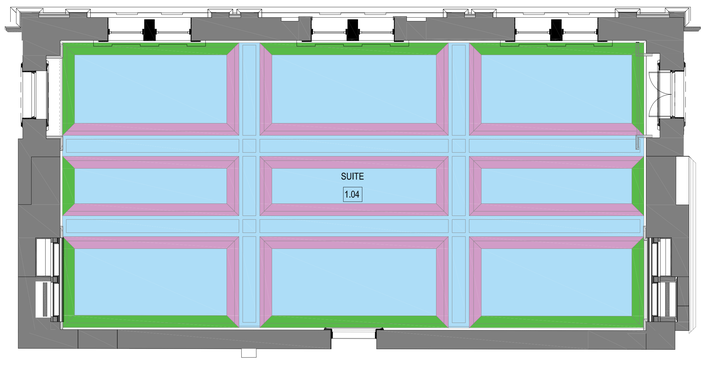
2 DETAIL A2 - BEAM CORNICE DETAIL - OPTION A ADDITIONAL ADHESIVE
1:10

NB: SIMILAR DETAIL APPLIES BOTH SIDES OF BEAM



3 DETAIL A3 - TYPICAL WALL CORNICE DETAIL
1:10

NB: SIMILAR DETAIL APPLIES BOTH SIDES OF BEAM



TYPICAL CORNICE LAYOUT
REFLECTED CEILING PART PLAN

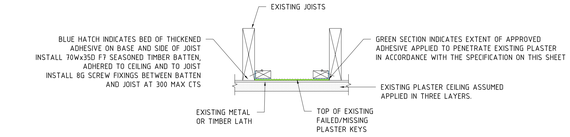
= EXISTING CORNICE AT WALLS
= EXISTING CORNICE AT BEAMS

METHODOLOGY A

1. METHODOLOGY A APPLIED GENERALLY TO EXISTING LATH AND PLASTER CEILINGS AS SHOWN ON NORTHROP DRAWINGS SH1001 THROUGH SH1004. REFER DETAIL A1 ON THIS SHEET FOR DETAILS
2. VISUAL INSPECTION OF CEILING BY ENGINEER FROM ABOVE & BELOW REQUIRED FOR ALL AREAS BEFORE PROCEEDING
3. IDENTIFY AREAS WHERE THE LATH KEYS ARE IN POOR CONDITION, MISSING OR DAMAGED.

HOLD POINT:
SUPERVISING ENGINEER TO ADVISE APPROPRIATE REPAIR METHODOLOGY

4. ALL CRACKS ARE TO BE TREATED USING SPECIAL ADHESIVE ("WESTOX RAP" THICKENED OR AN APPROVED ALTERNATIVE) ADHESIVE INJECTED INTO THE CRACKS DIRECTLY EVERY 150mm. CRACK TO BE PLUGGED WITH MODELLING CLAY PRIOR TO COMMENCING INJECTION TO PREVENT LEAKING. APPLICATION TO BE IN ACCORDANCE WITH SUPPLIERS SPECIFICATION.
5. METHODOLOGY A WILL REQUIRE THE LATH AND PLASTER CEILINGS TO BE INSPECTED CLOSELY AS PART OF AN ONGOING MAINTENANCE REGIME. INSPECTIONS ON THE CEILING SOFFIT WILL NEED TO OCCUR EVERY 12 MONTHS BY A QUALIFIED ENGINEER. IF DURING THE VISUAL INSPECTIONS CRACKING OR WATER DAMAGE IS IDENTIFIED, SEEK ADVICE FROM A STRUCTURAL ENGINEER.
6. THOROUGHLY CLEAN THE CEILING CAVITY OF ALL DUST, GREASE, LAITANCE AND OTHER CONTAMINATION THAT MIGHT PREVENT ADEQUATE BOND OF THE ADHEISIVE TO PLASTER/LATH. ENGINEER TO INSPECT.
7. PRIME THE CEILING SURFACE BY APPLYING WESTOX RAP PRIMER AT THE APPROXIMATE COVERAGE OF 0.75L/M2, UNTIL THE FULL SURFACE IS COVERED. THE PRIMER MAY BE APPLIED USING A MECHANICAL OR HAND PUMP SPRAY UNIT. ALLOW 24 HOURS TO CURE. IF THE PLASTER IS RESISTING ABSORPTION OF THE PRIMER, THE CONTRACTOR MUST ALLOW FOR THE POSSIBILITY OF RE-APPLICATION OF THE PRIMER, AND DRILLING 6MM HOLES INTO THE PLASTER TO ENCOURAGE ABSORPTION. THE CONTRACTOR SHALL ACHIEVE FULL PENETRATION AS REQUIRED BY WESTOX WITH NO VARIATION.
8. APPLY WESTOX RAP ADHESIVE AT THE APPROXIMATE COVERAGE OF 0.75L/M2, UNTIL THE FULL SURFACE IS COVERED. THE ADHEISVE MAY BE APPLIED USING A MECHANICAL OR HAND PUMP SPRAY UNIT.
9. FOR ANY CRACKS OVER 1MM WIDTH, GOUGES, VOIDS ETC IN THE PLASTER, PACK WITH WESTOX RAP THICKENED ADHESIVE USING A SPATULA.
10. INSTALL NEW TIMBER BATTEN ALONG EACH SIDE OF EACH JOIST BY CREATING A THICK BED OF WESTOX RAP THICKNED ADHESIVE ALONG THE LENGTH OF THE JOIST, FOR THE WIDTH OF THE NEW BATTEN. CONTINUE THE ADHESIVE BED UP THE SIDE OF THE JOIST TO THE TOP OF WHERE THE BATTEN WILL BE INSTALLED.
11. BED THE NEW TIMBER BATTEN IN THE THICKENED ADHESIVE, ENSURING CONTACT WITH ADHESIVE ON CEILING AND ADHESIVE ON JOIST.
12. INSTALL SKEW SCREWS BETWEEN BATTEN AND JOISTS AS SHOWN ON THE DETAILS.
13. IF CEILING IS PROPPED, DO NOT REMOVE PROPS BEFORE 7 DAYS AFTER APPLYING ADHESIVE.
14. PLEASE NOTE: ALL PENETRATIONS THROUGH JOISTS ARE TO BE CONFIRMED BY THE BASE STRUCTURAL ENGINEER.
15. FLAT BEAM SOFFITS ARE TO BE DEMOLISHED AND REINSTATED REFER NORTHROP DWG SH-2002 FOR DETAILS



1 DETAIL A1 - FLAT CEILING DETAIL - OPTION B TIMBER BLOCK ATTACHMENT
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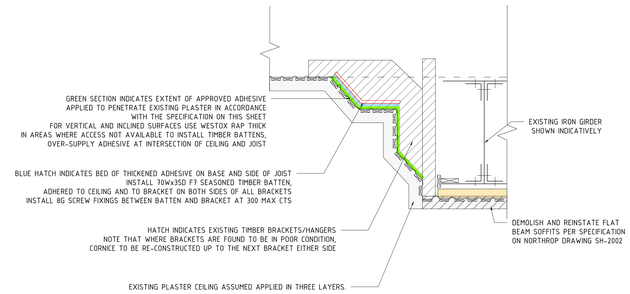

2 DETAIL A2 - BEAM CORNICE DETAIL - OPTION B TIMBER BLOCK ATTACHMENT
1:10

NB: SIMILAR DETAIL APPLIES BOTH SIDES OF BEAM

NOTES

1. FOR GENERAL CONSTRUCTION NOTES REFER TO NORTHROP DRAWING SH-0001
2. ALL LATH AND PLASTER WORK MUST BE PERFORMED BY AN EXPERIENCED CONTRACTOR WHO HAS WORKED EXTENSIVELY WITH SIMILAR MATERIALS.
3. THE CONTRACTOR MUST ALLOW TO STRIP ALL EXISTING PAINT FROM THE UNDERSIDE OF CEILINGS WHERE INTUMESCENT PAINT IS TO BE APPLIED.

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	PRELIMINARY ISSUE	IK	IK	IM	18/03/22
2	GENERAL UPDATE	IM	LS	IM	04/05/22
3	GENERAL UPDATE	LS	IM	IM	09/05/22
4	ISSUE FOR 50% AFC	LS	LS	LS	27/06/22

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE

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PROJECT
SANDSTONE PRECINCT
LANDS BUILDING
23-39 BRIDGE STREET, SYDNEY 2000, AUSTRALIA

DRAWING TITLE
LATH AND PLASTER TYPICAL PERMANENT STABILISATION DETAILS
LG TO LEVEL 1

JOB NUMBER S211516
DRAWING NUMBER SH-2001
REVISION 4
DRAWING SHEET SIZE = A0