

Concrete Remedial Works - 68 Latrobe Tce, Paddington

Introduction & Background

Design Sirs has been engaged by Core4 Services to conduct a structural assessment of concrete cancer to balconies/ walkways and provide recommended repairs to same. Concerns had been raised to condition of concrete walkways and balconies when cracking, chipping, and visible areas of rusted reinforcement were observed.

The structure is a 4-storey multi-residential dwelling, it has been constructed with suspended slab floors, walkways & balconies; which are supported by double skin brick walls. Built in the early 1980s, the building is approximately 43 years old, nearing the end of its typical residential 50-year design life.

Site Inspection

Design Sirs attended site on 31st March 2023 with Core4 Services and the property owner in attendance, weather at the time of inspection was fine & sunny. The building was found to be in a condition appropriate for its age, although it was evident areas require maintenance. Slabs & walkways exhibited concrete cancer at varying stages of severity.

Appendix A provides a photographic record of defects & inspection, Appendix B provides indicative site plan for defect severity & location.

Discussion

Engineering structures are often designed for a 50-year service life. This structure is approaching its 50-year service life. While structures often outlast this period, significant maintenance is often required between the 45-55 year marks to prolong their lifespan, follow by an on-going maintenance plan.

In concrete structures, steel reinforcement is protected from corrosion by surrounding concrete. As concrete ages, it undergoes the process of carbonation at an approx. rate of 1mm/year. Once carbonation reaches depth steel reinforcement, concrete cancer will begin to occur.

Areas prone to wetness or humidity, like near planter boxes, air-conditioning units, and pump rooms, can accelerate concrete carbonation. Site investigations revealed efflorescence and concrete cancer around balconies and planter boxes, indicating localized acceleration of the carbonation process.

Repair Works

Defect Classification

Design Sirs classified on-site concrete cancer defects into the following categories:

- Class A:
 - Minor concrete defect and/or paint defect
 - Minimal reinforcement showing with no visual evidence of corrosion
- Class B:
 - Moderate visual indication of early concrete cancer
 - concrete cracking/ spalling
 - some (100mm or less) reinforcement showing, some indication of corrosion
- Class C:
 - Severe indication of concrete cancer
 - Concrete cracked and/or fallen away in chunks
 - Moderate reinforcement exposure with significant corrosion.
- Class D:
 - Repairs unrelated to concrete slabs

Appendix B identifies locations of severity of defect.

Recommended Repairs

- Class A:
 - Clean up area, remove any debris and loose concrete. Remove any paint/ coatings from area
 - Repair any concrete pits/ cracks with Sika MonoTop -352 NFG concrete repair mortar or similar
 - Repaint sides and underside of all concrete balconies & walkways with Sikagard -680 S Betoncolour
- Class B:
 - Clean area & remove any loose concrete from area
 - Scabble back/ hammer out 50mm each end along exposed reinforcement
only exposed surface of bar need be showing
 - Confirm extent of corrosion and wire brush clean steel reinforcement
 - Paint steel reinforcement in SikaTop Armatec -110 EpoCem
 - Repair concrete with Sika MonoTop -352 NFG concrete repair mortar

- Class C:
 - Clean area & remove any loose concrete from area
 - Scabble back/ hammer out 150mm each end of exposed reinforcement bar
bar to be fully exposed 20mm clear all round surface
 - Confirm extent of corrosion and wire brush clean steel reinforcement
Any bars missing over 25% of mass – CALL ENGINEER
 - Install sacrificial anode, Sika FerroGard -510 Patch, at 600 crs.
 - Pre-drill hole into exg. Concrete at perimeter of repair area
 - Clear dust & pre-wet hole for 15 mins.
 - Remove excess water and apply Sika FerroGard -500 Crete
 - Install FerroGard 510 Patch, fully embed to 500 Crete mortar
 - Fix anode conducting wire to repaired reinforcement
 - Repair concrete with Sika MonoTop -352 NFG concrete repair mortar WITHIN 2 HOURS
- Class D:
 - Photo 16 & 20 – Wire brush clean steel lintel, remove all corrosion and paint
 - Photo 21 – Timber rot to cladding/ fascia boards – replace with new

It is expected the underside of all slabs are painted with a protective coating as per Class A repair schedule. If this is not to be undertaken, all Class B Repairs shall become Class C Repairs.

Undertaking proposed repairs will address all currently visible corrosion damage to concrete walkways and balconies. However, as the structure approaches its 50 service life, a regular maintenance program should be established. Design Sirs recommends:

- An engineer is engaged within 12-24 months to re-inspect walkways/ balconies for potential emerging defects
- Adopting a general maintenance program managed by a qualified professional to:
 - Clean all walkways, gutters & garden beds on an annual or bi-annual basis
 - Check drainage & services pipes every 4-5 years
 - Monitor & maintain the building's surfaces, remove surface rust and re-apply protective coatings every 10-15 years

We trust this covers the repair requirements. If you have any questions or concerns please don't hesitate to contact the writer directly

Design Sirs



Mark Carroll-Chilts

Senior Structural Engineer
BEng, MIEAust, NER, RPEQ

APPENDIX A

PHOTOGRAPHIC RECORD



FIGURE 1: Site Plan: 68 Bellevue Terrace, St Lucia - Red outline indicates area of investigation



PHOTOGRAPH 1.: No evident concrete cancer, clean area of debris, clean surface & paint



PHOTOGRAPH 2.: No evidence of concrete cancer. Efflorescence indicates on-going carbonation of concrete



PHOTOGRAPH 3.: Concrete cancer to balcony slab, extends back approx.400mm. Cancer along length of balcony at various points. Garden bed slab above slab



PHOTOGRAPH 4.: Concrete cancer to balcony slab, extends back approx.400mm



PHOTOGRAPH 5.: Moderate concrete cancer 2.0m from corner along balcony.



PHOTOGRAPH 6.: Minor areas of reinforcement exposure/ concrete cancer. Paint has significant spalling/ peeling



PHOTOGRAPH 7.: No evidence of concrete cancer, some efflorescence to concrete, paint is spalling/peeling



PHOTOGRAPH 8.: LHS – paint peeling/ spalling, concrete generally in good condition
RHS – Concrete spalling, some voids to reinforcement



PHOTOGRAPH 9.: Below walkway above concrete spalling/ falling away in small sections



PHOTOGRAPH 10.: Some spalling of concrete, areas of paint fully deteriorated.



PHOTOGRAPH 11.: cracking to concrete slab, spalling to some areas.



PHOTOGRAPH 12.: cracking to concrete slab, spalling to some areas.



PHOTOGRAPH 13.: Slab in generally good condition, with some efflorescence, minor paint defects



PHOTOGRAPH 14.: no indication of slab spalling/ cracks. Paint work has peeled away in large sections



PHOTOGRAPH 15.: Small area of exposed reinforcement, some minor slab spalling/ deterioration



PHOTOGRAPH 16.: Moderate corrosion to steel window lintel



PHOTOGRAPH 17.: Moderate cracking to concrete slab, evidence of early spalling/ blow-out from concrete cancer



PHOTOGRAPH 18.: Moderate cracking to concrete slab, evidence of early spalling/ blow-out from concrete cancer



PHOTOGRAPH 19.: Corner of slab appears to be in generally good condition



PHOTOGRAPH 20.: Minor corrosion to steel window lintel



PHOTOGRAPH 21.: Severe timber rot to timber skirting along roof eave



PHOTOGRAPH 22.: Spalling of concrete wall over bridge, evident of concrete blow out due to concrete cancer



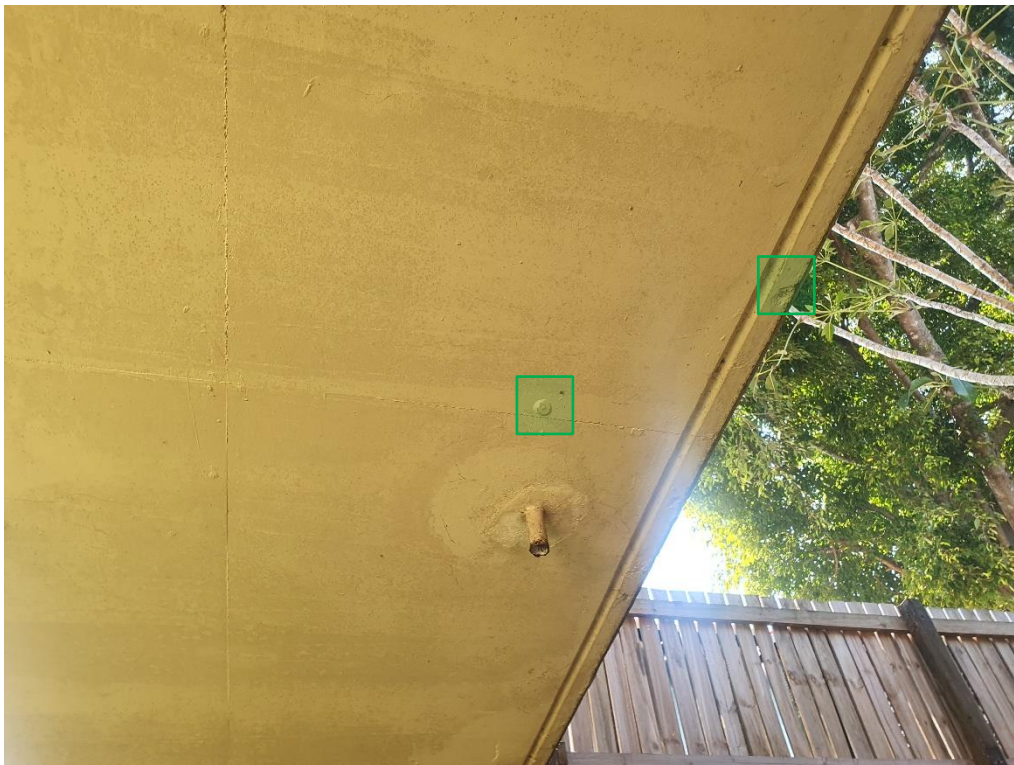
PHOTOGRAPH 23.: Underside bridge, moderate concrete cancer. Concrete spalling/ deterioration along underside edge



PHOTOGRAPH 24.: Large void near bridge support wall, severe corrosion to reinforcement. Large chunks of slab are missing/ have fallen away



PHOTOGRAPH 25.: Spalling of concrete wall over bridge, evident of concrete blow out due to concrete cancer



PHOTOGRAPH 26.: Minor defects to underside bridge, minor areas of spalling/ paint deterioration



PHOTOGRAPH 27.: Minor defects to underside bridge, minor areas of spalling/ paint deterioration



PHOTOGRAPH 28.: No evidence of concrete cancer, minor indications of deterioration. Minor defects to paint coating



PHOTOGRAPH 29.: No evidence of concrete cancer, minor indications of deterioration. Minor defects to paint coating



PHOTOGRAPH 30.: No evidence of concrete cancer, minor indications of deterioration. Minor defects to paint coating



PHOTOGRAPH 31.: Minor spalling/ blow out of concrete slab. Small area of reinforcement visible



PHOTOGRAPH 32.: Minor spalling/ blow out of concrete slab



PHOTOGRAPH 33.: Minor spalling/ blow out of concrete slab



PHOTOGRAPH 34.: Concrete slab expansion alongside brick support



PHOTOGRAPH 35.: Concrete slab expansion alongside brick support



PHOTOGRAPH 36.: Sections/ chunks of concrete slab have fallen away, sections of reinforcement corroded/ exposed



PHOTOGRAPH 37.: Sections/ chunks of concrete slab have fallen away, sections of reinforcement corroded/ exposed



PHOTOGRAPH 38.: Long dark stain/ crack indicates early reinforcement corrosion



PHOTOGRAPH 39.: Sections/ chunks of concrete slab have fallen away, sections of reinforcement corroded/ exposed



PHOTOGRAPH 40.: Sections/ chunks of concrete slab have fallen away. Large areas of reinforcement reinforcement corroded/ exposed



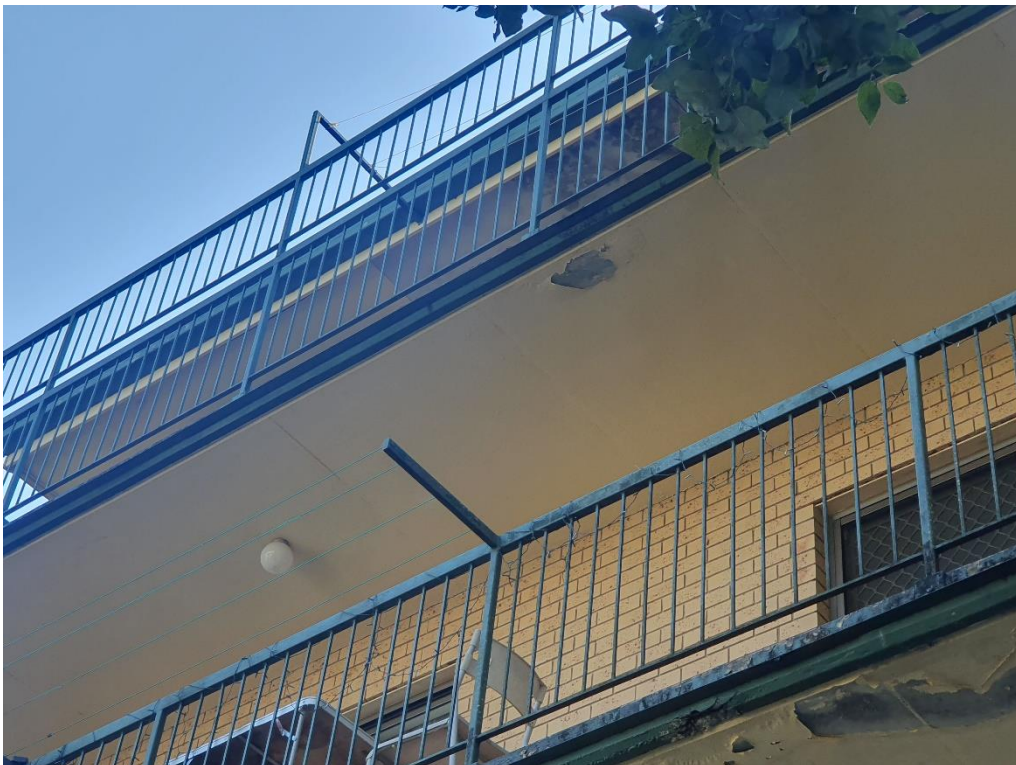
PHOTOGRAPH 41.: No evidence of concrete cancer. Efflorescence indicates on-going carbonation of concrete



PHOTOGRAPH 42.: No evidence of concrete cancer. Efflorescence indicates on-going carbonation of concrete



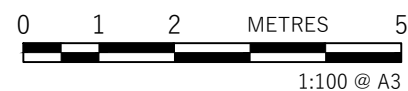
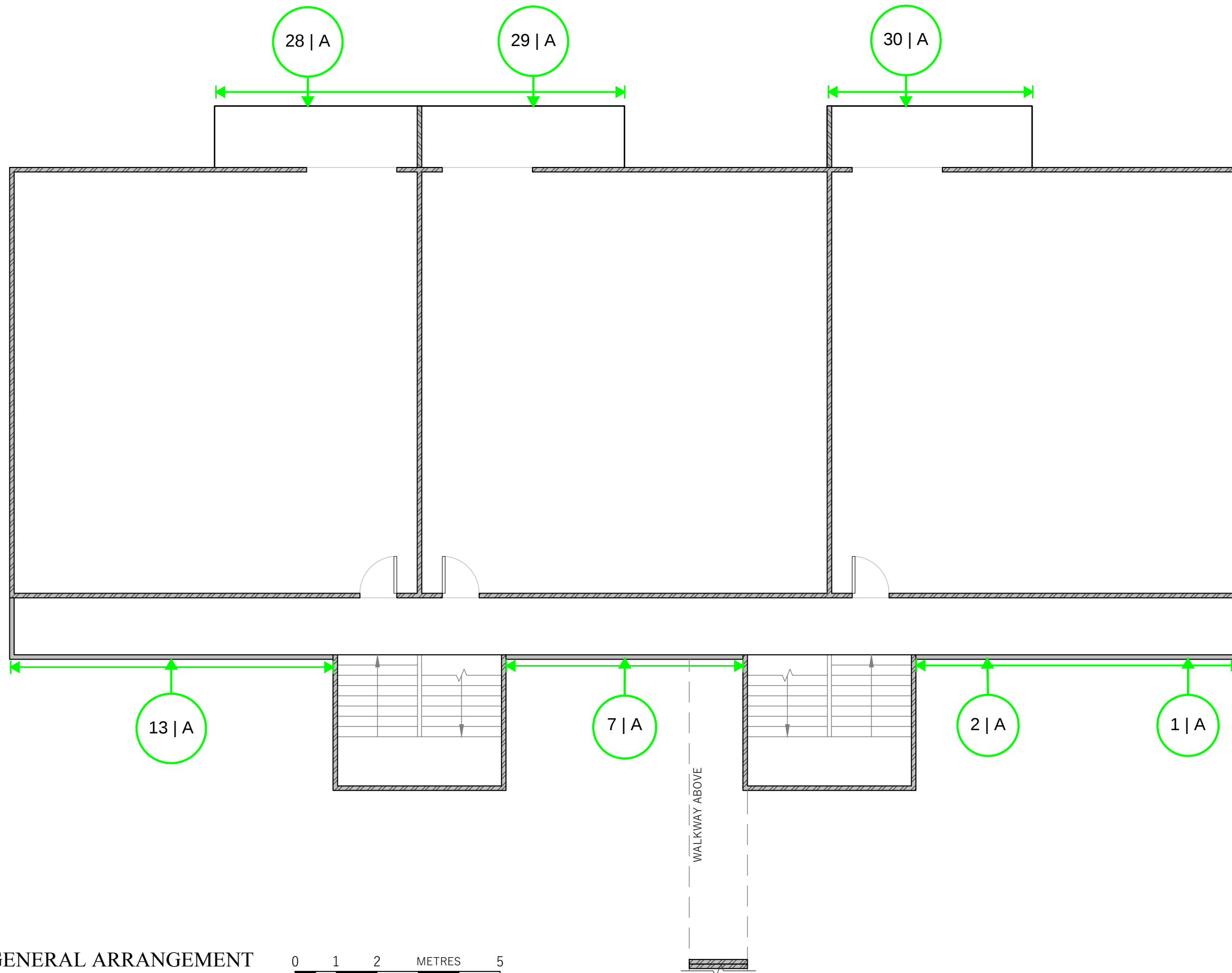
PHOTOGRAPH 43.: No evidence of concrete cancer. Efflorescence indicates on-going carbonation of concrete

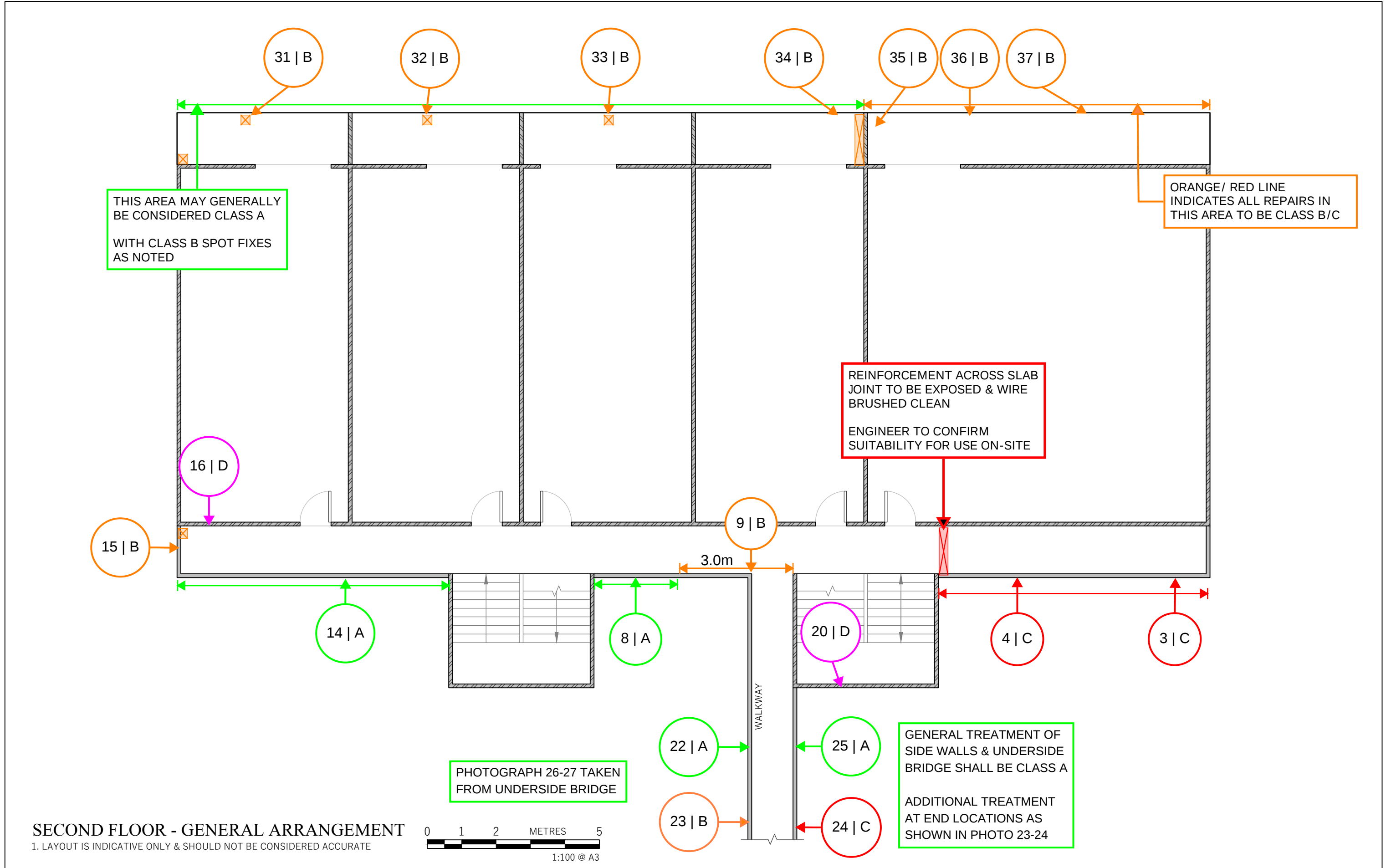


PHOTOGRAPH 44.: No evidence of concrete cancer. Efflorescence indicates on-going carbonation of concrete

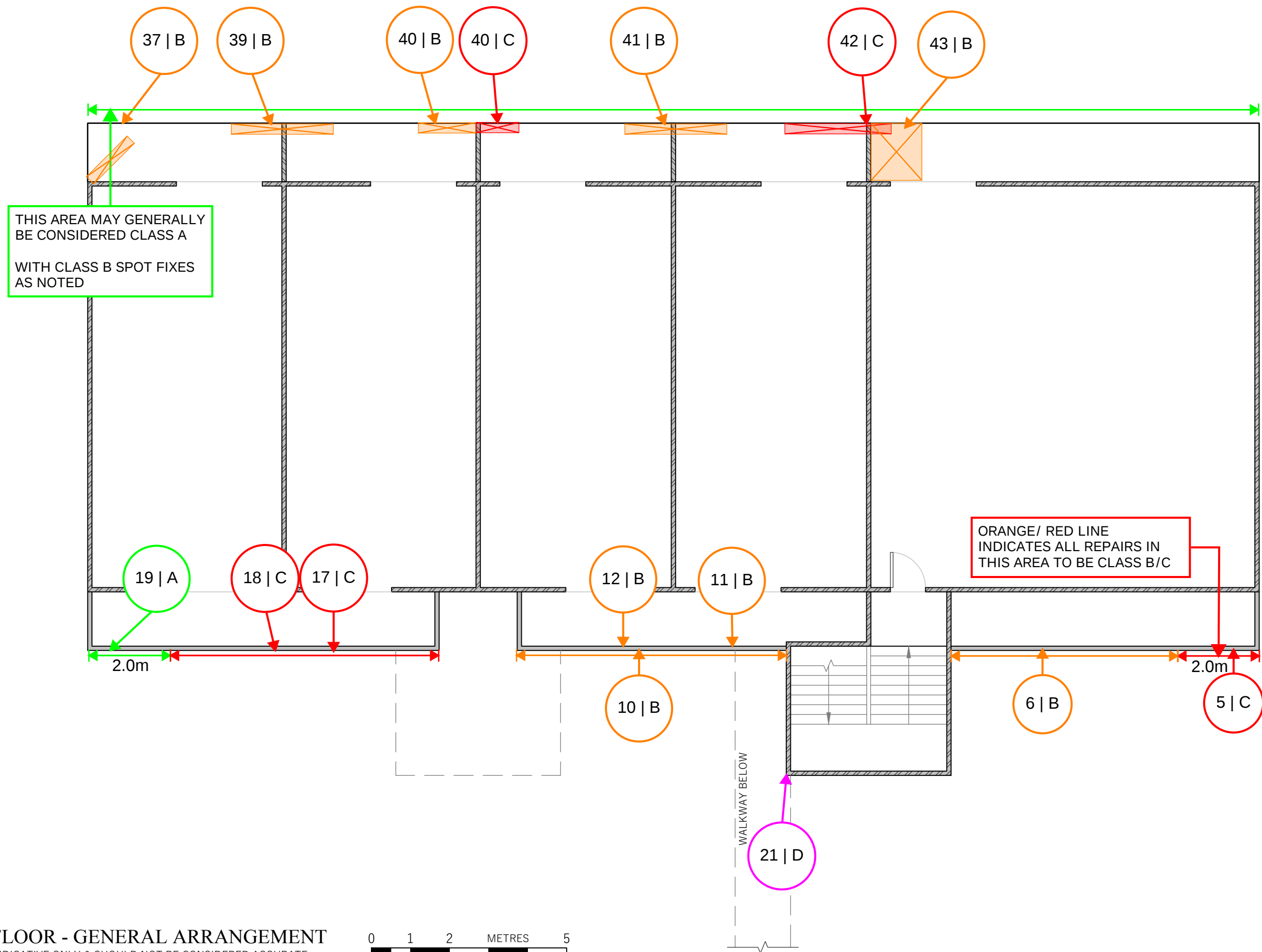
APPENDIX B

REPAIR DETAILS

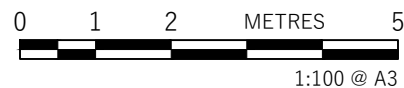




DESIGN SIRS ENGINEERS Structural Consulting Engineers Residential, Commercial & Industrial Investigation & Reporting REGISTERED NER Engineers Australia ENGINEERS AUSTRALIA Professional Engineer MEMBER Mobile: 0437 859 236 Email: info@designsirs.com.au 54 Patrea Street, Banyo QLD 4014				Date: AUG. 23 Drawn: D.C. Design: M.C. Certified: MARK CHILTS RPEQ: 25483	CLIENT CORE4 SERVICES	PROJECT CONCRETE CANCER REPAIRS AT 68 LATROBE STREET, PADDINGTON QLD 4064	PROJECT NO. S5192
01	ISSUED FOR INFORMATION	08/08/23	D.C.	THIS DRAWING & THE STRUCTURAL DESIGN CONTAINED WITHIN REMAINS THE PROPERTY OF DESIGN SIRS AND SHALL NOT BE COPIED, USED OR RETAINED IN PART OR IN WHOLE WITHOUT WRITTEN CONSENT			
Rev.	Description:	Date	Appd.	TITLE SECOND FLOOR - RECTIFICATION WORKS			
						DRAWING NO. S2	REV. 01



THIRD FLOOR - GENERAL ARRANGEMENT
1. LAYOUT IS INDICATIVE ONLY & SHOULD NOT BE CONSIDERED ACCURATE



				 Structural Consulting Engineers Residential, Commercial & Industrial Investigation & Reporting	  ENGINEERS AUSTRALIA Professional Engineer MEMBER Mobile: 0437 859 236 Email: info@designsirs.com.au 54 Patrea Street, Banyo QLD 4014	Date: AUG. 23	CLIENT CORE4 SERVICES	PROJECT CONCRETE CANCER REPAIRS AT 68 LATROBE STREET, PADDINGTON QLD 4064	PROJECT NO. S5192			
						Drawn: D.C.			Design: M.C.			
01	ISSUED FOR INFORMATION	08/08/23	D.C.					Certified:  MARK CHILTS RPEQ: 25483	 THIS DRAWING & THE STRUCTURAL DESIGN CONTAINED WITHIN REMAINS THE PROPERTY OF DESIGN SIRS AND SHALL NOT BE COPIED, USED OR RETAINED IN PART OR IN WHOLE WITHOUT WRITTEN CONSENT	TITLE THIRD FLOOR - RECTIFICATION WORKS	DRAWING NO. S3	REV. 01
Rev.	Description:	Date	Appd.									