



# Parliament House, Canberra



Building Facades and Finishes

21<sup>st</sup> March, 2005



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## Building Facades and Finishes

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<b>1.</b>	<b>INTRODUCTION .....</b>	<b>10</b>
<b>2.</b>	<b>EXECUTIVE SUMMARY.....</b>	<b>12</b>
2.1.	Part 1 – Precast Concrete Panels .....	13
2.1.1.	Description .....	13
2.1.2.	Condition Statement.....	13
2.1.3.	Major Issues .....	13
2.1.4.	Minor Issues .....	14
2.2.	Part 2 – Curved Walls .....	14
2.2.1.	Description .....	14
2.2.2.	Condition Statement.....	14
2.2.3.	Major Issues .....	14
2.2.4.	Minor Issues .....	15
2.3.	Part 3 – Paradise White Marble Cladding Stones to the Great Verandah .....	16
2.3.1.	Description .....	16
2.3.2.	Condition Statement.....	16
2.3.3.	Major Issues .....	16
2.3.4.	Minor Issues .....	16
2.4.	Part 4 – Exposed Concrete Wall Finishes .....	17
2.4.1.	Description .....	17
2.4.2.	Condition Statement.....	17
2.4.3.	Major Issues .....	17
2.4.4.	Minor Issues .....	17
2.5.	Part 5 – Water Features.....	18
2.5.1.	Description .....	18
2.5.2.	Condition Statement.....	18
2.5.3.	Major Issues .....	18
2.5.4.	Minor Issues .....	18
2.6.	Part 6 – Related Additional Items .....	18
2.6.1.	Forecourt Water Feature Waterproofing .....	18
2.6.2.	Glass Walled Link Bridges .....	18
2.6.3.	Senate Roof Ridge Pointing.....	19
2.6.4.	Bogong Moth Infestation .....	19
2.6.5.	Safe Roof Access.....	19
2.6.6.	Water Penetration Investigations.....	19
2.6.7.	House of Representatives Roof Damage .....	19
2.6.8.	Great Verandah Roof Waterproofing .....	19
2.6.9.	Queens Terrace Balustrades .....	19
<b>3.</b>	<b>PREAMBLE.....</b>	<b>20</b>
<b>4.</b>	<b>PRELIMINARIES.....</b>	<b>22</b>
4.1.	Definitions.....	22
4.2.	Access Methods .....	23

<b>5.</b>	<b>PART 1 – Precast Concrete Panels.....</b>	<b>25</b>
5.1.	Investigations Methodology Statement.....	25
5.2.	Investigations Findings .....	27
5.2.1.	Inclined Walls to Forecourt .....	27
5.2.1.1.	Staining.....	31
5.2.1.2.	Sealant Joints .....	31
5.2.1.3.	Spalling .....	32
5.2.1.4.	Impact Damage .....	32
5.2.1.5.	Lightning Conductor Anchors .....	32
5.2.1.6.	Delaminating Coating .....	32
5.2.2.	Ministerial Building Facades .....	33
5.2.2.1.	Staining.....	38
5.2.2.2.	Impact Damage .....	39
5.2.2.3.	Failed Ferrule Repairs.....	39
5.2.2.4.	Inclusions.....	40
5.2.3.	Ministerial Roof / Rooftop Garden Retaining Wall .....	41
5.2.3.1.	Concrete Spalling .....	44
5.2.3.2.	Calcium Carbonate Leaching .....	44
5.2.4.	Senate Building Facades .....	45
5.2.4.1.	Staining.....	52
5.2.4.2.	Bowed Panels.....	53
5.2.4.3.	Drip Grooves .....	54
5.2.4.4.	Failed Patch Repair .....	54
5.2.4.5.	Incomplete Sealant Works .....	54
5.2.5.	House of Representatives Facades.....	55
5.2.5.1.	Bird Damage.....	59
5.2.5.2.	Minor Cracks .....	59
5.2.6.	Queen's Terrace .....	60
5.2.6.1.	Failed Waterproofing .....	62
5.2.6.2.	Skylight Leak .....	62
5.2.6.3.	Delaminating Coating .....	62
5.3.	Analytical Evaluation .....	63
5.3.1.	Chloride Analysis .....	63
5.3.2.	Carbonation.....	64
5.3.3.	Covermeter.....	68
5.4.	Discussion and Recommendations .....	69
5.4.1.	Staining .....	69
5.4.2.	Sealant Joints and Bird Damage .....	70
5.4.3.	Spalling Concrete.....	70
5.4.4.	Impact Damage.....	71
5.4.5.	Lightning Conductor Fixings .....	71
5.4.6.	Delaminated Coatings.....	72
5.4.7.	Failed Lifting Ferrule Patch Repairs .....	72
5.4.8.	Inclusions .....	73

5.4.9.	Calcium Carbonate Leaching (Efflorescence) .....	73
5.4.10.	Bowed Panels .....	73
5.4.11.	Drip Grooves .....	74
5.4.12.	Failed Patch Repairs .....	74
5.4.13.	Minor Cracks (Precast) .....	75
5.4.14.	Failed Waterproofing .....	75
5.4.15.	Skylight Leak .....	76
5.4.16.	Chloride and Carbonation Induced Corrosion .....	76
<b>6.</b>	<b>PART 2 – Curved Walls Carmina Grey Granite and Verde Issorie Marble Cladding</b>	
	<b>Panels .....</b>	<b>78</b>
6.1.	Investigations Methodology Statement .....	78
6.2.	Investigations Findings .....	80
6.2.1.	Eastern Curved Wall Façade and Copings .....	80
6.2.1.1.	Fractured Panels .....	88
6.2.1.2.	Horizontal Joint Staining .....	88
6.2.1.3.	Tide Mark Staining .....	89
6.2.1.4.	Coping Staining .....	89
6.2.1.5.	Delaminating Panel Extensions .....	89
6.2.1.6.	Delaminating Repairs .....	90
6.2.1.7.	Coping Sealant .....	90
6.2.1.8.	Microcracking .....	90
6.2.1.9.	Lightning Conductor Anchors .....	90
6.2.1.10.	Calcium Carbonate Leaching .....	91
6.2.1.11.	Unique Staining Beneath Flagpole Mast .....	91
6.2.1.12.	Runoff Staining to South Roof Opening (Area 7) .....	92
6.2.1.13.	Redundant Security Camera Core holes .....	92
6.2.2.	Curved Wall Verde Issorie Niches and Linkway Gates .....	93
6.2.2.1.	Panel Failures .....	94
6.2.2.2.	Joint Staining .....	94
6.2.3.	Ministerial Entrance .....	95
6.2.3.1.	Joint Staining .....	96
6.2.3.2.	VI Cracks .....	96
6.2.3.3.	Soffit Staining .....	96
6.2.4.	Senate + HOR Features .....	97
6.2.4.1.	Fractured Panel .....	98
6.2.4.2.	Staining .....	98
6.2.5.	Senate AREA 2B North + South Features .....	100
6.2.5.1.	Deficient Detailing .....	101
6.2.6.	Senate Porte Cochere .....	102
6.2.6.1.	Reinforced Concrete Cracks .....	103
6.2.6.2.	Corroded Connector Plates .....	103
6.2.6.3.	Soffit Staining .....	103
6.3.	Discussion and Recommendations .....	104

6.3.1.	East and West Curved Wall Façade and Copings .....	104
6.3.1.1	Fractured Panels .....	104
6.3.1.2	Horizontal Joint Staining .....	105
6.3.1.3	Tide Mark Staining .....	106
6.3.1.4	Coping Staining .....	106
6.3.1.5	Delaminating Panel Extensions .....	107
6.3.1.6	Delaminating Repairs .....	107
6.3.1.7	Coping Sealants .....	108
6.3.1.8	Microcracking .....	108
6.3.1.9	Lightning Conductor Anchors .....	108
6.3.1.10	Calcium Carbonate Leaching (Efflorescence) .....	109
6.3.1.11	Unique Staining Beneath Flagpole Mast .....	109
6.3.1.12	Runoff Staining to South Roof Opening (Area 7) .....	110
6.3.1.13	Redundant Security Camera Core holes .....	110
6.3.2.	Curved Wall Verde Issorie Niche Panels .....	110
6.3.2.1	VI Panel Failures .....	110
6.3.2.2	Joint Staining .....	111
6.3.3.	Ministerial Entrance .....	112
6.3.3.1	Joint Staining .....	112
6.3.3.2	VI Cracks .....	113
6.3.3.3	Soffit Staining .....	113
6.3.4.	Senate and HOR Features .....	113
6.3.5.	Senate Area 2B North + South Features .....	114
6.3.6.	Senate Porte Cochere .....	114
6.3.6.1	Reinforced Concrete Cracks .....	114
6.3.6.2	Corroded Connector Plates .....	115
<b>7.</b>	<b>PART 3 – Paradise White Marble Cladding Stones to Great Verandah .....</b>	<b>116</b>
7.1.	Investigations Methodology Statement .....	116
7.2.	Investigations Findings .....	117
7.2.1.	Great Verandah .....	117
7.2.1.1.	Bowing Stone Panels .....	121
7.2.1.2.	Staining .....	122
7.2.1.3.	Cracks .....	123
7.2.1.4.	Replacement Panels .....	123
7.2.1.5.	Reworked Panel Finish .....	123
7.2.1.6.	Impact Damage .....	123
7.2.2.	HOR North and South Return Walls .....	124
7.2.2.1.	Staining .....	126
7.2.2.2.	Spalling at Panel Fixings .....	126
7.2.2.3.	Marble Panel Damage .....	127
7.3.	Discussion and Recommendations .....	128
7.3.1.	Great Verandah .....	128
7.3.1.1.	Bowing Stone Panels .....	128
7.3.1.2.	Staining .....	129

7.3.1.3.	Cracks.....	130
7.3.1.4.	Replacement Panels .....	130
7.3.1.5.	Reworked Panel Finish .....	130
7.3.1.6.	Impact Damage .....	130
7.3.2.	HOR North and South Return Walls .....	131
7.3.2.1.	Staining.....	131
7.3.2.2.	Spalling at Panel Fixings .....	131
7.3.2.3.	Marble Panel Damage.....	132
<b>8.</b>	<b>PART 4 – Exposed Concrete Wall Finishes .....</b>	<b>133</b>
8.1.	Investigations Methodology Statement.....	133
8.2.	Investigations Findings .....	134
8.2.1.	Parliament Drive Corner Retaining Walls .....	134
8.2.1.1.	Expansion Joints .....	137
8.2.1.2.	Coping Panel Joints.....	137
8.2.1.3.	Coping Stone / Parapet Interface.....	137
8.2.1.4.	Vertical Wall / Parapet Staining.....	137
8.2.1.5.	Calcium Carbonate Leaching .....	137
8.2.1.6.	Lawn Mowing Strips / Impact Damage.....	138
8.2.1.7.	Spalling Concrete Defect.....	138
8.2.2.	HOR Carpark Entrance Precinct.....	139
8.2.2.1.	Staining.....	142
8.2.2.2.	Calcium Carbonate Leaching (Efflorescence) .....	142
8.2.2.3.	Sealant Joints .....	142
8.2.2.4.	Cracking.....	142
8.2.2.5.	Balustrade Support Posts.....	142
8.2.3.	Senate Carpark Entrance Precinct .....	144
8.2.3.1.	Form Tie Plugs .....	146
8.2.3.2.	Weathering .....	147
8.2.3.3.	Bar Chair Corrosion.....	147
8.2.3.4.	Runoff Staining / Organic Growth .....	147
8.2.3.5.	Cracking.....	147
8.2.3.6.	Rainwater Head .....	147
8.3.	Analytical Evaluation .....	148
8.3.1.	Covermeter.....	148
8.3.2.	Chloride Analysis .....	148
8.3.3.	Carbonation.....	149
8.4.	Discussion and Recommendations .....	152
8.4.1.	Parliament Drive Corner Retaining Walls .....	152
8.4.1.1.	Sealant Joints .....	152
8.4.1.2.	Spalling Concrete .....	152
8.4.1.3.	Runoff Staining .....	153
8.4.1.4.	Cracking.....	154
8.4.1.5.	Coping Panel Staining.....	154
8.4.1.6.	Lawn Mowing Strips .....	155

8.4.1.7.	Impact Damage .....	155
8.4.2.	HOR Carpark Entrance Precinct.....	156
8.4.2.1.	Cracking.....	156
8.4.2.2.	Balustrade Support Posts.....	156
8.4.2.3.	Runoff Staining / Weathering .....	157
8.4.2.4.	Sealant Joints .....	157
8.4.2.5.	Calcium Carbonate Leaching (Efflorescence) .....	157
8.4.3.	Senate Carpark Entrance Precinct .....	158
8.4.3.1.	Run Off Staining / Weathering.....	158
8.4.3.2.	Form Tie Plugs .....	158
8.4.3.3.	Cracking.....	158
8.4.3.4.	Rainwater Head.....	159
<b>9.</b>	<b>PART 5 – Water Features .....</b>	<b>160</b>
9.1.	Investigations Methodology Statement.....	160
9.2.	Investigations Findings .....	161
9.2.1.	WD03 - HOR.....	161
9.2.2.	WD18 – Ministerial Courtyard .....	161
9.2.3.	WD19 – Ministerial Entrance .....	161
9.2.4.	WD21 .....	162
9.2.5.	Formal Gardens .....	162
9.3.	Discussion and Recommendations .....	163
9.3.1.	Calcium Carbonate Staining (Efflorescence).....	163
9.3.2.	Carmina Grey Granite Staining.....	163
9.3.3.	Reinforced Concrete Staining .....	164
9.3.4.	General Staining .....	164
9.3.5.	Waterproofing Membrane .....	164
<b>10.</b>	<b>PART 6 – Related Additional Items .....</b>	<b>165</b>
10.1.	Introduction.....	165
10.2.	Investigation Findings .....	165
10.2.1.	Forecourt Water Feature Waterproofing.....	165
10.2.2.	Glass Walled Link Bridges .....	166
10.2.3.	Senate Roof Ridge Pointing.....	166
10.2.4.	Bogong Moth Ingress.....	167
10.2.5.	Safe Roof Access.....	169
10.2.6.	Water Penetration Investigation.....	170
10.2.6.1.	AREA 8F - Ministerial Building - Southeast Ground Floor Suite.....	171
10.2.6.2.	AREA 10F - HOR Building - Northeast Ground Floor Suite.....	172
10.2.7.	HOR Roof Damage .....	173
10.2.8.	Great Verandah Roof Waterproofing .....	174
10.2.9.	Queen's Terrace Balustrade .....	175
	<b>APPENDIX A – BIBLIOGRAPHY .....</b>	<b>176</b>



<b>APPENDIX B – REFERENCE DRAWINGS .....</b>	<b>177</b>
<b>APPENDIX C – PHOTOGRAPH LIBRARY.....</b>	<b>178</b>
<b>APPENDIX D – ARUP SPECIALIST STONE CLADDING INSPECTION REPORT .....</b>	<b>179</b>
<b>APPENDIX E – CETEC REPORT OF ANALYSIS FOR CHLORIDE .....</b>	<b>180</b>

# 1. INTRODUCTION

Diagnostech were engaged by G.E.Shaw (ACT) Pty Ltd on behalf of the Department of Parliamentary Services to provide consultancy services in relation to the Building Facades and Finishes at Parliament House, Canberra.

These consultancy services have been completed generally in accordance with our Proposal for Specialist Consultancy Services dated 16<sup>th</sup> June 2004.

Site inspections and investigations commenced on 13<sup>th</sup> September 2004 and were completed on 29<sup>th</sup> October 2004.

This document incorporates six distinct sections as follows;

- PART 1 – Precast Concrete Panels
- PART 2 – Curved Walls – Carmina Grey Granite & Verde Issorie Marble Cladding Panels
- PART 3 – Great Verandah – Paradise White Marble Cladding Panels
- PART 4 – Exposed Reinforced Concrete Walls
- PART 5 – Water Features – Stonework Finishes

And in addition to our original brief;

- PART 6 – Related Additional Items

This document describes the inspection and investigative processes applied and associated findings obtained from representative areas of the building's facades and finishes at Parliament House, Canberra. The general intention of this document has evolved to provide a "health check" of the building facades and finishes with the original emphasis on staining of the major façade elements. While every care has been taken to note all the typical deficiencies across representative facades and finishes incorporated into this report, it is not exhaustive and other defects may exist that have not been encompassed by this report.

Inherent in the visual inspection process, numerous additional items were discovered whilst surveying the staining issues that are additional to the original scope and have subsequently been included into this report for completeness.

Various reference documents and drawings were provided and reviewed during the preliminary stages of the consultancy works and a bibliography has been provided in Appendix A.

This document is to be read in conjunction with the Reference Drawing documents referred herein as Appendix B (Doc Ref: 109.200407(02)). These Reference Drawings provide indicative extents of the close visual inspections undertaken. Where necessary, detail drawings have also been incorporated into Appendix B.

Deficiencies in the existing condition of the façade elements have been referred to herein as "defects". To assist in conveying the discovered defects clearly, photographic representation has been incorporated into the report. The photographs do not represent the full extent of all defects found, rather the type and propensity of each defect. The large number of digital photographs taken over the course of the inspections is abundant. A compilation compact disk of all photographs taken during the site phase forms Appendix C (Doc Ref: 109.200407(03)).

ARUP Façade Engineering were engaged as Specialist Stone Sub-consultants and their findings have been referred to in relevant sections of this report. ARUP's 'Stone Cladding Inspection' Report is located in Appendix D (Doc Ref: 83422/95).

Independent laboratory testing of concrete core hole specimens was undertaken and the full report of the results is located in Appendix E (Doc Ref: CN0411-05A).

Recommendations for remedial works have been noted, and where applicable, numerous options have been flagged with each having different levels of associated risk and aesthetic impact. In most cases we assume that the design of works will be determined largely by architectural judgements. Diagnostech have intentionally not made any architectural decisions, and the recommendations are based on technically feasible alternatives. Having stated this, the preliminary design concepts for the remedial work alternatives do concentrate on minimising the aesthetic impact on the building elements. It is understood that original materials, colours and surface finishes should be kept in accordance with original design concept.

Where our findings indicate the need for further investigations, testing and/or further discussion and consideration of client constraints, these have been referred to in the respective recommendations for each item.

The findings and opinions discussed within this document are primarily based on visual inspection of a limited selection of the building façade elements and as such are indicative only. Opinions provided herein are based on visual inspections, provided drawings and core specimen testing undertaken. Diagnostech accepts no liability in respect of, or in relation to, any negligence arising either directly or indirectly from the use of this document.

This report and associated appendices have been prepared for the express use by G.E.Shaw (ACT) Pty Ltd and Department of Parliamentary Services. It is not intended for and should not be relied upon by any other party and no responsibility is undertaken to any other party.

## 2. EXECUTIVE SUMMARY

Diagnostech Pty Ltd, together with selected specialist sub-consultants, have completed a Consultancy Project comprising an inspection process of the façade stone and concrete finishes of the Australian Parliament House, Canberra. The Consultancy Project was completed generally in accordance with the Diagnostech document 'Proposal for Specialist Consultancy Services' dated 16<sup>th</sup> June 2004 that was submitted in satisfaction of the 'Statement of Requirement Parliament House Building Facades and Finishes' brief provided by G.E.Shaw (ACT) Pty Ltd on behalf of the Department of Parliamentary Services.

The Consultancy Project comprised investigations intended to assess the defined façade elements sufficient to provide technical information necessary to enable an informed opinion about the nature and extent of previously identified and newly discovered defects and/or deterioration affecting the aesthetics, integrity, and durability of the stone and concrete facades.

The investigations predominantly comprised a visual inspection process incorporating walk-around Surveys and Close Visual Inspections conducted from rope and other access equipment. Subsurface investigations including: borescope inspections, defect deconstructions, tap testing, covermeter survey, carbonation tests, and chloride tests; were undertaken to augment and clarify the visual inspection process.

The brief required the report to be presented in five distinct sections i.e:

- PART 1 – Precast Concrete Panels
- PART 2 – Curved Walls -- Carmina Grey Granite & Verde Issorie Marble Cladding Panels
- PART 3 – Great Verandah - Paradise White Marble Cladding Panels
- PART 4 – Exposed Reinforced Concrete Walls
- PART 5 – Water Features – Stonework Finishes

An additional section 'PART 6 – Related Additional Items' has been incorporated to report on supplementary discovered issues.

This Executive Summary provides a general Condition Statement conclusion for each of these parts (subject to the various discovered defects), that reflects the overall findings of the Consultancy Project. Major defect issues are considered those that directly affect the performance and durability of the façade elements (prioritised from short term to long term risks), whilst minor issues are likely to have only aesthetic impact and/or present less evident performance/durability risks (similarly prioritised).

## **2.1. Part 1 – Precast Concrete Panels**

### **2.1.1. Description**

This section includes the following areas:

- Inclined Walls to Forecourt
- Ministerial Building Facades
- Ministerial Roof / Rooftop Garden Retaining Wall
- Senate Building Facades
- House of Representative Facades
- Queen's Terrace

Elements generally consist of precast concrete panels with various finishes including exposed aggregate, acid etched and brush blast.

### **2.1.2. Condition Statement**

The inspected precast concrete elements are considered to be in good condition for their age, and provided the identified defects are adequately addressed they should perform satisfactorily for the long term.

### **2.1.3. Major Issues**

The precast panels to the Senate Building Facades identified as bowing may not represent the only afflicted panels. To evaluate the extent of the problem and determination of any potential future structural integrity issue requires further investigation in the short term.

Incidences of spalling concrete defects were discovered to the Ministerial Roof/Rooftop Garden Retaining Wall. Extensive failure of the lifting ferrule patch repairs is imminent. Both of these defect categories require rectification in the short term.

The potential for spalling concrete in the long term is significant due to inadequate concrete cover and cracks that, although isolated in occurrence, nevertheless may represent a large number of incidences overall. A planned preventative maintenance strategy should be developed in the short term to minimise expensive future rectification works.

Precast panel sealant joints have deteriorated over time, are constantly subject to bird attack, and contain some design inadequacies (e.g. lightning rod penetrations) that limit their durability. Sealant selection may also be exacerbating the staining issue (e.g. silicone residue migration). The currently implemented replacement program requires re-evaluation in the short term in order to optimise its long term effectiveness.

### **2.1.4. Minor Issues**

Impact damage to panels (e.g. from lawn mowing equipment) is generally localised and affects the building aesthetics which is likely to worsen over time. Procedural strategies should be implemented in the short term to limit future degradation.

Delamination of the previously applied coating to the Queen's Terrace and behind the main public entry requires rectification.

Pollution retention resulting in the observed extensive concrete surfaces staining is an inherent characteristic of the coarse concrete finishes existing throughout APH. The staining is considered a continuing aesthetic issue. This is exacerbated by uncontrolled water run off due to panel design features that concentrates staining and, in some circumstances, results in calcium carbonate leaching. Long term aesthetic degradation of the concrete finishes is inevitable if preventative strategies, complimented by appropriate maintenance programs, are not adopted in the short to medium terms.

## **2.2. Part 2 – Curved Walls**

### **2.2.1. Description**

This section includes the following areas:

- East and West Curved Wall Façade and Copings
- Curved Wall Verde Issorie Niche and Linkway Gate Panels
- Decorative Features

Elements generally consist of Carmina Grey Granite and Verde Issorie Marble clad reinforced concrete structures, with some White Marble and other decorative stone finishes interspersed throughout the complex. Associated insitu reinforced concrete finishes are also included in this section.

### **2.2.2. Condition Statement**

Apart from the Verde Issorie (VI) stone material, the inspected stone elements are generally considered to be in good condition for their age, and provided the identified defects are adequately addressed they should perform satisfactorily for the long term.

The VI stone material is considered unsuitable for its as-constructed use as a thin panel cladding material incorporated in a building with a design life of 200 years.

### **2.2.3. Major Issues**

Immediate public safety provisions should be implemented to mitigate the possibility of collapse of the discovered failed Verde Issorie niche panels. There exists the possibility that 30-40% of the panels may similarly fail in the future.

VI stone is considered inherently fragile and hence is not suitable for enduring façade cladding finishes. This fact necessitates a program of comprehensive survey and associated diagnostic investigation implemented in the short term to ascertain the actual extent of deterioration of the panels, and to determine strategies for repair and replacement over the life of the building.

Identified fractured panels to the curved walls and copings are not considered to be in immediate danger of collapse unless subject to an external event. Nevertheless they should be replaced in the short term. Concurrently, a comprehensive survey and diagnostic investigation should be implemented to identify similarly affected panels that diagnoses the cause(s) and evaluates the potential for additional and future occurrences.

The identified widespread occurrence of delaminated panel edges and face repairs to the curved walls and also to the Paradise White marble features of the Senate Building, may present a public safety hazard (e.g. caught and ejected by lawnmowers). A make safe exercise should be undertaken immediately, followed by a monitoring process and optional repair maintenance strategy.

The potential occurrence of concrete spalling of the Senate Porte Cochere insitu reinforced concrete elements (due to cracking) should be incorporated with the recommended preventative maintenance strategy for precast panels (Refer Section 2.1.3).

Corroded steel baseplates to the Senate Porte Cochere tubular steel roof frame require rectification in the short term.

The actual cause(s) of unique staining beneath the flagpole mast is currently unidentified. The possible corrosion of concealed structural elements signals the need for an intensive investigation in the short term.

Stone panel sealant and gasket joints have deteriorated over time, similar to the precast concrete panel joints. Sealant/gasket selection may also similarly be exacerbating the staining issue. The currently implemented sealant/gasket replacement program requires re-evaluation in the short term in order to optimise its long term effectiveness.

#### ***2.2.4. Minor Issues***

The observed extensive staining of stone surfaces is considered a continuing aesthetic issue, exhibiting similar sources to the concrete staining issue i.e. pollution retention exacerbated by uncontrolled water run off due to panel design features that concentrates staining and calcium carbonate leaching. Additional stain sources include joint sealant and gasket degradation, and moisture ingress. Current severe localised calcium carbonate leaching should be removed in the short term to restore the designed appearance of the stone finishes. Further aesthetic degradation of the stone finishes in the long term is inevitable if preventative strategies, complimented by appropriate maintenance programs targeted at the varying categories of staining, are not adopted in the short to medium terms.

The incidence of stone inclusion micro-cracking is not considered a significant defect. Periodic monitoring to gauge propagation into adjoining parent stone should form part of an ongoing long term maintenance management strategy.

Redundant holes from removed security cameras should be repaired in the short term (waterproofing and stone surface reinstatement) in accordance with best standard maintenance practice.

### ***2.3. Part 3 – Paradise White Marble Cladding Stones to the Great Verandah***

#### ***2.3.1. Description***

This section includes the following areas:

- Great Verandah
- House of Representatives North and South Return Walls

Elements consist of Paradise White Marble cladding generally to reinforced concrete structures.

#### ***2.3.2. Condition Statement***

The Great Verandah Paradise White (PW) marble stone cladding panels are in fair to poor condition for their age and require replacement in the medium to long terms.

The structural integrity of the House of Representatives North and South Return Walls PW cladding is also suspect.

#### ***2.3.3. Major Issues***

Immediate public safety provisions should be implemented to mitigate the possibility of collapse of the discovered bowing PW marble panels.

Implementation of an intensive diagnostic investigation and options study is required in the short term to provide strategies for interim works and the ultimate replacement of the Great Verandah PW stone. Concurrent investigation of the structural integrity of the House of Representatives North and South Return Wall PW stone should also be implemented.

#### ***2.3.4. Minor Issues***

Ancillary stone defects to the Great Verandah PW cladding (i.e. including staining, inclusions, damage, cracks and other minor defects) are not considered relevant in light of the structural integrity issue with these elements.



## **2.4. Part 4 – Exposed Concrete Wall Finishes**

### **2.4.1. Description**

This section includes the following areas:

- Parliament Drive Corner Retaining Walls
- House of Representatives Carpark Entrance Precinct
- Senate Carpark Entrance Precinct

Elements generally consist of insitu and precast concrete components variously finished and including associated stone features (e.g. stone copings to Parliament Drive Corner Retaining Walls).

### **2.4.2. Condition Statement**

The inspected concrete and stone elements are considered to be in good condition for their age, and provided the identified defects are adequately addressed they should perform satisfactorily for the long term.

### **2.4.3. Major Issues**

Isolated spalling concrete defects were discovered to the Parliament Drive Corner Retaining Walls. Similarly corroded form-ties were recorded to the Senate Carpark Entrance Precinct. Both of these defect categories require rectification in the short term.

The potential for spalling concrete in the long term is significant due to inadequate concrete cover and cracks, that although isolated in occurrence, nevertheless may represent a large number of incidences overall. A planned preventative maintenance strategy should be developed in the short term to minimise expensive future rectification works.

Sealant joints have deteriorated over time as previously discussed (Refer Section 2.1) and require replacement in the short term.

### **2.4.4. Minor Issues**

Concrete surfaces are affected by impact damage similar to the precast panels (Refer Section 2.1). Procedural strategies should be implemented in the short term to limit future degradation, which should include evaluation of the effectiveness of the unitised stone lawn mowing strips (some of which are damaged or subsided).

Staining as per the precast panels (Refer Section 2.1) and curved walls (Refer Section 2.2) affecting the concrete and stone surface respectively is considered a continuing aesthetic issue. Long term aesthetic degradation of the concrete finishes is inevitable if preventative strategies, complemented by appropriate maintenance programs, are not adopted in the short to medium terms.

## **2.5. Part 5 – Water Features**

### **2.5.1. Description**

This section includes the 19 external water features that exist throughout the APH complex. Each water feature is unique in design, function and configuration. They are largely composed of granites and marbles and generally over reinforced concrete structures.

### **2.5.2. Condition Statement**

The inspected water feature stone elements are generally considered to be in good condition for their age, and provided the identified defects are adequately addressed they should perform satisfactorily for the long term.

### **2.5.3. Major Issues**

Water egress is believed to be occurring from some of the inspected water features due to discovered deteriorated waterproof membrane linings. This represents a net loss of water, and increases pollution into the environment from the applied chemical treatment of the water (e.g. chlorine). This may also affect the staining of the stone. Water egress from affected water features should be investigated and rectified in the short term.

### **2.5.4. Minor Issues**

The observed extensive staining of stone surfaces is considered a continuing aesthetic issue, exhibiting similar sources to those previously discussed (ref: Part 2 above). Additional stain sources include calcium carbonate deposited by fountain devices, and treated water contaminants. Current severe localised calcium carbonate leaching should be removed in the short term to restore the designed appearance of the stone finishes. Further aesthetic degradation of the stone finishes in the long term is inevitable if preventative strategies, complimented by appropriate maintenance programs, targeted at the varying categories of staining, are not adopted in the short to medium terms.

## **2.6. Part 6 – Related Additional Items**

The following items were observed during the inspection process that are considered to be major issues within the stated definition, and that consequently require remedial action.

### **2.6.1. Forecourt Water Feature Waterproofing**

Water penetration occurs through the forecourt water feature and requires rectification in the short term to preserve the long term structural integrity of the concrete forecourt slab/basement carpark roof structure.

### **2.6.2. Glass Walled Link Bridges**

Observed dislodged weatherseal gaskets to double glazed unit vision panels require rectification to preserve water/sound/heat resistance and insulation characteristics.

### ***2.6.3. Senate Roof Ridge Pointing***

Observed deteriorated tiled roof ridge pointing should be rectified to prevent possible water penetration in the short term.

### ***2.6.4. Bogong Moth Infestation***

Implement an investigation into the extent and entry source of Bogong moths with a view to undertaking remedial works to reduce the likelihood of associated problems (e.g. water penetration, odour).

### ***2.6.5. Safe Roof Access***

Undertake a program of upgrading the safe access of the various building roofs for maintenance personnel in compliance with best practice workplace health and safety standards.

### ***2.6.6. Water Penetration Investigations***

Undertake an intensive water penetration testing program and diagnostic investigation to determine the cause(s) of water penetration into: Area 8F - Ministerial Building Southeast Ground Floor Suite; and Area 10F - HOR Building Northeast Ground Floor Suite.

### ***2.6.7. House of Representatives Roof Damage***

Investigate the extent and nature of observed damage to roof insulation, protection and waterproof membrane, and rectify to minimise further deterioration and prevent possible future water penetration into the building.

### ***2.6.8. Great Verandah Roof Waterproofing***

Carry out remedial works to reduce loss of user amenity and possible slip hazards presented by water penetration from the overhead glass roof structures.

### ***2.6.9. Queens Terrace Balustrades***

Carry out remedial works to modify/replace the non-compliant balustrade to the terrace area.

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**Building Facades and Finishes**  
**Review of Stonework Condition Report**

Project No: 109.200407

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