Maintenance

Master Specification

M12A Electrical and Mechanical Birkenhead Bridge

Document Information	
KNet Number:	14301808
Document Version:	2
Document Date:	July 2022

DEPARTMENT FOR INFRASTRUCTURE AND TRANSPORT

Government of South Australia
Department for Infrastructure and Transport

Document Amendment Record

Version	Change Description	Date
1	Initial issue	
2	Update format	July 2022

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Contents

M12A Birkenhead Bridge

1 Description of works and work Requirements

General

1.1 The Birkenhead Bridge ("the Bridge") requires routine inspection and maintenance to prevent operational breakdowns which create pedestrian, road, and marine traffic inconvenience, and to ensure the reliability of the operation of the bascule spans.

1.2 The Works consist of the provision of electrical, electronic, and mechanical inspections and maintenance for the Birkenhead Bridge, Northern and Southern bascule pier operational systems / mechanisms.

1.3 Services to be provided include:

a) programmed 4-monthly mechanical and 4 monthly electrical / electronic inspections plus annual additional electrical / electronic inspections;

b) maintenance of the Bridge's, Northern and Southern bascule pier operational systems / mechanisms to rectify faults found during regular inspections and other site visits;

c) responsive, reactive, and urgent maintenance including balancing of the bascule spans as required; and

d) reporting of any maintenance repairs required from regular inspections of the Bridges Northern and Southern bascule pier operational systems / mechanisms.

1.4 In addition the Contractor shall:

a) perform SMS as requested by the Superintendent, in accordance with the specifications;

b) provide an emergency response and fault response service; and

c) develop inspection / test sheets as required.

1.5 Programmed Routine Maintenance activities are to be inclusive of required consumables. No additional payment will be made for consumables such as oil, grease, fuel etc.

Site Requirements

1.6 The Traffic Management Centre (TMC) is responsible for the overall operation of traffic over the Birkenhead Bridge. The Contractor shall report to the TMC prior to work being undertaken and maintain constant communication.

1.7 The Contractor shall ensure as a minimum that both prior to and when working on the Bridge that the Traffic Management Centre and the Superintendent are advised of the Contractor's work.

1.8 A Bridge Operator will attend site as required to open the bridge.

1.9 Whenever the Contractor and Bridge Operator are both onsite the Contractor shall report to the Bridge Operator prior to work being undertaken. This is to ensure that induction to site can be performed, and to receive communication devices such as handheld radio(s). Constant communications with the Bridge Operator is required when working on the Bridge to ensure that suitable notification, is given prior to the Bridge being raised.

1.10 The Bridge must be locked out from operation whenever maintenance staff may be endangered by its operation.

2 Contractors Nominated Representative

2.1 The Contractor shall nominate a Site Representative for Routine inspections and maintenance who shall have the authority to make decisions on behalf of the Contractor. The Contractor shall nominate an Emergency Response Representative to respond to emergency and fault breakdowns, who shall

be competent to make recommendations to the Superintendent to return the Bridge to a safe operational condition.

2.2 The Contractor shall advise the Superintendent of any changes to the Contractor's nominated Site Representatives and Emergency Response Representatives.

3 Drawings / Systems Operation and Maintenance Manuals

3.1 The following are provided in the Appendices for this Part M12A:

a) Birkenhead Bridge drawings (Appendix 5 – Birkenhead Bridge Constriction and Electrical Schematic Drawings); and

b) Electrical / Electronic systems and maintenance manuals (Volumes 1 – 5) (Appendix 4 – Birkenhead Bridge Operation and Maintenance Instruction Manuals Volumes 1-5).

3.2 The accuracy and completeness of the drawings is not guaranteed. The Contractor must maintain a current and accurate set of drawings and manuals for all Assets under the Contract and must provide to the Superintendent within 28 days a copy of any document updated as a result of the Works or discovery of an error or omission.

4 Bridge Constraints

Heritage Considerations

4.1 The Bridge is on the State Heritage Register (file no.14348) and is an important historic structure. All Works are required to provide an authentic and high level of conservation consistent with modern materials, techniques, and trade practices without compromising the cultural significance of the place.

4.2 All Works shall be planned and executed in accordance with the principles and logic of the Australia ICOMOS Burra Charter. In particular the following principles shall be adhered to:

a) Understanding of the significance of the place, and how this is embodied in its fabric and setting;

b) Understanding of the significance of the place by a methodical process of collecting and analysing information before making decisions; and

c) the Works shall be based on a respect for the existing fabric, and carry it out with the least possible physical intervention without distorting the evidence provided by the fabric.

4.3 A conservation management plan has been prepared and is available on request (an extract is included in Appendix 3 – Extracts from Heritage Conservation Management Plan).

4.4 Where replacement materials are specified or required, they shall be selected specifically to match as closely as reasonable those that they are intended to replace, and shall be the best of their type. Where identical matching is not possible, the Contractor shall submit to the Superintendent proposal(s) for consideration and approval.

4.5 Notwithstanding that elements may not comply with current requirements, no attempt shall be made to rectify original design and/or construction faults without the prior approval of the Superintendent.

Adelaide Dolphin Sanctuary

4.6 The Bridge is located above the Adelaide Dolphin Sanctuary, which is protected by the Adelaide Dolphin Sanctuary Act 2005. The Act states that "A person must take all reasonable measures to prevent or minimise any harm to the Sanctuary through his or her actions or activities" and "the extent to which an act or activity may have a cumulative effect on the Sanctuary" (Refer Part 5 of the Act). The Contractor shall ensure that all activities undertaken do not breach the Adelaide Dolphin Sanctuary Act 2005.

5 Risk Analysis and Hazards

5.1 The Contractor shall conduct and document a site specific risk and safe work analysis prior to any work taking place. Where required, equipment lock-out procedures shall be documented including the removal of lock-outs left in place by others. The initial analysis should cover inspections and routine maintenance (minor repairs).

5.2 The Contractor must negotiate suitable times for maintenance and locking-out of the bridge with the TMC. Lock-outs must be scheduled to minimise impact on road and marine users and must be approved by the TMC. The Contractor is not entitled to additional payments resulting from maintenance scheduling.

6 Inspection Requirements

Programmed Inspections and Maintenance

6.1 The programmed inspections and maintenance schedule is as detailed in Appendix 1 – Birkenhead Bridge Inspection Schedule. The Contractor shall plan, conduct, and coordinate all inspection and maintenance activities listed in the schedule.

6.2 The Contractor shall submit a schedule of inspections to the Superintendent during the Mobilisation Period. The Contractor shall update the schedule when new systems are installed and commissioned or if the required timing of tasks change.

6.3 The Superintendent reserves the right to be present for inspections. The Contractor must provide a minimum of 48 hours' notice to the Superintendent for any change to scheduled inspection dates or planned maintenance works.

6.4 Inspections must be undertaken in accordance with all relevant Australian Standards and Austroads Guidelines.

Four Monthly Mechanical Inspections

6.5 Commencing in the first month of the Maintenance Period, the Contractor shall carry out inspections on a 4-monthly basis to check mechanical components for wear and / or damage, correct operational settings of equipment, then carry out work and repair requirements as authorised by the Superintendent.

6.6 The Bridge shall be raised and lowered at least once per inspection to ensure all elements of the operation are functioning correctly.

6.7 The Works shall include checking, adjusting, lubricating, minor maintenance works as necessary, and reporting, including but not limited to the following:

a) the main rack and pinion gear G1 for damage, wear, and signs of adequate lubrication;

b) the gear trains G2 to G11 for damage, wear, and signs of adequate lubrication, including the removal of covers for the examination of the gears;

c) the drive motor mounting and frame condition;

d) the main trunnion and machine frames for cracking and mounting soundness;

e) the wear to all trunnion washers and bearings;

f) the main engine room-bridge bearing, landing pads - remove check for damage and / or wear and clean out any debris and / or dirt;

g) the main bearing train for wear and soundness of lubrication penetration. This will include the removal of covers for the examination of the bearings;

h) the shafting and couplings for any wear or damage;

i) the main brake group operations with due regard to brake shoe lining wear and torque settings;

j) the centre-lock mechanism and linkages for adjustment, adequate lubrication, and fitness to operate with particular attention to inspection and reporting on the condition of the shims;

k) the air compressor operation, settings, reservoir condition, and drain. Change compressor oil 12 monthly;

l) the operation of the main and auxiliary drain pumps and all equipment for the counterweight rooms;

m) walkway, platforms, stairways, and landings for soundness of structure, non-slip of treads, and general condition; and

n) report detailing fault logs and trend analysis, including an executive summary and recommendation for work required to ensure continued safe operation of the bridge.

6.8 Identification of the components/items listed in above can be located within the supplied drawings (Refer Appendix 5 – Birkenhead Bridge Constriction and Electrical Schematic Drawings).

Four Monthly Electrical / Electronic Inspections

6.9 Commencing in the first month of the Maintenance Period, the Contractor shall carry out inspections on a 4-monthly basis to check electrical / electronic components for wear and / or damage, correct operational settings of equipment, and carry out work and repair requirements as authorised by the Superintendent.

6.10 The Bridge shall be raised and lowered at least once to ensure all elements of the operation are functioning correctly and within tolerances.

6.11 The Works shall include checking, adjusting, minor maintenance work as necessary and reporting, including but not limited to the following:

a) 4 × sets of 37 kW motors;

b) 4 × sets of Main Brakes;

c) 4 × sets of Emergency brakes;

d) control PC including video screen, touch screen, mouse, and keyboard;

e) backup of software programs configurations and settings (e.g. SCADA). Backup copies shall be stored on a secure server and be available for retrieval as may be required;

f) each control station to ensure that the operation of the bridge in both automatic and manual is correct and safe;

g) all spotlights, navigation lights, horn, and anemometer operation;

h) check the contents of the main switchboards for any wear or damage;

i) Allen Bradley drives and secondary resistance banks;

j) electric motor encoders and the veracity of their settings;

k) all span closed and latch limit switches;

l) all bridge opening limit switches;

m) operation of the main counterweight pit pumps (auxiliary pumps);

n) ablution tank pump operation;

o) internal and span lighting and general power outlet points;

p) all video camera operation and screen condition;

q) monitor cathodic protection readings to determine current is flowing including recording of Potential measurements;

r) check all operation of flashing warning lights, bells, and boom gates. Replace components to ensure all lights are operating as required. Ensure cables are sound and do not snag as gates operate. Adjust raised and lowered positions as may be required. Check operation and condition of all limit switches. Lubricate all bearings and gear components. Check bells and strikers for signs of wear and repair as necessary; and

s) report detailing fault logs, trend analysis, including an executive summary and recommendation for work required to ensure continued safe operation of the bridge. Including:

i) details of any replaced components, including type, date, location, and the source and manufacturer of the component; and

ii) details of component suppliers.

Annual Electrical / Electronic Inspections

6.12 The Contractor shall provide an annual inspection to check electrical / electronic components for, wear and / or damage, correct operational settings of equipment, and carry out work and repair requirements as authorised by the Superintendent.

6.13 The Bridge shall be raised and lowered at least once to ensure all elements of the operation are functioning correctly.

6.14 This Work shall include all scope of the 4-monthly mechanical and electrical inspections in Clauses 6.5-6.11 (“Four Monthly Mechanical Inspections” and “Four Monthly Electrical / Electronic Inspections”), in addition to, but not limited to, the following:

a) 4 × 37kW drive motors, check bearings, insulation resistance test, and resistance test of windings;

b) thermographic analysis of all switch boards, drives control boards, and cable connections including the power mains from the consumer’s side of the SAPN service;

c) check operation of power supply changeover contactors;

d) switchboards – clean and vacuum, tighten all terminals, clean off rust, and repaint to match;

e) control cubicles – check all relays and terminations for wear, clean off rust, and repaint to match;

f) cable marshalling boxes – tighten all terminations, clean and vacuum, clean off rust, and repaint to match;

g) Cathodic Protection checks including:

i) calibration of in built meter;

ii) surge protection filters, cooling fan operation, inlet filters on PSU doors, tightness of terminations; and

iii) measure currents from each connection and potential from reference electrodes at junction box; and

h) reports for the above detailing fault log, conditions approaching tolerances, trending analysis, thermographic images, and including an executive summary and recommendation for work required to ensure continued safe operation of the bridge.

7 Emergency Breakdown Services

7.1 In the event of the Contractor being notified and requested to attend site to rectify emergency breakdown the Contractor shall ensure that the Superintendent and the TMC are advised of the event.

7.2 This will allow for notifications to be given to other stakeholders of the structure and enable the on call program to be cancelled during the period of any emergency repair works.

7.3 The Contractor shall provide a highly responsive and complete 24 hour, 7 days a week, mechanical, and electrical / electronic emergency break-down repair service for the bascule span operations. Response times are critical and following notification the Contractor must respond within the times given in Appendix 2 – Birkenhead Bridge Fault Response Times.

8 Reporting Requirements

Programmed Inspection Reports

8.1 The Contractor shall submit a report to the Superintendent within 14 days of completing each scheduled inspection.

8.2 The reports shall include the following:

a) summary of any visible signs of damage, loss, corrosion, and excessive wear to the items / components listed to be inspected / maintained;

b) listing of Works completed and required repairs, including recommendations and methodologies to retain operational service of the bridge, for all associated items / components inspected;

c) estimates for any required repairs or maintenance, including the timeframe to repair and any materials, components, and labour to return listed items back to operational service;

d) the risk profile and criticality of any Asset that requires maintenance; and

e) Inspection and Test Sheets recording the inspections, test results, lubrication, adjustments, and any repairs undertaken for each of the items / components listed to be inspected / maintained.

8.3 The Superintendent has no obligation to award any additional works from inspections undertaken by the Contractor. Any additional Works may be instructed through a Work Order.

Programmed Maintenance Reports

8.4 The Contractor shall submit a report to the Superintendent within 14 days of completing any maintenance works. The reports shall be inclusive of the following:

a) summary of any works undertaken to repair / replace items / components / equipment that required servicing / replacement, including dates and times spent making them good;

b) any findings or conclusions associated with failure of items / components / equipment required to be serviced or replaced;

c) any operations and maintenance manuals relevant to replaced items / components / equipment; and

d) any certifications required in accordance with statutory and regulatory requirements.

Emergency Breakdown Reports

8.5 The Contractor shall submit a report to the Superintendent within 14 days of completing emergency repair work undertaken to make the bridge operational. The reports shall be inclusive of the following:

a) summary of any works undertaken to repair / replace items / components / equipment that required servicing / replacement, including dates and times spent making them good;

b) any findings or conclusions associated with failure of items / components / equipment required to be serviced or replaced;

c) any operations and maintenance manuals relevant to replaced items / components / equipment; and

d) any certifications required in accordance with statutory and regulatory requirements.

9 Bridge Operation Constraints

9.1 The Contractor is advised of the following constraints:

a) public navigating the Port River can request to have an opening of the Bridge in accordance with a Departmental on call program. All requests are managed through the Traffic Management Centre and the Bridge is opened within 2 hours of receiving such a request;

b) opening times can be found at: https://www.sa.gov.au/topics/boating-and-marine/boat-operators-licences-and-permits/opening-the-port-river-bridges;

c) except in emergencies, activities that restrict traffic (including Bridge opening for test purposes) must occur outside the hours 07:00 to 09:00 am and 4:00 to 6:00 pm.

d) except in emergencies, the Contractor may request approval to close the Bridge to vehicle and / or pedestrian traffic. At least two months prior to the proposed closure, written approval must be obtained from the Superintendent. The Principal reserves the right to reject any request for any closure.

10 Equipment Rendered Idle

10.1 Equipment rendered isolated/inoperative during inspections or maintenance, must be locked off and safety information warning tagged, with information clearly printed stating the following:

a) detailed reason for the isolation;

b) the full name of person responsible for rendering the isolation;

c) the name of the company the person represents;

d) the date of the isolation; and

e) the date of estimated return to service.

10.2 The Contractor shall have a documented procedure for isolating/locking off of equipment and for the removal of the isolation.

10.3 The Bridge Operator(s) and the Superintendent must be notified immediately and in writing of any such isolation and the possible effect it may have on the operation of the Bridge and their safety.

11 Appendix 1 – Birkenhead Bridge Inspection Schedule

11.1 Refer separate file.

12 Appendix 2 – Birkenhead Bridge Fault Response Times

Device Failure	Response Times
Bascule Span	
Condition	
Bascule span is closed, traffic flow is not impeded due to breakdown and no vessel is waiting for the span to open	48 hours
Bascule span is closed, traffic flow is not impeded due to breakdown but a vessel is waiting for the span to open or a span opening to allow a vessel to pass underneath has been booked and is due within 24 hours.	90 minutes
Bascule span cannot be fully or safely closed.	Target 30 minutes Maximum 90 minutes
Boom Gate and Warning Signal	
Condition	
Boom gate and or warning signal not operating correctly, bascule span is closed, traffic flow is not impeded due to breakdown and no vessel is waiting for the span to open	48 hours
Boom gate and or warning signal not operating correctly, bascule span is closed, traffic flow is not impeded due to breakdown but a vessel is waiting for the span to open or a span opening to allow a vessel to pass underneath has been booked and is due within 24 hours.	90 minutes
Boom gate and or warning signal not operating correctly, Bascule span cannot be fully or safely closed.	Target 30 minutes Maximum 90 minutes

13 Appendix 3 – Extracts from Heritage Conservation Management Plan

EXTRACT FROM HERITAGE CONSERVATION MANAGEMENT PLAN (PAGE 15 & 16)

3.2 Delineation of Significant Fabric and Components

The following elements of the bridge are considered significant:

a) The overall form and design of bridge
b) Structural components including steel girders
c) Concrete piers and control towers, counterweight chambers
d) Balustrading and original light standard components
e) Exterior of concrete control tower
f) Concrete piers
g) Timber piles
h) Bascule mechanism

3.3 Elements of Bridge Not considered significant

The following elements are not essential to the cultural significance of the bridge and may need upgrading and changing according to the functional requirements of the bridge:

a) Bridge decking
b) Electrical motors for opening bridge
c) Later non-original tops to lights
d) Later changes to Control Tower (such as air-conditioning units)
e) Decking to Pedestrian paths
f) Pedestrian refuges
g) Electric/electronic control systems for the bascule span
h) Forward bearing landing pads
i) General machinery (e.g. compressor horn, sirens, etc., shafts and gearing)
j) Deck joints

CONSTRAINTS AND REQUIREMENTS

1.1 Constraints Arising from Statements of Significance

The Birkenhead Bridge is significant due to its engineering design, opening configurations, design elements and overall structure. It is recommended that works undertaken on the bridge to its structure should be in the nature of conservation of the original fabric and original design. No new work should be undertaken which detracts from its aesthetic value, its cultural significant or its engineering significance.

1.2 Constraints Arising from External Statutory Requirements

1.2.1 Heritage Registration

The Birkenhead Bridge is included on the State Heritage Register and the Register of the National Estate and therefore any works undertaken to the Bridge require the approval of the Minister for Environment and Heritage through Heritage South Australia.

14 Appendix 4 – Birkenhead Bridge Operation and Maintenance Instruction Manuals Volumes 1-5

14.1 Refer separate files.

15 Appendix 5 – Birkenhead Bridge Constriction and Electrical Schematic Drawings

15.1 Refer separate files.