**PART M80**

**MAINTENANCE & TENSIONING OF WIRE ROPE SAFETY BARRIER SYSTEMS**

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**1. GENERAL**

This Part specifies the requirements for the maintenance and tensioning of Tensioned Wire Rope Road Safety Barrier (**“WRSB”**) Systems.

WRSB systems shall comply with the following (in order of precedence):

(1) contract specific drawings;

(2) AS 3845 "Road Safety Barrier Systems"; and

(3) the Manufacturer’s Instructions.

Delineators shall comply with Part R80 "Supply of Guide Posts and Delineators" and Part R81 “Installation of Guideposts and Delineators”.

**2. QUALITY REQUIREMENTS**

At a minimum, the Contractor’s Quality Plan shall include the following documents, procedures and instructions:

1. a copy of the manufacturer’s instructions and any other procedures for the maintenance of the Wire Rope Safety Barrier; and
2. a copy of the current Calibration Certificate for the tensioning device.

If not provided beforehand, the documentation shall be submitted at least 14 days prior to the commencement of installation.

Provision of the documentation listed in this Clause shall constitute a **hold point**.

**3. REPLACEMENT OF WIRE ROPE SAFETY BARRIER SYSTEM COMPONENTS**

The Contractor shall replace damaged components of the WRSB system. The components used must be compatible with the existing system

**4. MAINTENANCE OF WIRE ROPE SAFETY BARRIER**

**4.1 General**

The WRSB System shall be maintained in accordance with Appendix 1: Guidelines for the Maintenance of Wire Rope Safety Barrier.

**4.2 Post Footings and Anchor Blocks**

The Contractor shall clear post footing, anchor block footings and surrounding sealed area of dirt and debris.

Damaged post footings shall be replaced. The Contractor shall remove the damaged footing and reinstate the disturbed hole with compacted rubble prior to drilling a fresh hole. Excavated material shall be removed off site or, where approved, incorporated in to the Works elsewhere.

**4.3 Posts**

Damaged posts shall be replaced. Driven sleeve posts shall not be used.

**4.4** **Wire Ropes**

Ropes shall be inspected for corrosion and damage. Any deterioration shall be noted in the verification report.

**4.4.1 Tensioning**

The current Calibration Certificate for the tensioning device shall not be dated 12 months earlier than the Date of Verification of Tension.

Verification of the tension shall be undertaken only when the ambient temperature is between 0oC and 30oC.

Where required, all ropes shall be re-tensioned appropriate to the WRSB system and ambient temperature in accordance with Appendix 2: “WRSB Temperature – Tension Table”.

**4.4.2 Initial Tensioning**

The tension in each rope shall be verified within six months of the date of installation for new WRSB and within 6 (or 12) months of the date of the first tensioning for old WRSB.

Following the initial verification of the rope tension hot dip galvanized swaged ends and tension fittings shall be fully wrapped with Denso tape.

The Contractor shall provide:

1. certification that the requirements of this Clause have been complied with; and
2. a record of measurement in accordance with Clause 4.4.4 Records

**4.4.3 Compliance Schedule**

Compliance shall be in relation to the tension appropriate to the ambient temperature in Appendix 2

|  |  |
| --- | --- |
| **Tolerance of Tension Requirements** | **Next Verification** |
| Rope tension greater than 120% | Re tension and verify again in 6 months |
| Rope tension greater than 100% and less than 120% | No further verification until the next scheduled verification |
| Rope tension equal to or greater than 85% but less than 100% | Re tension and verify again in 2 years |
| Rope tension less than 85% | Re tension and verify again in 6 months |

**4.4.4 Records**

The Contractor shall provide a ‘Tension Report’ recording the results of verification including details of the following:

1. location; (Road number, Start and End maintenance marker, side of road);
2. date of inspection;
3. degree of corrosion / damage (eg mild, medium, severe);
4. date and time of tensioning;
5. ambient temperature;
6. Initial measurement obtained for each rope;
7. adjusted tension of each rope; and
8. the next scheduled verification.

**4.5 Engagement at Anchors and Turn Buckles**

At completion of verification of the tension, ropes shall be engaged:

|  |  |
| --- | --- |
| **Location** | **Measure of engagement** |
| Anchor point with threaded Swage  Anchor point using mechanical fittings | ≥ 10mm past the last nut.  ≥ 100mm past the fitting. |
| Turn buckle | 30mm ±10 mm |

The Contractor shall ensure all hot dip galvanized swaged ends and tension fittings are fully wrapped with Denso tape.

**4.6 Safety Check Ropes**

At completion of verification of the rope tension, safety check ropes shall be placed in accordance with the manufacturer’s drawings.

**4.7 Post Colour and Delineation**

Posts colour and delineators shall comply with the following:

|  |  |
| --- | --- |
| **Situations other than narrow medians less than 2.8m** | **Narrow medians less than 2.8m** |
| Post shall be green except for every fourth post, which shall be white. | All posts to be white. |
| For posts spaced between 2 and 2.5 m, every white post shall be affixed with a delineator. | For posts spaced between 2 and 2.5 m, every fourth post shall be affixed with a delineator. |
| For other post spacings, delineators shall be affixed at 8 to 10.5 m intervals. | For other post spacings, delineators shall be affixed at 8 to 10.5 m intervals. |

**5. HOLD POINTS**

The following is a summary of Hold Points vide Part 140 "Quality System Requirements", referenced in this Part:

|  |  |  |
| --- | --- | --- |
| **CLAUSE REF.** | **HOLD POINT** | **RESPONSE TIME** |
| 2 | Submission of Quality Documentation | 7 days |
| 3 | Certification of the barrier system | 7 days |
| 4.4 | Calibration certificate for the tensioning device. | 1 day |

**6. VERIFICATION REQUIREMENTS AND RECORDS**

The Contractor shall supply the following records:

| **CLAUSE REF.** | **SUBJECT** | **RECORD TO BE PROVIDED** |
| --- | --- | --- |
| 4.4 | Tensioning | Certificate of Compliance with tensioning requirements and details of installation. |
| 4.4.4 | Verification | Tension Report |

**APPENDIX 1**

**MAINTENANCE OF WIRE ROPE SAFETY BARRIER (WRSB)**

**SCOPE**

These guidelines set out the general requirements for the maintenance of DPTI WRSB installations. Guidance is also provided on procedure for tensioning ropes.

1. **INSPECTIONS**

Safety or Drive by inspections to be undertaken (as a minimum) monthly in accordance with the schedule of inspections. At a minimum, detailed inspections are to be undertaken at the following intervals from the time of installation:

1. 10 years after installation;
2. 15 years after installation and every 2 years thereafter; and
3. immediately following an accident.

Details shall be recorded on Appendix 3: “Detailed Inspection Checklist”.

1. **TENSIONING**

Verification of the tension of all ropes shall be undertaken at each detailed inspection.

The ropes shall have the tension verified in accordance to the tension appropriate to the ambient temperature detailed in Appendix 2: “Steel wire Rope Barrier Temperature Tension Table”.

Where the tension of ropes at a site does not comply, additional verification in accordance with the times set out in Table 1 “Compliance Schedule” shall be undertaken.

The next verification shall take place in accordance with the following table:

|  |  |
| --- | --- |
| **Tolerance** | **Next Verification** |
| Rope tension greater than 120% | Re tension and verify again in 6 months |
| Rope tension greater than 100% and less than 120% | No further verification until the next scheduled verification |
| Rope tension equal to or greater than 85% but less than 100% | Re tension and verify again in 2 years |
| Rope tension less than 85% | Re tension and verify again in 6 months |

In the event of vehicle impact damage, the tension shall be checked immediately following reinstatement of the WRSB and the verification regime shall be initiated as for a new installation.

1. **RECORDS**

Detailed records shall be maintained after the following:

1. Safety or drive by Inspections
2. Asset Inspections
3. Detailed inspections
4. After a vehicle accident (include accident, report number, photos work order and costs)

Data collected in the completion report, asset inspection and tension report shall be provided in Microsoft Excel or Access files.

1. **MAINTENANCE OF COMPONENTS**

WRSB components shall conform with the following:

**Ropes**

Ropes shall not be in contact with the ground. Check for frayed or broken strands. Clean minor surface corrosion and treat with appropriate paint. Where steel pitting or flaking is present report to the region for expert advice. Record location of deterioration on Tension Report

Assembled Correctly:

Rope configuration is different in the two barrier systems and ropes should be correctly aligned for safe operation of the system.

Engagement:

Steel anchor to wire rope connection using a threaded swage maintain a minimum of 30mm threaded rod visible past the last nut. Steel anchor to wire rope connections using mechanical fitting (Brifen) maintain a minimum 100 mm of wire rope past the fitting.

Check ropes:

Replace damaged check ropes

Fully extend check ropes along the tensioned rope and clip in place.

Secure to the anchor frame.

Ensure check rope clear of debris and not fouled by other ropes.

**Post**s

Brifen Posts

Use a ‘Z’ section post on the verge and ‘S’ section post on the median. The radiused smooth edge is presented to the flow of traffic. The first two posts of each end use steel lugs to support the interwoven ropes, the remainder are fitted with plastic bobbins. The post height is 680 mm above ground level

Flex Fence

Use a ‘Σ’ sigma shape post. The post height is 780mm above ground level. Check posts for corrosion at ground level and clear posts of accumulated debris. Ensure excluder post washers are functional, replace missing washers/covers. Replace missing post end caps, bobbins and plastic spreaders. Replace bent posts where deflection is ≥ 30mm from the vertical.

Post colour

Narrow medians less than 2.8m all posts shall be white;

All other locations posts shall be green except for posts affixed with delineator.

Delineator posts shall be white.

The green is G61 to AS 2700

The white is N14 to AS 2700.

**Footings**

Replace damaged post footings.

Ensure area around the footings is free draining.

Clear debris from anchor points

**Delineation**

WRSB end caps do not have the dimensions to support sheet delineators to the size specified in AS 1742.

Space delineators on narrow medians shall be at 10 m ±2 m.

All other locations space delineators in accordance with AS 1742 part 12.

**Tension verification**

Rope tensioning shall be undertaken in accordance with manufacturer’s instructions.

**5. RECORDS**

Records shall be provided in accordance with the following.

|  |  |
| --- | --- |
| **DATA** | **WHEN** |
| New asset | Contract completion / Asset Cap |
| Asset inspection reports | Annually by Maintenance area |
| Tension reports | Contract completion / tension verification |
| Accident damage | Accident Report |

**New Asset (completion report)**

1. location; (Road number, Start and End maintenance marker, side of road)
2. manufacturer;
3. date of installation;
4. ambient temperature;
5. initial tension; and
6. next scheduled verification

**Asset Inspection Report**

1. location; (Road number, Start and End maintenance marker, side of road)
2. date of inspection; and
3. evidence of corrosion/damage.

**Tension Report**

1. location;
2. date;
3. ambient temperature when tensioned;
4. initial measurement obtained for each rope; and
5. adjusted tension of each rope

**APPENDIX 2**

**Temp**

**Required**

**Tension**

**Required**

**Reading**

**Required**

**Tension**

**Required**

**Reading**

**Required**

**Tension**

**Required**

**Reading**

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**0.0**

**31.5**

**6.32**

**22.6**

**5.15**

**32.0**

**6.40**

**1.0**

**31.0**

**6.27**

**22.3**

**5.11**

**32.0**

**6.40**

**2.0**

**30.5**

**6.22**

**22.0**

**5.07**

**32.0**

**6.40**

**2.5**

**30.2**

**6.20**

**21.9**

**5.05**

**32.0**

**6.40**

**3.0**

**29.9**

**6.15**

**21.8**

**5.02**

**31.7**

**6.36**

**4.0**

**29.4**

**6.05**

**21.6**

**4.96**

**31.1**

**6.28**

**5.0**

**28.8**

**5.95**

**21.4**

**4.90**

**30.5**

**6.20**

**6.0**

**28.3**

**5.87**

**21.0**

**4.82**

**30.5**

**6.20**

**7.0**

**27.8**

**5.79**

**20.6**

**4.74**

**30.5**

**6.20**

**7.5**

**27.5**

**5.75**

**20.4**

**4.70**

**30.5**

**6.20**

**8.0**

**27.2**

**5.71**

**20.3**

**4.67**

**30.1**

**6.14**

**9.0**

**26.7**

**5.63**

**20.0**

**4.61**

**29.3**

**6.02**

**10.0**

**26.1**

**5.55**

**19.7**

**4.55**

**28.5**

**5.90**

**11.0**

**25.6**

**5.47**

**19.4**

**4.47**

**28.5**

**5.90**

**12.0**

**25.1**

**5.39**

**19.1**

**4.39**

**28.5**

**5.90**

**12.5**

**24.8**

**5.35**

**18.9**

**4.35**

**28.5**

**5.90**

**13.0**

**24.5**

**5.33**

**18.8**

**4.33**

**28.1**

**5.84**

**14.0**

**24.0**

**5.29**

**18.5**

**4.29**

**27.3**

**5.72**

**15.0**

**23.4**

**5.25**

**18.2**

**4.25**

**26.5**

**5.60**

**16.0**

**22.9**

**5.19**

**17.9**

**4.23**

**26.5**

**5.60**

**17.0**

**22.4**

**5.13**

**17.6**

**4.21**

**26.5**

**5.60**

**17.5**

**22.1**

**5.10**

**17.5**

**4.20**

**26.5**

**5.60**

**18.0**

**21.8**

**5.03**

**17.3**

**4.17**

**26.5**

**5.60**

**19.0**

**21.3**

**4.89**

**17.0**

**4.11**

**26.5**

**5.60**

**20.0**

**20.7**

**4.75**

**16.7**

**4.05**

**26.5**

**5.60**

**21.0**

**20.2**

**4.65**

**16.4**

**4.01**

**25.9**

**5.52**

**22.0**

**19.7**

**4.55**

**16.1**

**3.97**

**25.3**

**5.44**

**22.5**

**19.4**

**4.50**

**16.0**

**3.95**

**25.0**

**5.40**

**23.0**

**19.1**

**4.45**

**15.8**

**3.93**

**25.0**

**5.40**

**24.0**

**18.6**

**4.35**

**15.5**

**3.89**

**25.0**

**5.40**

**25.0**

**18.0**

**4.25**

**15.2**

**3.85**

**25.0**

**5.40**

**26.0**

**17.5**

**4.17**

**14.9**

**3.81**

**24.3**

**5.32**

**27.0**

**17.0**

**4.09**

**14.6**

**3.77**

**23.6**

**5.24**

**27.5**

**16.7**

**4.05**

**14.5**

**3.75**

**23.2**

**5.20**

**28.0**

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**29.0**

**15.9**

**3.93**

**14.1**

**3.63**

**23.2**

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**30.0**

**15.3**

**3.85**

**13.8**

**3.55**

**23.2**

**5.20**

**31.0**

**14.8**

**3.77**

**13.5**

**3.53**

**23.2**

**5.20**

**32.0**

**14.3**

**3.69**

**13.2**

**3.51**

**23.2**

**5.20**

**32.5**

**14.0**

**3.65**

**13.0**

**3.50**

**23.2**

**5.20**

**33.0**

**13.7**

**3.60**

**12.9**

**3.47**

**22.9**

**5.16**

**34.0**

**13.2**

**3.50**

**12.6**

**3.41**

**22.2**

**5.08**

**35.0**

**12.6**

**3.40**

**12.3**

**3.35**

**21.5**

**5.00**

**36.0**

**12.1**

**3.30**

**12.0**

**3.29**

**21.5**

**5.00**

**37.0**

**11.6**

**3.20**

**11.7**

**3.23**

**21.5**

**5.00**

**37.5**

**11.3**

**3.15**

**11.6**

**3.20**

**21.5**

**5.00**

**38.0**

**11.0**

**3.10**

**11.4**

**3.16**

**21.1**

**4.90**

**39.0**

**10.5**

**3.00**

**11.1**

**3.08**

**20.3**

**4.70**

**40.0**

**10.0**

**2.90**

**10.8**

**3.00**

**19.5**

**4.50**

**STEEL WIRE ROPE SAFETY BARRIER TEMPERATURE-TENSION TABLE**

**BRIFEN**

**Flexfence**

**Armorwire**

**APPENDIX 3**

**DETAILED INSPECTION CHECKLIST**

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