

PART M80

MAINTENANCE & TENSIONING OF WIRE ROPE SAFETY BARRIER SYSTEMS

CONTENTS

1. GENERAL
2. QUALITY REQUIREMENTS
3. REPLACEMENT OF WIRE ROPE SAFETY BARRIER SYSTEM COMPONENTS
4. MAINTENANCE OF WIRE ROPE SAFETY BARRIER
5. HOLD POINTS
6. VERIFICATION REQUIREMENTS AND RECORDS
7. ATTACHMENT M80A MAINTENANCE OF WIRE ROPE SAFETY BARRIER (WRSB)
8. ATTACHMENT M80B STEEL WRSB TEMPERATURE TENSION TABLE
9. ATTACHMENT M80C DETAILED INSPECTION CHECKLIST

1. GENERAL

- .1 This Part specifies the requirements for the maintenance and tensioning of Tensioned Wire Rope Road Safety Barrier ("WRSB") Systems.
- .2 WRSB systems shall comply with the following (in order of precedence):
 - (a) contract specific drawings;
 - (b) AS 3845 "Road Safety Barrier Systems"; and
 - (c) the Manufacturer's Instructions.
- .3 Delineators shall comply with Part R80 "Supply of Guide Posts and Delineators" and Part R81 "Installation of Guideposts and Delineators".
- .4 Documents referenced in this Part are listed below:
 - (a) Part R80 "Supply of Guide Posts and Delineators"
 - (b) Part R81 "Installation of Guideposts and Delineators"
 - (c) Part G20 "Quality System Requirements"
 - (d) AS 1742
 - (e) AS 2700
 - (f) AS 3845 "Road Safety Barrier Systems"

2. QUALITY REQUIREMENTS

- .1 At a minimum, the Contractor's Quality Plan shall include the following documents, procedures and instructions:
 - (a) a copy of the manufacturer's instructions and any other procedures for the maintenance of the Wire Rope Safety Barrier; and
 - (b) a copy of the current Calibration Certificate for the tensioning device.
- .2 If not provided beforehand, the documentation shall be submitted at least 14 days prior to the commencement of installation.
- .3 Provision of the documentation listed in this Clause shall constitute a **HOLD POINT** (refer M80.5 "Hold Points" .

3. REPLACEMENT OF WIRE ROPE SAFETY BARRIER SYSTEM COMPONENTS

- .1 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

General

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

Post Footings and Anchor Blocks

- .2 The Contractor shall clear post footing, anchor block footings and surrounding sealed area of dirt and debris.
- .3 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.

Posts

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

Wire Ropes

- .5 Ropes shall be inspected for corrosion and damage. Any deterioration shall be noted in the verification report.
 - (a) Tensioning
 - .1 The current Calibration Certificate for the tensioning device shall not be dated 12 months earlier than the Date of Verification of Tension.
 - .2 Verification of the tension shall be undertaken only when the ambient temperature is between 0°C and 30°C.
 - .3 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".
 - (b) Initial Tensioning
 - .1 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.
 - .2 Following the initial verification of the rope tension hot dip galvanized swaged ends and tension fittings shall be fully wrapped with Denso tape.
- .6 The Contractor shall provide:
 - (a) certification that the requirements of this Clause have been complied with; and
 - (b) a record of measurement in accordance with Clause 4.4.4 Records

Compliance Schedule

- .7 Compliance shall be in relation to the tension appropriate to the ambient temperature in Appendix 2 Steel WRSB Temperature Tension Table.

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

Records

- .8 The Contractor shall provide a 'Tension Report' recording the results of verification including details of the following:
 - (a) location (Road number, Start and End maintenance marker, side of road);
 - (b) date of inspection;
 - (c) degree of corrosion / damage (e.g. mild, medium, severe);
 - (d) date and time of tensioning;
 - (e) ambient temperature;
 - (f) Initial measurement obtained for each rope;

- (g) adjusted tension of each rope; and
- (h) the next scheduled verification.

Engagement at Anchors and Turn Buckles

.9 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

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

Safety Check Ropes

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

Post Colour and Delineation

.12 Posts colour and delineators shall comply with Table 4.12.1 below:

Table 4.12.1 Post Colours and Delineation

<u>Situations other than narrow medians less than 2.8m</u>	<u>Narrow medians less than 2.8m</u>
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

.1 The following is a summary of Hold Points referenced in this Part:

CLAUSE REF.	HOLD POINT	RESPONSE TIME
2.3	Submission of Quality Documentation	7 days
3	Certification of the barrier system	7 days
4.4.8	Calibration certificate for the tensioning device.	1 day

6. VERIFICATION REQUIREMENTS AND RECORDS

.1 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

7. ATTACHMENT M80A MAINTENANCE OF WIRE ROPE SAFETY BARRIER (WRSB)

SCOPE

- .1 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

- .1 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:
 - (a) 10 years after installation;
 - (b) 15 years after installation and every 2 years thereafter; and
 - (c) immediately following an accident.
- .2 Details shall be recorded on Appendix 3: "Detailed Inspection Checklist".

2. TENSIONING

- .1 Verification of the tension of all ropes shall be undertaken at each detailed inspection.
- .2 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".
- .3 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.
- .4 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

- .5 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.

3. RECORDS

- .1 Detailed records shall be maintained after the following:
 - (a) Safety or drive by Inspections
 - (b) Asset Inspections
 - (c) Detailed inspections
 - (d) After a vehicle accident (include accident, report number, photos work order and costs)
- .2 Data collected in the completion report, asset inspection and tension report shall be provided in Microsoft Excel or Access files.

4. MAINTENANCE OF COMPONENTS

- .1 WRSB components shall conform with the following:

Ropes

- .2 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

- .3 Assembled Correctly
Rope configuration is different in the two barrier systems and ropes should be correctly aligned for safe operation of the system.
- .4 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.
- .5 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.

Posts

- .6 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
- .7 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.
- .8 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

- .9 Footings
Replace damaged post footings.
Ensure area around the footings is free draining.
Clear debris from anchor points

Delineation

- .10 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

- .11 Rope tensioning shall be undertaken in accordance with manufacturer's instructions.

5. RECORDS

- .1 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

- .2 New Asset (completion report)
location (Road number, Start and End maintenance marker, side of road);
manufacturer;
date of installation;
ambient temperature;
initial tension; and
next scheduled verification
- .3 Asset Inspection Report
location (Road number, Start and End maintenance marker, side of road);
date of inspection; and
evidence of corrosion/damage.
- .4 Tension Report
location;
date;
ambient temperature when tensioned;
initial measurement obtained for each rope; and
adjusted tension of each rope

8. ATTACHMENT M80B STEEL WRSB TEMPERATURE TENSION TABLE

STEEL WIRE ROPE SAFETY BARRIER TEMPERATURE-TENSION TABLE

Temp (°C)	BRIFEN		Flexfence		Armorwire	
	Required Tension (kN)	Required Reading (-ve)	Required Tension (kN)	Required Reading (-ve)	Required Tension (kN)	Required Reading (-ve)
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	16.4	4.01	14.4	3.71	23.2	5.20
29.0	15.9	3.93	14.1	3.63	23.2	5.20
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

9. ATTACHMENT M80C DETAILED INSPECTION CHECKLIST

Inspection Team			
Site No.			
Road			
RRD	From		
	To		
Side			
Guardfence Length (m)			
Construction Date			
Date of Inspection			
Barrier Type (Manufacturer)			
Anchor assembly	Footing	1.1	
	Ropes engaged (min 10 mm)	1.2	
	Assembled correctly	1.3	
	Corrosion	1.5	
	Safety Check Ropes	1.6	
Posts	Footing	2.1	
	Type (Z, S or Sigma)	2.2	
	Colour	2.3	
	Paint/Galvanizing condition	2.5	
	Corrosion	2.6	
	Missing Z washers	2.7	
	Missing bobbins	2.8	
	Missing caps	2.9	
	Missing reflectors	2.10	
	Damage	2.11	
Ropes	Tension1	3.1	
	Tension2	3.2	
	Tension3	3.3	
	Tension4	3.4	
	In post slot/bobbins	3.5	
	Corrosion	3.6	
	Damage (broken wires, kinks & deformation)	3.7	
	Other	3.8	
Turnbuckles	Position between posts	4.1	
	Engaged 30mm or 10mm min	4.2	
	Damage	4.3	
	Corrosion	4.4	
Audit required		5	
Photos		6	