Inspection and Test Plan – Installation of Steel Beam Guard Fence and WRSB

Project no. CC-0374 **Project name** Pakenham Roads Upgrade **Date** **Approved by** Reuben Samuel

ITP no. 1630-P200-SYM-QAC-ITP-0031 **Revision date** **REV: 01 31/10/2024** **Plant and equipment used**

Lot no. **Location (chainages, detailed description or marked up plan)**

Attach Dockets, Certificates and QA Documents to ITP

					Verification of acceptance by					Remarks/record (eg. Test frequency reports, certificates, checklist etc)
					Symal			Superintendent		
Item no.	Activity	Ref docs	Acceptance criteria	Freq	Key	Resp	Initial/ date	Key	Sign/ date	
1.0 Pre-start activities										
1.1	**Safety** Ensure that the following items have been actioned: - SWMS if applicable - Plant Pre-start Inspection - Service locations identified - Traffic Management Plans (if req'd) - All staff inducted	SMP	SWMS/WMS submitted reviewed and accepted if required. Plant inspections completed and entered. TSA training completed. Pre-work briefings completed. Service Diagrams available and services located	Once (Pre-Start)	**H**	SE				Service map Attached. ☐
1.2	Excavation Permit	SMP	All identified underground services marked and potholed to confirm location and depth. No machine excavation within 1m of underground services.	Prior to start of works	**H**	SE				Permit No……
1.3	Material Compliance – Steel	DoT Clause 708.05 (a) 708.05 (b) 708.04	Submit to the Superintendent all test certificates related to the supply of steel for the Works at least 14 days prior to commencement of installation. All testings shall be endorsed in accordance with the NATA registration for that lab. Only safety barrier products listed in RDN 06-04 shall be used	14 days Prior to start of works	**H**	SE		**H**		Compliance/test certificates Action point & linked. ☐

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1.4	Material Compliance – W-beam Base Metal Mechanical Properties	DoT Clause 708.05 (a) 708.05 (c) (i)	Below information marked on steel W-beams, posts at both ends and all plastic components: Name of the manufacturer; batch number strength grade and base metal thickness of the steel W-Beams W-beams to meets requirements of AS/NZS 1594 Grade HA350. Mechanical Properties of Base Metal: • Min. Yield Strength: 350MPa • Min. Elongation in 80 mm: 16% • Min. Tensile Strength: 430MPa The base metal shall comply with the following tolerances when measured in accordance with the methods of AS/NZS 1365 • Base metal thickness 2.7 mm +0.21 mm or -0.10 mm • Mill camber tolerance on 2500 mm length 10 mm max • Mill tolerance on strip width +2.5 mm, -0.0	Prior to start of works	**H**	SE				Compliance/test certificates ☐
1.5	Material Compliance – Steel Posts and Blocks	DoT Clause 708.05 (c) (ii)	Manufactured from steel which meets AS/NZS 1594 Grade HA250 Base material thickness shall be 6.0 mm +/-0.27 mm.	Prior to start of works	**H**	SE				Compliance/test certificates ☐
1.6	Material Compliance – Terminal Sections	DoT Clause 708.05 (c) (iii)	Manufactured from steel which meets AS/NZS 1594 Grade HA350	Prior to start of works	**H**	SE				Compliance/test certificates ☐
1.7	Material Compliance – WRSB	DoT Clause 711.05	Submit to the Superintendent for review not less than 14 days prior to the proposed use of materials and components, a signed statement including relevant test reports demonstrating the compliance of the materials and components with the specification for the proprietary WRSB system and VR711	Prior to start of works	**H**	SE		**H**		Compliance/test certificates ☐

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			The installation of the WRSB shall not proceed until the signed statement and certificates of compliance have been accepted by the Superintendent.							
1.8	Protective Treatment - Galvanising	DoT Clause 708.05 (d)	• Treatment should be in accordance with AS 1627 - Parts 1 and 4 and finished by hot-dipped galvanising in accordance with AS/NZS 4680. • Hot-dipped galvanised coating on Bolts, Nuts and Washers shall comply with AS 1214. • All galvanised coatings shall be smooth, adherent, and free from stains, gross surface imperfections, markings, brand names and/or inclusions. Appearance is of prime importance and colour shall be uniform. • Where curved W-beam of less than 45 m curve radius is specified, the curving operation shall be carried out off site in a manner that will not result in damage to the galvanising.	Prior to start of works	**H**	SE				Galvanisation Compliance/test certificates ☐
1.9	Protective Treatment - repair	DoT Clause 708.05 (d)	• Repairs to a damaged galvanised coating to be done with zinc-rich inorganic Paint with a minimum of 2 coats in accordance with AS 3750.9 and one coat of aluminium paint.							Yes ☐ No ☐ N/A ☐ Photo Evidence
1.10	Material Compliance – Breakaway Cable Terminal	DoT Clause 708.05 (f)	The wire rope shall comply with the requirements of AS3569 and the details shown on Drawings. Wire ropes used in proprietary devices must comply with the manufacturer's recommendations.	Prior to start of works	**H**	SE				Compliance test certificates ☐
1.11	Material Inspection, Handling and Storage	DoT Clause 708.06 708.11 708.13	• Items are loaded, transported, unloaded, stacked, and handled in such a way to protect items from distortion and that galvanised surfaces are protected from damage.	Prior to start of works &	R I	SE				Incoming Material Checklist

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					Symal			Superintendent		
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		IFC Drawings	• All materials stored to prevent damage and corrosion at least 200 mm above the ground on platforms, slabs, or other supports. • Rusted, bent, or damaged steel shall be rejected. • If stacks located behind a serviceable road safety barrier system, the clear space must allow for dynamic deflection and proper functioning of the end treatments. • Ensure that materials are in compliance with VicRoads specifications and IFC Drawings. • Ensure there are no hard objects within the deflection zone of the barrier.	Throughout construction process						☐
1.12	Pre-Construction Planning	DoT Clause 708.07 (a), (c) & (d)	• Plan and execute the work in a manner that prevents damage to underground and above ground facilities. Construct a guard fence to form a smooth line vertically and horizontally, when viewed along the line of the installation, free of humps, sags, or other irregularities, within tolerances. • Any component of a guard fence must not be welded, or flame cut in the field under any circumstances. Welding and flame cutting may only be conducted when shown on drawings in accordance with the manufacturer's recommendations. • End treatments and transitions commissioned at the earliest practicable time where the guard fence is being constructed on a road open to traffic. Temporary end treatments to the satisfaction of the Superintendent to be provided until the permanent treatments are complete. Removal of an existing installed safety barrier system includes: • Dismantling or demolition of safety barriers, transitions, and end treatments • Extracting all posts, anchors and other in-ground components and materials	Prior to start of works	I	SE				

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			• Removing all components and waste materials from the site • Cleaning, backfilling and mechanically compacting all excavations and holes in 150 mm layers to not less than the density of the surrounding layers. • Stacking or disposing of components and waste materials							
1.13	Associated Pavement Shoulder widening	VR 708.15 VR AGRD 06	Where required, widening of the existing shoulder on the median or outer verge applications adjacent to locations where guard fence is to be installed, shall be completed. • The edge of shoulder shall be saw-cut to provide a neat straight edge against which the additional pavement can be placed. • Pavement layers shall be stepped a minimum 150 mm horizontally to enable new widening to be keyed into the existing pavement. Has the above been completed? ☐ Yes ☐ No ☐ N/A	Prior to start post install	H	SE				
2.0 Post Installation										
2.1	Set Out	DoT Clause 708.08	Prior to installation, the required location and length of all barrier alignments are to be confirmed with the Superintendent.	Each lot & Each possession	H	SE		**H**		
2.2	Posts – Installation (Guardrail)	DoT Clause 708.08 (a) 708.08 (e) VicRoads AGRD	• Installed to a depth not less than shown on IFC drawings/manufactures • Posts orientated to the direction of traffic as shown on drawings. • Posts shall be installed by driving, provided there is no distortion or damage which may reduce their effectiveness. • If site conditions dictate that the posts cannot be driven, then the posts shall be installed in holes. The bottom of the holes shall be adequately	Each lot & Each possession	I	SE				

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			compacted to achieve the same density as the surrounding soil. • Posts in rock – 75 mm clearance from back of post to face of the hole. • Posts shall be installed such that the back of post is not less than 500 mm from hinge point. Refer to figure 1 at the back of this document for post offsets requirements.							
2.3	Posts – Installation (WRSB)	DoT Clause 711.07 (c)	• The Contractor shall install the wire rope and posts to the line, level and height as shown on the drawings, the specification, manufacturer's specification and to the tolerances specified in clause 711.08. • Posts shall be spaced in accordance with the manufacturer's specification unless otherwise required by the design requirements of VicRoads Road Design Note RDN 06-02. Posts shall be installed with their correct profile in the direction of travel. • The vertical alignment of the wire ropes shall be smooth and uniform, without sudden changes in gradient and generally consistent with the vertical alignment of the edge of the traffic lanes. The length of the post socket or overall length of the post may be adjusted in accordance with the tolerances specified by the manufacturer to achieve the specified vertical alignment. Any such adjustment shall be as per the manufacturer's specification and obtained written statement of advice, which shall be submitted by the Contractor for review by the Superintendent. • **The WRSB shall not be installed until the set out alignment of the posts has been reviewed and accepted by the Superintendent.**	Each lot & Each possession	H	SE		H		
2.4	Posts – Backfilling	DoT Clause 708.08 (a)	• Posts in rock – Except for anchorage posts, post holes backfilled with a granular material. • Other post holes backfilled with selected earth, free of rock.	Each lot &	I	SE				

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			• Backfill shall be firmly compacted not exceeding 100 mm compacted layers. • Posts in paved areas shall be backfilled 50 mm below underside of such paving and remaining depth filled with paving material.	Each possession						
2.5	Post – Foundation (Displacement Test)	DoT Clause 708.08 (a)	• Foundation displacement at ground level not to exceed 3 mm when a 1 kN. force is applied 200 mm below the top of the post in any direction. Any failing post shall be rectified and retested plus one similar post within 5 m. Rectification to be completed via re-compaction of material surrounding the post and/or removal and replacement of the post.	Each lot & Each possession	R	SE				Records
2.6	Non-Standard Post Lengths	DoT Clause 708.08 (a)	Where non-standard post lengths or other special measures are required (e.g., Shallow Concrete Foundations), details to be provided to the Superintendent. Where shallow foundations that require a concrete ground beam are proposed to be constructed, the design shall be proof engineered by a VicRoads pre-qualified consultant.	Each lot & Each possession	H	SE		H		Yes ☐ No ☐ N/A ☐
2.7	Bolted Connection In reinforced concrete beam	IFC Drawings VR 670 VR 708	Where posts are not required and guard rail is installed directly onto reinforced concrete: • Confirm bolt size and grade are as per IFC drawings. • After the barrier has been installed and all connections made, the gap between the base plate and the top of concrete footing shall be completely filled with a flowable dual shrinkage compensating proprietary cementitious grout. • HP - Railing posts shall not be grouted until the Contractor provides a Survey Certificate verifying compliance with the specified tolerances on lines and levels.	Each lot & Each possession	H	SE		H		Survey Conformance Check ☐

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			• Where Welding is required, welds shall be completed in accordance with "RAIL SPLICE DETAIL" as per 1630-P200-SYM-SBR-DRG-0461. • Where required, all damaged galvanised coatings to be repaired.							
3.0 Guard Fence and WRSB Installation										
3.1	Guard Fence/Rail - Installation	PS3060.06 (X) DoT Clause 708.05 (d) 708.08 (b) 708.08 (e)	• Guard fence shall be installed at the offsets shown on Standard Drawing SD 3502 or as directed as per the IFC drawings • Guard Fence/Rail sections lapped so that the exposed ends face away from near sided approaching traffic. • Edges of guardrail fixed in contact with post or post blocks. • All bolts fully tightened. • All bolts on the traffic side of w-beam installations shall be flush with the w-beam. • Posts attached to bridges or culverts shall be bolted to supporting members as shown on drawings. • Where radius of curvature is 45m or less, guardrail sections shall be curved to shape prior to delivery to site. • End treatments constructed in accordance with the drawings.	Each lot & Each possession	H	SE NA				Subcontractor Records
3.2	End Treatments	DoT Clause 708.08 (c)	• During installation of wire ropes in the end treatments of W-beam, ensure that no twisting of the rope occurs. • The anchorage cable shall be tightened sufficiently to remove slack. • When rope assemblies are used, the nuts at each end of the rope shall be tightened to a minimum torque of 50 Nm on the assemblies or as per the manufacturer's requirements.	Each lot & Each possession	R	SE				Subcontractor Records

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3.3	Concrete Anchor Blocks (WRSB)	DoT Clause 711.07 (b) (ii) (iii)	• Anchor blocks and post foundations shall not be constructed until the design and manufacturer's acceptance has been reviewed by the Superintendent. • Anchor block foundation and post foundation holes shall be free of loose material, debris and water prior to the placement of concrete. • Further to any installation guidelines for construction of anchor blocks for a proprietary WRSB system, the Contractor shall form anchor block holes by excavating the hole to the correct dimension, shape, level and alignment specified by the proprietary system. • Over-excavation of the anchor block excavation shall not be reformed with form work or soil, but shall be cleaned out and filled with concrete forming the concrete anchor block. • In situ concrete post foundations shall be constructed using N25 strength grade concrete or 20 MPa geopolymer binder-based concrete conforming to the requirements of clause 711.04(c). • Notwithstanding the specific proprietary WRSB system requirements, the anchor blocks shall be constructed using N32 strength grade concrete or 32 MPa geopolymer binder-based concrete conforming to the requirements of clause 711.04(c). • All anchor frames, posts, sockets and reinforcing rings shall be positioned to the line and levels as specified in the drawings and shall be secured against displacement during placing of the concrete. • No construction joints shall be provided within the anchor block. • The finished surface of all anchor blocks and footings shall be shaped such that water cannot pool on the surface. • **Anchor blocks and post foundation shall not be cast until inspected by the Superintendent.**	Each lot & Each possession	H	SE		H		Concrete dockets Pre-pour inspection Subcontractor Records

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3.4	WRSB Tolerances	DoT Clause 711.08 (a) (b) (c)	Tolerances for construction of the WRSB system shall be in accordance with the lesser of the manufacturer's specification or as follows: (a) vertical tolerance on the height of the WRSB shall be ±20 mm from the design line (b) longitudinal line tolerance for the WRSB system shall be ±20 mm in plan view (c) tolerance on post spacing shall be ±25 mm. WRSB height shall be measured from the road pavement when it is located within 1.5 m of the edge of pavement. For distances beyond 1.5 m, the WRSB height shall be measured from the ground surface at its location. •	Each lot & Each possession	I	SE				
3.5	Height of guard fence/rail	DoT Clause 708.08 (d) 708.08 (f)	• Top of Rail shall be within 25 mm of the specified level. • Rail shall be within 50 mm of the specified line. • Variations in line and level shall not occur at a rate exceeding 15 mm in any 5 m length. • Top of bolt head relative to w-beam -0 mm, +5 mm Notwithstanding the above, the line and level shall be adjusted to provide a smooth and even vertical and horizontal alignment. **Guard rail install location:** ☐ **within 0 to 1 m behind the back of kerb:** mounting height (vertical dimension from ground surface to centre of w beam) shall be measured from the lip of kerb.	Each lot & Each possession	H	SE				As-built survey and tabulations verifying compliance (Survey Conformance Report) ☐

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			☐ **within 1.5 m from edge of carriageway without kerb:** mounting height (vertical dimension from ground surface to centre of w beam) shall be measured from the lip of kerb. ☐ **Distances beyond 1.5m** the mounting height shall be measured from the nominal ground surface at the guard fence location.							
3.6	Motorcyclist Safety	DoT Clause 708.09 IFC Drawing	Where specified, steel rub rail or other proprietary under-run systems, as listed in RDN 06-04 to be at attached to Guard Fence on nominated sections of barrier as shown on the drawings only. A 50 mm gap shall be provided between the rub rail and the ground to allow for passage of water.	Each lot & Each possession	R I	SE				
3.7	Installation of Delineators	DoT Clause 708.11	• Delineators to be as per VicRoads Supplement to AS 1742.2 Clause 4.2.5.4(b). • Contractor to supply and fasten flexible plastic mounting brackets fitted with 100 cm2 of Class 1A retro-reflective material, as defined in AS/NZS 1906.2. • Red delineators on the left side of one-way and two-way roadways. • White delineators on the right side of two-way roadways; and • Yellow delineators on the right side of one-way roadways • Delineators not required where Guard Fence offset is greater than 4 m from the traffic lane. White guideposts with delineators shall be installed in accordance with VicRoads Supplement to AS 1742.2 Clause 4.2.4 – Guideposts.	Each lot & Each possession	R I	SE				Subcontractor Records
3.8	Concrete maintenance strips	DoT Clause 708.12	Concrete used for guard fence maintenance strips shall comply with AS1379 and VR 703.	Each lot						

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			Concrete maintenance strips beneath all steel beam guard fence railing shall meet the following requirements: • 300 mm clear of the rear of the post and 300 mm clear from the face of w-beam • Bedding to be 75mm thick of class 3 crushed rock • Concrete shall be 75mm thick and 20MPa Strength. • Edges of infill boarded up prior to pour. • Edge board shall be parallel with steel beam guard rail fencing. • Surface finished with a wooden float to produce a lightly textured finish. • Shall be constructed with a minimum 2% cross fall away from the road and shall be flush with the adjacent ground level so the finished level does not impede road runoff. Where maintenance strip is adjacent to kerb or pavement, cork expansion joint or approved alternative shall be placed in between kerb / pavement and infill area. Where crushed rock is used, provide Incoming material testing requirements for Class 3 material. Where concrete is to be used, testing of concrete shall be conducted as per 703.11. Frequency of testing: • 1 test per lot; or • 1 test for every 50m3 of concrete.	R & I Each possession	SE				Material Delivery Dockets – Concrete ☐ Crushed Rock ☐ Subcontractor Records Concrete test results (if required) ☐ Class 3 Crushed Rock Material Certification (if required) ☐

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3.9	Expansion Joints perpendicular to the line of Guard Fence	DoT Clause 708.12 SD 3503 1120-SYM-RFI-0074	Full depth expansion joints (cork or approved equivalent) shall be provided, perpendicular to the line of the steel beam guard fence, 200mm each side of every post. alternatively, the following 2 options could also be considered: (i) a 75% depth (56mm) saw cut (200mm each side of every post) for the full width of the maintenance strip; (ii) a leave-out area around the post filled with 75mm thick low strength concrete mix (less than 0.85mpa) Additional option approved as per 1120-SYM-RFI-0074: - Similar to the method used for Kerb, a guillotine cut between 40-70% to be completed during concreting works - Following this a tooled edging to a depth of 20mm to produce a neat groove not less than 5mm wide on the exposed surface as seen on kerb profiles	Each lot & Each possession	R I	SE				
3.10	Delineators	DoT Clause 708.11	• Delineators to be as per VicRoads Supplement to AS 1742.2 Clause 4.2.5.4(b). • Contractor to supply and fasten flexible plastic mounting brackets fitted with 100 cm2 of Class 1A retro-reflective material, as defined in AS/NZS 1906.2.	Prior to start of works	R	SE				Delineators Compliance test certificates ☐

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3.11	WRSB Tensioning	VR711.07 (e)	Each wire rope shall be tensioned in accordance with the relationship between rope tension and ambient temperature, applicable to the proprietary WRSB system as per the manufacturer's specification. A tensioning report for shall be submitted to the Superintendent for review within seven days of the tensioning works being carried out.	Each Lot	R	SE		**R**		Tensioning report/subcontractor documentation
3.12	WRSB Tensioning and Testing	VR711.07 (f)	**Side load testing of posts shall be undertaken at locations nominated by the Superintendent prior to the installation of the wire rope.** • Side load testing of posts shall be carried out by applying a force of 10 kN (approximately 1 tonne) to the post 600 mm above ground level at an angle of 45 degrees to the WRSB. The top of the footing shall not move more than 3 mm. If the footing withstands the force with a movement of less than 3 mm at ground level then the footing shall be considered acceptable.	Each Lot	R	SE		**H**		
4.0 Completion of Steel Beam Guard Fence										

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					Symal			Superintendent		
Item no.	Activity	Ref docs	Acceptance criteria	Freq	Key	Resp	Initial/ date	Key	Sign/ date	
4.1	Guard Fence Tolerances	DoT Clause 708.08 (d)	The guard fence shall be installed at the positions so confirmed and shall be constructed true to line and level and to the following tolerances: i. Variation from true plan position of posts ±20 mm ii. Variation of line of w-beams from specified vertical profile ± 10 mm. iii. Variation of w-beams from specified horizontal alignment ± 20 mm. iv. Variation of posts from vertical (measured at top of the post) ± 15 mm. v. Orientation of block and/or post to w-beam +0 mm, -15 mm measured at the point of greatest offset between the block or post to the w-beam) vi. Dimension of holes -0 mm, +50 mm Top of bolt head relative to w-beam -0 mm, +5 mm.	Each lot & Each possession	R I	SE				Survey Conformance Report ☐
4.2	Safety Barrier Compliance Audit	Table PS3090.021 VR 708.10 VR 711.09	After Completion, arrange for a safety barrier compliance audit on all proprietary guard fence, end treatments and WRSB constructed under the Contract. The audit shall be undertaken, and a report prepared by the Australian Licensed Supplier of the safety barrier system. In addition, complete and submit to the Superintendent, compliance certificates for review. The CoC need to be signed by both Symal representative and the Supplier.	Each lot & Each possession	H	SE		**H**		Compliance Audit and Certificate of Compliance ☐
4.3	Reinstated Works	DoT Clause 708.17 708.18 708.19 708.20	• All existing signs and markings, median crossings and existing vegetation removed due to Guard Fence installation shall be reinstated. • Any damage to existing vegetation shall be rectified immediately to the satisfaction of the Superintendent. • Reinstatement inspection not applicable for areas where guard rail is installed prior to landscaping works being completed – landscaping to be	Each lot & Each possession	**H**	SE		**H**		

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			completed in accordance with the IFC Drawings and inspection to be covered in landscaping ITP.							
5.0 Work Lot Close Out										
5.1	Test Reports	VIC Roads Specifications	All Test reports received and Reviewed	Each lot	R	SE				NATA Endorsed Test Reports ☐
5.2	Product Non-Conformance	QMP	All Product Non-Conformance(s) recorded and closed (if applicable)	Each lot	R	SE				NCR reports
5.3	Quality Representative to check the above criteria and records to confirm	CQMP Lot Records	All above criteria met, and records identified attached.	Each lot	R	SE				Completed Checklist (if applicable) and reports and other compliance records attached.

Works complete (signer SS) _____ **Date works complete** _____

Lot conforms (signer PE) _____ **Date lot closed** _____ **NCR/s no. raised** _____ **Date NCR closed for this lot** _____

Responsibility (Resp.) Key: **PM**-Project Manager, **PE**-Project Engineer, **SE**- Site Engineer, **CS**-Civil Superintendent, **SS**-Site Supervisor, **SV**-Surveyor, **CR**-Client Representative

S – Superintendent

Inspection Key: W – Witness, **H –** Hold Point, **S –** Surveillance, **R –** Review Point, **I –** Inspection Point

Figure 1 - *Table V6.8.1a: Offset from the traffic lanes (m)* from *VicRoads ARGD06*

Design Domain		Rural high-speed [1]	Rural low-speed	Urban freeways	Urban roads
NDD	**Desirable**	4.0 – 6.0 m	3.0 – 6.0 m	4.0 – 6.0 m	2.5 – 6.0 m
	Minimum	3.0 – 4.0 m	2.5 m	3.0 m	1.0 – 3.0 m
EDD		1.0 – 3.0 m	-	-	0.0 – 1.0 m [3]
DE		0.6 – 1.0 m	0.6 – 2.5 m	0.6 – 3.0 m	-

Notes:

1. Operating speed greater than or equal to 80km/h
2. Barrier offsets are measured to the closest part of the barrier. E.g. the face of W-beam or Thrie-beam, or the face of WRSB post.
3. On urban roads, a barrier offset assessment must be undertaken in accordance with Table V6.8.1b for all offsets less than 1.0m. If the assessment results in a 'Yes' for all questions, offsets between 0 – 1m are considered NDD. If the assessment results in a 'No' for any question, offsets between 0 – 1m are considered EDD, and the assessment must be provided to DTP.
4. NDD = Normal Design Domain, EDD = Extended Design Domain and DE = Design Exception. Further information can be found in Commentary V2 of this Supplement.