

Technical Circular T-09/09

Date: September 29, 2009

Supersedes T-15/04

To: All HQ Directors: Operations, Planning and Major Projects
All Regional Directors
All Regional Managers, Engineering
All Regional Traffic Engineers
All District Managers Transportation
All Project Managers

Subject: Cable Barrier

Purpose:

This Technical Circular replaces Technical Circular T15/04 Wire Rope Safety Fence. Since 2004, cable barrier has been included as a treatment option for road safety barrier on provincial roads. This revised Technical Circular establishes the requirement of a Professional Engineer in British Columbia to provide assurance that the cable barrier design and the completed project are in conformance with the manufacturer's specification.

Background:

A cable barrier system consists of tensioned wire ropes supported by frangible posts with, as a minimum, anchors at both ends of the system. The kinetic energy of the impacting vehicle is absorbed by the wire ropes to reduce impact acceleration to vehicle occupants.

The open design of cable barrier minimizes the visual obstruction that other barriers can present, reduces the accumulation of drifting snow along the roadway and provides better sight distance for roads with curvilinear alignment.

The average time for a normal repair after a crash is approximately 1.5 to 2 hours for a 3- person crew.

Cable barrier has been proven to effectively prevent median cross over crashes and off-road crashes. Studies from South Carolina Department of Transportation have shown that Cable Barrier can reduce highway fatalities by 30%. Reports from the Colorado Department of Transportation and Australian transportation authorities concluded that the number of fatal accidents have been significantly reduced since the installation of cable barrier.

Superseded
by T-0213

Policy:

A 4-cable barrier system may be considered as one of the treatment options for median and roadside barrier in accordance with Technical Bulletin DS09001, attached to this Technical Circular.

For median applications, the cable barrier must meet the crash test requirements of NCHRP Report 350 Test Level 4. For roadside applications, the cable barrier must meet the crash test requirements of NCHRP Report 350 Test Level 3.

Each cable barrier design is unique to its location and therefore each design must have an Engineer of Record (EOR). Upon completion of the final design, and prior to construction, the EOR shall execute and submit to the Ministry Representative an original of the "Assurance of Professional Design and Commitment for Field Reviews" form H1252, including Schedule A- Summary of Design and Field Review Assignments, specimen attached. The forms are located at:

H1252 -<http://www.th.gov.bc.ca/forms/getForm.aspx?formId=1107>
Schedule A -<http://www.th.gov.bc.ca/forms/getForm.aspx?formId=1110>

Upon completion of the construction, the EOR will execute and submit to the Ministry Representative an original of the "Assurance of Field Reviews and Compliance" form H1254, specimen attached. The form is located at <http://www.th.gov.bc.ca/forms/getForm.aspx?formId=1105>.

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Ministry of Transportation & Infrastructure
TECHNICAL BULLETIN

Subject: Cable Barrier (Median and Roadside)	
Date: September 29, 2009	Author: Joy Sengupta, P.Eng.
Bulletin Number: DS09001	Action Required: Immediate
Bulletin Type: Revised Standard	Effective Date:
Contacts	Standards Affected
Joy Sengupta, P.Eng. Senior Highway Safety Engineer Engineering Branch, Victoria Phone: 250-356-5292	Replaces previous Technical Bulletin DS04004 and supplements Technical Circular T-09/09. Insert at the back of Section 640 of the BC Supplement to TAC.

1. Background:

Cable barrier system consists of tensioned galvanised steel wire ropes and support posts with anchors at both ends of the system. The wire rope is held in place by frangible support posts with a concrete foundation. The kinetic energy of the impacting vehicle is absorbed by the wire ropes which reduces impact acceleration to vehicle occupants.

Cable barrier has been used for several years worldwide to effectively reduce off-road and median crossover crashes. It minimizes view obstruction and improves stopping sight distance on highways. The cost of installation is comparable to the cost of installing concrete median barriers or W-beam guardrails.

Crash test results have shown that the typical wire rope deflection is approximately 2.5 m for a 3.0 m typical post spacing. The deflection can be reduced by using a tighter post spacing.

Median cable barrier products must meet **NCHRP Report 350 Test Level 4** evaluation criteria. Note, the Ministry's current 810 mm high concrete median barrier meets the Test Level 4 design specification. Roadside cable barrier products must meet **NCHRP Report 350 Test Level 3**.

2. Basic Criteria:

- A 4-cable barrier system may be considered for the median and roadside under the following situations:
 1. On divided highway sections with a history of median crossover crashes.
 2. On highway sections with curvilinear alignment to improve stopping sight distance.
 3. On scenic routes to minimize view obstruction.
 4. At locations where drifting snow creates a hazard.
- Cable barrier should NOT be considered as a **Median Barrier** when:
 1. The distance behind the cable barrier available for cable deflection upon crashes is less than the minimum space specified in the vendor's design guideline.
 2. The radius of horizontal curve of a road section is lower than the minimum radius specified in the vendor's design guideline.
 3. The radius of curve of a vertical sag of a road section is lower than the minimum k-value specified in the vendor's design guideline.
- Cable barrier should NOT be used as a **Roadside Barrier** where the soil or rock condition does not provide sufficient stability to hold the concrete foundation of the supporting posts in place under vehicle impact. Consult with the vendor for details.
- Locations need to be evaluated carefully to determine if cable barrier is the appropriate barrier treatment. Contact the MoT Sr. Highway Safety Engineer if additional guidance is needed.
- As the cost of installation of end anchors is relatively high, the length of cable required needs to be evaluated carefully to determine if cable barrier is a cost-effective barrier treatment option.
- All projects that involve cable barrier should be submitted for ICBC Cost-Sharing evaluation.

3. Application Guidelines and Restrictions

- Cable barrier may be used typically as:
 1. Median Barrier
 2. Roadside Barrier
- An engineering review is required when considering using cable barrier on Highway Segments with the following physical characteristics:
 1. On highways with narrow median.
 2. On the center line of undivided highway sections.
 3. On a horizontal alignment with a small radius of curve. Typical minimum value is 200 m. Contact the vendor for more detail.
 4. On a sag vertical alignment with a small k-value.

4. Design Guidelines:

- Cable barrier products have substantial differences in design, specification and method of installation. Consult with the vendor for design details and specifications. (i.e. post spacing, clearance from road shoulders, clearance from drop-off, barrier application on steep slope, concrete foundation design, flared end treatment, transition between different types of barriers, typical length of barrier, cable tensioning, etc.)
- The height of the cables (measured from ground level beneath the line of the cable barrier) is critical to the containment properties of a barrier system. Consult with the vendor for design details (i.e. cable height tolerance, etc.) and specifications.
- Experience from other jurisdictions indicates that heavy accumulation of snow behind the cable barrier may bend the frangible supporting posts when it settles. An engineering review is required when considering using cable barrier in areas with heavy snow accumulation.
- Cable barrier should NOT be connected directly to any other safety barrier or bridge parapet. However, the cable barrier can be interfaced with certain other types of barrier when installed in accordance with the details specified by the vendors.
- The concrete post foundation shall be of sufficient size to ensure that it is not displaced when the post is knocked down under vehicle impact. Consult with the vendor for design details.

- A sleeve should be used in the socket of a concrete post foundation to facilitate removal of the damaged post. Consult with the vendor for design details.
- Retro-reflective delineators should be considered for placement on the caps of the support posts. Consult with the vendor for design details.
- An engineering review is required when considering the use of cable barrier in a manner that does not conform to the specifications in the vendor's design guideline. Contact the MoT Sr. Highway Safety Engineer if additional guidance is needed.

5. Action:

Insert this Technical Bulletin in the BC Supplement to the TAC Geometric Design Guide following Section 640.