


<b>Government of Alberta</b>  Transportation	<b>PROTECTION FOR LOW CLEARANCE STRUCTURES</b>		<i>Issued: JAN 2009</i>
			<i>Revised: JUN 2009</i>
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<b>RECOMMENDED PRACTICES</b>	PART	HIGHWAY SIGNS	
	SECTION	WARNING SIGNS	
	SUB-SECTION		

## General

Grade separation structures and truss bridge structures are susceptible to collision damage from over-height loads. Despite vertical clearance postings on and in advance of the structures, many have sustained collision damage from over-height loads.

An overview of the procedure for conducting an engineering review of the applicable high load warning system is provided in this guideline.

### *The Hierarchical System*

A hierarchical system of signing and other supplementary devices has been developed to treat a range of operational conditions at low clearance structures.

The system allows for the application of three levels of protection for low clearance structures through the use of warrants. The warrants consider the risks, costs, and frequency of high impact collisions in addition to the physical characteristics of the overhead structure and approaching roadway.

The first level of protection is to be installed at all full overhead structures. This exceeds the guideline outlined in the Manual of Uniform Traffic Devices for Canada (MUTCDC), where the protection is only required on overhead structures with a vertical clearance of 4.3 meters or less.

## Standardization

Protection for low clearance structures should be implemented in a consistent manner to ensure their effectiveness and appropriate road-user response.

### **Three-Level System of Safety Measures**

If it is determined through an engineering study that a low clearance structure is at risk of a high load collision, the next step is to determine the appropriate safety measures.

The following three warrants identify the criteria for supplementary traffic control devices at problematic low clearance structures. The warrants consider three levels of traffic control devices for a different range of operational conditions.

#### *Level 1 – Warrant for Use of Low Clearance Sign and Advance Low Clearance Sign*

The warrant for the use a low clearance warning sign (WA-27) and an advance low clearance warning sign (WA-26) represents the first level of protection for overhead structures. These signs are placed at all full overhead structures regardless of the actual clearance between the road and the structure.

A recent design bulletin (#50/2007) further increases the visibility of low clearance warning signs. The bulletin indicates that fluorescent yellow diamond grade cubed (DG3) sheeting should be used. This is much more reflective than the previous standard of using high intensity yellow sheeting (ASTM Type III and IV).

The standard WA-26 and WA-27 signs consist of a black message on a yellow background.



<b>WA-26</b>	<b>750 mm x 750 mm 900 mm x 900 mm</b>	
<b>Colour</b>	Symbol and border Background	Black Yellow
<b>Sheeting</b>	Fluorescent Yellow Diamond Grade Cubed	



<b>WA-27</b>	<b>900 mm x 600 mm</b>	
<b>Colour</b>	Symbol and border Background	Black Yellow
<b>Sheeting</b>	Fluorescent Yellow Diamond Grade Cubed	

The Low clearance warning sign (WA-27) should be placed directly on the structure where it is clearly visible to oncoming traffic. The sign should be centered over all the travel lanes in the direction approaching the overhead structure (one sign per direction). On divided roads with a separate collector-distributor road running parallel to the main road, an additional WA-27 sign should be placed over the center of the travel lanes on the collector-distributor road approaching the structure in each direction.

The procedure for determining the clearance displayed on the Low Clearance warning sign is described in the Recommended Practices: Calculation of Clearance for Overhead Clearance Signs. To determine the height shown on the sign, the actual height is rounded down to the nearest tenth of a meter and a factor of safety of 0.1 meters is added.

The advance Low Clearance warning sign (WA-26) should be located a distance approximately 500 – 700 meters from the overhead structure and approximately 100 – 300 meters in advance of the escape route (typically an exit ramp). When these criteria cannot be met, engineering judgment should be used to determine the appropriate sign location.

Undivided highways should have one sign located on the right hand side of the road. Divided highways should have a low clearance warning sign located on both sides of the travel lanes.

A second Low Clearance warning sign (WA-26) may be placed in advance of the overhead structure when either of the following conditions exist:

- traffic can enter the highway after the first low clearance warning sign but prior to travelling under the low clearance structure
- one minor over-height collision over a five year period



As with the first location for advance low clearance warning signs, the sign should be placed on the right hand side of the road on undivided highways and two signs (one on the right hand side and one on the left) should be used on divided highways.

*Level 2 – Warrant for Use of Low Clearance Sign with Border*

Replacing the advance Low Clearance warning sign with an advance Low Clearance warning sign with a high visibility border (WA-26X) serves to increase driver awareness of the upcoming low clearance structure. This measure is usually introduced when drivers fail to respond appropriately to the upcoming low clearance structure.

A standard WA-26X sign consists of a black message on a yellow background with an orange and white striped border.

<b>WA-26X</b>	<b>900 mm x 900 mm</b> (outer border) <b>750 mm x 750 mm</b> (inner border)	
<b>Colour</b>	Symbol and border Background Enhanced border	Black Yellow Orange
<b>Sheeting</b>	Fluorescent Yellow Diamond Grade Cubed	

If there is more than one set of low clearance warning signs in advance of the overhead structure, and the warrant for the low clearance warning sign is met, all signs should be upgraded to this new design (advance low clearance warning sign with high visibility border).

An advance Low Clearance warning sign with a high visibility border may be installed when any of the following warrants are met:

- previous protective measures have proven ineffective in reducing collisions with overhead structures
- A history of two or more over-height collisions in a five year period
- the clearance height is lower than would normally expected for the area
- the low clearance structure is hidden due to sightline restraints in advance of the structure

*Level 3 – Warrant for High Load Warning System*

A High Load Warning System represents the highest level of protection for low clearance overhead structures. A High Load Warning System consists of a Load Too High Exit warning sign (WA-113) with externally mounted flashing amber lights, which are activated by a height sensor.

A standard WA-113 sign consists of a yellow background with a black message and border with red accents.



<b>WA-113</b>	<b>2700 mm x 1500 mm</b>	
<b>Colour</b>	Message and border Background Accents	Black Yellow Red
<b>Sheeting</b>	ASTM Type III and IV	

Placement of the Load Too High Exit warning sign should be no further than 100 m in advance of the exit lane. The sign should be located over the lane closest to the exit lane (typically the rightmost lane).

The widespread use of High Load Warning Systems could reduce their effectiveness and should therefore only be used in situations where they are required. High load warning systems should be restricted to locations that meet the following warrant.

A high load warning system may be warranted when some combination of the following conditions are met:

- previous protective measures have proven ineffective in reducing collisions with overhead structures
- A history of three or more over-height collisions in a five year period
- the overhead structure has a vertical clearance of less than 5.3 m
- structures have a history of multiple over-height collisions
- repairs may cause significant traffic delays and congestion
- the cost and frequency of over-height impact repairs are significant
- impacts may cause significant structural damage
- installation of a high load warning system will provide a long term economic benefit

**References to Standards**

<i>Recommended Practices</i>	Calculation of Clearance for Overhead Clearance Signs
<i>Best Practice Guideline</i>	High Load Warning Systems <a href="http://www.transportation.alberta.ca/2649.htm">http://www.transportation.alberta.ca/2649.htm</a>
<i>Manual of Uniform Traffic Control Devices for Canada (MUTCDC)</i>	A3.4.9 Low Clearance Signs
<i>Traffic Safety Act</i>	Commercial Vehicle Dimension and Weight Regulation
<i>Design Bulletin #50/2007</i>	Fluorescent Yellow Diamond Grade Cubed Sheeting for Warning Signs