50MAX HPMVs – Guidance Note for Assessment of Bridge Capacity

Objective

The purpose of this Guidance Note is to provide information to Road Controlling Authorities (RCAs) for the assessment of bridges for 50MAX High Productivity Motor Vehicles (50MAX HPMV).

Background

The 2010 Vehicle Dimension and Mass (VDM) Rule Amendment allows vehicle operators to apply for High Productivity Motor Vehicle (HPMV) permits for vehicles with divisible loads, provided their axle and gross masses are within specified limits.

Vehicles loaded to the “Full HPMV” limits create demands in excess of the current Class 1 loadings, and strengthening of bridges may be necessary to support these loads.

The 50MAX HPMV loading curve was developed to provide a significant gain in freight efficiency without increasing the loads on pavements. It also enables 50MAX HPMV vehicles to cross most existing bridges without the need for strengthening. An increase in vehicle loading is achieved by extending the existing Class 1 Gross Weight loading curve beyond the existing 44 tonne cap, to a maximum of 50 tonnes, as shown in the figure below. Essentially, this maintains the existing Class 1 axle loads and spacings, but increases the allowable total mass by up to 6 tonnes.

50MAX individual and axle set mass limits are identical to the Class 1 limits.

Figure 1 – Vehicle Mass vs Wheel Base Loading Curves for Full HPMV, 50MAX and Class 1 Vehicles
50MAX Load Effects on Bridges

Detailed analysis work has been undertaken to assess the effect of 50MAX HPMV loading on bridge structures. This analysis has concluded that almost all bridges will not experience increased loading demands beyond current Class 1 legal loadings, and therefore should be able to safely support 50MAX HPMV loading. The only exceptions are:

a) Older bridges with simply supported spans greater than 25m length;

b) Older bridges with both flexural continuity between spans and span lengths greater than 13m;

c) Posted bridges.

Guidance is provided below to assist in the screening of structures falling into category (a). A detailed review of structures in categories (b) and (c) is recommended to determine whether 50MAX loading can be safely supported.

Capacity Assessment of Bridges Based on Design Loading

Bridge capacity assessments should be carried out by an experienced bridge structural engineer. Detailed assessments, where required, shall be carried out in accordance with Section 7 of the NZTA Bridge Manual 3rd Edition (available on the NZTA website).

Where construction drawings for a bridge are not available, an accurate determination of load carrying capacity is likely to require significant engineering input, including site investigation, materials testing, structural analysis or proof loading.

The adequacy of a bridge with simply supported spans can be assessed initially based on the original design loading and/or date of construction. Where no other information is available, such data may provide guidance to allow a decision on the adequacy of a bridge to carry 50MAX HPMVs prior to more detailed information being obtained. To aid this process, Figure 2 provides guidance on the likely bridge span ranges than can adequately support 50MAX HPMVs.
Table 1 - Design Loading, Construction Date, and 50MAX HPMV Acceptable Span Range

<table>
<thead>
<tr>
<th>Design Loading</th>
<th>Construction Date</th>
<th>50MAX HPMV Acceptable Span Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>HN-HO-72</td>
<td>1972 – present day</td>
<td>All spans</td>
</tr>
<tr>
<td>H20-S16-T16</td>
<td>1961-1971</td>
<td>All spans</td>
</tr>
<tr>
<td>H20-S16-44</td>
<td>1944-1960</td>
<td>0 – 30m</td>
</tr>
<tr>
<td>H20-S16-41</td>
<td>1943</td>
<td>All spans</td>
</tr>
<tr>
<td>Traction Engine</td>
<td>1933-1942</td>
<td>0 – 25m *</td>
</tr>
</tbody>
</table>

*Provided bridge is unposted and is assessed as being able to safely support class 1 vehicles

**Figure 2 – Acceptable Simply Supported Span Range for 50MAX HPMV Vehicles**

Note that Figure 2 should only be used by experienced structural engineers, in conjunction with a review of the bridge condition, structural form and failure mechanisms. It should not be relied upon for a structure that contains any critical structural weaknesses that could create a non-ductile failure mechanism under live loading.