Vehicle dimensions and mass permitting manual (volume 2)

Part H:

Higher mass permitting procedures for structures management consultants

Current as at 1 February 2022

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Record of amendments in this part

Note: Amendments to the *Vehicle dimensions and mass permitting manual* can affect individual or multiple parts in a volume. Gaps in the amendment number in the table below indicate amendments in the other volume. For a complete record of all amendments to the manual, please refer to the 'Record of amendments' at the start of both volumes.

Amendment to 2nd edition	Description of main changes in this part	Effective date
Amendment 6	**Approved full HPMV routes**: For HPMV permit applications, OPermit or other structural analysis is not required for routes that are approved for full HPMV loads. With the majority of state highways now approved for full HPMV, OPermit analysis is a diminishing part of the process. See section *H1.1 General principles*. **Axle weight flexibility (AWF)**: The requirements for general access and HPMV AWF have been clarified. Outdated references to 'User Defined' AWF have been removed. See section *H2.2 Understanding axle weight flexibility (AWF).* **General access AWF**: Clarification has been added that checks of bridge decks are generally not required for general access AWF. See section *H2.4 Assessing bridge decks*. **Bridges proposed to be approved for full HPMV loads** should be independently assessed. See section *H3.1 How to conduct an independent bridge assessment*. **Increased FOCs**: The guidelines for when to use higher stress levels have been revised and clarified. If a FOC higher than 0.86 is to be allowed on a restricted bridge, the requirement for six-monthly inspection and structural data confirmation has been removed. Specific inspection programmes for critical bridges should be discussed with Waka Kotahi first. See section *H3.2 Allowing increased material stresses.*	1 February 2022

Contents

Part H: Higher mass permitting procedures for structures management consultants

Introduction

About this part

This part of the *Vehicle dimensions and mass permitting manual* (volume 2) describes the Waka Kotahi NZ Transport Agency guidelines for assessing high productivity motor vehicle (HPMV) and specialist vehicle permit applications for their impact on bridges.

Purpose

The purpose of this part is to be a 'how-to' reference for the specialist analysis of the impact on bridges of the higher mass limits available under HPMV and specialist vehicle permits. It is intended to document best practice and make the permitting processes transparent to all stakeholders.

Audience

The primary audience for this part are structures management consultants (SMCs) who work with permit issuing officers (PIOs) on assessing bridge capacities for permit applications to exceed standard mass limits.

PIOs, local road controlling authorities and transport operators may also have an interest in the technical analysis of such applications.

Scope

This part contains information and procedures for assessing higher mass HPMV and specialist vehicle permit applications. It does not cover how to assess overweight permit applications. The procedures for dealing with overweight permit applications are well established and documented elsewhere.

In this part

This part contains the following chapters:

Chapter H1: General guidelines for assessing bridges for higher mass permit applications

Overview

About this chapter

This chapter describes the general principles for assessing HPMV or specialist vehicle permit application for their impact on bridges. It includes overview diagrams of different assessment approaches.

In this chapter

This chapter contains the following sections:

H1.1 General principles

Terminology

Permits for HPMVs and specialist vehicles to exceed standard mass limits are collectively referred to in this manual as 'higher mass' permits, as opposed to 'overweight' permits for indivisible loads or overweight vehicles.

Approved full HPMV routes

For HPMV permit applications, OPermit or other structural analysis is not required for routes that are approved for full HPMV loads.

'Full HPMV' refers to the maximum mass limits that are specified in the VDAM Rule and available under a permit.

Two approaches

The guidelines described in this part involve two approaches to the assessment:

- an independent analysis of the bridge, and/or
- an analysis based on the data in OPermit.

For an illustration of the two approaches, see diagram 1 in the next section *H1.2 Overview diagrams of assessing bridges for higher mass permits.*

Modifying OPermit data

OPermit was designed for the permitting of overweight vehicles. To review an HPMV or specialist vehicle permit application, you need to modify the OPermit output data. This is because different load factors and impact factors are used for assessing HPMVs and specialist vehicles compared with overweight vehicles.

Posting assessment

HPMVs and specialist vehicles are to be treated in the same manner as normal heavy vehicles in terms of posting assessment.

No restrictions other than route

Unlike for overweight permits, Waka Kotahi does not specify travel time, speed restrictions or special bridge crossing requirements on HPMV and specialist vehicle permits.

The only restrictions that may be placed on an HPMV or specialist vehicle permit are on weight and route. This means there are only two options for bridge crossings:

- either the vehicle will have unrestricted access, or
- it will be denied access altogether.

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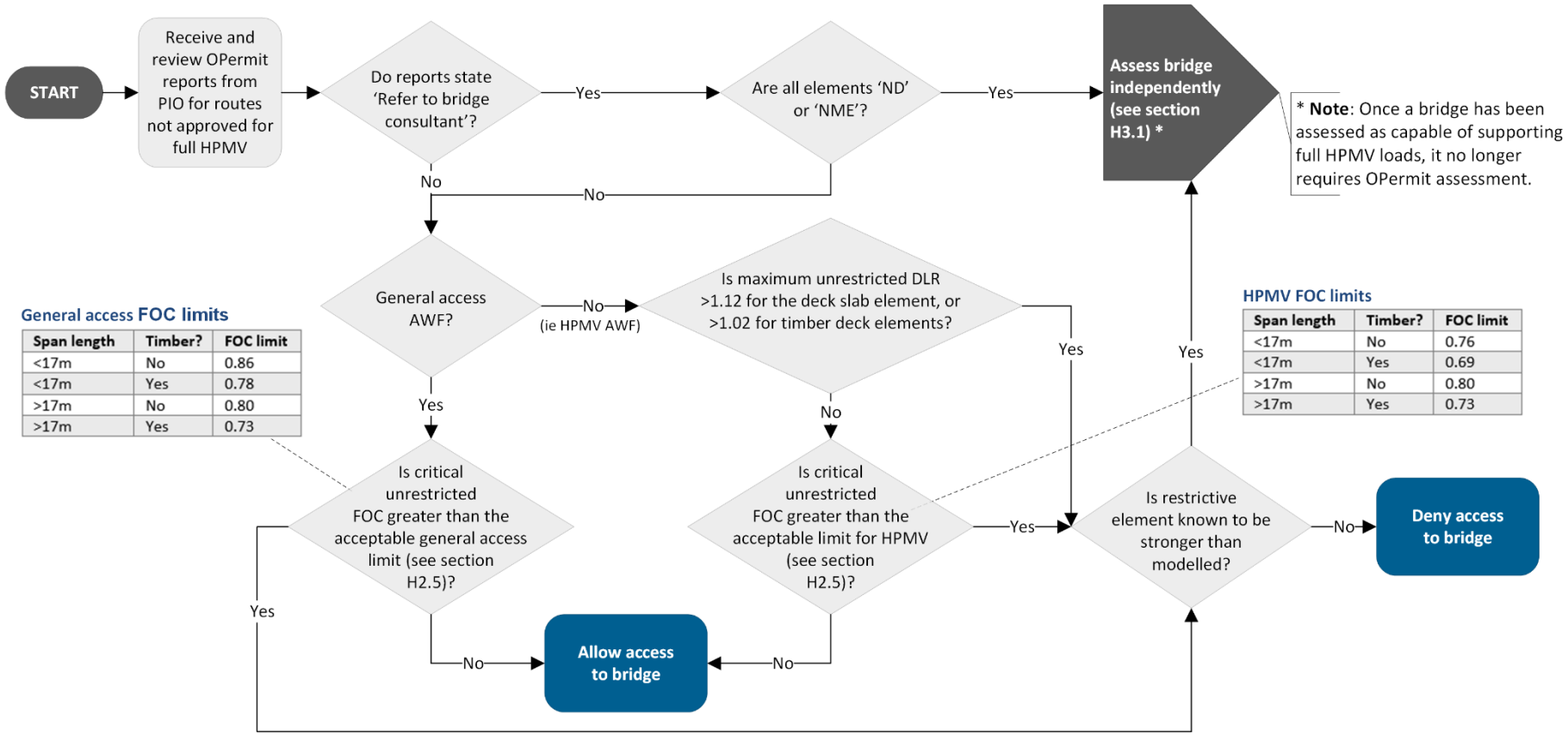
H1.1 General principles continued

Axle weight flexibility for HPMVs	As for general access vehicles, operators of HPMVs require axle weight flexibility (AWF) to allow some variation in how the vehicles are loaded. This applies particularly to logging trucks, where it is difficult to achieve accurate distribution of loads consistently. Without AWF, many operators are unable to ensure axle weight compliance. For details see section *H2.2 Understanding axle weight flexibility (AWF).* **Note**: AWF is not available for specialist vehicle permits.
Use engineering judgment and knowledge	Use your engineering judgment and your knowledge of your bridge stock at all times when assessing bridge capacity for a higher mass permit.
Clarification and help	If you find any anomalies in the output from OPermit that mean these guidelines are not applicable, or if you are unsure of any step in the process, contact the Principal Structures Engineer at Waka Kotahi for clarification in the first instance.

H1.2 Overview diagrams of assessing bridges for higher mass permits

Diagram 1: HPMV permits

This diagram summarises the steps involved in assessing an HPMV permit application. This process is only required on routes that have not been approved for full HPMV.



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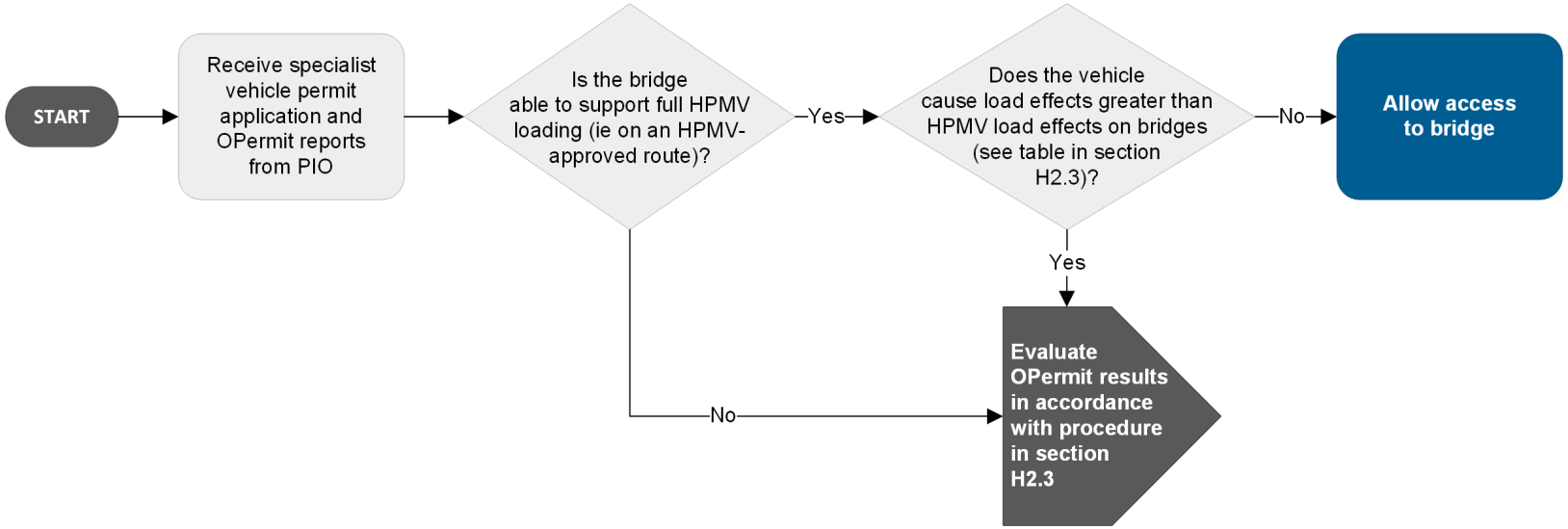
H1.2 Overview diagrams of assessing bridges for higher mass permits continued

Diagram 2: Specialist vehicle permits

This diagram gives a high-level overview of the steps involved in assessing specialist vehicle permit applications.



Chapter H2: Assessing a bridge using OPermit data

Overview

About this chapter

This chapter describes how to assess bridge capacity using OPermit data.

In this chapter

This chapter contains the following sections:

H2.1 Reviewing OPermit reports

When OPermit analysis is required

OPermit analysis is only required for routes that are not approved for full HPMV.

The HPMV permit application form explains to applicants that a permit gives them automatic access to the full HPMV network and directs them to apply only for routes that are not already approved for full HPMV.

Three types of OPermit reports

For routes that are not approved for full HPMV, permit issuing officers (PIOs) should provide you the following reports from OPermit:

- Summary Report
- Element Comparison Report, and
- Detailed Report.

These reports will be in PDF format. They are also available as Excel files.

This section describes how to use the Element Comparison Report. When to use the Detailed Report is explained in sections *H2.4 Assessing bridge decks* and *H2.5 Assessing bridge spans*.

Finding information

You can find particular bridges in the OPermit reports using the search function.

Element Comparison Report

The Element Comparison Report lists the elements of the bridge structures across a number of columns. Each bridge element is given a code.

The table below shows the codes used in the critical restriction section of the Element Comparison Report and their meanings.

Code	Meaning
-1	Unrestricted
0	50km/h own lane
1	20km/h own lane
2	Crawl own lane
3	Crawl central
4	Do not cross
ND	No data
NME	Not modelled using this element
[No code – blank]	Refer to bridge consultant

Continued on next page

H2.1 Reviewing OPermit reports continued

Bridge description

In the right-hand column of the Element Comparison Report is the critical restriction description of the bridge:

Critical Restriction:	
Code	Description
3	Crawl Central
2	Crawl Own Lane
1	20 km/h Own Lane
-1	Unrestricted
	Refer to bridge consultant

The restriction may be:

- a specific level of restriction (for example '50km/h Own Lane', 'Crawl Own Lane' or 'Do Not Cross')
- 'Unrestricted', or
- 'Refer to bridge consultant'.

The meaning of these restrictions is explained below.

Some restriction

If the description on the Element Comparison Report does not read 'Refer to bridge consultant', or 'Unrestricted', there will be some level of restriction shown.

The five levels of restriction correspond to codes 0 to 4 in the table on the previous page.

Unrestricted

If the description on the Element Comparison Report reads 'Unrestricted', the bridge will show the number -1 for all of the elements modelled.

This means that under a rating load check, the vehicle would not require a restriction on the bridge for an overweight permit. However, the vehicle may still be unable to cross the bridge safely under posting load assessment as an HPMV.

'Refer to bridge consultant'

If the description on the Element Comparison Report reads 'Refer to bridge consultant', the report will have either:

- 'ND' (no data) or 'NME' (not modelled using this element) for each of the elements, or
- the deck slab element will be restricted to 'Do not cross' (that is the deck slab column will have the number 4).

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H2.1 Reviewing OPermit reports continued

'NME' (not modelled using this element)

'NME' means the element can be ignored because it has been considered non-critical to the structure.

Procedure

Follow the steps below to review the Element Comparison Report.

Step	Action
1	Refer to the description on the Element Comparison Report and to the table below to determine your next step. **If the description is …** / **Then continue with …** 'Refer to bridge consultant' → step 2. Some other restriction → step 3. 'Unrestricted' → the procedures in sections H2.3 to H2.5.
2	Are all the elements in the Element Comparison Report 'ND' or 'NME'? • If **yes**, continue with section *H3.1 How to conduct an independent bridge* assessment. • If **no**, go to step 3. **Note**: If the bridge has ND (no data) or NME (not modelled using this element) for all of its elements, there is no structural information held on the bridge in the Bridge Data System (BDS). This means you will need to undertake an independent posting assessment of the bridge in accordance with section 7 of the Waka Kotahi *Bridge manual* (3rd edition).

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H2.1 Reviewing OPermit reports continued

Procedure (continued)

Step	Action
3	Is the only restricted element the deck slab? • If **yes**, continue with section *H2.4 Assessing bridge decks*. • If **no**, go to step 4. **Note**: If the only restricted element is the deck slab, then the following will appear in the Element Comparison Report: – a number between 0 and 4 will be in the deck slab column – either -1 (unrestricted) or NME (not modelled using this element) will be in the other columns. 'NME' means the element can be ignored because it has been considered non-critical to the structure. If the deck slab is the only restricted element, the bridge may be able to safely support the HPMV as most deck slabs are known to be stronger than modelled in OPermit. However, the other elements still need to be checked. If the deck slab is not the only restricted element on the structure, then another element on the structure is also restricted. This other element will have a Fraction of Capacity (FOC) greater than 1.0 when the vehicle is unrestricted. This, in turn, means that the element will be restricted for HPMVs.
4	Is the restrictive element likely to be stronger than modelled? • If **yes**, continue with section *H3.1 How to conduct an independent bridge assessment*. • If **no**, deny the vehicle access to the bridge. Continue with section *H3.3 Reporting back to the PIO.*

H2.2 Understanding axle weight flexibility (AWF)

For HPMV permits only

Axle weight flexibility (AWF) allows operators to manage loads that are difficult to distribute uniformly and precisely across all axles. It is only available for HPMV higher mass permits and does not apply to specialist vehicle permits.

Two types of AWF

There are two types of axle weight flexibility:

- **General access**: The applicant provides actual axle weights (which add up to the requested gross mass). Flexibility is accommodated by restricting axles, axle sets and pairs of axle sets on the permit to the general access mass limits in the VDAM Rule schedule 3, parts 1 and 2.
- **HPMV**: The applicant provides actual axle weights (which add up to the requested gross mass). Flexibility is accommodated by restricting axles, axle sets and pairs of axle sets on the permit to the HPMV mass limits in the VDAM Rule schedule 3, parts 3 and 4.

General access AWF

By limiting axle sets to general access mass limits, all transverse elements on unposted bridges (decks, transoms, etc) should safely support the HPMV even with flexibility on the axle weights.

These requirements apply to general access AWF:

- Individual axle masses and axle set masses must not exceed the general access mass limits defined in the VDAM Rule schedule 3, part 1.
- Adjacent pairs of axle sets must also be limited to general access limits, as defined in the VDAM Rule schedule 3, part 2.
- Groups of three or more axle sets are limited to the HPMV mass limits prescribed in the VDAM Rule schedule 3, part 4, and the total mass for the group must equal the sum of the individual axle weights applied for.
- The vehicle gross mass is restricted to the total mass applied for, which must equal the sum of all individual axle masses applied for.

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H2.2 Understanding axle weight flexibility (AWF) continued

HPMV AWF

These requirements apply to HPMV AWF:

- Individual axle weights must be no more than the HPMV limits defined in the VDAM Rule schedule 3, part 3, tables 3.1−3.5.
- Adjacent pairs of axle sets and groups of axle sets must be limited to the HPMV limits specified in the VDAM Rule schedule 3, part 4.
- Any group of three or more axle sets is limited to the mass applied for (that is the sum of the weights of individual axles on the application).
- The vehicle gross mass on the permit is restricted to the total mass the applicant has applied for, which must equal the sum of all individual axle masses applied for.

Impact of AWF

AWF can have a significant impact on the load effects caused by a vehicle. If the mass of axle groups of three or more axle sets is restricted to the mass applied for, the maximum increase in load effects due to axle weight flexibility may be up to 7% for longer span bridges for both general access AWF and HPMV AWF, and up to 12% for shorter span bridges for HPMV AWF.

Applicants with high loading accuracy may be better off with general access flexibility (and higher GVM) than with HPMV AWF and reduced GVM.

Simplified solution

An accurate assessment of AWF would require multiple permutations of the same vehicle being run through OPermit, with the critical results from each run being used to determine the final restrictions on the vehicle. This is both difficult and time-consuming.

The procedures in the following sections therefore provide a simpler solution that involves applying a reduction to the limiting fraction of capacity (FOC) or deck loading ratio (DLR) value to account for the increased load effects caused by AWF.

Information on critical axle groups

Further information on the axle sets that are critical for various types of vehicles can be found in section *D8.1 Critical axle groups for HPMVs* in part D of this volume.

H2.3 Specialist vehicle permitting procedures

Introduction

Applications for specialist vehicle permits should be processed in a similar way to permit applications for HPMVs. In particular, specialist vehicle applications are to be processed as a posting assessment using OPermit, with no restrictions to be imposed other than weight and route.

OPermit information will come through from the PIO in a similar format as for an HPMV permit application. The information should indicate that the permit is for a specialist vehicle.

Specialist vehicle axle mass limits and effects on structures

Specialist vehicle operators can apply for increased axle weights as set out in the VDAM Rule schedule 3, part 3, table 3.6.

The *Load effects table* on the next page shows axle masses and spacings that cause load effects that are no worse than HPMV loading across all bridge elements. Therefore, if a bridge has been independently assessed as being able to support HPMV loading, it should also be able to support specialist vehicles with the axle mass and spacings that comply with the final column in the table.

Where the axle mass of a specialist vehicle is greater than the values in the last column of the load effects table, the load effects can be greater than HPMVs. Therefore, specialist vehicles with these heavier axle masses could be declined access, even if the bridge has been assessed as suitable to support HPMVs. These vehicles require assessment through OPermit, and may require further detailed bridge analysis if deck data is considered overly conservative.

This assessment process is illustrated in diagram 2 in section *H1.2 Overview diagrams of assessing bridges for higher mass permits.*

All elements of bridges designed to HN-72 and free of any defects which may reduce load capacity have been shown to be capable of supporting the full specialist vehicle axle mass limits. Therefore, the majority of modern bridges are expected to be unrestrictive to specialist vehicles.

No axle weight flexibility

Axle weight flexibility does not apply to specialist vehicle permits.

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H2.3 Specialist vehicle permitting procedures continued

Load effects table

This table shows specialist vehicle axle masses causing load effects equivalent to HPMVs.

Type of axle set	Spacing between tandem axles (m)	HPMV axle mass limits (kg)	Specialist vehicle axle mass limits (kg)	Maximum HPMV equivalent mass (kg)
Twin-tyred axle in any axle set	–	8800	12,000	8800
Two axles in a tandem axle set comprising:				
(a) a twin-tyred axle with a single large-tyred axle and a 60/40 load share	≥1.0	13,600	16,000	13,600
	≥1.1	13,600	16,000	14,200
	≥1.2	13,600	16,000	14,700
	≥1.3	13,600	16,000	15,200
(b) a twin-tyred axle with a single large-tyred axle and a 55/45 load share	≥1.0	14,500	18,000	14,500
	≥1.1	14,500	18,000	15,000
	≥1.2	14,500	18,000	15,400
	≥1.3	14,500	18,000	15,700
Two twin-tyred axles:				
(a) spaced less than 1.3m from the first axle to the last axle	≥1.0	15,000	17,000	15,000
	≥1.1	15,000	17,000	15,300
	≥1.2	15,000	17,000	15,600
(b) spaced 1.3m or more but less than 1.8m from the first axle to the last axle	≥1.3	16,000	18,000	16,000
(c) spaced 1.8m or more from the first axle to the last axle	≥1.8	16,000	18,000	16,000

H2.3 Specialist vehicle permitting procedures continued

Procedure

Follow the steps below to assess a specialist vehicle permit application.

Step	Action
1	Is the specialist vehicle travelling on an approved full HPMV route (that is has the bridge been assessed as capable of supporting full HPMV loading, in accordance with the Waka Kotahi *Bridge manual* 3rd edition)? • If **yes**, go to step 2. • If **no,** go to step 3.
2	Do the axle weight limits fit within the 'Maximum HPMV equivalent mass' limits given in the load effects table above? • If **yes**, allow vehicle access to the bridge. • If **no**, go to step 3.
3	Undertake an assessment of the bridge deck in accordance with section *H2.4 Assessing bridge decks.* Then go to step 4.
4	Undertake an assessment of the bridge span in accordance with section *H2.5 Assessing bridge spans* and then determine if the vehicle can be allowed access to the bridge.
5	When you have completed your assessment, continue with section *H3.3 Reporting back to the PIO*.

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H2.4 Assessing bridge decks

Checks not required for general access AWF

By limiting axle sets to general access mass limits, all transverse elements on unposted bridges (decks, transoms, etc) should safely support the HPMV even with flexibility on the axle weights.

Note: The maximum increase in axle weight of an HPMV is 10% above legal general access mass limits (for example for a quad-axle set). However, for many axle combinations, this increase is less (the maximum increase on twin-tyred axles in a tandem axle set is 3–7% above general access limits, depending on axle spacing). Therefore, the majority of deck slabs with general access capacity are expected to be able to safely support HPMV loads. If the structure is in sound condition and performing suitably under general access loads, no further check of transverse elements is required.

Which report to use?

You need the Detailed Report for assessing bridge decks.

DLR limiting values

Concrete decks

The deck loading ratio (DLR) limit for concrete deck slabs is less than the overweight vehicle value of 1.3 for the following reasons:

- Only 'Unrestricted' conditions are allowed (restriction level -1)
- The load factor for overweight analysis is 1.49. The load factor for evaluation of existing structures for normal loads is 1.9. HPMVs and specialist vehicles are considered to be normal vehicles.
- The dynamic load factor (DLF) for overweight vehicles (restriction level -1) is 1.43 for concrete deck slabs (OPermit impact code of 2). The DLF for normal and HPMV vehicles is 1.3.
- Hence the limiting DLR for concrete deck slabs becomes:

  DLR limit = 1.3 x (1.49/1.9) x (1.43/1.3) = 1.12

Timber decks

The DLR limit for timber decks is further reduced for the following reasons:

- The dynamic load factor (DLF) for overweight vehicles (restriction level -1) is 1.0 for timber decks (OPermit impact code of 1). This is due to the ability of timber decks to sustain higher stresses under short duration loads, based on the 1st edition of the Waka Kotahi *Bridge manual* (1995).
- A DLF of 1.0 is also assumed for normal and HPMV vehicles, based on the same rationale as above.
- Hence the limiting DLR for timber decks becomes:

  DLR limit = 1.3 x (1.49/1.9) = 1.02

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H2.4 Assessing bridge decks continued

Procedure

Follow the steps below to assess the bridge deck using OPermit data.

Step	Action
1	Is the application for a specialist vehicle? • If **yes**, go to step 3. • If **no**, go to step 2.
2	What type of AWF has the applicant requested? • If general access AWF, go to section *H2.5 Assessing bridge spans*. • If HPMV AWF, go to step 3.
3	Calculate the unrestricted deck loading ratios (DLRs) for the deck slab element (or timber deck element) with the maximum restricted value. Unrestricted DLR = 1.1(VAI / DCF) where: – VAI = vehicle axle index, and – DCF = deck capacity factor. For details see *DLR limiting values* above.
4	Is the highest unrestricted DLR greater than 1.12 (1.02 for timber elements)? • If **yes**, deny access to the bridge. *Continue with section H3.3 Reporting back to the PIO*. • If **no**, continue with section *H2.5 Assessing bridge spans*.

H2.5 Assessing bridge spans

Which report to use?

If the description of the critical bridge restriction is 'Unrestricted', the critical unrestricted shear and moment FOCs can be taken from the Element Comparison Report.

However, if the bridge description is 'Refer to bridge consultant' or some level of restriction, the Element Comparison Report will show FOC values based on the restriction level, or may show no FOC values at all.

Whenever the description does **not** read 'Unrestricted', use the Detailed Report to find the critical unrestricted FOCs for the bridge.

HPMV limiting FOC values

FOC = 1.0 is the limiting criterion for overweight vehicles. For HPMVs the limiting value for the critical FOC limit is 0.86 and 0.78 for timber elements. These limits are further altered to account for axle weight flexibility (AWF), as outlined below.

The FOC limits are less than the overweight vehicle value of 1.0 for the following reasons:

- Only 'Unrestricted' conditions are allowed (restriction level -1)
- The load factor for overweight analysis is 1.49. The load factor for evaluation of existing structures for normal loads is 1.9. HPMVs and specialist vehicles are considered to be normal vehicles.
- The dynamic load factor (DLF) for overweight vehicles (restriction level -1) is 1.43. The DLF for normal and HPMV vehicles is 1.3.
- Hence the limiting factor becomes 1.0 x (1.49/1.9) x (1.43/1.3) = 0.86.

The FOC limit of 0.86 (and 0.78 for timber) is based on the maximum axle weights being entered into OPermit for permit assessment.

With AWF, some axle weights could increase with others decreasing, altering the load distribution of a vehicle. To account for the effects of AWF, the FOC limit is reduced.

Timber elements

Note that the above limiting FOC is 1.0 x (1.49/1.9) = 0.78 for timber members. Although OPermit uses a DLF of 1.0 for timber members, this is balanced with a reduced load duration factor of 1.0.

However, the DLR check is less sophisticated than the FOC check for timber decks, and the FOC check should be used for each of the elements. Note that the FOC limit for timber decks is not shown on the Element Comparison Report and will need to be checked using the Detailed Report. If the critical DLR is below 1.3, the FOC values may not be shown. In this case, you will need to check the DLR value.

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H2.5 Assessing bridge spans continued

Table of FOC limits

The critical FOC limits for various criteria are shown in the table below.

AWF type	Span length	Timber components	FOC limit
General access	≤ 17 metres	No	0.86
		Yes	0.78
	> 17 metres	No	0.80
		Yes	0.73
HPMV	≤ 17 metres	No	0.76
		Yes	0.69
	> 17 metres	No	0.80
		Yes	0.73
Specialist vehicle	All spans	No	0.86
		Yes	0.78

Notes:

- Although AWF increases the load effects on spans, a bridge with spans of 17 metres or less that has general access posting weight capacity should be able to support HPMVs with general access AWF. However, bridges with spans longer than 17 metres will potentially have load effects in excess of general access effects.
- For short span bridges (less than 17-metre span), the load effects for vehicles with HPMV AWF on their axle weights exceed the effects of general access vehicles by a maximum of 12%. Therefore, a bridge that can safely support legal general access vehicles (that is the bridge is not posted) should be able to safely support vehicles with HPMV AWF at a FOC limit reduced by 12%.

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H2.5 Assessing bridge spans continued

Procedure

Follow the steps below to assess the application against the FOC limits.

Step	Action
1	Identify the critical unrestricted FOC for the bridge and refer to the *Table of FOC limits* above.
2	Is the critical unrestricted FOC greater than the relevant limit in the table? • If **yes**, deny vehicle access to the bridge. • If **no**, allow vehicle access to the bridge.
3	Continue with section *H3.3 Reporting back to the PIO.*

Chapter H3: Conducting an independent assessment of a bridge

Overview

About this chapter

This chapter describes how to conduct an independent bridge assessment. It also covers how to report the bridge analysis results for a permit application back to the PIO.

In this chapter

This chapter contains the following sections:

H3.1 How to conduct an independent bridge assessment

When to assess a bridge independently

You may need to undertake an independent assessment of the bridge in addition to or instead of the OPermit analysis for a number of reasons, such as:

- the bridge is proposed to be added to an approved full HPMV route
- there is no structural data for the bridge in OPermit
- a particular element is known to be stronger than modelled in OPermit
- data in OPermit is overly conservative
- the posted speed for the bridge is below 100km/h
- the span of the bridge or the length of a continuous section is considerably longer than the vehicle (that is multiple vehicles can load a span at the same time)
- the deck slab is the only restricted bridge element, or
- the timber deck is the only restricted element (and OPermit has no FOC values for the timber deck).

Use judgment

You should use engineering judgment and the best structural information that you have when conducting an independent assessment of a bridge.

Assessment guideline

To decide whether to give the vehicle access to the bridge, do the assessment in accordance with the Posting Evaluation criteria (γ_{LL} = 1.9) in section 7 of the Waka Kotahi *Bridge manual* (3rd edition), using the best structural information available on the bridge.

Allowing increased load

Higher stress levels (that is lower load factors and higher FOCs) may be justified where only one or two bridges are restricted on an important route.

Refer to section 7 of the Waka Kotahi *Bridge manual* (3rd edition) for further information and see section *H3.2 Allowing increased material stresses* below.

Safe bridge standards

Analysis for various HPMVs has shown that all bridges designed to HN-HO-72 and the majority of bridges designed to H20-S16-T16 with spans less than 30 metres are expected to safely support HPMVs, provided the bridge elements have no known weaknesses or deterioration.

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H3.1 How to conduct an independent bridge assessment
continued

Incorrect values in OPermit

OPermit currently assesses concrete deck slabs conservatively. Most concrete deck slabs should safely support HPMVs provided the deck does not have known weaknesses.

During the national screening process, a number of elements were found that were not modelled correctly in OPermit. Similarly, there are instances of incorrect structural capacity data. These data discrepancies continue to be identified and remedied.

Updating OPermit

If you find any data in OPermit that is overly conservative or non-conservative, update it as soon as possible to reflect the true capacity of the element.

Excluded from OPermit reports

If a structure has been assessed to be adequate for HPMV loading through an independent assessment, the structure can be excluded from review of OPermit reports.

Most state highway routes in New Zealand have now been assessed as suitable for full HPMV loads. The approved full HMPV routes are published on the Waka Kotahi website at nzta.govt.nz/commercial-driving/high-productivity/full-hpmv-network-map.

Approved full HPMV routes are excluded from the PIO permitting process.

H3.2 Allowing increased material stresses

Introduction

This section provides additional information to section *H3.1 How to conduct an independent bridge assessment*.

Increased FOCs

Higher stress levels (that is lower load factors and higher FOCs) may be justified where only one or two bridges are restricted on an important route.

Note that due to the limitations of OPermit to replicate highly complex structural analyses, it is beneficial to confirm structural adequacy for HPMV loading with higher stress levels as part of the structural analysis. The structure may then be excluded from future review of OPermit reports.

Criteria for allowing increased stress

For this approach to be adopted, the following criteria should be met, as recommended in section 7 of the *Bridge manual*:

- The bridge must be one of a small number of bridges restricting vehicles on an important route.
- The deterioration factors for the bridge should be accurately assessed. This should be confirmed by undertaking an initial inspection to assess the condition of the bridge.
- Engineers should satisfy themselves that the structure has a ductile failure mode.
- The accuracy of the bridge structural data should be confirmed.
- The bridge should be inspected at no more than six-monthly intervals.
- Engineers should satisfy themselves that early replacement or strengthening is feasible.

For full details, refer to section 7.4.3 of the *Bridge manual* (3rd edition).

Discuss with Waka Kotahi

You should discuss your decision to implement a specific inspection programme for a critical bridge to justify higher stress levels with the Waka Kotahi Principal Structures Engineer.

Waka Kotahi would want to be satisfied that:

- the cost of regular inspections is justified due to high HPMV and specialist vehicle demand, and
- the bridge is in good condition and regular inspections are relatively easy to undertake.

H3.3 Reporting back to the PIO

Introduction

Once you have assessed all the bridges on the proposed route, including assessments of axle weight flexibility, you must report the results back to the PIO.

What to report

The report must be in writing. Send an email to the PIO and include, as a minimum:

- your name
- the date of your assessment
- the permit application number
- your recommendation for either granting or declining the permit, and
- any other information you feel may be relevant to the permit application.

If you recommend that the permit application be declined, also include in your report:

- a list of bridges to which access is denied, and
- if feasible, advice on the changes to the permit type (for example from HPMV AWF to general access AWF) or a reduction in axle weights that would make it probable that the application would succeed for the specified route.

Note: Permits must not be issued with axle masses **below** general access limits.