

THE EFFECT OF VSB6 ON BALL COUPLINGS

THE NATIONAL HEAVY VEHICLE REGULATOR HAS RECENTLY RELEASED A MAJOR UPDATE OF VEHICLE STANDARDS BULLETIN NO 6 - THE NATIONAL HEAVY VEHICLE MODIFICATION CODE (VSB6) THAT – AMONG MANY THINGS – HAS CHANGES THE REGULATIONS AROUND BALL COUPLINGS.

Story By Wayne Baker

The National Heavy Vehicle Regulator (NHVR) has made many significant changes as part of major update of Vehicle Standards Bulletin Number 6 (VSB6) - the National Heavy Vehicle Modification Code. One is the rated capacity of the most common coupling type in Australia, the 50mm ball coupling, which now may no longer be able to be used to tow some trailers or caravans.

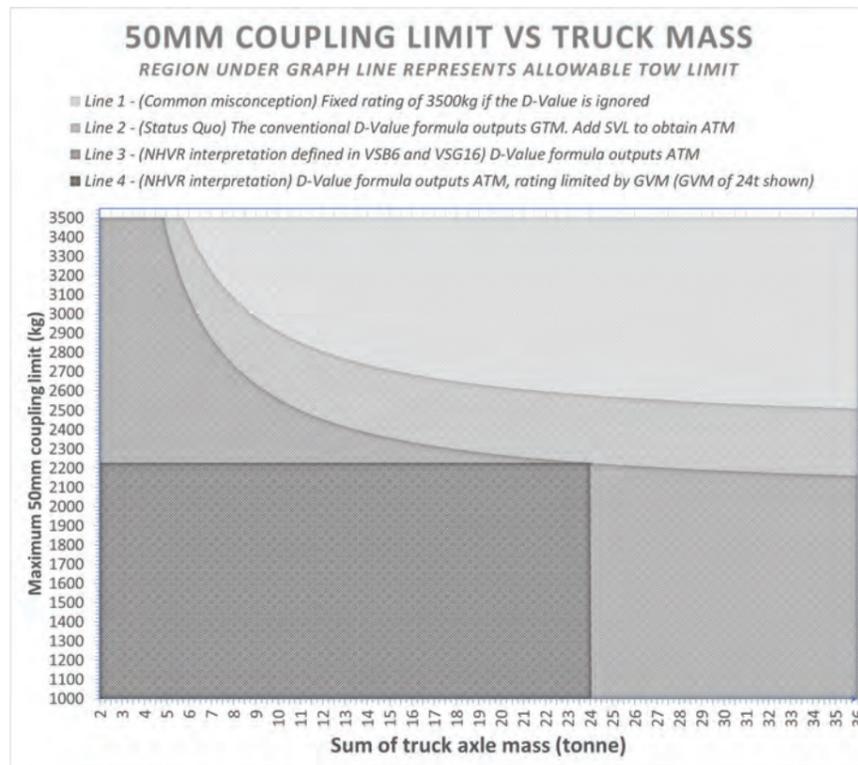
Generally, the regulation will draw a line in the sand regarding the strength, life or performance of a product, which creates a level playing field for parts suppliers, and creates consumer confidence regarding value and safety. However, where there is room for interpretation there can be multiple lines in the sand. The following paragraphs show four interpretations and plot the resultant ratings as the 'lines in the sand' that they create in the graph below.

COMMON MISCONCEPTION

A common understanding is that a 50mm ball coupling rated to 3,500kg can always tow 3,500kg, irrespective of other factors. This is not the case, as other factors can reduce the rating for a given journey, including whether the trailer has been fitted with suitable brakes for the load.

STATUS QUO

The current status quo is to use the



The graph shows how the four interpretations result in different maximum trailer weights, with 'Line 4', representing the requirements of the new VSB6, shown as calculated for a truck with a GVM of 24 tonnes.

D-value formula to account for the D-value of the coupling for a given load scenario for the truck. This applies to all couplings.

D-value reflects the ability of a coupling to handle dynamic forces in the longitudinal axis (forward – rearward direction) and is critical for couplings

as they experience dynamic forces throughout their life and this is a dominant criterion for coupling design. The D-value for a 50mm coupling can be understood to equal 20kN, by reference to the Australian Standard AS 4177.3.

Using the D-value formula described

in ECE Regulation 55 and AS 2213.1, entering tonnes for mass units and using the European naming convention, this equivalent formula returns the axle group Gross Trailer Mass (GTM):

$$D(\text{kN}) = \frac{T \cdot C}{T + C} \cdot g$$

transposes to:

$$C = \frac{D \cdot T}{((g \cdot T) - D)}$$

where

C = GTM, the total weight on the trailer axles

T = the total weight on the truck axles

g = 9.81 (gravitational constant).

For example, consider a truck with an unladen mass of 4,000kg, Gross Vehicle Mass (GVM) of 11,000kg, and Gross Combination Mass (GCM) of 16,000kg.

When empty, T=4,000kg and the truck can tow a 3,500kg trailer with the 50mm ball because it weighs less than 5,000kg.

When the truck weighs over five tonnes, calculating the ATM using the D-Value results in a diminished tow capacity.

When the truck is laden to its GVM, which includes any vertical load imposed

COMBINATION PINTLE HOOKS

Many 'combination' pintle hooks must also be de-rated. Some exist on the Australian market that incorporate a 50mm ball so the above rules apply. Operators should insist on strength and interchangeability compliance with AS4177.2 for the 50mm Ball, and separately, compliance with ADR62 for the integrated pintle hook.



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by the trailer, the D-value calculation reveals Maximum GTM = 2500kg, or maximum aggregate trailer mass (ATM) of (2500kg + 350kg) 2,850kg.

This is the same truck, but when loaded, the truck can legally tow 650kg less using the same 50mm ball than when it was empty.

THE FORMULA RETURNS ATM (NOT GTM)

The new VSB6 emphasizes the importance of using the coupling D-value when rating the capacity of the 50mm ball. This has always been the case, so the revised National Standard serves to highlight a status quo that has been poorly adhered to and rarely enforced. To assist operators to calculate the D-value limit, an equation is presented in the VSB6 that is simply a transposition of the aforementioned D-value equation.

50mm coupling limit = $(GVM * 10,000,000) / (4903 * GVM - 10,000,000)$ = maximum permitted trailer mass (MPTM).

The NHVR has determined that what it calls the '50mm coupling limit' is the ATM, as opposed to the GTM. In other words, this formula diminishes the rated maximum capacity because it includes the load that the trailer imposes on the truck. This is a maximum static vertical load limit of 350kg.

This interpretation follows from what I believe to be an error in the D-value definition that appears in the Appendices of AS 4177.1, AS4177.2 and AS4177.3 that

describe a dynamic testing option. These definitions in AS4177 are different from the definitions in common use as described in the European regulations and Australian Standard AS2213.1. In affect, VSB6 has propagated the error and the result is a reduced towing rating.

The formula described in the AS4177 appendices is never used in practice for dynamic testing because the Standard offers the static test option for 50mm Ball couplings. No rationale is offered in the standard for this exemption from a dynamic cyclic test. A 50mm ball coupling can be imported from China and sold on the Australian market with just one sample having survived just one static test, which reveals nothing about the fatigue life, material quality or component vulnerability to repeated load cycles.

RATING IS LIMITED BY TRUCK GVM

The VSB6 formula prescribes that the '50mm coupling limit' is calculated at the worst-case scenario. The formula refers to the truck when it is fully laden at GVM, but a truck on a given journey could weigh anywhere between its tare and the GVM. By selecting GVM in this equation a worst-case scenario rating results. This can typically diminish the allowable rating by around 300-500kg compared to the unladen truck. To estimate the maximum that a truck can tow under the new VSB6 interpretation, use 'Line 3' to cross-reference the GVM (the lower axis, sum of truck axle mass) against an ATM (the vertical axis, '50mm coupling limit').



ABOUT THE AUTHOR
Wayne Baker is an Executive Member of the Australian Road Transport Suppliers' Association (ARTSA), Engineering Manager at Bartlett Equipment, and a Chartered Professional Mechanical Engineer.