

Bolt Pattern Assessment Sheet

Aim: This sheet has been made to allow TCS to assess the suitability of the bolt pattern for your towbar. A guided example is shown below with a step by step explanation of the process. This is followed by a diagram and table that will need to be completed and returned to TCS.

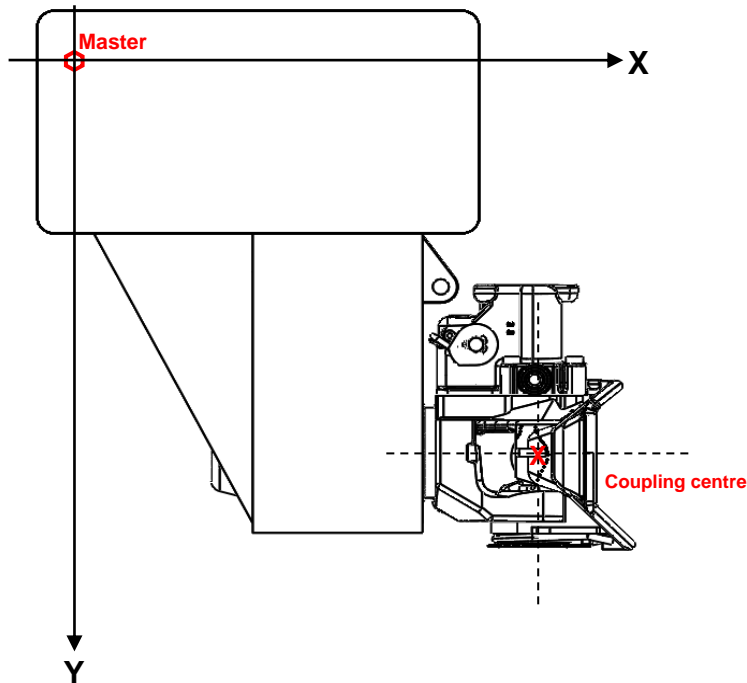
Step 1- Choose the master bolt

The master bolt will serve as a reference from which the location of the other bolts and coupling centre are measured. It does not matter which bolt is assigned the master bolt, but some locations will make the numbers easier to work with. For our example we have *conveniently* chosen the master bolt on the top left side (see figure 1 below).

Step 2 - Choose the directions of the 'X' and 'Y' axes

The chosen direction of the axes does not matter but some orientations will make the numbers easier to work with. By choosing the axes as shown in Figure 1 we avoid the use of negative numbers. Every measurement in the example is now measured positive relative to the master bolt.

Figure 1- Bolt spacing example



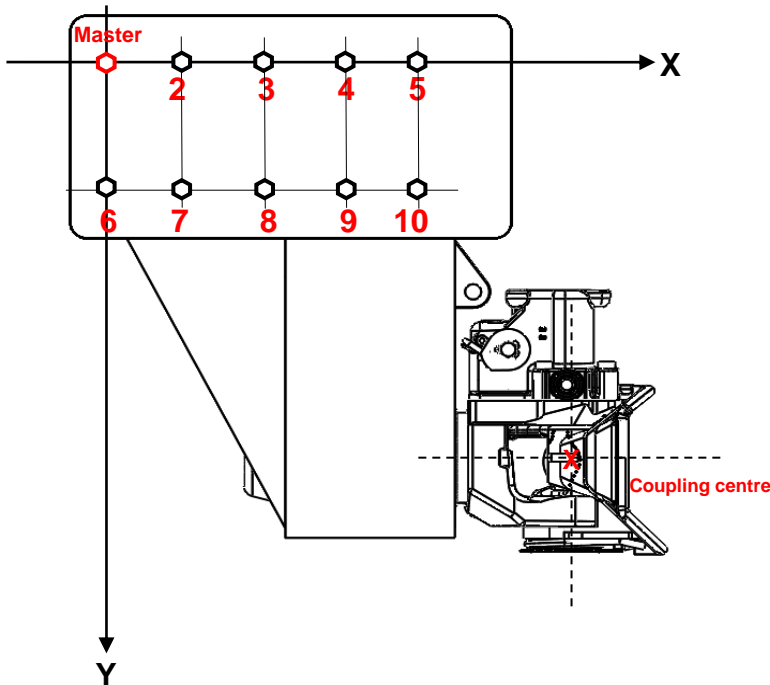
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Step 3 - Number the bolts

For identification purposes, each bolt will need to be assigned a number. Figure 2 below shows a possible assignment of numbers.

Note: the master bolt represents number 1, so we must start at 2.

Figure 2 - Numbering the bolts

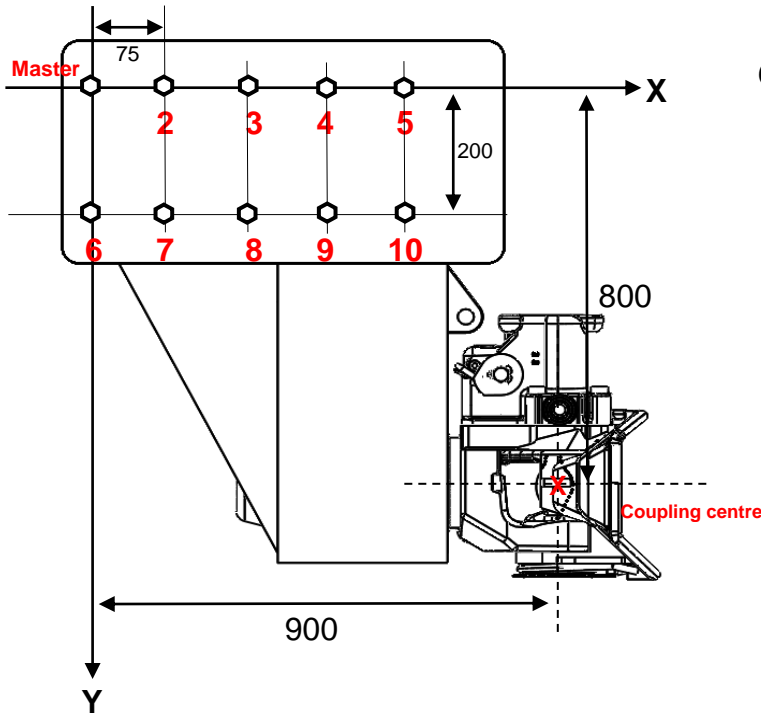


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Step 3 - Measuring dimensions

The spacing between the bolts and distance to coupling centre point must now be measured. Figure 3 shows some of the required dimensions (not all spacing has been shown due to symmetry. Values have been arbitrary chosen and are not to scale). It is important that the 'x' and 'y' coordinates are given relative to the master bolt and must also take into consideration the direction of the axes. These distances are then to be recorded similar to as shown in Table 1 below. Once the distances have been recorded, the calculations can be conducted.

Figure 3 - Measuring bolt spacing example



Centre point of other coupling types

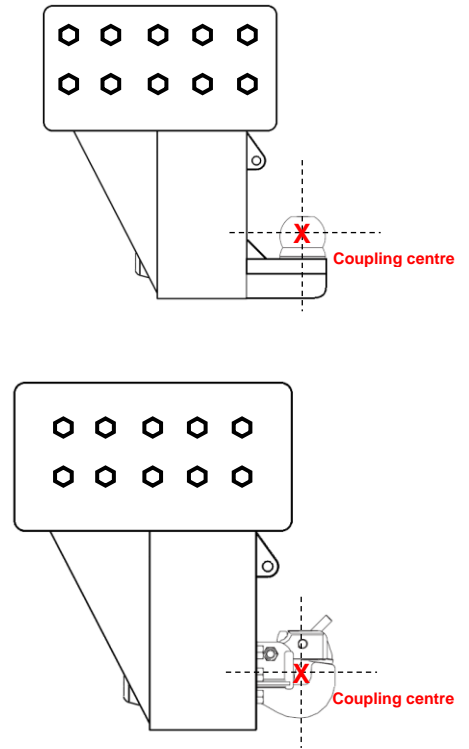


Table 1- Location of bolts and coupling.

Inputs				
Bolt #	x (mm)	y (mm)	Diameter (mm)	ISO Grade
Master	0	0	16	8.8
2	75	0	16	8.8
3	150	0	16	8.8
4	225	0	16	8.8
5	300	0	16	8.8
6	0	200	16	8.8
7	75	200	16	8.8
8	150	200	16	8.8
9	225	200	16	8.8
10	300	200	16	8.8
11				
12				
Hitch	900	800		

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Step 4 - Submitting details

Now that you are familiar of the requirements needed for the assessment of the bolts on your towbar, please specify the bolt pattern and master bolt on the blank template below and record the bolt spacing on the table on the following page. Please also specify the ISO grade and diameter of the bolts.

Disclaimer

This document has been prepared by TCS to provide guidance to vehicle modifiers when installing a tow hitch onto a vehicle and this submission alone will not guarantee the bolt pattern is suitable; TCS must reply in writing to confirm acceptability. These guidelines are supplied without prejudice and TCS will not be held liable for any problems that arise from misinterpretation of these guidelines or from the introduction of new rules after the issue date of these guidelines. The following documents take precedence over this document and should be read in conjunction with the guidelines in this document:

1. Vehicle Standard (Australian Design Rule 62/xx – Mechanical Connections Between Vehicles)
2. VSB-6 Sections H & P: National Code of Practice for Chassis Modifications and Tow Coupling Installations on heavy vehicles

All modifications must be carried out by a suitably qualified tradesperson in accordance with the relevant Australian Design Rules, Australian Standards and National Codes of Practice. Any uncertainties should be discussed with TCS prior to commencing the modification.

Refer to TCS' "Drilling Chassis Holes" guidelines for other relevant information and guidance on drilling holes into a heavy vehicle chassis.

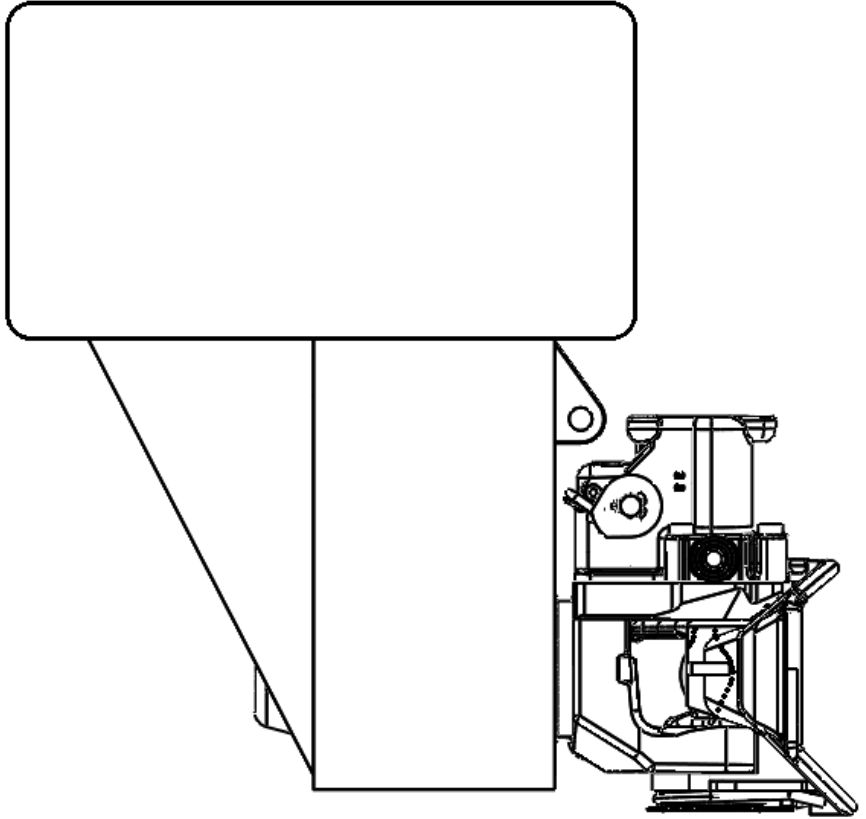
Some additional requirements for fitting a towbar to a vehicle chassis are:

- High tensile self-locking nuts must be used
- Hardened washers must be used under bolt head & nut, contact TCS for additional guidance if there are any obstructions which prevent this from occurring
- Welding side mounting plates to a sub-frame is often an acceptable practice (**whereas welding to the chassis is not, therefore do not weld side mounting plates to a chassis**). TCS can be contacted for advice to confirm if this is suitable for your particular application.

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Please fill in the table below and show bolt pattern

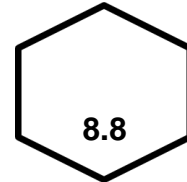
Inputs				
Bolt #	x (mm)	y (mm)	Diameter (mm)	Grade
Master				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
Hitch				



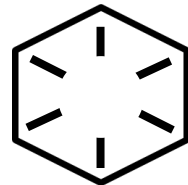
Typical bolt grades:



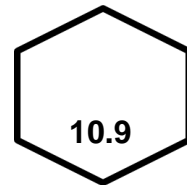
SAE Grade 5



ISO Grade 8.8



SAE Grade 8



ISO Grade 10.9

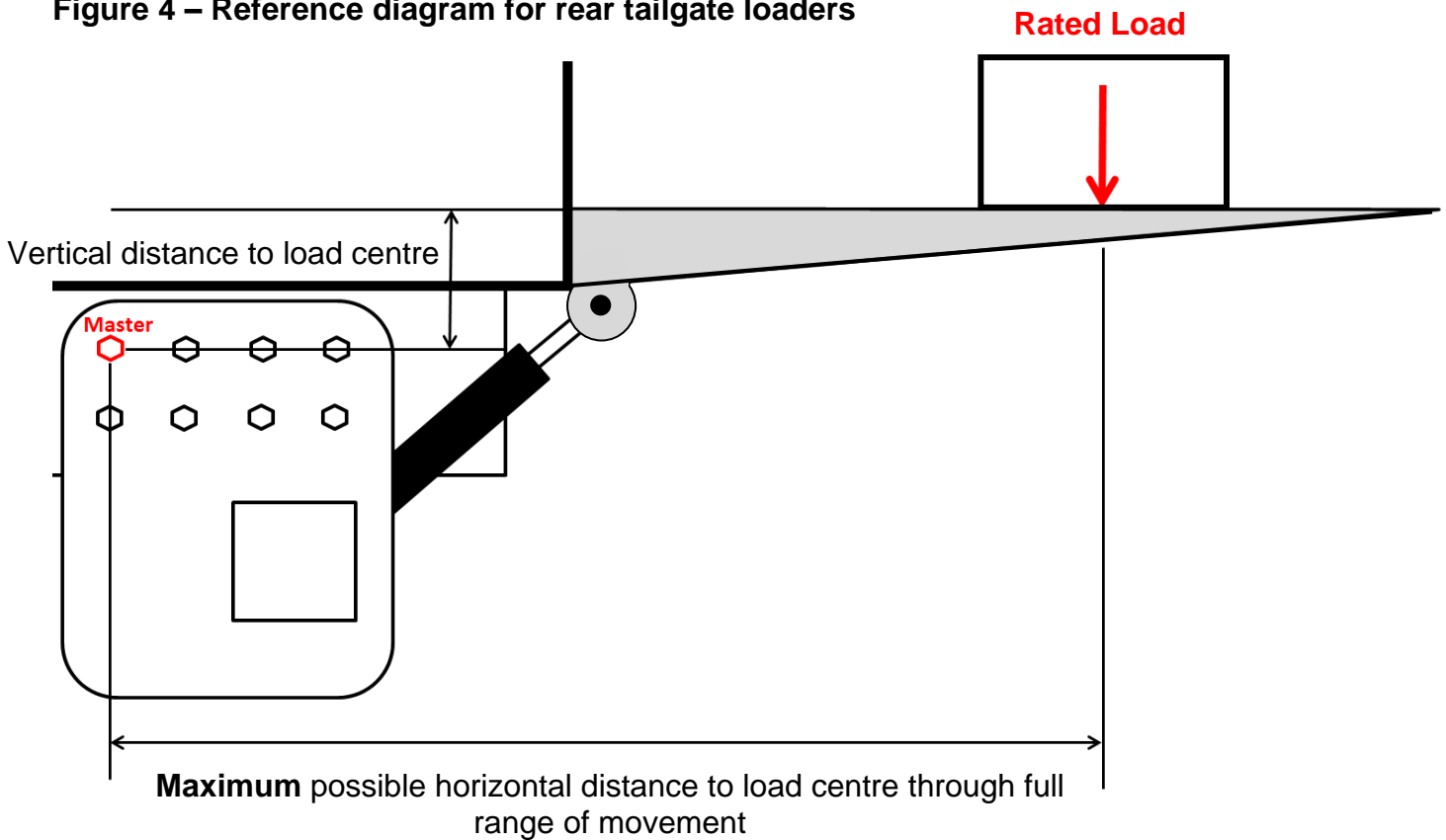
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Bolt pattern assessment for rear tailgate loaders

The bolt pattern on rear tailgate loaders can also be assessed with a similar process as done with towbars. Steps 1-3 as outlined previously would still apply but instead of specifying the coupling centre, the load centre, load rating and self weight of the tailgate loader would need to be specified (see Figure 4 below). These values are given by the manufacturer.

Note: the load centre will need to be given relative to the master bolt.

Figure 4 – Reference diagram for rear tailgate loaders



Submitting details

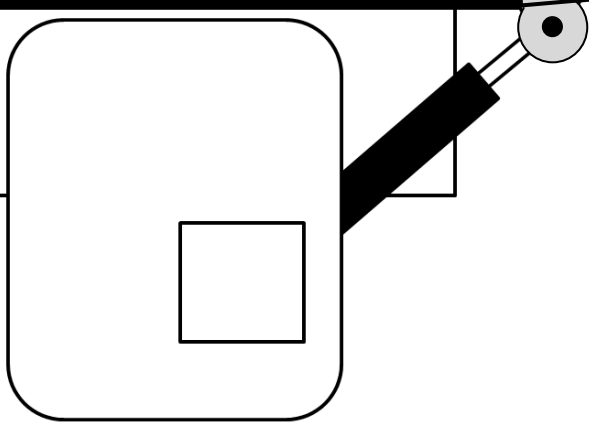
Please specify the bolt pattern and master bolt on the blank template overleaf and record the bolt spacing on the table on the following page. Please also specify the ISO grade and diameter of the bolts.

Bolt Pattern Assessment Sheet

Please fill in the table below and show bolt pattern

Inputs				
Bolt #	x (mm)	y (mm)	Diameter (mm)	Grade
Master				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

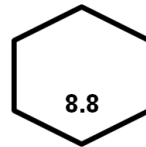
Component details	
Make	
Model	
Load Rating (kg)	
Tare/Self weight (kg)	
Master bolt to load centre (mm)	(Horizontal)
Master bolt to load centre (mm)	(Vertical)



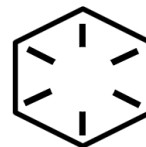
Typical bolt grades:



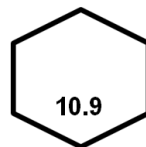
SAE Grade 5



ISO Grade 8.8



SAE Grade 8



ISO Grade 10.9