Correct Installation of OHW Weight Guide Rod Brackets

Instances of wrongly adjusted OHW tension regulator guide rod brackets are appearing throughout the network. These brackets are interfering with the vertical travel of the weights, which can cause significant problems with the regulated OHW run (which can be up to 1km long). Refer to Figure 1.

This ETN provides setup information to ensure that these brackets are positioned to clear the weight stack as it travels up & down with conductor temperature changes.

Description of Guide Rod Brackets

There are 2 main styles of guide rod support brackets installed in the OHW network:

- The Original Bracket. Fitting 601/28 series coupled with fitting 601/44 series. Refer to Figure 2. The threaded rod on this arrangement gave only limited adjustability, and has been in existence from the mid-1970’s to about 2008.

- The New Bracket. Arrangement fitting 601/72 series. Refer to Figure 3. This new bracket arrangement is shown on standard arrangement drawing EL 0450662 and is included as Figure 12 at the end of this ETN. This arrangement was developed and signed-off in 2007 to improve the adjustability so as to ensure the guide rod can be positioned in the correct location in most instances. All new tension regulators are to use this arrangement (as called up by all the current tension regulator standard arrangement drawings).

Purpose of Guide Rods

Guide Rods are installed primarily to help prevent the (otherwise unrestrained) weight stack from swinging under gusty wind conditions or from other external influences eg vandals - if the weights swing too far they could possibly strike a passing train.

Main Points

- Guide Rod Brackets must not interfere with the vertical travel of tension regulator weights.

Contact

Ken FitzGerald
8922 1583

Disclaimer

This document was prepared for use on the RailCorp Network only.

RailCorp makes no warranties, express or implied, that compliance with the contents of this document shall be sufficient to ensure safe systems or work or operation. It is the document user’s sole responsibility to ensure that the copy of the document it is viewing is the current version of the document as in use by RailCorp.

RailCorp accepts no liability whatsoever in relation to the use of this document by any party, and RailCorp excludes any liability which arises in any manner by the use of this document.

Copyright

The information in this document is protected by Copyright and no part of this document may be reproduced, altered, stored or transmitted by any person without the prior consent of RailCorp.
The standard Guide Rod (fitting 601/10) is a steel pipe about 27mm diameter and 3,450mm long, and is required to be installed vertically.

The stack of weights are loosely connected to the vertical rod by means of an “Eye-Bolt” (fitting 73/12) that's installed in one of the weights. (Refer to the relevant tension regulator standard arrangement drawing for which weight in the stack takes the eye-bolt). The eye-bolt is intended to glide up and down the guide rod (ideally with no bearing friction), and it ensures the weights are laterally constrained to this rod.

Correct Installation

To work properly, each guide rod and accompanying support brackets are to be installed correctly.

- The rod must be vertical and aligned with the eye-bolt in the weight stack, ideally providing no bearing friction on the rod.
- The weights must be allowed to travel up and down by their full extent under temperature changes, without the eye-bolt being restricted by either top or bottom support bracket. (Use the “WeightSet.xls” program to determine suitable bracket heights for weight travel).
- The top and bottom support brackets must be physically clear of the weight stack when it passes by. There must be at least 25mm clearance as nominated in Note 7 on drawing EL 0450662 (refer to Figure 12).

Both top and bottom support brackets are to take up the same relative configuration. This is clearly shown in Figure 3.

Rod verticality must be checked with a spirit level.

The eye-bolt has a threaded length of 110mm. The special weight that this eye-bolt threads into (ie. fitting 600/28) has a thread depth of almost 100mm. For security, the eye-bolt must be threaded into its weight by about 50mm minimum, which leaves some adjustment provision for the distance from the eye in the eye-bolt to the face of the weights, which can help gain better clearance to the guide rod support brackets. The eye must be horizontal for proper alignment with the vertical rod and it must be locked in place with M20 nut & spring washer.

The fasteners on the guide rod brackets that are intended for locking the position of the rod (Item 4 on standard arrangement drawing EL 0450662 - Figure 12) are to be firmly locked in position to prevent any change of position.

When weights are initially installed, it is not always obvious whether the weights will actually need to travel past either the top or bottom guide rod brackets (or both). This would depend on the setup level of the guide rod and more importantly the actual tension length of OHW being tensioned (for instance, a 1,000m wire run would cause the weights to travel vertically by about 3.3m).
Weight Tensioners are accurately modelled using RailCorp’s “WeightSet.xls” spreadsheet program, which must be used for setting up all new devices or height adjustments of existing devices (since 2009). Figure 4 is an example graphic output from the WeightSet program, which shows the weights lower than the top bracket and higher than the bottom bracket at some moderate temperature. However, under cold conditions when the wire contracts the weights can travel above the top bracket, and under hot conditions when the wire expands the weights can travel below the bottom bracket. This may not be obvious to the installer.

Thus it is imperative that the weights not be impeded by these guide rod support brackets. Figure 5 shows how the latest Guide Rod Bracket can be wrongly configured to interfere with (in RED) or correctly configured to clear (in BLUE) the set of weights.
Possible Consequences

The biggest consequence of impeded weight travel is either a tension loss or gain in the OHW conductor/s being tensioned. The design of the OHW relies on the correct tension being maintained (within typ. ±10%), and the reliability of the OHW will suffer if that tension is not maintained. Considering the extent of the OHW run can be as far as 1km or so, the risk exposure is considerable.

Figure 6 shows an example of what can happen if the weights need to go lower than the bottom bracket will allow (old style bracket). These brackets are not designed to support the weights, and they will become deformed as a consequence, which can lead to other problems.

Figure 7 shows an instance where the pulleys had been installed in the wrong holes of the side plates, which resulted in the pulleys (& thus the weights) being located closer to the mast. This therefore also places the weights unacceptably close to the guide rod and its support brackets.

Figure 8 shows the error in detail, and Figure 9 shows the correct location of pulleys and spacers installed on the side plates. It is a simple mistake that can have significant adverse consequences. In this situation there was no way of providing guide rod support brackets that did not interfere with the weight travel, which is unacceptable.

Any excessively deflected guide rod as shown in Figure 7 should suggest something is wrong, and should thus prompt some action to rectify this situation.
Commissioning

When installed, where possible, the horizontal clearance from the side of the weights to the top and bottom guide rod brackets is to be measured and the values recorded to confirm a clearance of > 25mm. This information must be recorded on the tension regulator installation quality check sheet and handed over to the District.

If the installed weights are not located next to the brackets then a visual check for clearance must be made.

*Figure 10* (viewed underneath eg. using a mirror or the like) and *Figure 3* (viewed from on top where available) show possible views that can confirm obvious clearance without the need for measurement. In this case, the tension regulator installation check sheet must note that the weights had been visually checked for suitable clearance.

A check should also be made to ensure the guide rod does not bind heavily on the eye-bolt in the weight stack. As an indicator the rod should be straight over its length.

![Figure 10 - Upward View of Twin Weights Showing Unimpeded Weight Travel](image)

The eye-bolt in the weights must be located in the correct weight number (refer to relevant standard arrangement). It must be securely threaded into this weight, be oriented so its hole is horizontal for proper alignment to slide up the guide rod, and it must be locked-off using a tightened lock nut and spring washer (as per the standard arrangement drawing). *Figure 11* shows an incorrectly installed eye-bolt arrangement.

![Figure 11 - Improperly Installed Eye-Bolt](image)

Neal Hook

Chief Engineer Electrical