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ADJUSTING S-CAM BRAKES ON TRUCKS AND TRAILERS

The following document has been prepared by TCS to provide basic guidance to vehicle modifiers when adjusting S-cam brakes and/or changing slack adjuster settings.

These guidelines are supplied without prejudice and free of charge to assist technicians. TCS will not be held liable for any problems that arise from sole reliance on, or misinterpretation of, these guidelines or from the introduction of new rules after the issue date of these guidelines. The following documents should be read in conjunction with these guidelines:

1. Manufacturer Brake Adjustments Guidelines and Maintenance Instructions
   (takes precedence over VSB-6 and TCS guidelines)
2. VSB-6 Section G: National Code of Practice for Brake Modifications
   (takes precedence over TCS guidelines)

All modifications must be carried out by a suitably qualified technician 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.

These guidelines are not intended to be used as the sole instructional tool for technicians; technicians must be trained by a suitably qualified individual/organisation before conducting any sort of brake adjustment and/or modification. These guidelines do not provide such training and must only be used as a quick reference guide to supplement such training.

The 'slack adjuster setting' is the distance between the centre of the S-cam shaft and the centre of the hole in the slack adjuster that the booster push rod clevis is attached to. The typical slack adjuster settings are 127mm (5"), 152mm (6") and 180mm (7"). Brands such as BPW offer alternative slack adjuster settings, which are typically 120mm, 135mm, 150mm, 165mm and 180mm.

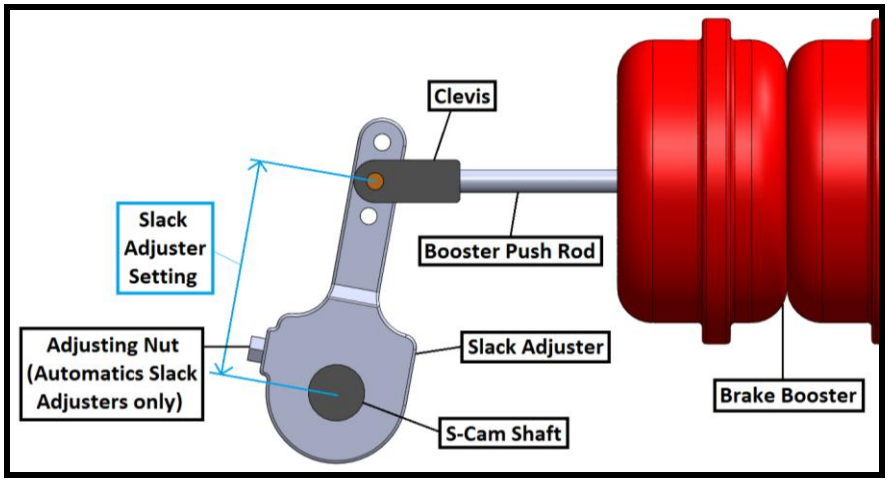

FIGURE 1A: MEASURING THE SLACK ADJUSTER SETTING

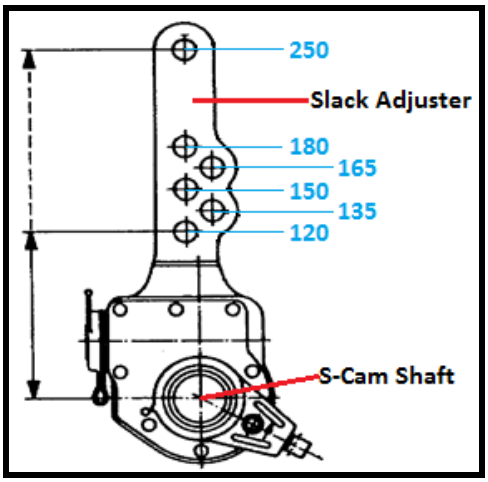

FIGURE 1B: BPW SLACK ADJUSTER

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When conducting any sort of brake system modification, TCS makes the following recommendations:

- **Replace conventional slack adjusters with automatic slack adjusters** to optimise brake performance throughout the full life of the brake shoe and prevent the need for ongoing adjustment
- **Ensure both brake boosters fitted to a single axle are the same make and model**; even though the size of the boosters (24/30, 30/30, etc.) may be the same on each axle, the performance characterisitcs of the boosters can vary slightly from brand to brand (due to variations in diaphragm area, etc.) which may result in slightly uneven braking between the left and right wheels if the boosters on a single axle are different brands
- When installing EBS on older trailers, install new boosters, don't re-use old ones

New brake boosters are supplied with long push rods to suit a large range of axles and slack adjuster settings. These booster push rods usually need to be shortened to achieve a suitable angle between the slack adjuster and booster push rod. The reason for this is explained below.

The brake booster push rod exerts a force on the slack adjuster, which rotates the S-Cam, which pushes the brake shoes against the brake drums, resulting in a brake torque. When a booster push rod exerts a force on the slack adjuster, some of the force makes the slack adjuster rotate the S-Cam shaft but some of the force simply compresses or 'stretches' the slack adjuster itself and doesn't result in torque being applied to the S-Cam shaft. These portions of the booster push rod force are known as 'components' and are illustrated by blue (useful component) and red (wasted component) arrows in the figures below.

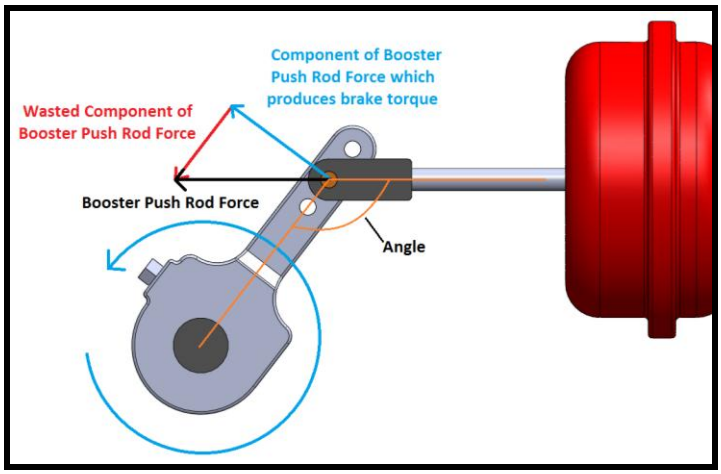

FIGURE 2A: BRAKES PARTIALLY APPLIED

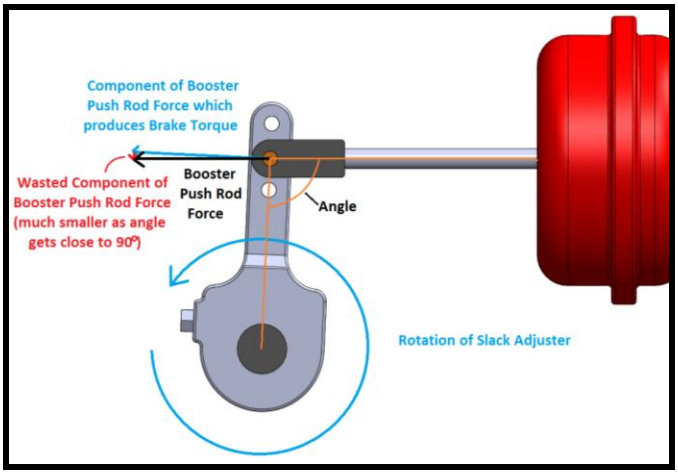

FIGURE 2B: BRAKE FULLY APPLIED

In the early stages of brake application, a larger portion of the booster push road force is wasted as it isn't converted to brake torque, but as the angle between the booster push rod and the slack adjuster approaches 90°, much more of the booster push rod force is converted to brake torque, resulting in stronger braking performance; this is known as a 'rising rate' effect. The most efficient braking performance is achieved when the angle between the booster push rod and the slack adjuster is 90° as the 'wasted' force component is eliminated.

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If the booster push rods haven't been shortened properly, the angle may become less than 90° before the booster push rod reaches its full travel; once the angle drops below 90°, the 'wasted' component of the booster push rod force reappears and increases the more the angle reduces. This is called a 'falling rate' effect and means the braking performance loses efficiency at the critical time when the brakes are fully applied. This falling rate effect is illustrated below:

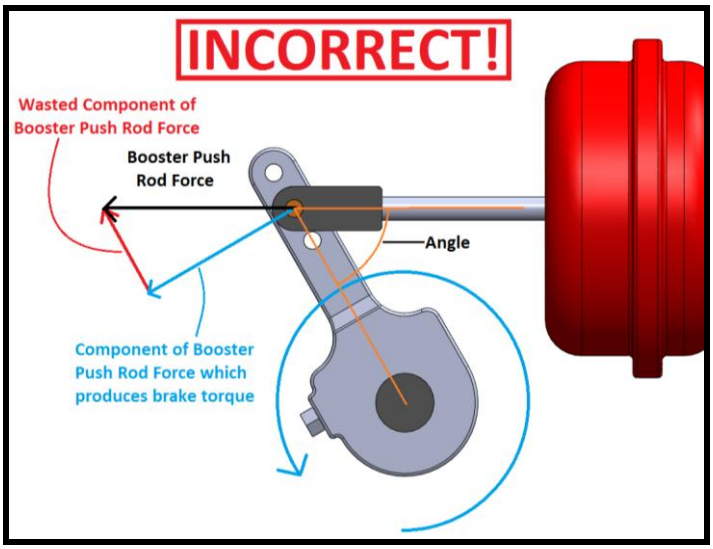

FIGURE 3: FALLING RATE EFFECT

To ensure brakes are correctly adjusted, the angle between the booster push rod and the slack adjuster should be *just* greater than 90° when the brakes are fully applied (refer to manufactures instruction for exact angle). The adjustment nut on the automatic slack adjuster must also be adjusted in accordance with the manufacturer's specifictions.

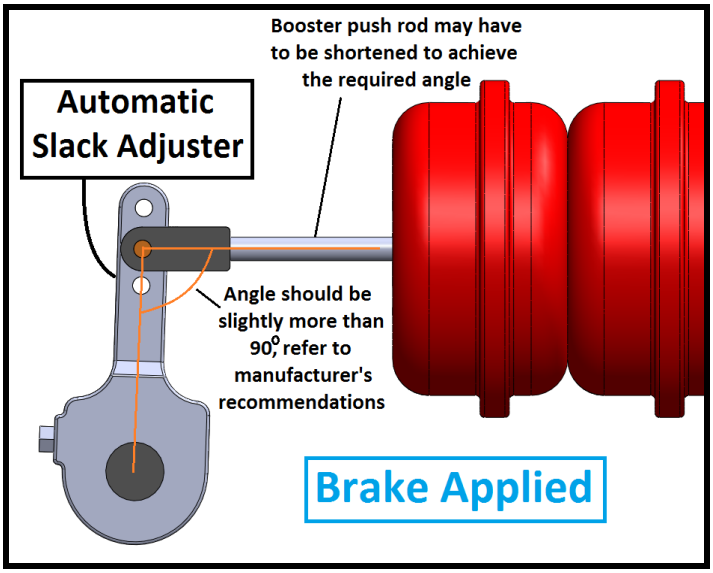

FIGURE 4: INITIAL AUTOMATIC SLACK ADJUSTER CONFIGURATION WHEN BRAKES ARE FULLY APPLIED

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The initial setup angle is similar for a conventional slack adjuster, but adjustments must be continually made throughout the life of the brake shoes to allow for brake shoe wear. These adjustments can usually be made by disconnecting the clevis and rotating it up the thread of the booster push rod toward the brake booster, however the booster push rod will need to be shortened if it starts clashing with the slack adjuster.

Booster Height Adjustment:

If the slack adjuster setting needs to be changed, the booster height may also need to be adjusted to ensure the booster push rod isn't subjected to unneccessary bending. Brake booster mounting brackets usually have multiple mounting holes to accommodate height adjustments.

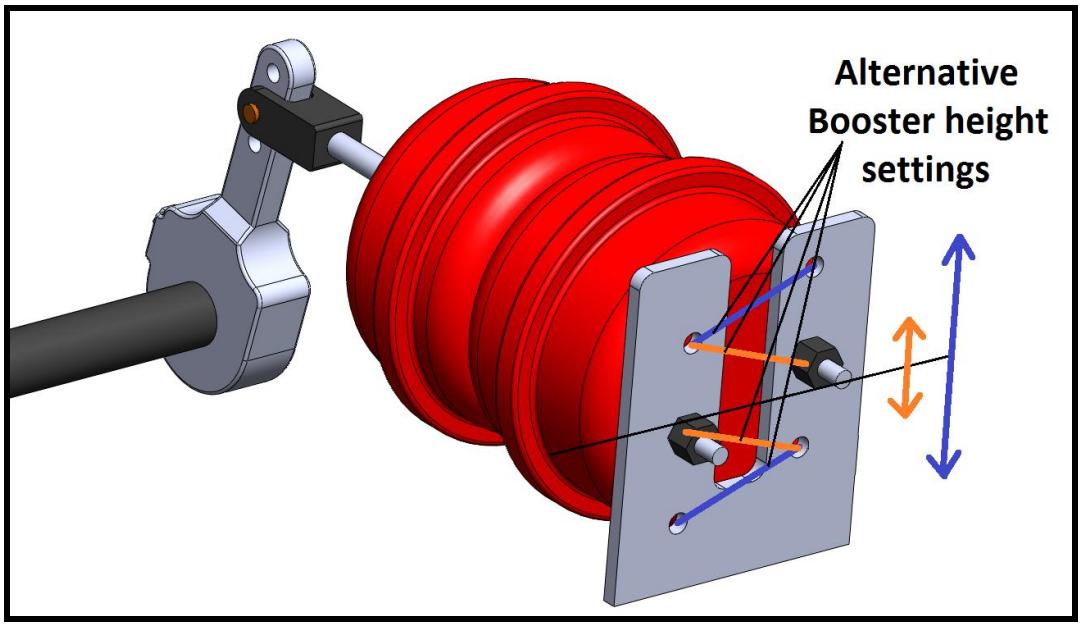

FIGURE 5: BOOSTER HEIGHT ADJUSTMENT HOLES

When changing the slack adjuster setting it is important to ensure the booster push rod length is suitable to achieve the requirements outlined above; if the slack adjuster length is to be reduced, the booster push rod may have to be shortened, but, more importantly, if the slack adjuster setting needs to be increased, the booster push rod may not be long enough to achieve optimal braking performance and the boosters will need to be replaced.