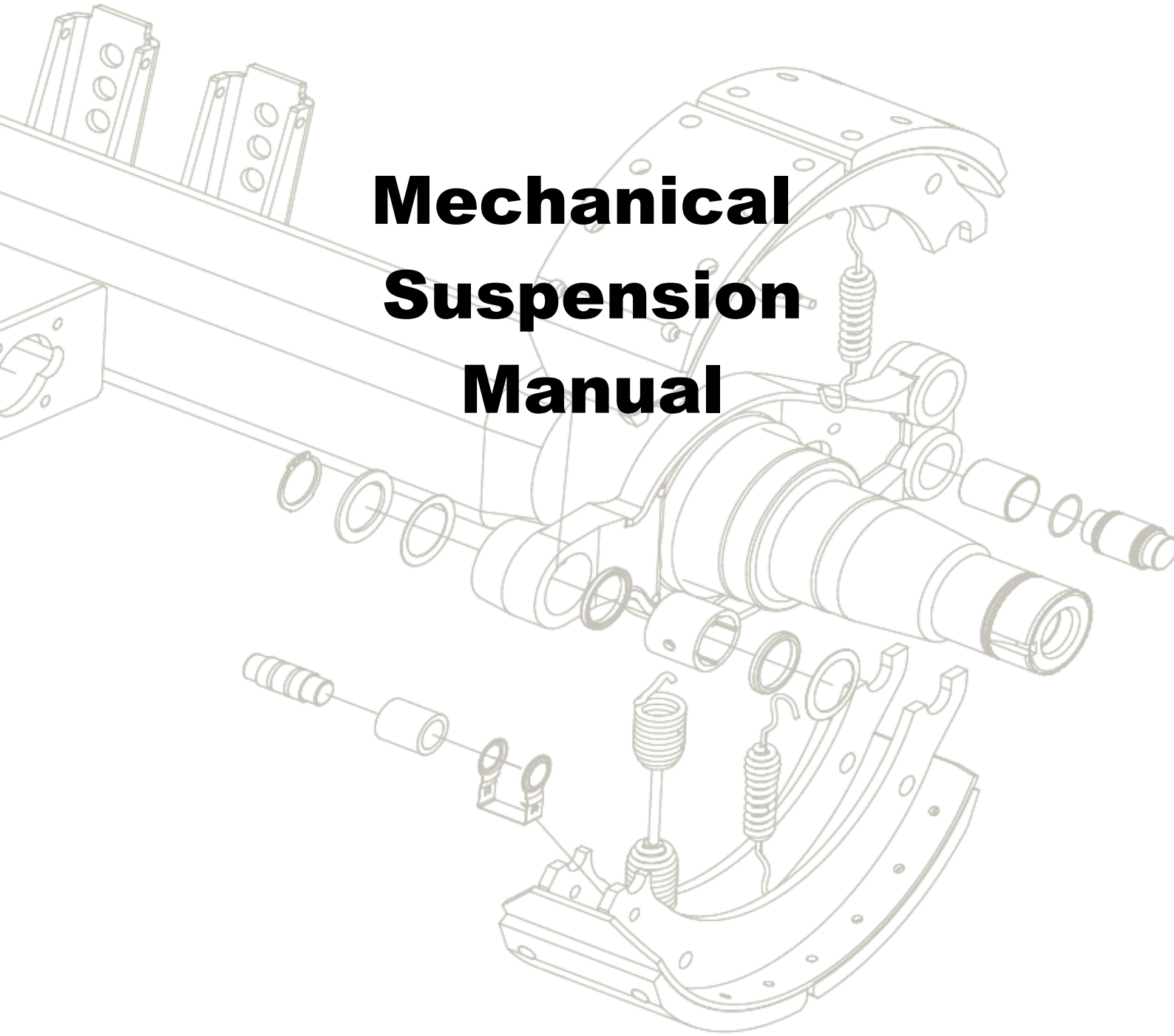
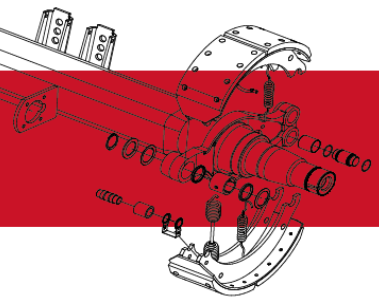
granning
axle and suspension solutions

# Mechanical Suspension Manual





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Revision Date: Jan 2021
Part No. 80271 Rev D

# 1. Safety Procedures and Information

**Safety First**

Be sure to read and follow all installation and maintenance procedures.

## 1.1. Lifting

Practice safe listing procedures. Consider size, shape and weight of assemblies. Obtain help or assistance of a crane and licensed operator when lifting heavy assemblies. Make sure the path of travel is unobstructed before lifting or moving an assembly. Always wear appropriate safety clothing and equipment to prevent injury in the event of an accident.

## 1.2. Welding

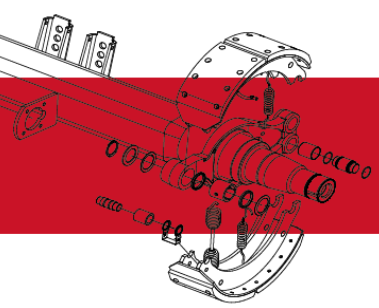
When welding, be sure to wear all personal protective equipment for face and eyes. Ensure that the work area has adequate ventilation and visual protection for passers-by. When welding, protect the spring beams and air springs from weld splatter and grinder sparks. Do not attach "ground" connections to springs.

Under normal use, steel presents few health hazards. However, prolonged or repeated breathing of iron oxide fumes produced during welding may cause bad health.

## 1.3. Overloading

Overloading is the practice of transporting a load that exceeds the design specified ratings of that vehicle. Overloading can cause component failure resulting in accidents, injuries and even death.


This symbol indicates that the reader should pay special attention to the specific requirements or warnings stated.



## 2. Positioning Suspension Hangers

### Single Axle (Figure A)

Fit the front hanger bracket by measuring from the trailer king pin to the centre of the suspension. The front and rear hanger positions can then be located from this.

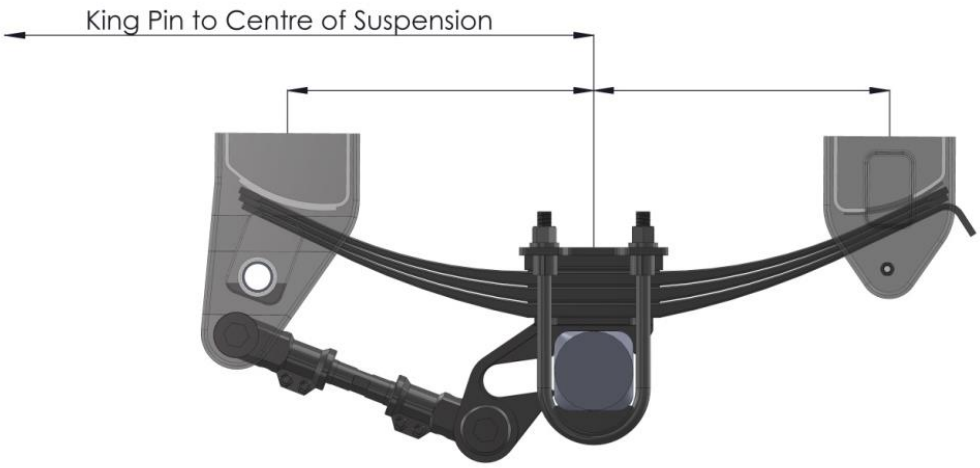



**Figure A**

The centre equaliser should be positioned first by taking a measurement from the king pin to the centre of the equaliser bracket. The front and rear hanger brackets can then be positioned by measuring from the centre pin of the equaliser bracket to the centre of the appropriate hanger bracket. On a Tri Axle use first centre hanger to kingpin.

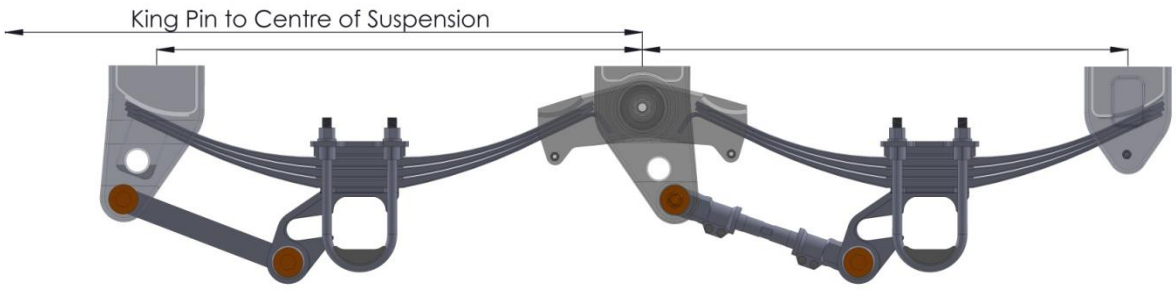
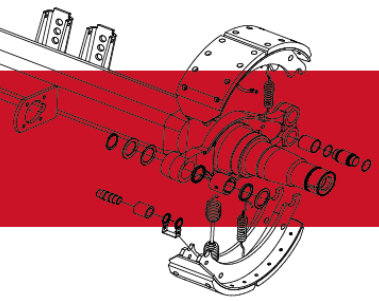
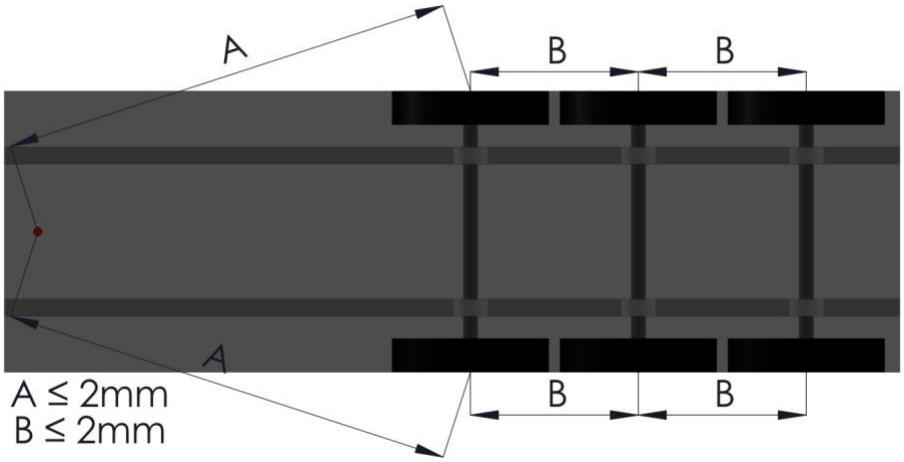



**Figure B**



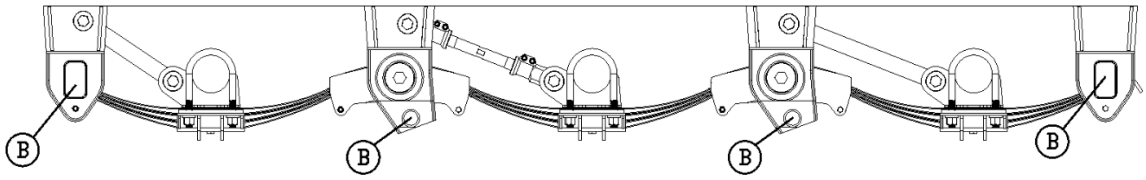



**Tracking of trailer axles**

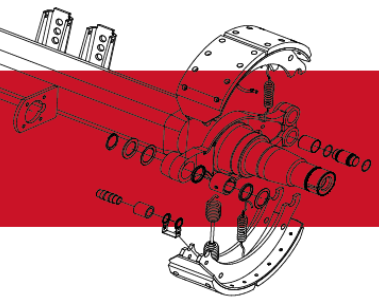
Check the diagonal distances between all the hangers i.e. Front Hangers, Equaliser Hangers, and Rear Hangers. These measurements must be within ±3mm as shown on the technical drawings.
If these measurements are correct, insert a steel pipe cross brace through the holes on the hangers as shown in Figure 1.

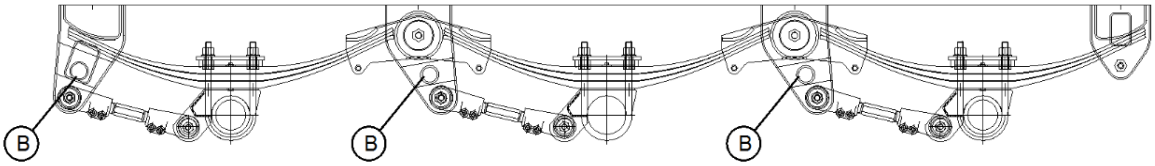
## 3. Hanger bracing

**Ultra Underslung**




Front and rear hanger bracing = Suspension centres -100mm
Centre hanger bracing = Suspension centres + 150mm
Bracing Tube = Ø48 pipe 4mm wall
B = Position of bracing tube






## Over and Underslung

Front and centre hanger bracing = Suspension centres +150mm
Bracing Tube = Ø48 pipe 4mm wall
B = Position of bracing tube

Front and middle hanger must have cross brace. Ø48 pipe, 4mm wall, Pipe length=Suspension centres + 150mm

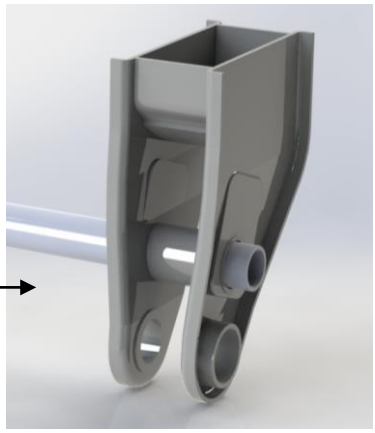
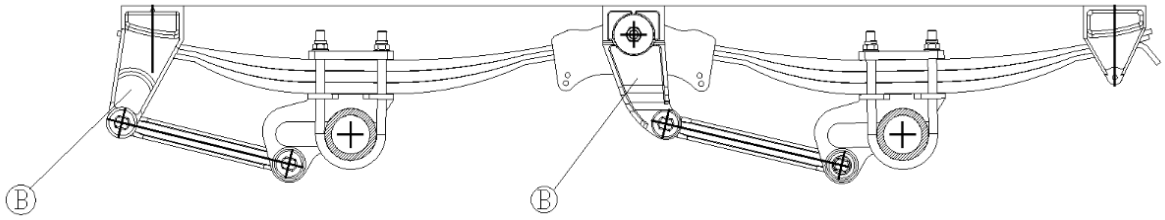
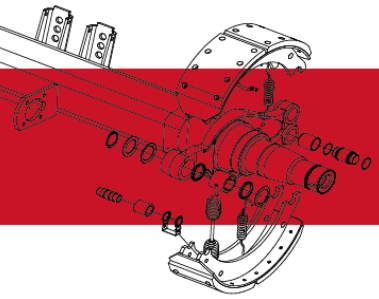


**Figure 1**

Bracing tube should be welded to the front and middle hangers on **100mm wide spring suspensions.**



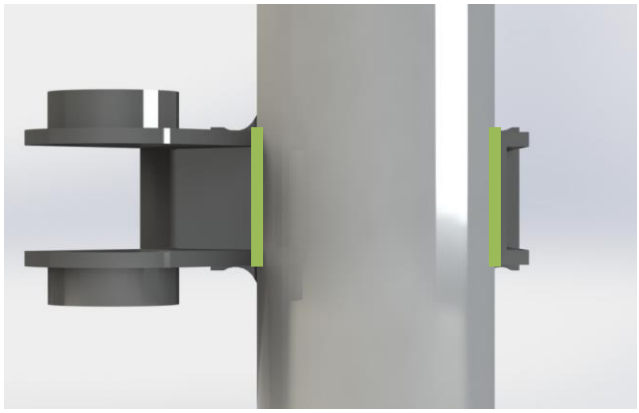

Front hanger bracing = Suspension centres -129mm. Centre hanger bracing= Suspension centres -207mm
Bracing Tube = Ø48 pipe 4mm wall
B = Position of bracing tube



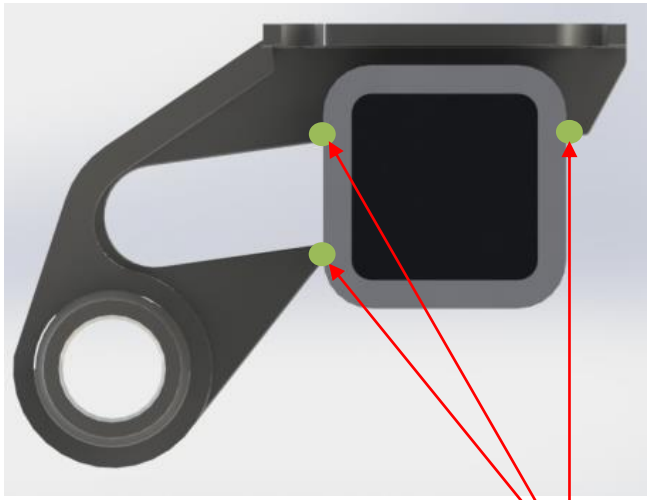
## 4. Axle Seat Welding

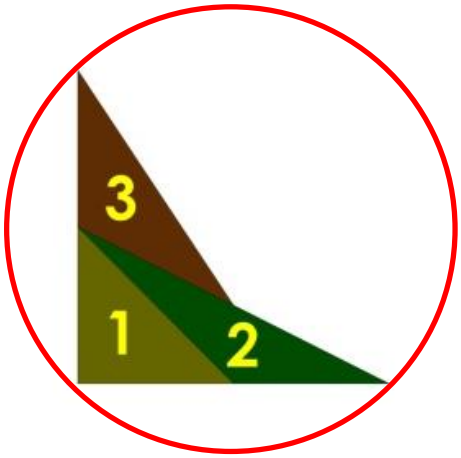

**Specific Welding procedures are required for installation.**

All welds should be triple pass, as pictured below.



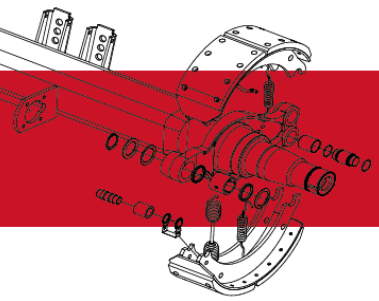
36146 Axle seat – Weld details






8mm Fillet Weld required
in 3 locations

61174 Axle seat – Weld details



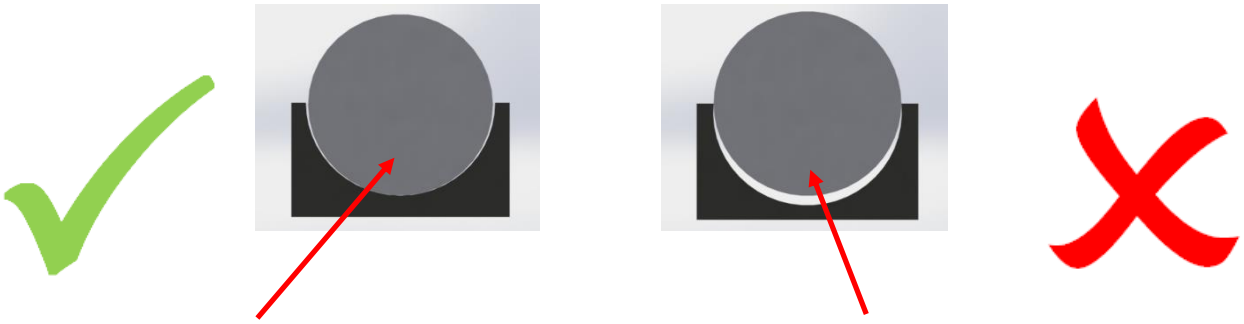

**Do not connect the earth cable to any part of the axle assembly that will put a wheel bearing between the ground cable and weld area. If this does occur, the wheel bearing will be damaged by electrical arcing.**

Earthing of the axle should be done on the parts attached to the axle such as the booster brackets, camshaft support brackets or the brake spider.

Connections should be tight and clean.

The area to be welded must be clean and free of grease, dirt or other contaminates that might affect the quality of the welds.
Brackets that wrap around the axle should touch the axle, as shown in Figure 2, View A. With this type of fit, loads on the bracket are transferred directly to the axle. The bracket, as shown in Figure 2, View B would transfer the load through the weld. This may overstress and crack the weld.

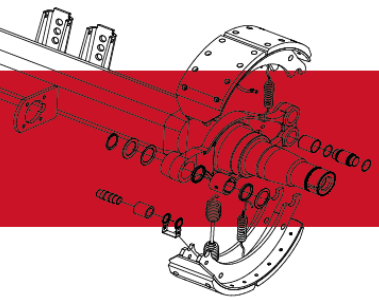
**VIEW A** **VIEW B**



Ensure contact at this point between axle and saddle

Gap Present
(Incorrect contact, as shown, will cause excessive weld stress and lead to the axle cracking)

**Figure 2**

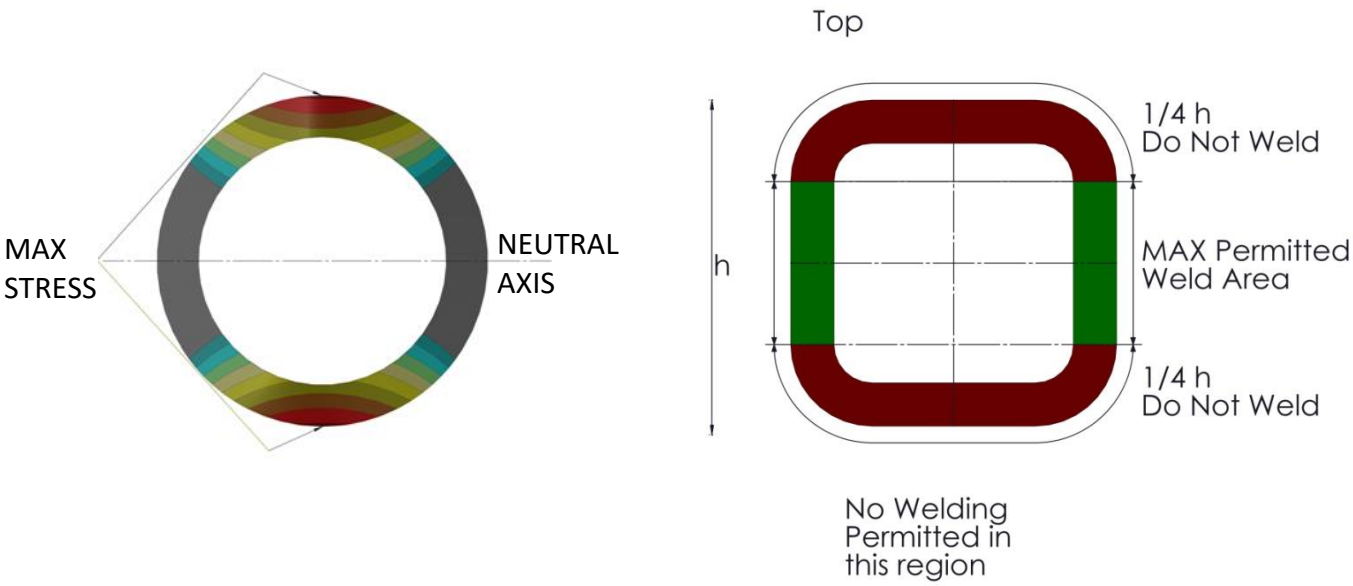


## 5. Axle Installation

**Read this section before welding the axle saddles**

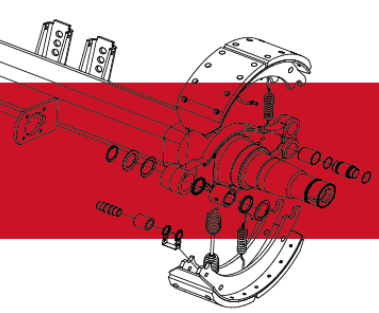
### Beam Stresses

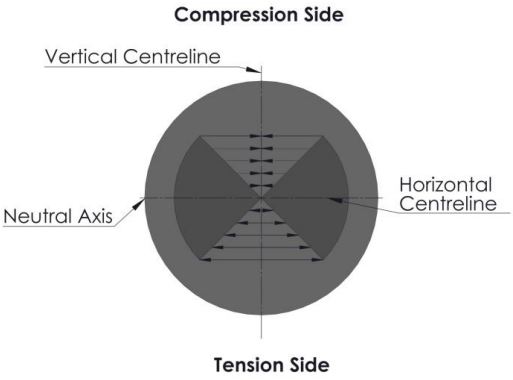
Granning Axle beams are manufactured from high tensile, solid beam. In service these beams are subjected to combined bending and torsional stresses. Maximum combined stresses occur along the top and lower surface of the beam. The minimum stresses occur along the front and rear centre line, called the neutral axis.

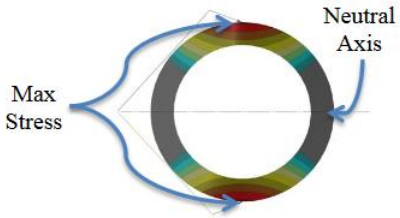


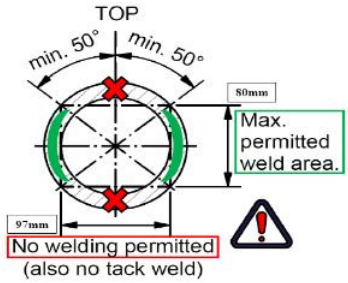

### Effects of Beam Welding

When a weld is made on the beam, it creates in effect an area of extreme localised heat treatment. The heat generated by the welding process will cause the beam material, within the immediate vicinity of the weld, to become hardened. This results in a small area of brittleness replacing the required property of ductility. It can be seen that should an area of localised hardening appear at either point of maximum stress, the strength of the beam could seriously be affected. Therefore any welding must be in the neutral zone, ie not in top or lower 100 degrees.





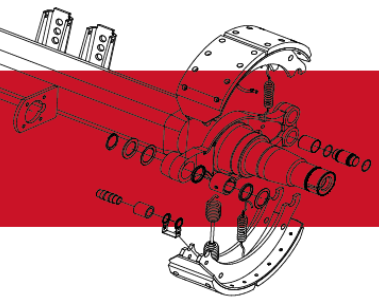




In addition, the torsional stress imparted on the braking is also taken into consideration when rating the axle capacity. An additional allowance of both stresses due to beam loading (bending) and braking (torsional) is factored into the calculations to provide an acceptable design factor of safety.
These stresses are periodically applied and reversed many times during the normal life of the axle beam. For this reason the beam material must have certain properties, such as impact strength, that permit it to absorb shock by flexing and then returning to its original shape.

### 5.1. How welding Affects Axle Beam Material

All welds made on the beam create, in effect, an extremely localized heat-treatment of the metal. The heat generated during the welding can cause the material in the heat affected zone to become hardened or brittle. Welding can impart this undesirable characteristic to the normally ductile structure. Areas that may need to flex to some extent to operate properly may be crack after being welded due to the effect that brittleness has on reduced fatigue handling. This small hardened area becomes the weakest section.
For this reason, it is necessary when welding to avoid the high stress areas in the compression stress zone and the tension stress zone. All welds should be kept as close to the neutral axis as possible. Welds on the axle should preferable be along the axle, circumferential to avoid unfavorable weakness in the axle structure. If circumferential welds are needed, the area below the horizontal centerline of the axle cross section (the tension side) should be avoided.



## 5.2. Preheating Requirement

***Absolutely no welding should be done on axles that are below room temperature (20°C).*** Before welding on suspension components or any part on the axle, the area of the attachment point should be warmed slowly to 200-250°C. After checking the temperature, the part(s) should be tack welded in place immediately. Recheck the temperature. If the temperature has dropped below 180°C, reheat to 200-250°C and complete welding as per instructions.

## 6. Suspension Assembly

Assemble the adjustable torque arms to the same length as the fixed torque arms (the length can be adjusted to improve axle tracking). Alternate the position off the adjustable torque arm on adjacent axles from passenger side to driver side (Driver Side: Adjustable – Rigid – Adjustable, Passenger Side: Rigid – Adjustable- Rigid). Fit the end of the torque arm in the bracket and insert the bushes from each side. Lubricate all tapered rubber and poly bushes on the taper surfaces with a liquid soap solution (50% liquid soap – 50% water). *We DO NOT recommend any other lubricants – e.g. Rubber grease, Detergent etc.* Fit pin, washers and nut, ensuring that the torque arm is central in the bracket. Tighten torque arm pin lock nuts to 150-200Nm.
For better bush durability, ensure correct location of the torque arm and avoid metal to metal contact (see Photo A – example of good installation).
It may be necessary to fit special spacers (Photo C) to prevent the torque arm being pulled to one side and prevent excessive build up of bush material between the torque arm and the bracket and under the bolt head or the nut washers. (Photo B – example of bad installation)

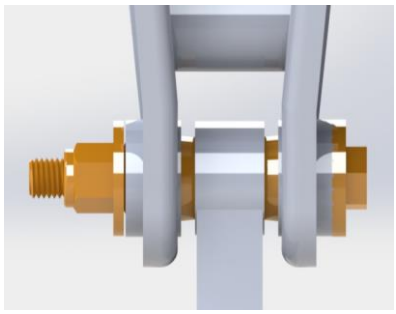


**Photo A**

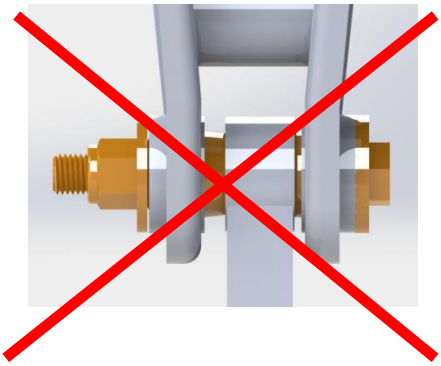
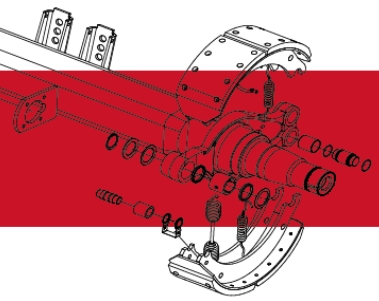
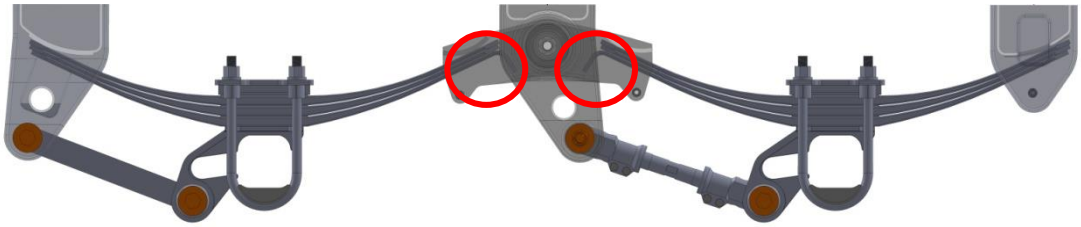


**Photo B**

**Photo C**



## 6.1. Spring orientation



Mount the springs onto the axles with the hooks according to the supplied drawing

Tighten "U" bolt nuts evenly to the correct torque in a cross pattern, as shown in F[illegible]

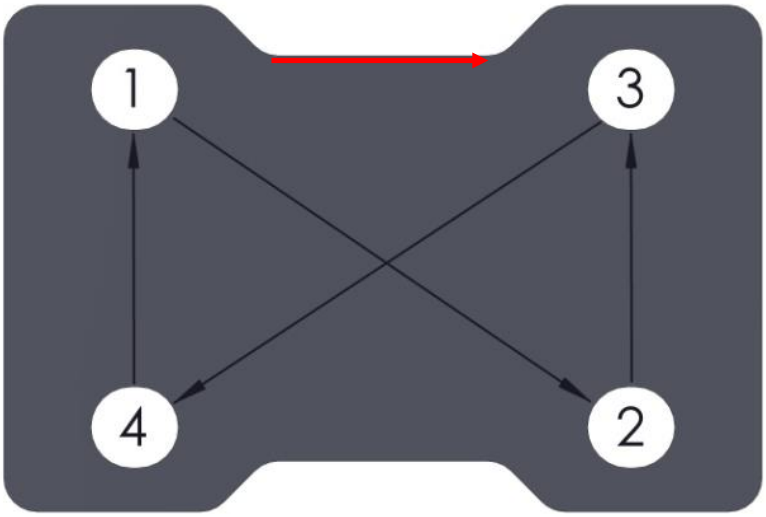
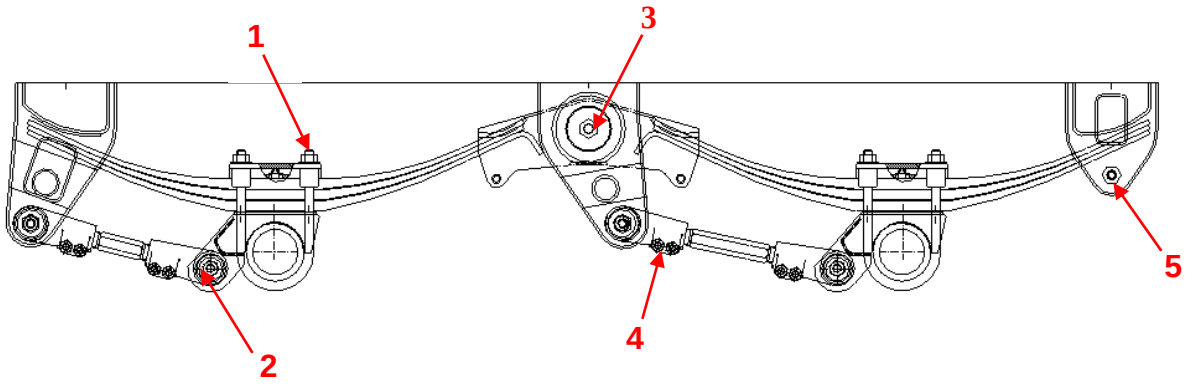



**Figure 4**

***ALL TORQUES ARE DRY OR LIGHTLY OILED***

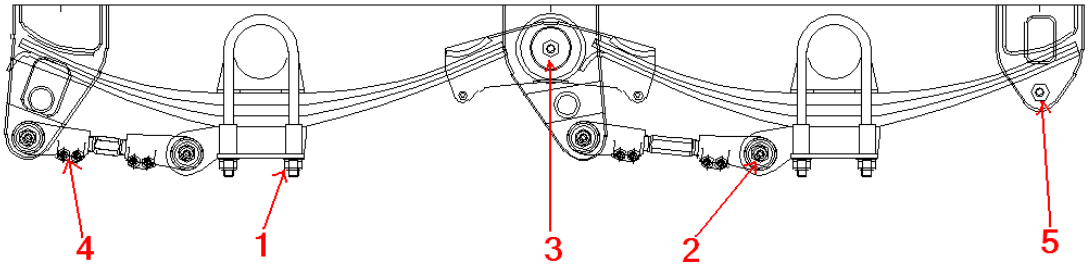
## OVERSLUNG, 127 Round, 1/3/4-Leaf, Multi-leaf

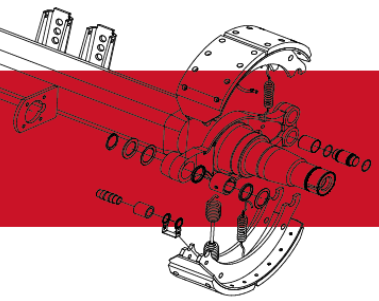
| | | | |
|---|---|---|---|
| 1 | U-Bolts (M22) | = | 540 Nm |
| 2 | Torque Arm | = | 200 Nm |
| 3 | Equaliser Shaft Bolts | = | 350 Nm |
| 4 | Torque Arm Pinch Bolts | = | 100 Nm |
| 5 | Drop out Bolts | = | 85 Nm |




## UNDERSLUNG, 127 Round, 1/3/4-Leaf, Multi-leaf

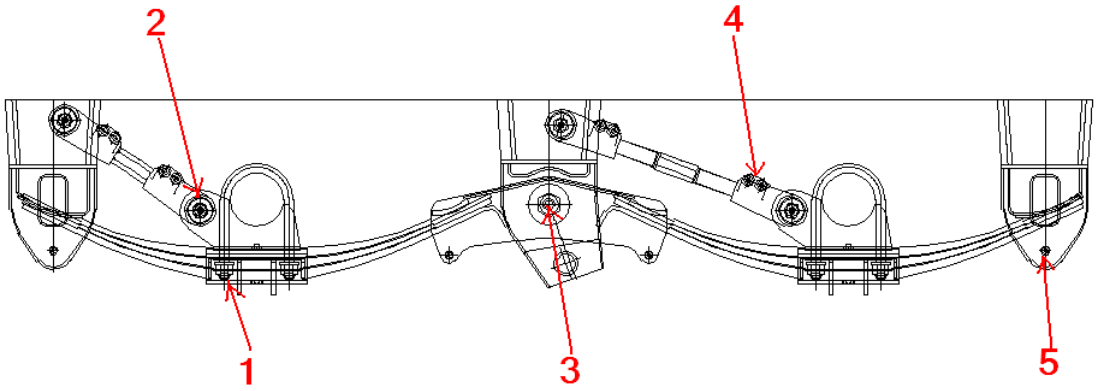
| | | | |
|---|---|---|---|
| 1 | U-Bolts (M22) | = | 640 Nm |
| 2 | Torque Arm | = | 200 Nm |
| 3 | Equaliser Shaft Bolts | = | 350 Nm |
| 4 | Torque Arm Pinch Bolts | = | 100 Nm |
| 5 | Drop out Bolts | = | 85 Nm |



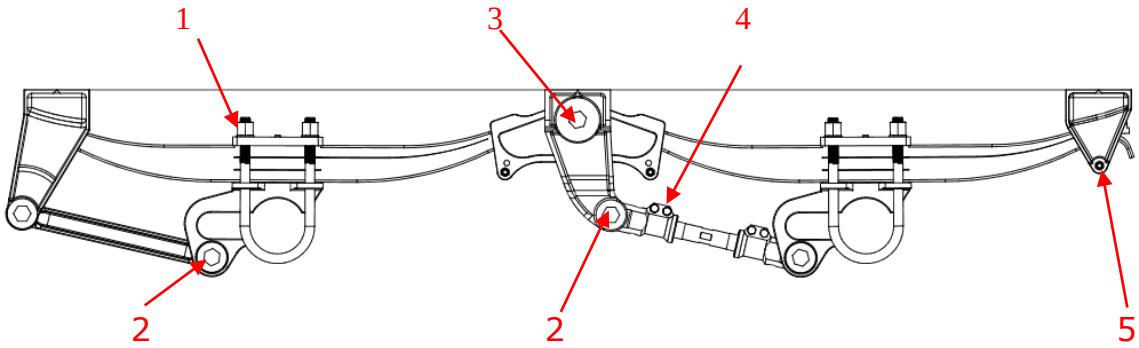
## ULTRA UNDERSLUNG, 127 Round, 1/3/4-leaf, Multi leaf

| | | | |
|---|---|---|---|
| 1 | U-Bolts (M22) | = | 640 Nm |
| 2 | Torque Arm | = | 200 Nm |
| 3 | Equaliser Shaft Bolts | = | 350 Nm |
| 4 | Torque Arm Pinch Bolts | = | 100 Nm |
| 5 | Drop out Bolts | = | 85 Nm |

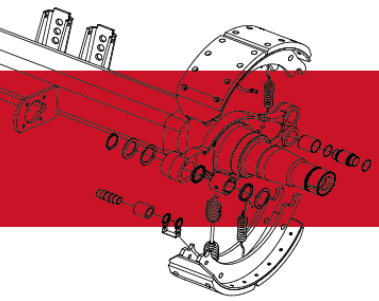



## 100mm Wide Spring Heavy Duty, 127 Round, 3 leaf, Multi leaf

| | | | |
|---|---|---|---|
| 1 | U-Bolt nuts (M22) | = | 520-550 Nm |
| 2 | Torque Arm | = | 300-360 Nm |
| 3 | Equaliser Shaft Bolts | = | 350 Nm |
| 4 | Torque Arm Pinch Bolts | = | 100 Nm |
| 5 | Drop out Bolts | = | 75-85 Nm |

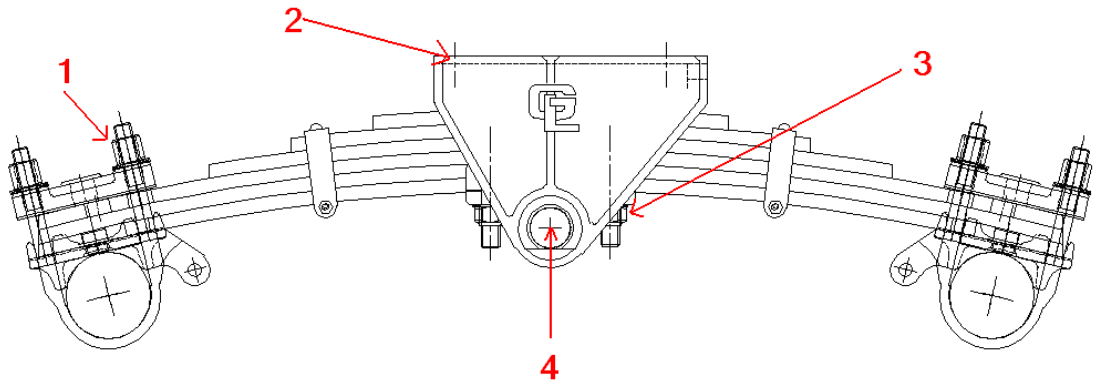



Same torque figures apply to offset hanger



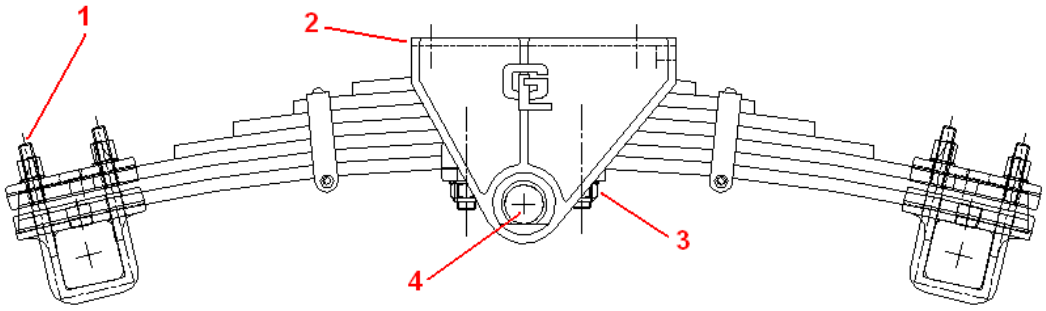
## WALKING BEAM, 127mm Round, Overslung

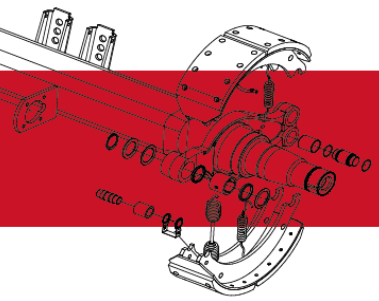
| | | | |
|---|---|---|---|
| 1 | U-Bolt (M24) to Axle | = | 800 Nm |
| 2 | Hanger to Frame (M22) | = | 530 Nm |
| 3 | Suspension to Rocker U-Bolt (M27) | = | 850 Nm |
| 4 | Rocker Bolt Castle Nut | = | 40 Nm |




## WALKING BEAM, 90mm Square, Overslung, 6 Leaf, 7 Leaf

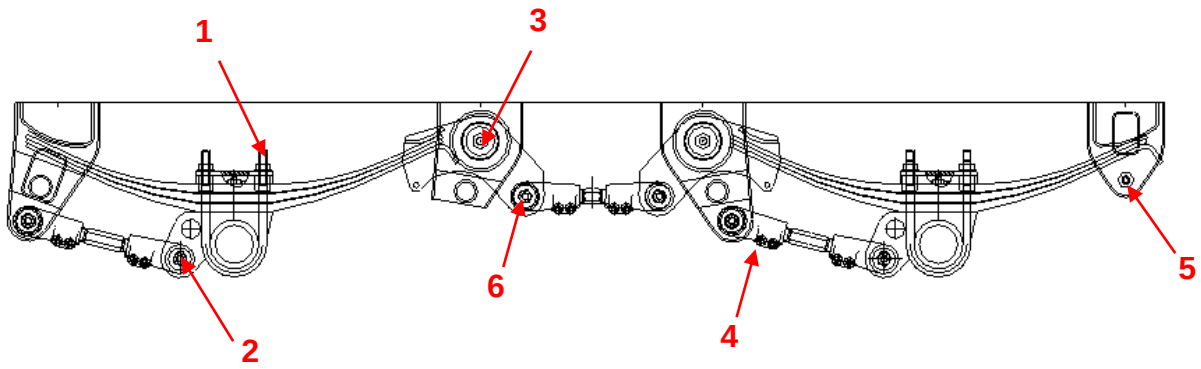
| | | | |
|---|---|---|---|
| 1 | U-Bolt (M20) to Axle | = | 500 Nm |
| 2 | Hanger to Frame (M22) | = | 530 Nm |
| 3 | Suspension to Rocker U-Bolt (M27) | = | 850 Nm |
| 4 | Rocker Bolt Castle Nut | = | 40 Nm |



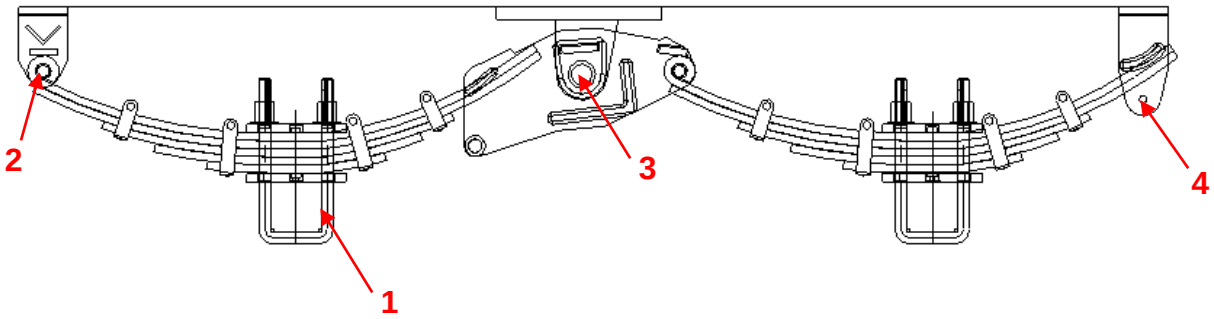
## OVERSLUNG, 127 Round, 1-Leaf, 3-Leaf, Multi-leaf

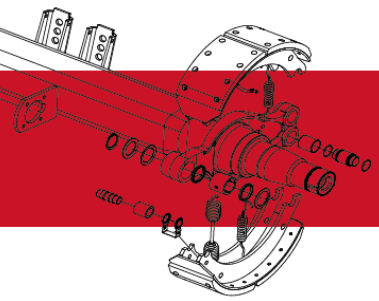
| | | | |
|---|---|---|---|
| 1 | U-Bolts (M22) | = | 540 Nm |
| | Torque Arm | = | 200 Nm |
| 3 | Equaliser Shaft Bolts | = | 350 Nm |
| 4 | Torque Arm Pinch Bolts | = | 100 Nm |
| 5 | Drop out Bolts | = | 85 Nm |
| 6 | Torque Arm (No Rubber Bushes) | = | 70 Nm |




## AGRICULTURAL SUSPENSION, 70-90-100 Square

| | | | |
|---|---|---|---|
| 1 | U-Bolts (M20) | = | 450-500 Nm |
| 2 | Spring Eye Bolt | = | 170 Nm |
| 3 | Equaliser Shaft Bolts | = | 200 Nm |
| 4 | Drop out Bolts | = | 80 Nm |



## Commercial Suspension Setup

Release the brake system and pull the trailer forward in a straight line. This will free the trailer from any binding. Ensure that the ground level is smooth.

For best results use the axle extensions and a king pin post, or a suitable optical alignment device are recommended. Align the front axle by lengthening or shortening the adjustable torque arm (driver's side of the trailer) with the king pin as shown in Figure 5

When the axles are aligned to ±3mm, tighten the torque arm clamp nuts on the front axle to 90-100Nm.


**Specific torque requirements are recommended.**

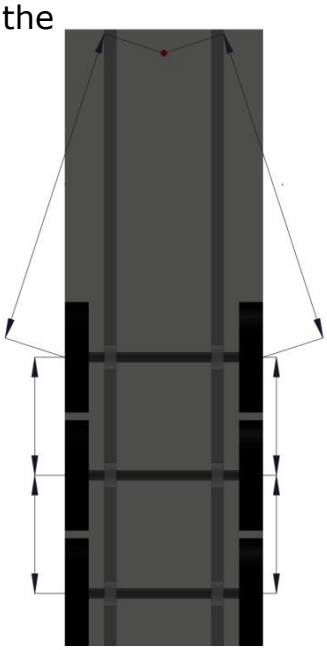
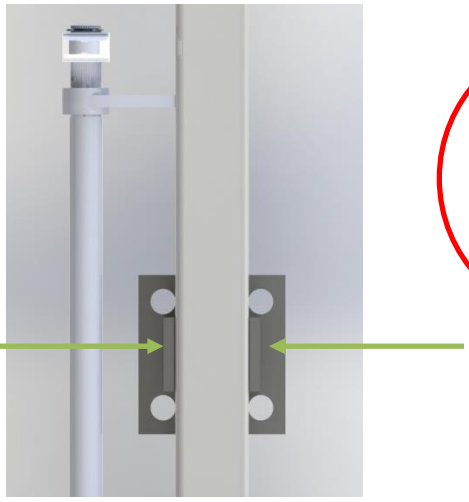
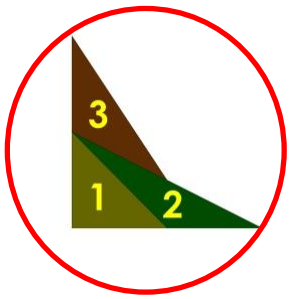


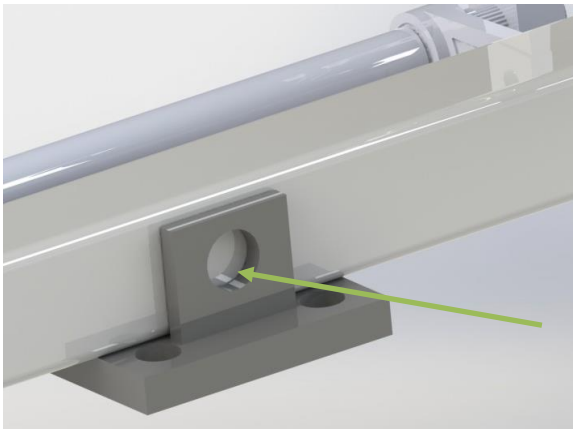
**Figure 5**

## Agricultural Suspension Setup

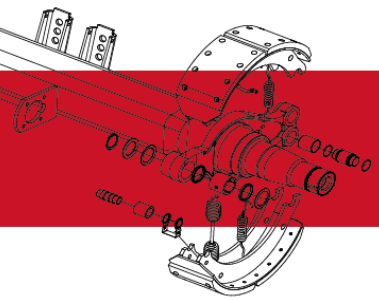
### Axle Saddle Welding



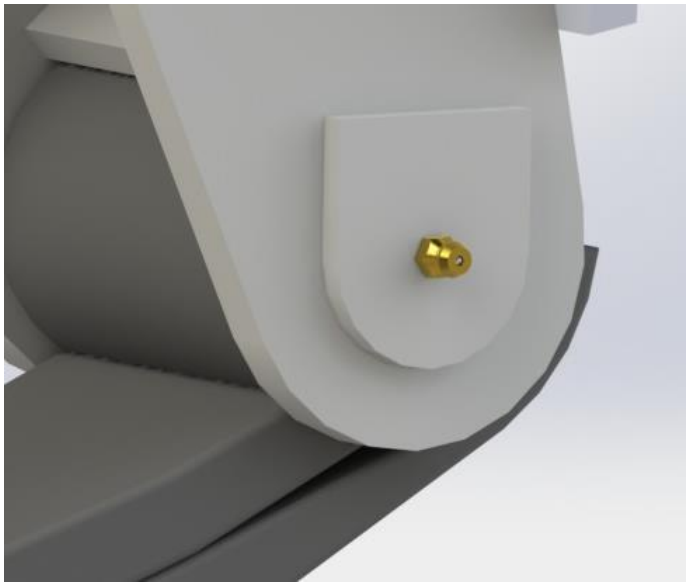


Ensure the axle is welded to the axle seat by the side holes only with a 5mm fillet weld all around

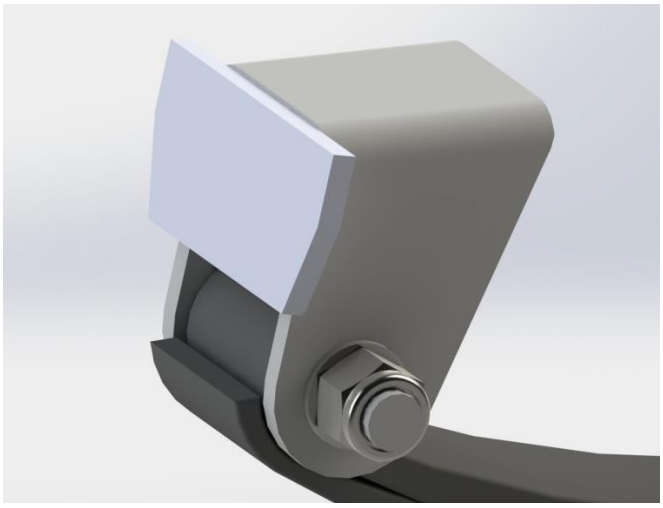


## Suspension Lubrication



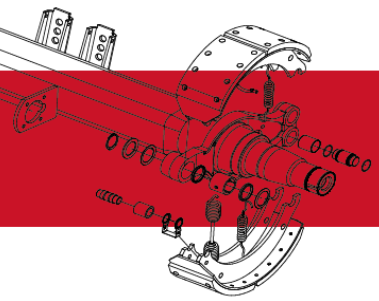
Ensure all Greasing points are properly greased to ensure smooth and trouble free operation of the suspension

## Wide Chassis Rail Support



When using this suspension on a chassis with wide rails it is recommended to weld a supporting brace to the front hanger to spread the load more evenly over the beam

## Commercial Suspension Maintenance Intervals



| □ Maintenance Work<br>○ Lubrication | After the First Laden Journey | After the first 1,000Km | Every 3 Months thereafter |
|---|---|---|---|
| **Service Intervals** | | | |
| Visually check all components for damage and wear. | | | □ |
| Check that the balance beam bolts are torqued correctly | | | □ |
| Check torque arm bolts are torqued correctly | □ | | □ |
| Check U-Bolt torque | □ | | □ |
| Check drop out bolts are tight | | | □ |
| Check torque arm clamping bolts are properly tightened | | | □ |
| | | | |
| **Lubrication Intervals** | | | |
| Lightly grease sliders/sliding ends of the springs | ○ | ○ | ○ |

## Agricultural Suspension Maintenance Intervals

| □ Maintenance Work<br>○ Lubrication | After the first 5,000Km (After first Month) | Every 15,000km or 1 Month | Every 90,000km or 6 Months |
|---|---|---|---|
| **Service Intervals** | | | |
| Visually check all components for damage and wear. | | | □ |
| Check torque on all nuts and bolts are to recommended settings | □ | | □ |
| | | | |
| **Lubrication Intervals** | | | |
| Lubricate Equaliser Bushing | ○ | ○ | ○ |
| Lightly grease sliding ends of the springs | ○ | ○ | ○ |