INSTALLATION, OPERATIONS, & SERVICE MANUAL

R-1110/R-1150 WITH R-1130 REAR

SAFETY PRECAUTIONS

<u>If any installation problems are encountered, please call G&B Specialties for technical assistance before continuing with the installation process.</u>

- Failure to heed to any of the following warnings could result in severe bodily injury and/or equipment damage.
- Read and understand this manual completely before attempting installation of the equipment.
- Installation instructions provided below only address the RAFNA railgear equipment. Applicable railway company procedures and policies must be adhered to.
- Before performing any work under the vehicle or railgear, ensure the engine is turned off and the parking brake is set.
- Beware of all pinch points on the railgear and keep all parts of the body clear.
- Always disconnect the vehicle's battery when welding on the vehicle or railgear to protect the vehicle's electrical system.

CONTENTS

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1.0 GENERAL INFORMATION

WORK AREA

The work area in which the railgear is to be installed should meet these minimum requirements to facilitate the installation and conditions that allow the work to be completed in a safe, accurate and timely manner.

- Floor – The floor should be level to provide good measurements required to check alignment of the railgear. The floor should also be sufficiently hard to prevent damage by the railgear wheels.
- Lighting – The work area should be adequately lighted.
- Space – There should be enough space to maneuver the railgear components into position and to safely work around other equipment.

TRUCK CONDITION

Before installation, the truck should be checked in some important areas.

- Tires – The tire pressure should be checked for the manufacturer's recommended inflation and checked for consistent pressure readings from all tires. This will ensure correct traction of the tires on the rails. In addition, the condition of the rear tires must be determined. If they are worn, they should be replaced.
- Alignment – Rear truck axle should be square with the truck frame. G&B Specialties recommends that a reputable alignment shop should check this. 0- degree thrust angle (which can be different that the manufacturer's specification) is required for proper railgear operation.
- Frame and Suspension – On a new truck these should be in good condition. On a used truck, the frame should be inspected for damage. The suspension components should also be checked for damage or wear. If any problems in these areas are not corrected, it will cause difficulty aligning and operating the railgear.
- Transverse Torque Rods – On vehicles that will regularly experience high center of gravity loads on rails, it is advised to install rear tandem control rods to limit transverse axle displacement. This is also necessary on long wheelbase vehicles to limit front tandem walking off in tight radius curves.

PRELIMINARY INSTALLATION

Roll the rear railgear up on the rear installation rails under the truck frame in the back. The railgear is usually installed with the safety pin offs on the rear. However, truck bodywork may dictate locating pin offs in the front.

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2.0 HYDRAULIC SYSTEM CONNECTION

NEW HYDRAULIC SYSTEM

If G&B Specialties' railgear is to be the only hydraulic components and there is not an existing hydraulic system, equip the truck with a 5 to 7 GPM, 2500-PSI pump, Suction Filter and a 5-gallon reservoir. The tank should have a minimum of one suction port (3/4" NPT), one return port (1/2" NPT) and a tank filler-breather. Fill the tank with UNAX Oil Rx 46 or equivalent hydraulic oil.

Route a pressure line (SAE 100r2-8 and –8JIC swivels at each end) from the pump to the center of the front bumper. The in port of the hydraulic control valve is connected to the pressure line. The outlet port of the front hydraulic control valve is routed to the inlet port of the rear hydraulic control valve. The outlet port of the rear hydraulic control valve is connected to the return port in the hydraulic reservoir. See **Figure 2-1**. The remaining ports on the front valve are connected to the front cylinders. The bottoms of the both cylinders connect, with a tee at the valve, to the same valve port. Check that proper hose clearance is obtained to avoid chafing and shield hoses if necessary.

WARNING

Be certain that front and rear valves are plumbed correctly. Each valve port is marked "INLET" or "OUTLET". Plumbing valve backwards will result in an unsafe condition, possible injury and/or damage.

EXISTING HYDRAULIC SYSTEM

If the truck has an existing hydraulic system, install an appropriately sized diverted valve in the pressure line after the pump and before any existing equipment valves. One-outlet routes to the existing valves and the other to the center of the front bumper. The in port of the hydraulic control valve is connected to the pressure line. The outlet port of the front hydraulic system valve is routed to the inlet port of the rear hydraulic control valve. The outlet port of the rear hydraulic control valve is connected to the return port in the hydraulic reservoir. See **Figure 2-2**. The remaining ports on the front valve are connected to the front cylinders. The bottoms of both cylinders connect, with a tee at the valve, to the same valve port. Check that proper hose clearance is obtained to avoid chafing and shield hoses if necessary. Directly after the pump, it is good practice to install a relief valve, set for the system pressure to provide overpressure protection for the pump.

Note:

Railgear valves have built in pressure reliefs and the hydraulic working pressure of the system is 2000 PSI. The front valve is pre-set to 1500 PSI at the relief and the rear valve is pre-set to 2000 PSI. All other components supplied by G&B Specialties are rated 2500 PSI. Care must be exercised that the relief pressures at the valves don't exceed this. To ensure proper system pressure, check with a gauge.

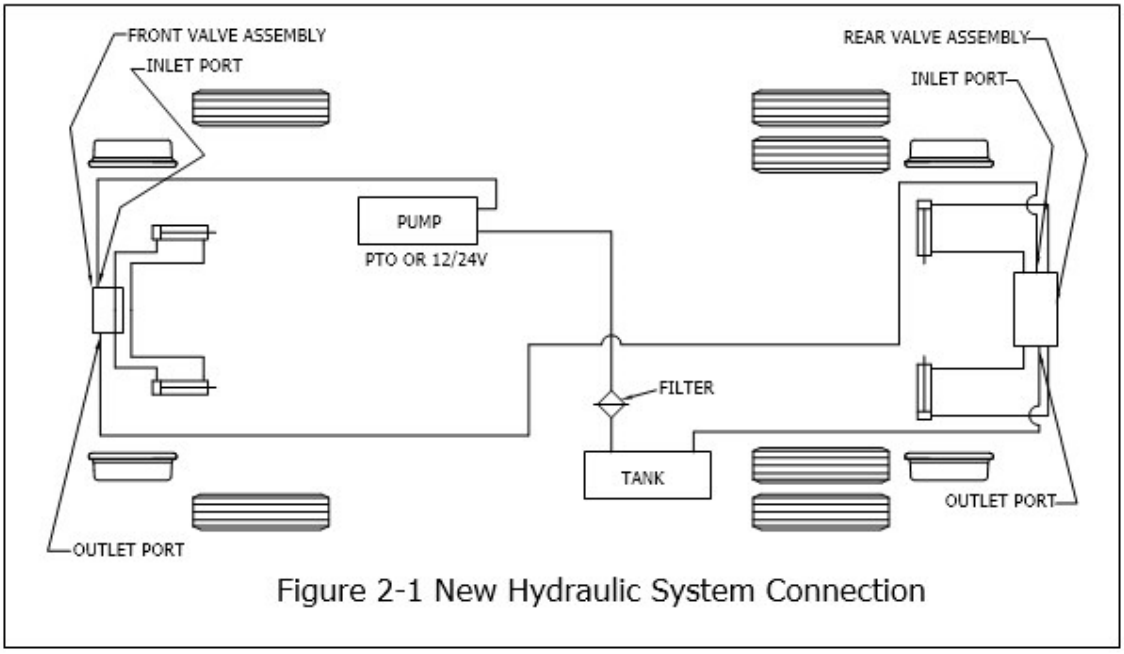


Figure 2-1 New Hydraulic System Connection

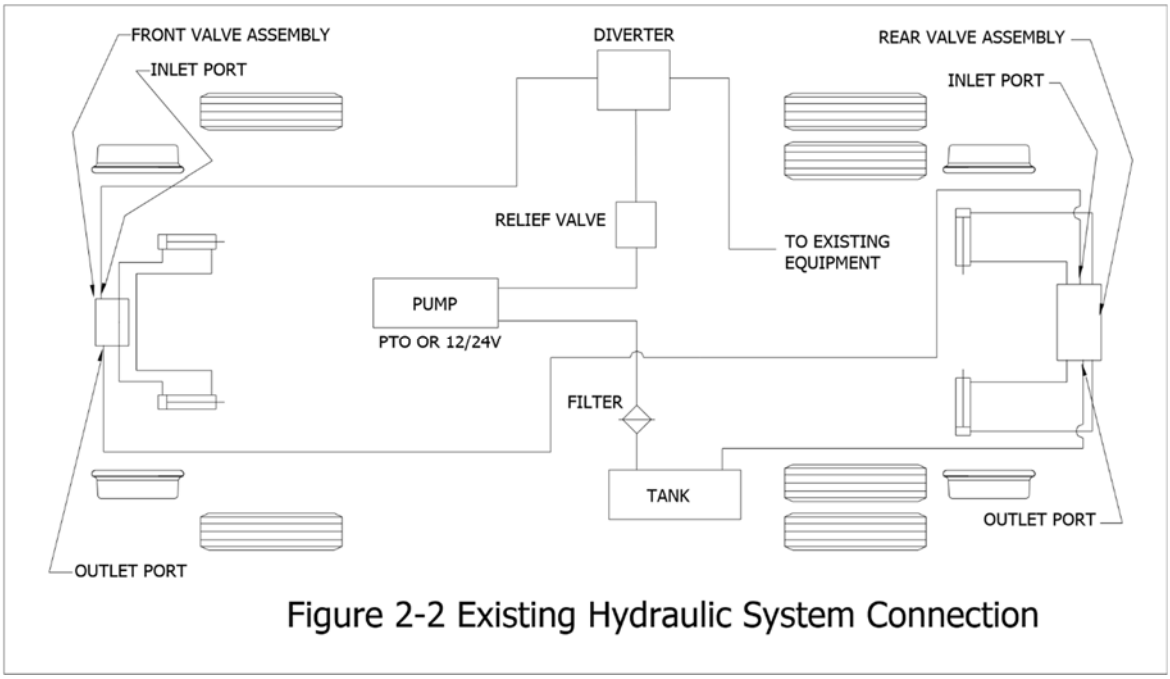


Figure 2-2 Existing Hydraulic System Connection

3.0 FRONT RAILGEAR INSTALLATION

Note:

If the vehicle has been supplied with an integral extended front frame, then frame extensions will most likely not be required. The front valve plate can be welded directly to the extended front frame.

PRELIMINARY INSTALLATION

1. Remove front truck bumper.

2. Bolt/weld a frame extension to the truck frame as required. Make sure that tilt cabs or hoods will clear the frame extensions when opened. Trim the brackets and gusset as necessary. All truck frame extensions with bolt-on brackets must use 5/8"-11 bolts minimum, hardened steel washers, and grade-8 prevailing torque locknuts. All the grade-8 hardware should be tightened to the hardware manufacturer's specifications. Check that the frame extensions are level, and square with the truck frame.

3. In normal applications, mount the front valve plate assembly between the front frame extensions (with the hydraulic valve underside and the handle facing forward) and weld valve plate in place. In case this is not possible, mount the valve plate in the most appropriate, and easily accessible location.

4. Check to make sure that there is a minimum of 65" between the tires for the railgear to operate.

5. Before installation make sure that you have the correct link arms for your vehicle. The correct arms will allow the railgear to fully engage the rails and not interfere with the truck itself throughout its range of motion.

INSTALLATION RAILS

When installing Railgear it is necessary to get proper tire traction on the rail. This is accomplished by employing standard gauge rails, or surrogate "installation rails" (which can be fabricated from 3" square steel tubing per Figure 3-1) during installation of your railgear, to properly set the mounting height of the system. Make sure you have something ready to use as surrogate installation rails but do not position your vehicle on them at this time. These "rails" can be simple 2x4's or steel "C" channel, as long as they are level, will not crush under the weight of the vehicle, cannot move or tip over, and are tall enough that the wheel edge does not hit the ground.

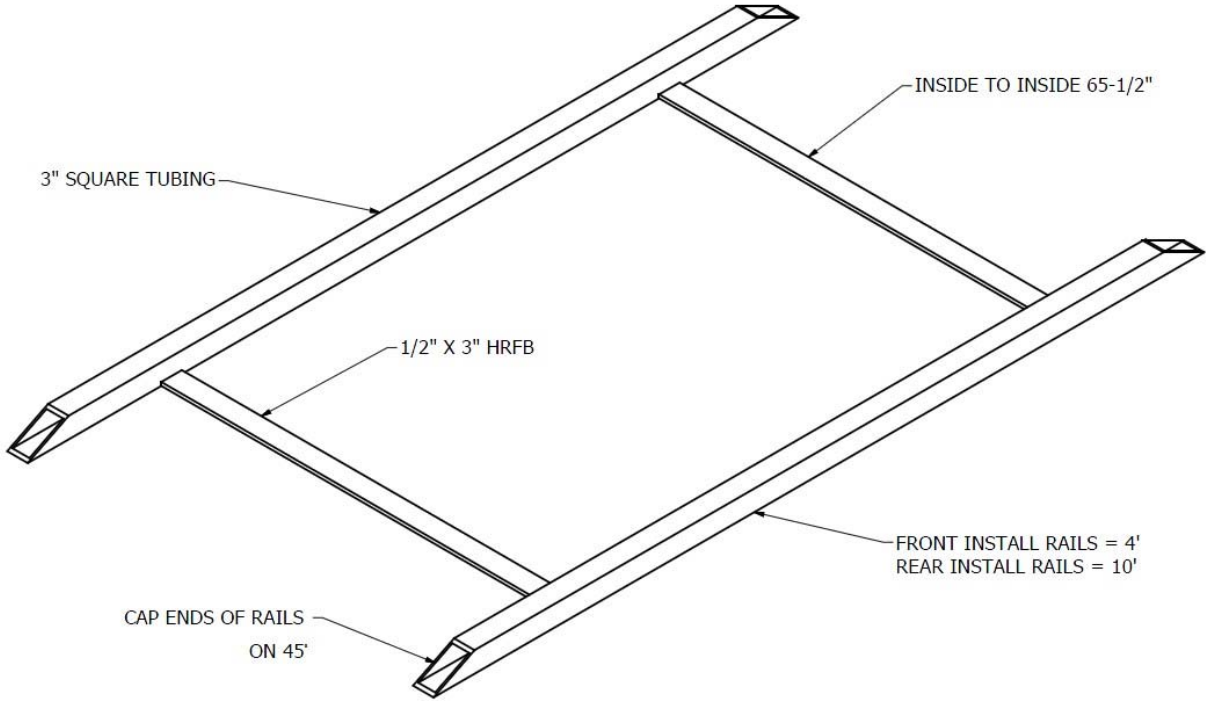


Figure 3-1 Front and Rear Installation Rails

FRONT RAILGEAR INSTALLATION

Figures of Key Features

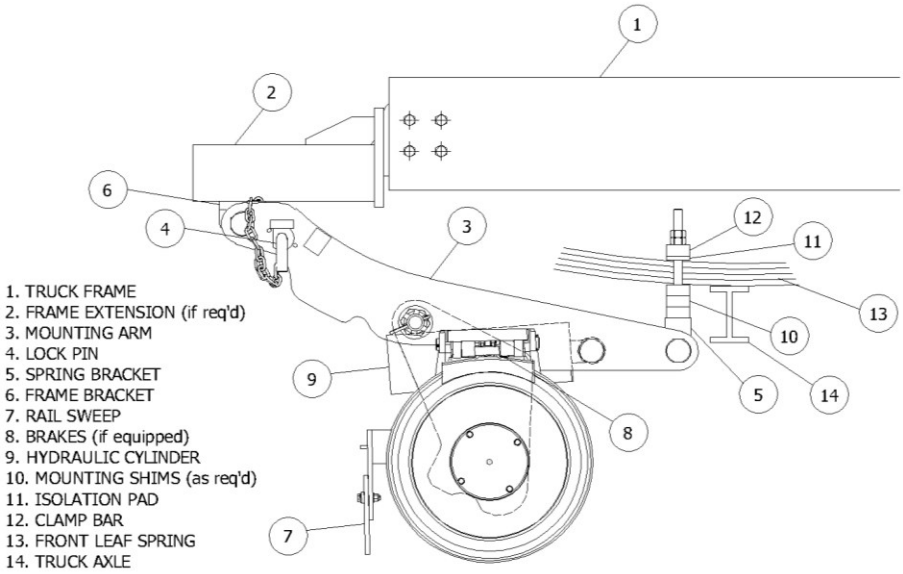


Figure 3-2 Front Railgear Components

WARNING

Before rotating front gear, ensure the axle is positioned correctly or damage to the cylinders could occur. (Figure 3-2)

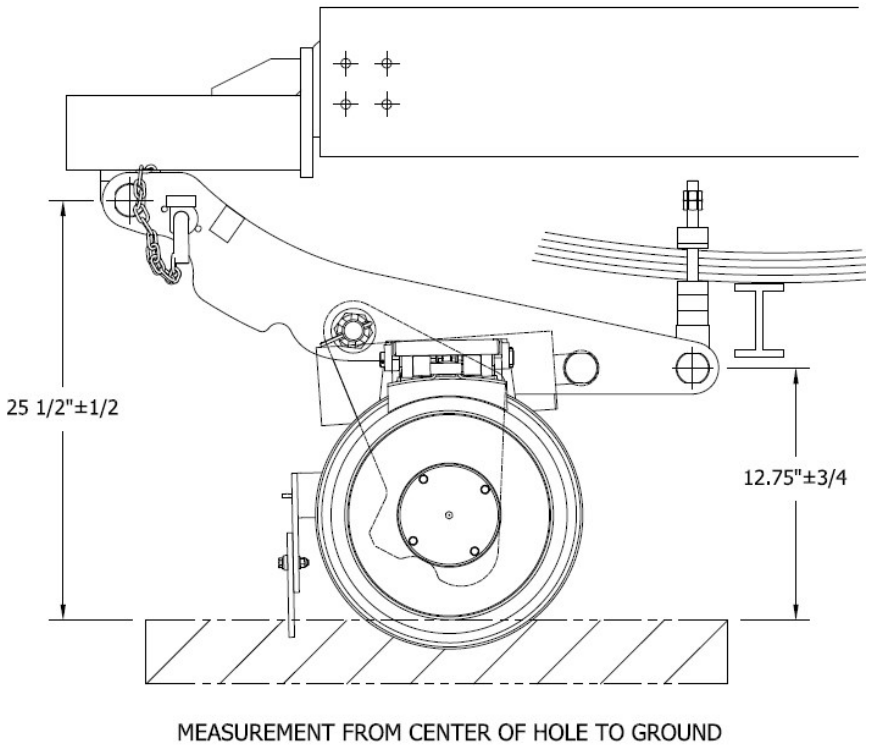


Figure 3-3 Critical Height Measurements

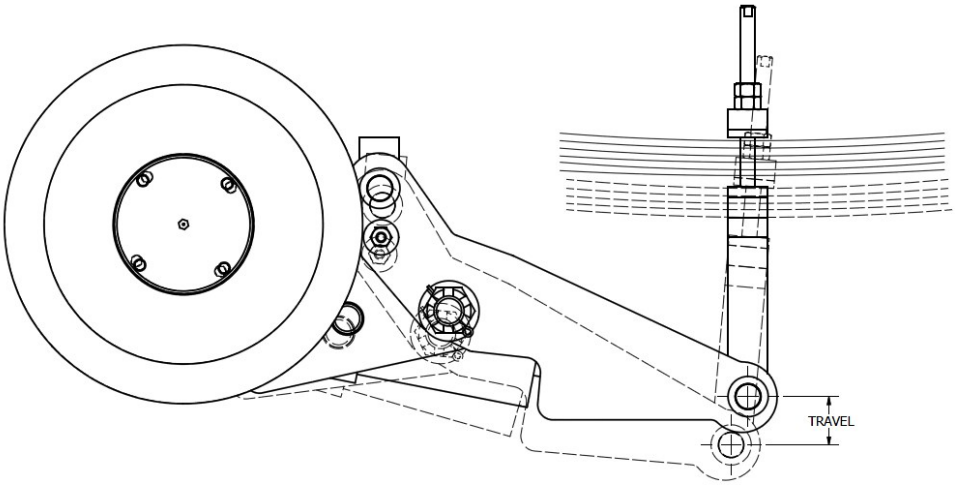


Figure 3-4 Interference Range

Clearance Note:

Proper clearance will allow the railgear to move up and down with the truck's front suspension. As the truck tire bumps on the road, the truck spring allows the front axle to move upward. Since the railgear is attached to the spring just forward of the front axle, sufficient clearance must be allowed to prevent interference with other truck parts. The front mounting pin does not move in relation with the truck frame because it is fastened to the frame extension or the truck frame. As the front mounting pin does not move and the rear-mounting pin does, the railgear effectively rotates around the front mounting pin. Therefore, the part of the railgear near the rear mounting pin moves more that the part near the front mounting pin and attention needs to be paid to possible clearance problems that this movement may cause.

Note:

If the vehicle has been supplied with an integral extended front frame, then frame extensions should not be necessary. The frame-mounting bracket can be brought up to the extended frame. Follow all instructions for finding the proper ground clearance with frame extensions. Solid or load bearing spacers may be required to obtain the proper ground clearance to the front mounting pin.

MOUNT SPRING BRACKET

- Slide the Railgear under the truck frame, positioning the spring bracket hangers as close to the front truck axle as possible. Have a minimum of half of the spacer sitting on the spring. The hanger can be move a max of 6" from the truck axle.
- Once in position use floor jacks under the outboard and inboard long arm on the driver's side. Use jack to raise spring hanger toward trucks spring leaves. Raise until the rear mounting pin is 12.75" from the ground.
- Once at the correct height attach the spring bracket to the truck spring using a rubber spacer directly on top of the leaf springs. Then use flat bar to secure the spring hangers.
- Tighten until the rubber spacer just begins deforming.
- Repeat on passenger's side.

Spacers will need to be added to ensure spring bracket is 12.75" from the ground.
The spacers are to be placed between the spring bracket, and the underside of the truck spring. After lifting the Link Arms into place, attach the spring brackets to the truck spring, using two ¾"-10 hex nuts per stud. Push the spring brackets against the axle beam and tighten the hex nuts onto the top spacer to cage the springs. The front railgear can now be actuated with the hydraulic system, which will easily position the front of the Link Arms to the level of the frame extensions for securement. The frame needs to be raised just enough to touch the frame extensions or truck frame.

To check the spring bracket location, check:

- That the spring bracket to truck axle is the same on both sides.

MOUNTING CROSS TUBE

- Ensure that both spring brackets are installed correctly before installing the mounting cross tubes.
- Remove the front pins offs and make sure the steering tires are pointed forward. Actuate the hydraulic cylinders which will allow for the long arms to be raised toward the frame. The cross tubes must be elevated until touching the frame or extension.
- The center of the front mounting pin must be 25.5" from the ground. If required, up to 3" of load bearing shims may be used to achieve the correct height. If more than 3" is needed, a mounting block may be required.
- The hydraulic cylinders should be properly positioned to hold shims in place until alignment can be completed.
- Check the truck frame and make sure that there is no interference with the railgear.

TIRE CLEARANCE

Note:

When the railgear is completely lowered the front of the truck tires should be approximately 2 inches from the top of the installation rails. If the test is being done off-rail, the wheel flange will add an extra inch and a quarter of height, so the wheel should be about 3.25" off the ground (Use a smooth hard surface for this! If the vehicle sinks into the ground, getting accurate measurements will be impossible). The front and rear mounting pins may be lowered to allow for tire clearance. Minimum height for the mounting pin is 23" on front and 10" on rear. This allows the railgear to have a minimum of 8" ground clearance when in the road position.

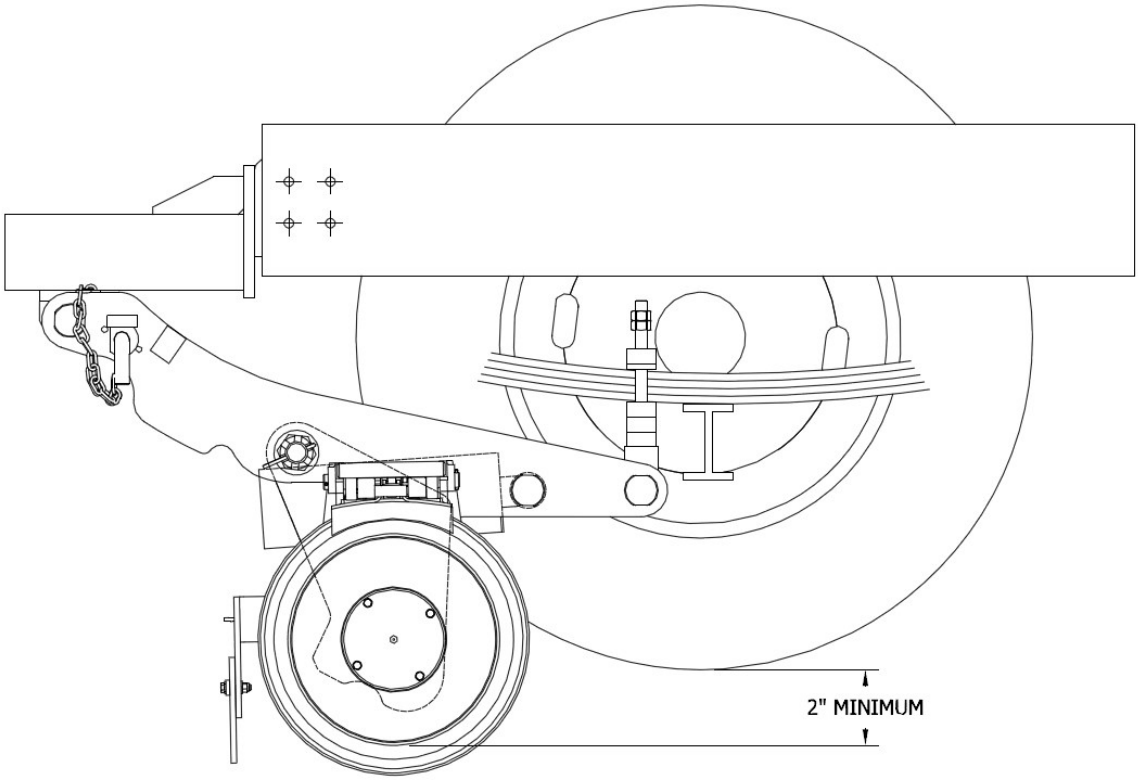


Figure 3-5 Front Tire Clearance

Note:

Because the angle of the cobra brakes needs to be set before welding the front railgear axle, you should now begin brake installation.

4.0 FRONT COBRA BRAKE/RAILSWEEP INSTALLATION

COBRA BRAKE GENERAL INFORMATION

First an air toggle valve will need to be installed in the instrument panel of the vehicle. This valve disconnects the railgear brake system when not in use.

On the front valve plate assembly, and rear frame bracket, a relay valve will be located. The control line feeding this relay valve comes from the control valve described above. The supply line to this relay valve comes from the check valve screwed into the air reservoir. There is a ball valve and a pressure regulator inline between the check valve and relay valve. The ball valve will disconnect the railgear brake system from the vehicle air system regardless of the position of the air toggle valve. The pressure regulator will allow adjustment of the front to rear bias, so that both axles will brake evenly and not allow one axle to lock, which would cause the wheels to slide.

The railgear Cobra Brake Assembly brake actuators are connected to the delivery ports on the railgear air relay valve.

KIT COMPONENTS

Table 4-1 Air Brake Kit

K-R1150BXVX001 AIR BRAKE KIT, FRONT (R1110/50)		
Part #	Description	Qty
R-11076A	Operating Valve Assembly	1
R-19035	Air Brake Hose	1
R-19039	Air Brake Hose	1
R-19033	90 Degree Elbow, Male Flare X 3/8 NPT	2
R-32030D	Brake Assembly, Drivers Side	1
R-32030P	Brake Assembly, Passengers Side	1
K-R11BXVX002B	Air Brake Control Kit	1
K-R1150RSFR001 RAIL SWEEP KIT, FRONT (R1110/50)		
Part #	Description	Qty
R-16589D	Rail Sweep Assembly, Drivers Side	1
R-16589P	Rail Sweep Assembly, Passengers Side	1
R-990KIT-436	Hardware Kit, Rail Sweep/Air Brake	1

INSTALLATION

Install airlines and valves as shown in Air Brake Schematic, Figure 4-2. Make certain that the front air brake pressure regulator is set to 75 PSI.

It is the responsibility of the installer to supply the required air to the in-cab control valve, and from the in-cab control valve to the relay valve. The hoses, fittings etc., required for this connection are not included in this kit.

Note:

The brakes should not be tested until the front railgear unit has been fully welded on the vehicle.

1. The brakes/sweeps bolt to the collars on the axle. Welding the collar is unnecessary.

2. Fasten the brakes with the provided hardware, as shown in Figure 4-1, through the railsweep bracket (use longer provided bolts on the side with the railsweep) towards the front of the vehicle.

3. Repeat step 2 for other side of axle.

4. Proceed to plumb brakes as shown in Figure 4-2.

Note:

The sweeps should only be adjusted with the front railgear unit in the fully lowered rail position, and with the axle and brake/sweep mounting bracket angled 5°down toward to the running surface of the rail, as is required for the brake assembly.

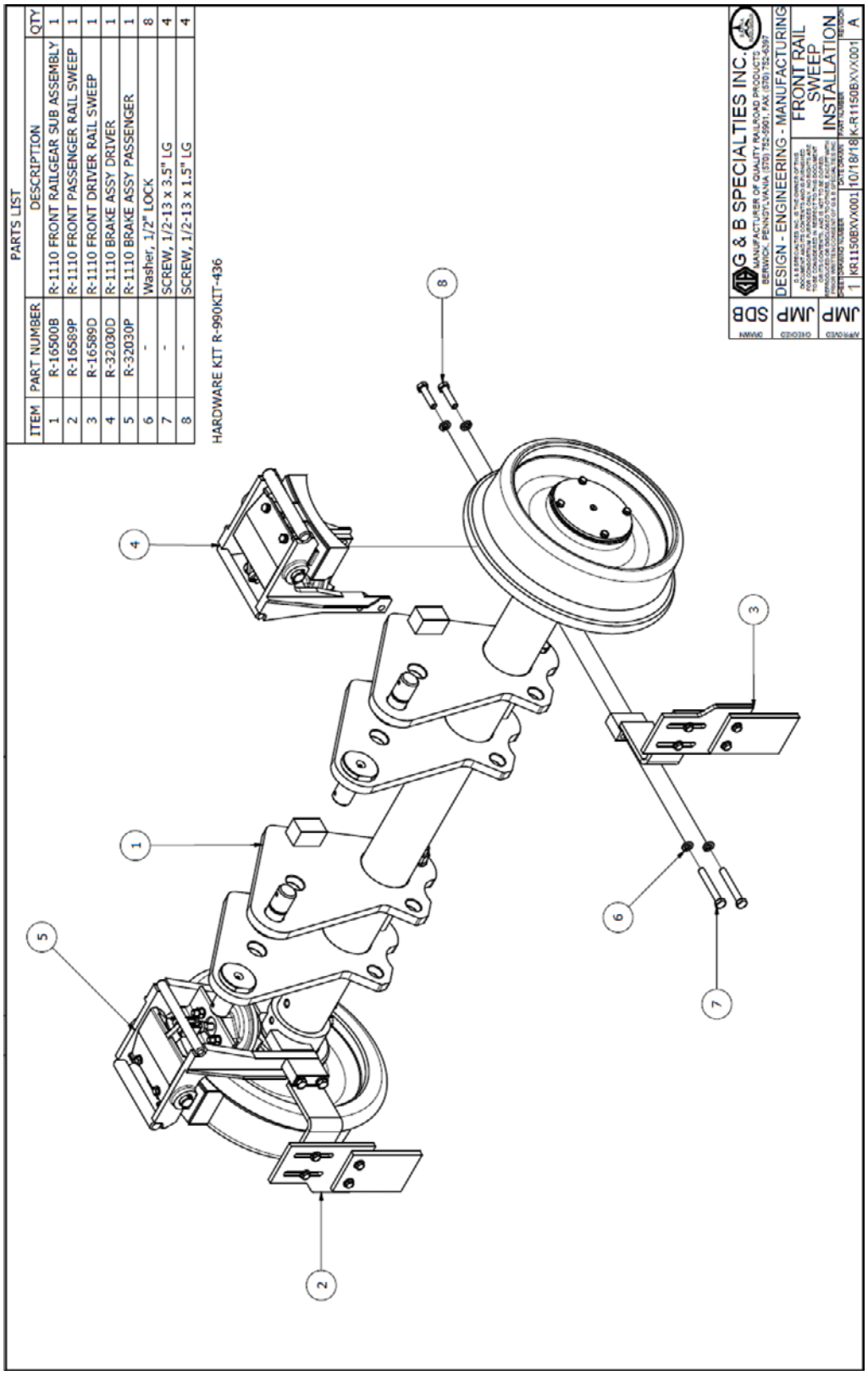
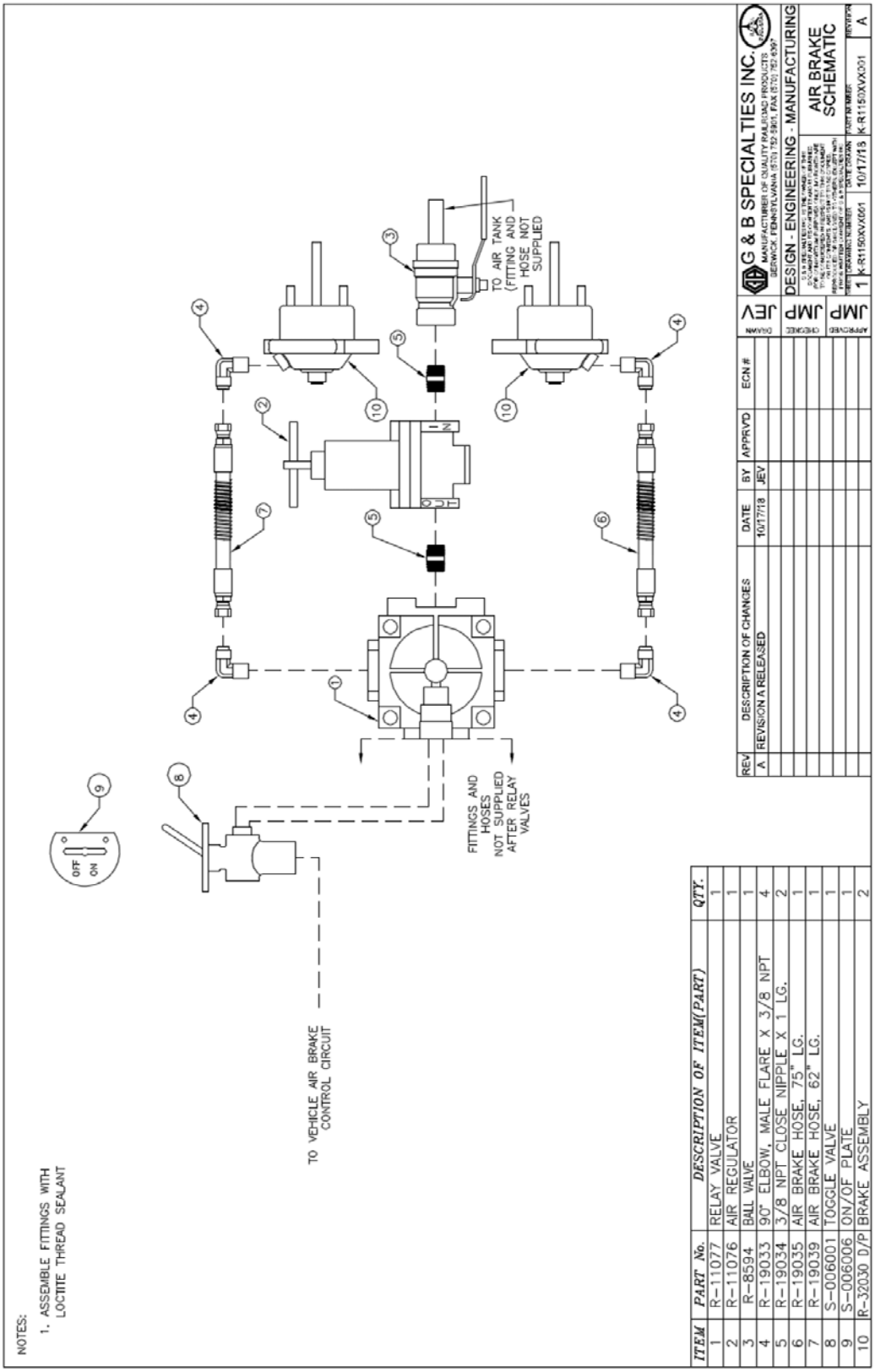


Figure 4-1 Rail Sweep Installation with Cobra Brakes



ITEM	PART No.	DESCRIPTION OF ITEM(PART)	QTY.
1	R-11077	RELAY VALVE	1
2	R-11076	AIR REGULATOR	1
3	R-8594	BALL VALVE	1
4	R-19033	90° ELBOW, MALE FLARE X 3/8 NPT	4
5	R-19034	3/8 NPT CLOSE NIPPLE X 1 LG.	2
6	R-19035	AIR BRAKE HOSE, 75" LG.	1
7	R-19039	AIR BRAKE HOSE, 62" LG.	1
8	S-006001	TOGGLE VALVE	1
9	S-006006	ON/OF PLATE	1
10	R-32030 D/P	BRAKE ASSEMBLY	2

Figure 4-2 Brake Pneumatic Schematic

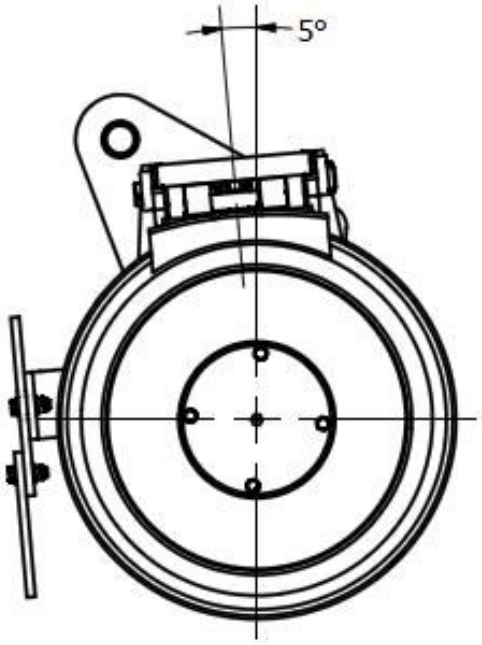


Figure 4-3 Brake alignment

BRAKE ADJUSTMENT/TESTING

1. Proceed to the next section and weld the front railgear axle before testing brakes!

2. There is a jam nut and clevis located on the threaded rod attached to the air brake chamber. This is used to adjust the gap between the wheel and brake shoe.

3. Operate the vehicle on a test track. With the air toggle valve in the "on" position and the ball valves open, check that:

    - When the vehicle brake pedal is depressed, the railgear brake clamps the rail wheel enough to slow its rotation but not enough to stop its rotation. The rail wheels should not be allowed to lock up.

    - That the brakes release properly when the pedal is released.

If the brakes do not function properly, contact a service representative at G&B Specialties.

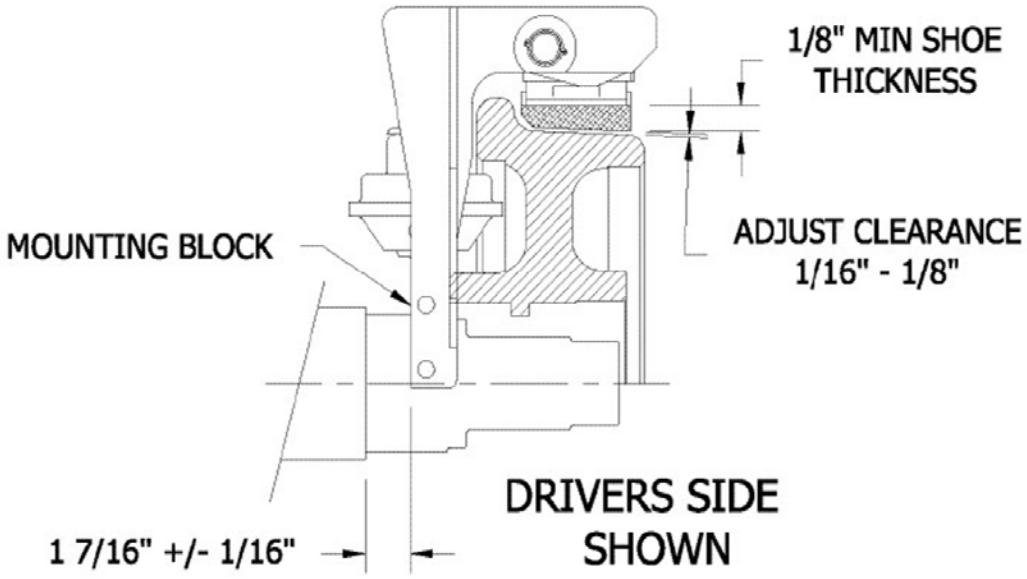


Figure 4-4 Brake Dimensions.

FRONT RAILGEAR ALIGNMENT

Now that the brakes are attached, the front railgear is now ready to be aligned and squared. Three measurements need to be taken to ensure that everything is properly aligned. Before welding, ensure brakes have 5 Degrees offset, as shown in Figure 4-3.

To align to link arms, check:

- That they are parallel with each other and the truck frame.

The distance between the Link Arms should be the same at the front mounting pin as it is at the rear-mounting pin. This prevents the railgear from binding during up and down movements. In addition, the distance from the truck frame to the Link Arms should be uniform on both sides of the railgear.

- That they are the same distance forward.

Measure the distance from the front mounting pin to the common point on the truck frame. If the measurements are off, square the railgear by loosening the nuts on spring hanger and move the appropriate distance, then re-tighten.
Measure the distance from each spring hanger back to the truck axle. Since the forward position of the Link Arms has been verified in step (2), an off measurement here probably means that the truck axle is miss-aligned and needs to be corrected.

After these alignment checks, and after ensuring that there is sufficient clearance, the frame mounting brackets can be tack welded to the frame extensions, as shown in Figure 4-6.

Note:

Do not attach welding ground clamp to the railgear wheels. This will cause arcing across the bearings and lead to premature bearing failure.

Raise the front rail wheels just above the floor, making sure there is enough room to slide the surrogate installation rails under the railgear wheels.

Because the railgear axle assembly is not fixed to the pivot arms, the rail wheels will need to be centered. To center the wheels, measure the distance from the inside of the rail wheels to the truck frame. If the measurements are not identical, slide the axle assembly in the appropriate direction and re-check rail wheel to truck frame distances. With the axle tube now centered, tack weld the axle tube to the outer pivot arms.

The front railgear is now ready to be lowered onto the installation rails. When the railgear is completely lowered, the front truck tires should be about 2" off the top of the installation rails. If the railgear will not lift the truck, check that the cylinders are not cross plumbed. If they are not, and the railgear still will not lift, you may need to adjust the hydraulic pressure. Check that the system pressure relief valve, and the front hydraulic control valve are both set high enough for your application.

Note:

Hydraulic pressure is set at the factory, and is sufficient for most typical installations, so always check for other operational issues before increasing pressure. All hydraulic adjustments must be done by a qualified technician who is familiar with hydraulic operation and should be performed in small increments.

As a final review, recheck the center alignment of the railgear wheels to the truck frame. If it is off, break the tacks between the outer pivot arms and the axle tube, move the axle tube to the correct position and re-tack.

FINAL FRONT INSTALLATION

Ensure that the hex nuts on the spring hangers are tight and secured with Loctite Red or equivalent thread compound. Remove the excess stud length from both spring hangers. Leave approximately 1" of threads above the hex nuts. If these studs are not trimmed, they may cause a clearance problem with other parts of the truck.

After the studs are trimmed, you may hard-weld tacked components as shown in Figure 4-6. Weld as follows:

- Weld inboard side of outside pivot arms to axle tube all the way around.
- Fully weld, on all sides, front mounting blocks / cross tubes to truck frame.
- If shims were required, fully weld shims into place on all sides for each shim location.

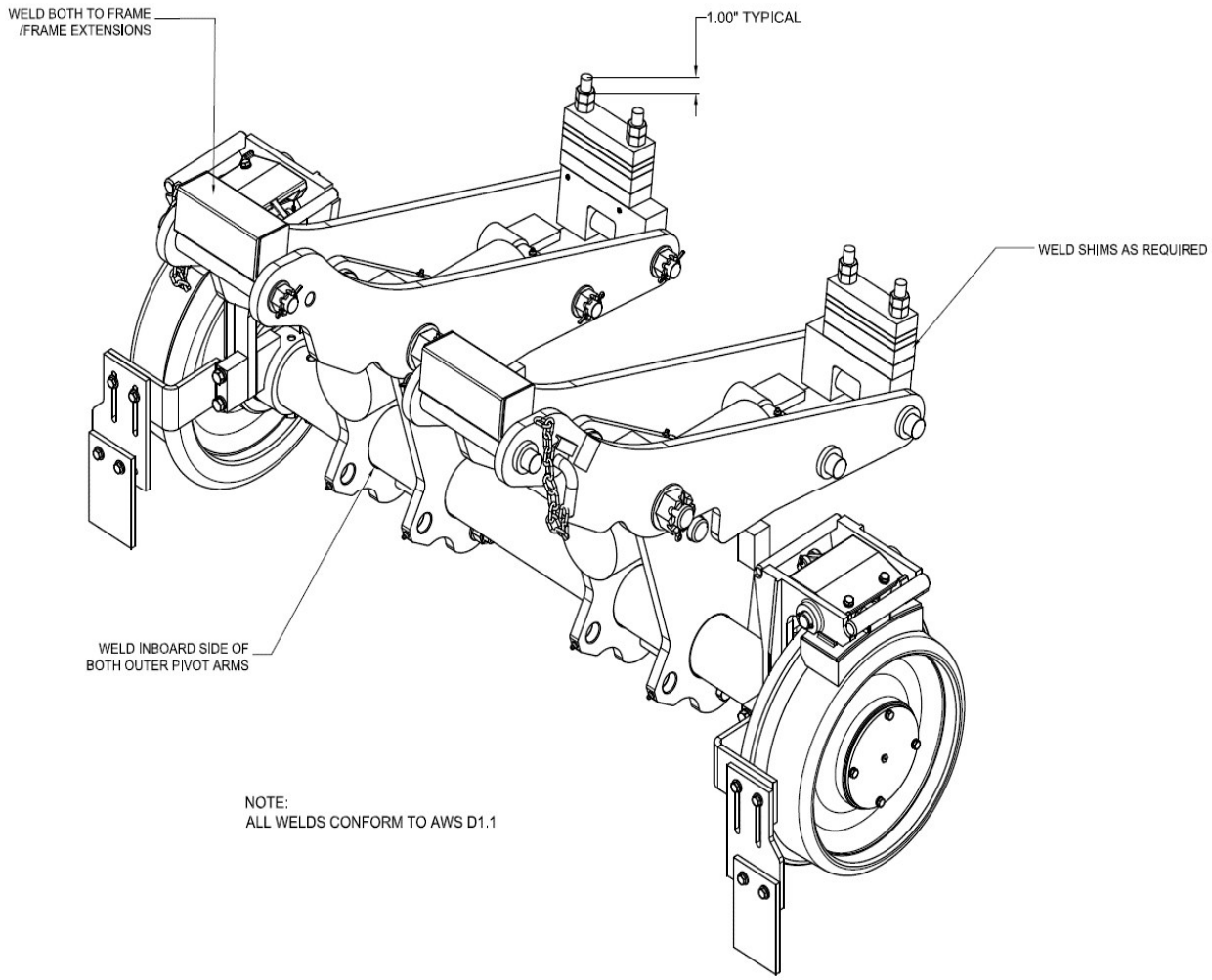


Figure 4-6 Welding Diagram

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5.0 REAR RAILGEAR INSTALLATION

Note:

This section is for reference: please see MIO-R13RXX001 for units equipped with R-1130 rear railgear.

Note:

It is important to check truck tire pressure (especially the rear tires) to be sure that it is at the manufacturer's recommended level.

With the truck on the rear installation rails, position the rear railgear as close to the rear tires as practical (allowing clearance for mud flaps). The following table gives standard location and clearance guidelines for the rear railgear. Generally, it is advisable to leave a minimum of 2" clearance to any tire, spring or suspension component.

Minimum Distance From:	Single Axle	Tandem Axle
Tire to rail wheel center	15 ¼"	11 ¼"
Minimum Truck Frame Extension (from tire)	21 ¼"	17 ¼"
Overall Rail Guide Clearance (from tire)	24 ¼" x 19"	20 ¼" x 19"

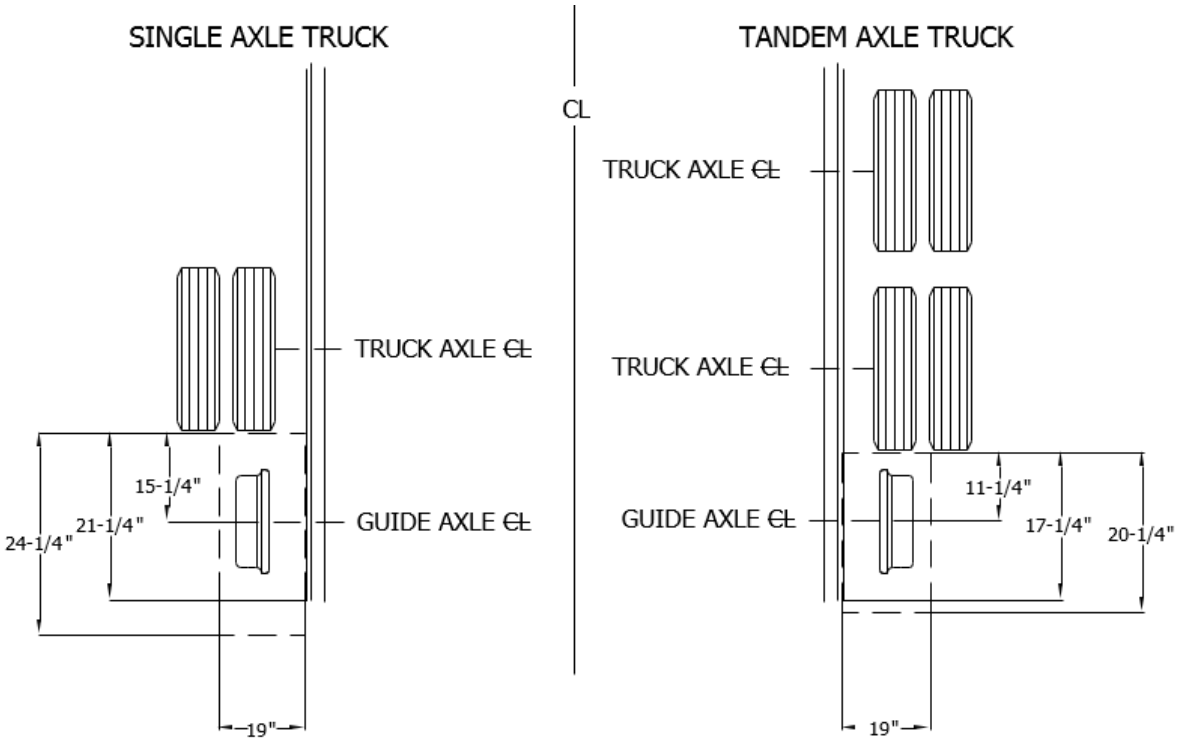

Figure 5-1

If the truck frame does not extend a minimum of 21 ¼" for a single axle or 17 ¼" for a tandem axle truck, beyond the rear tire/mud flap, it should be extended to provide the necessary clearance for mounting the railgear.

In addition, while the railgear typically drops straight down, it can also articulate from side to side, to allow alignment of the vehicle with the rail. As such, a clear space must extend from the frame outward on either side for at least 19”**.**

REAR SPACER INSTALLATION

Before proceeding, place a temporary 6” x 6” x 3/8” wall steel tube spacer between the truck frame and railgear mounting plate. Actuate both rear cylinders to raise the rear railgear mounting plate to the truck frame.

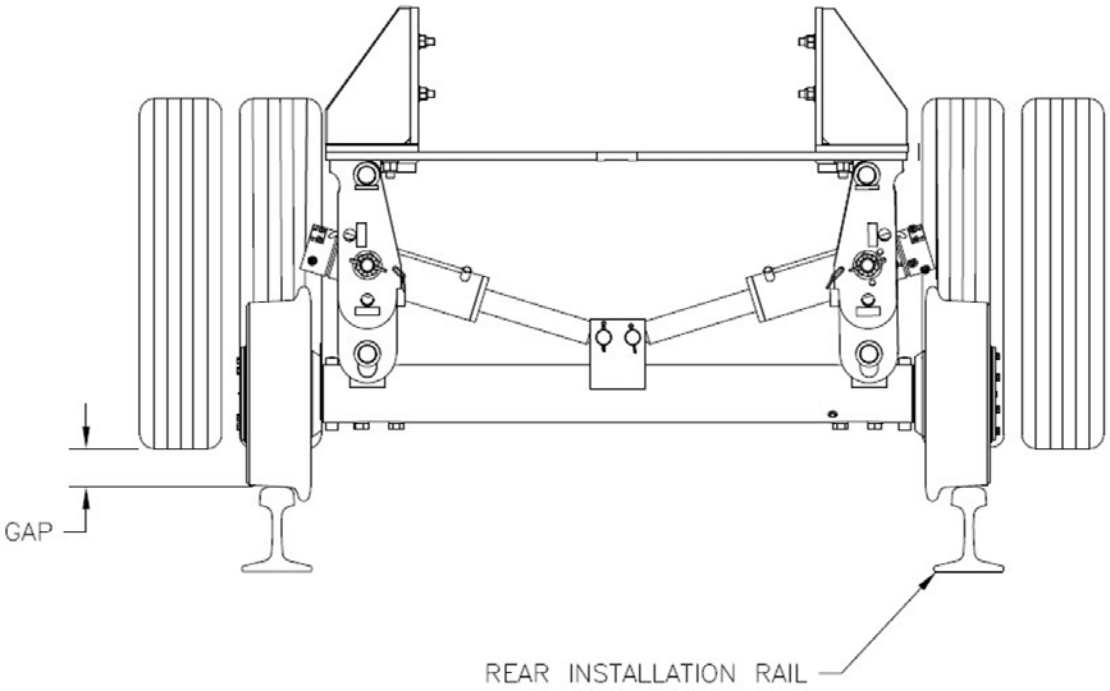

Figure 5-2

Note:

Temporarily secure the rear railgear in place to prevent any movement during the remaining installation.

Raise the rear mounting plate and the truck frame to lift the truck wheels off the rear installation rails. Measure the gap between the truck tires and the rear installation rails. In general, the truck spring deflection equals 6” minus this gap. To calculate the required spacer thickness, multiply the spring and tire deflection by 60%. The formula is:

Calculated Spacer Thickness= (6.0”-Gap) x .6

The following table shows the calculated spacer thickness for several common gaps. Use the table below as a quick reference. Please note, the actual measurements may vary slightly, and should be calculated before fabricating a spacer out of solid steel pieces. This spacer will bear the full force of the vehicle rear axle and should not be hollow.

Table 5-1

If Gap =	Spring and Tire Deflection (6.0" -Gap)	Calculated Spacer Thickness (6.0 -Gap) x .6
5"	1"	¾"
4"	2"	1 ¼'
3"	3"	1 ¾"
2"	4"	1 3/8"
1"	5"	3"

Release the clamps holding the rear railgear mounting plate to the truck frame. Collapse the railgear to its folded position (which will lower the truck tires down to the installation rails). Replace the temporary 6" spacers with the permanent, calculated spacers, and tack in place onto the rear railgear mounting plate.

Extend the rear railgear to the rail position (which will raise the truck frame). The truck inner duals should be flat to slightly cupping the installation rails. Too much weight on these tires (truck frame to low) will cause rapid tire wear. Not enough weight (truck frame too high) will cause spin and poor braking.

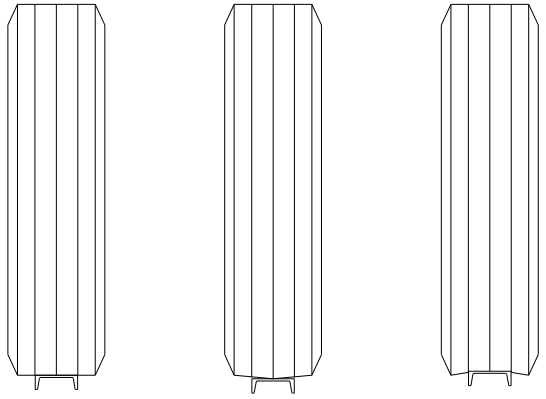

Figure 5-3

If necessary, adjust the spacer thickness to achieve proper tire cup on the installation rails.

SQUARE REAR RAILGEAR WITH TRUCK AXLE

Once the proper spacer height, and the railgear has been spaced away from the rear truck tires, the rear railgear needs to be made square with the rear truck axle. Four measurements must be taken to ensure this requirement.

- The distance from the truck axle to the Rear Railgear at both ends. Distance "A" must be equal to "B" (within 1/16").

- The diagonal distance from the truck axle to the opposite side of the Rear Railgear.

Distance "C" must equal "D" (within 1/8")

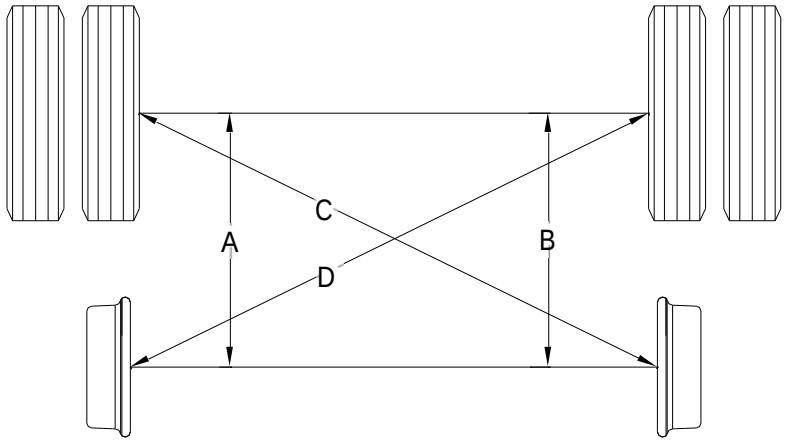

Figure 5-4

Note:

Although the previous mounting conditions and alignment may be met, be certain that enough room exists between the rear railgear and other equipment. As previously stated, this should include a 2" clearance around the Railgear (more if equipped with remote pin offs). Also, ensure that there is clearance to remove the pin offs from their holes.

FINAL REAR INSTALLATION

Using the mounting plate as a template, drill four 21/32" dia. holes through the truck frame. Locate the mounting plate to allow for maximum adjustment of the rear railgear mounting plate. Bolt the mounting plate on the rear railgear mounting plate and truck frame with 5/8"-11 grade 5 bolts and Nylock nuts. Tack weld the mounting plate to the rear railgear mounting plate. If readjustments are needed later, the welds can be ground off and the rear railgear mounting plate can be slid up or down by loosening the bolts in the slots.

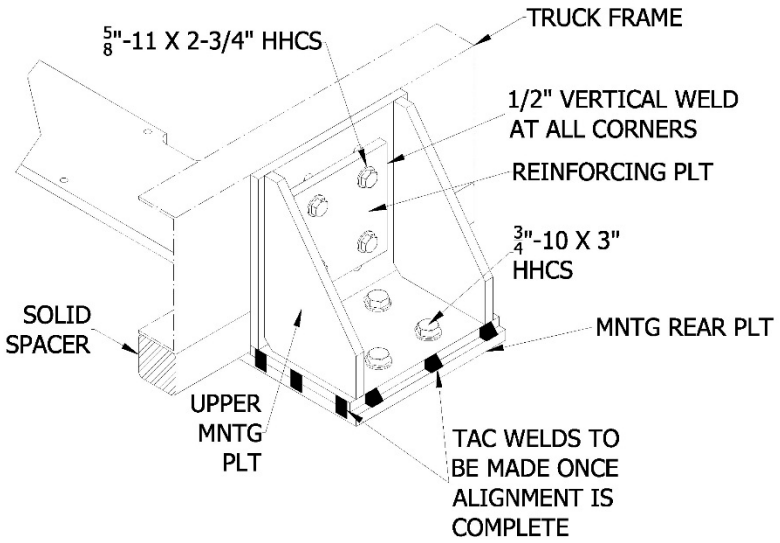

Figure 5-5

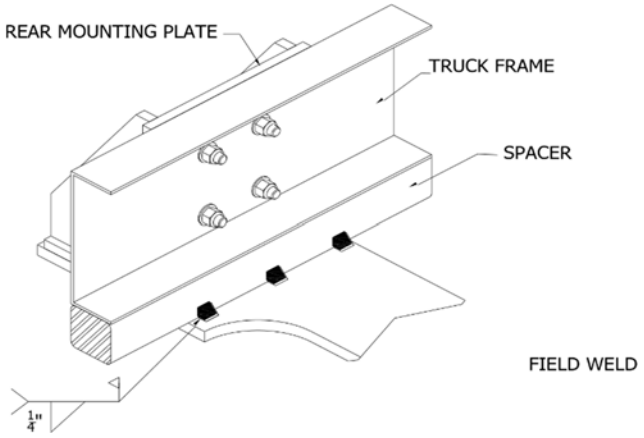

Figure 5-6 Welding Of Spacer

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6.0 OPTIONAL EQUIPMENT

RAIL SWEEPS

Units with Brakes

On units equipped with brakes, front and/or rear, the rail sweeps are assembled on the railgear prior to shipment.

Units without Brakes

On units without brakes, rail sweeps are assembled on the railgear prior to shipment.

Rail Sweep Adjustment

Adjust the rubber sweeps so that they are slightly touching the rail head.

BRAKES

Plumbing Installation

An air toggle valve will need to be installed in the instrument panel of the vehicle. This valve disconnects the railgear brake system when not in use.

On the front valve plate assembly and rear frame bracket, a relay valve will be located. The control line feeding this relay valve comes from the control valve described above. The supply line to this relay valve comes from the check valve screwed into the air reservoir. There is a ball valve and a pressure regulator inline between the check valve and relay valve. The ball valve will disconnect the railgear brake system from the vehicle air system regardless of the position of the air toggle valve. The pressure regulator will allow adjustment of the front to rear bias, so that both axles will brake evenly and not allow one axle to lock and slide.

The railgear Cobra Brake Assembly brake chambers are connected to the delivery ports on the railgear air relay valve.

Install airlines and valves as shown in the **Air Brake Schematic**. Make certain that the front air brake pressure regulator is set to 75 PSI and the rear air brake pressure regulator is set to 30 PSI.

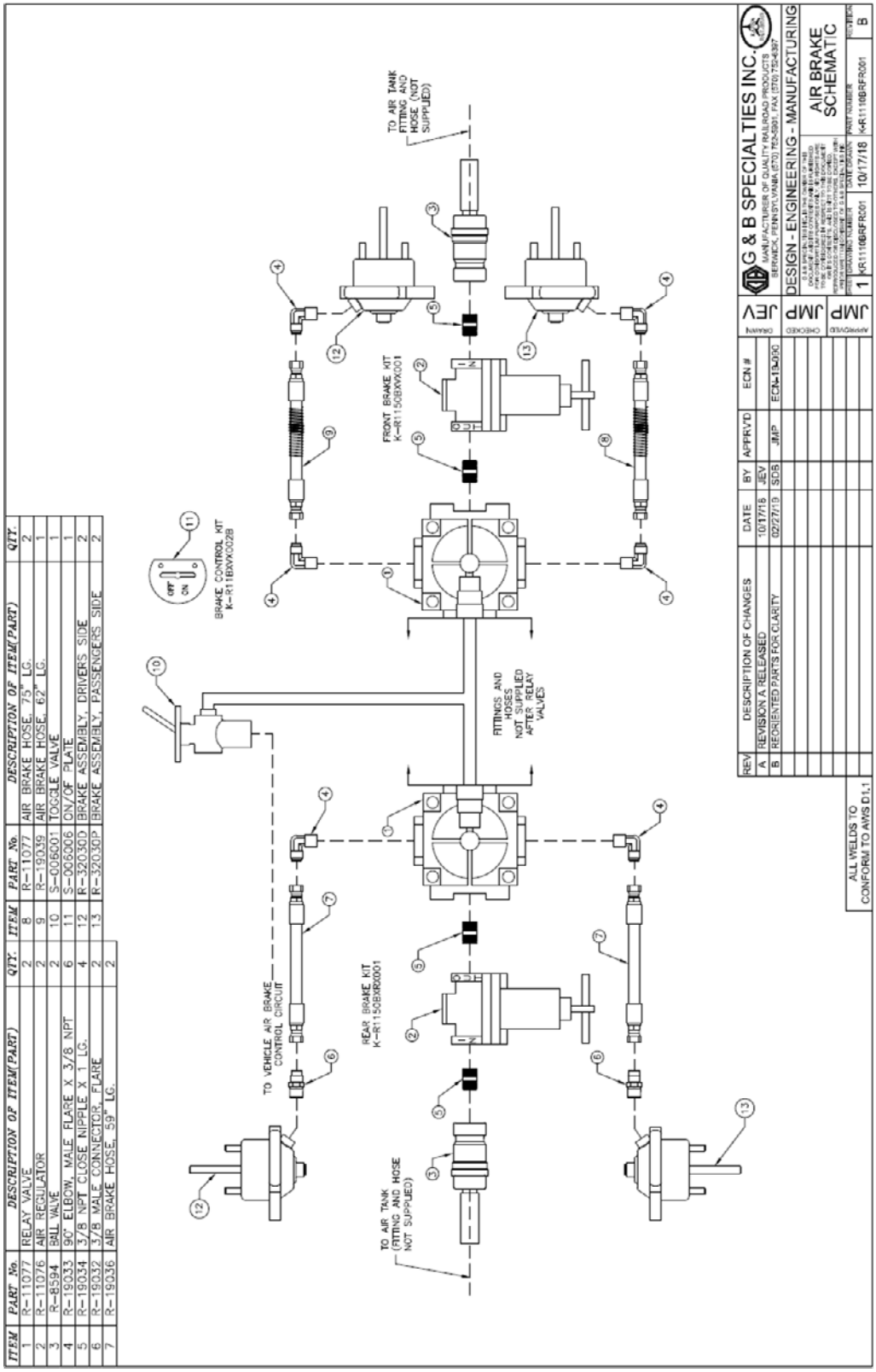
Testing

Operate the vehicle on a test track. With the air toggle valve in the “on” position and the ball valves open, check that:

(1) When the vehicle brake pedal is depressed, the railgear brake clamps the rail wheel enough to slow its rotation but not enough to stop its rotation. The rail wheels should not be allowed to lock up.

(2) That the brakes release properly when the pedal is released.

If the brakes do not function properly, contact a service representative at G&B Specialties.



ITEM	PART No.	DESCRIPTION OF ITEM(PART)	QTY.
1	R-11077	RELAY VALVE	2
2	R-11076	AIR REGULATOR	2
3	R-8594	BALL VALVE	2
4	R-19033	90° ELBOW, MALE FLARE X 3/8 NPT	6
5	R-19034	3/8 NPT CLOSE NIPPLE X 1" LG.	4
6	R-19032	3/8 MALE CONNECTOR, FLARE	2
7	R-19036	AIR BRAKE HOSE, 59" LG.	2
8	R-11077	AIR BRAKE HOSE, 75" LG.	2
9	R-19035	AIR BRAKE HOSE, 62" LG.	2
10	S-006001	TOGGLE VALVE	1
11	S-006006	ON/OF PLATE	1
12	R-320300	BRAKE ASSEMBLY, DRIVERS SIDE	2
13	R-320300	BRAKE ASSEMBLY, PASSENGERS SIDE	2

REV	DESCRIPTION OF CHANGES	DATE	BY	APPR'D	ECN #
A	REVISION A RELEASED	10/17/16	JEV	JMP	
B	REORIENTED PARTS FOR CLARITY	02/27/19	SDS	JMP	ECN-19-000

Figure 6-3

Brake Installation

On the Front Valve plate assembly, and rear frame bracket, relay valves will be located. The control line feeding these relay valves comes from the air toggle valve described above. The supply lines to the relay valves comes from a check valve screwed into the air reservoir. There is a ball valve and a pressure regulator inline between the check valves and each relay valve. The ball valve will disconnect the railgear brake system from the vehicle air system regardless of the position of the air toggle valve. The pressure regulator will allow adjustment of the front to rear bias, so that both axles will brake evenly and not allow one axle to lock and slide.

The railgear Cobra Brake Assembly brake chambers are connected to the delivery ports on the railgear air relay valves.

Install airlines and valves as shown in the above Air Brake Schematic. Make certain that the front air brake pressure regulator is set to 75 PSI.

It is the responsibility of the installer to supply the required air to the in-cab control valve and from the in-cab control valve to the relay valve. The hoses, fittings etc. required for this connection are not included in this kit.

See pages 66, 67, and 93, for Assembly and Parts.

1. Place brake assemblies on stub axle and bolt them fast.
2. Install railsweeps, using the longer hardware on the side of the horizontal brake assembly.
3. Proceed to plumb the brakes.
4. Adjust and test brakes as outlined.
5. Loosen the sweep plate hardware, and lower or raise the rubber sweep as required so the bottom of the sweep is just above the top of the rail head.
6. Adjust and test brakes as outlined on pg. 32.

7.0 FRONT TO REAR ALIGNMENT

FINAL ALIGNMENT

These final adjustments are necessary to align the front railgear to the rear railgear (which has already been aligned with the rear truck axle). The alignment of the railgear to the truck will affect the way the vehicle tracks down the rail. If the vehicle is not properly aligned the railgear may pull to one side, have excessive wheel flange wear and be prone to derailment. Four measurements need to be taken to do this final alignment and should be taken with the railgear fully deployed in the rail position

(1) The distance from the Front Rail Wheel to the Rear Rail Wheel on each side in figure 7-1, distance "E" must equal to "F" (within 1/8").
(2) The diagonals from the Front Rail Wheel to the Rear Rail Wheel on the opposite side.

In **figure 7-1**, distance "G" must be equal to "H" (within ¼")

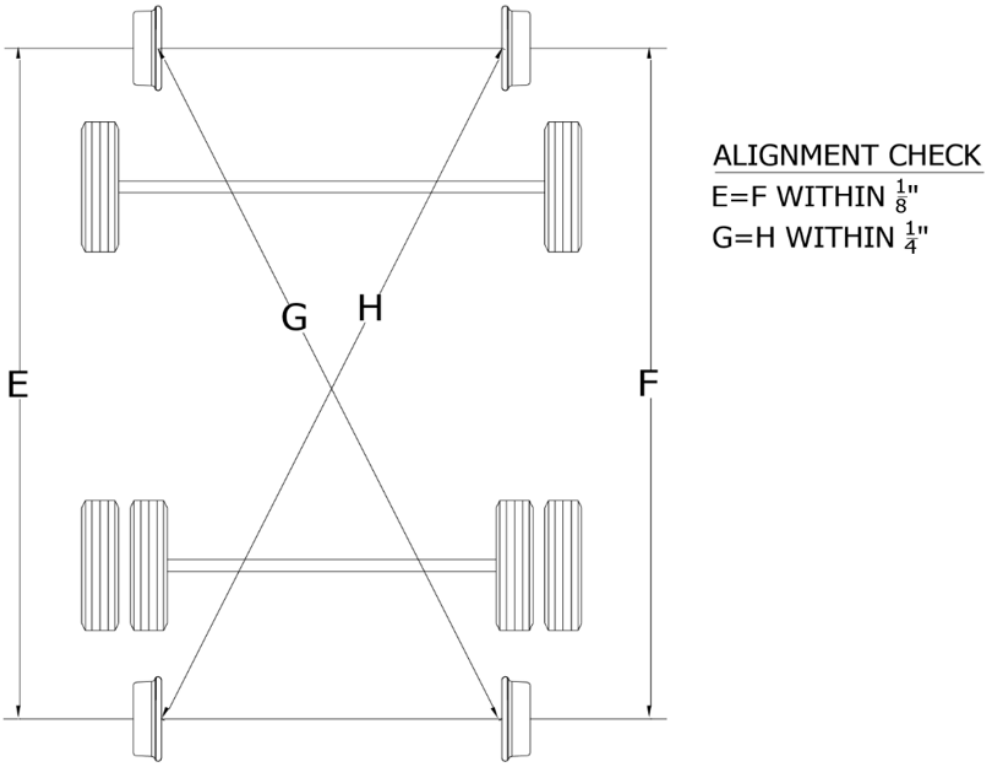


FIGURE 7-1

After the front and rear railgear have been properly aligned, complete structural welds may be applied at the locations that were previously only tacked:

- On the front railgear, between the frame mounting brackets and frame (or frame extensions, if required).
- On the front railgear between the axle tube and the lower portion of the clamp assembly.

8.0 FINAL CHECKLIST

- Rail test the vehicle to check for good traction and braking. An industrial siding, or some authorized track time will be required. Check that the rail wheels do not lock up and slide.
- Adjust the railgear for proper height as required.
- Cross check the rear railgear to the vehicle rear axle again.
- Weld the mounting plate to the rear frame mounting plate with two 2" welds per side.
- Welding the plates must be done, do not forget it.
- Double-check that all welds, nuts, cotter pins and fasteners are in place and installed properly.
- Route and secure all hoses and wires, making sure that there will be sufficient clearance from pinch points and exhaust.
- Check the Hydraulic reservoir for proper fill level.
- Raise the railgear to the road position and install locking pins.
- Apply the decal kit as shown on page 102, 103, and 104.

INSTALLATION CHECK LIST

Check tire pressures

Front Alignment

- Front mounting Pin height: **25 ½"**
- Rear mounting Pin height: **12 ¾"**

Rear Alignment Single Axle Tandem Axle

- Tire rail Wheel Center **15 ¼" 11 ¼"**
- Minimum truck frame extension **22 ¼" 17 ¼"**
- Calculate Spacer thickness (with 6" spacer) = **(6.0" -GAP) x .6**

Check overall measurements

- Rear truck axle to rear railgear (straight) A=B (within 1/16")
- Rear truck axle to rear railgear (diagonal) C=B (within 1/8")
- Front Rail Gear to rear railgear (straight) E=F (within 1/8")
- Front Rail Gear to rear railgear (diagonal) G=H (within ¼")

9.0 INSTALLATION SUMMARY

Initial Instructions

- Provide adequate work area (floor, lighting and space)
- Inspect truck condition: tire pressure and condition, frame and suspension bushings on truck, alignment and transverse torque rods
- Fabricate front and rear installation rails
- Drive truck onto installation rails

Hydraulic System Connection

- For new hydraulic system: Install pump, PTO, tank & main hydraulic lines to Front and Rear Valves.

- For existing hydraulic systems: Install diverter valve, main relief valve and main hydraulic lines to Front and Rear valves.

Rear Railgear Installation

- Location of Rear Railgear
- Recheck tire pressure
- Measure for location with single axle truck and tandem axle truck

Spacer installation with Front Railgear on rails in track position

- Place 6" spacer between frame and mounting bracket then lower rail guide to track position
- Calculate Spacer thickness (using formula)
- Raise railgear to road position and remove temporary spacer
- Install permanent spacer and tack in position
- Lower railgear to track position and check Tire cup

Square Railgear with Truck Frame

- Primary: Measure Rear railgear to truck axle (both sides)
- Secondary: Measure diagonal from rail wheel axle to truck axle
- Check Rail Guide clearance including lock pins 2" clearance minimum

Final Rear Installation

- Drill holes for mounting plate, install and tighten bolts
- Tack weld mounting plate and spacers to rear mounting plate

Front to Rear Alignment

- Measure Front to Rear Rail Wheels: E=F (within 1/8")
- Measure Front to Back diagonal: G=H (within ¼")
  - If necessary, add shims to Front railgear and tack in place
  - Upon completion of alignment, weld:
- Frame mounting brackets to frame (or frame extensions)

Rail Sweeps

- Rail Sweep components
- Rail Sweep installation

Brakes

- Brake Components
- Plumbing Installation
- Testing

Air-Lock

- Air-Lock Components
- Air-Lock Installation

Final Checklist

- Rail test truck for traction and braking
- Re-adjust railgear height as required
- Cross check rear rail wheel to truck rear axle
- Weld mounting plate to mounting bracket
- Check welds, fasteners and cotter pins. Tie-strap hoses and wires.
- Top off hydraulic fluid
- Touch-up Paint
- Raise Front & Rear railgear and install locking pins
- Apply Decal Kit

10.0 STEERING WHEEL LOCK

All Vehicles must be using a steering wheel lock while on the rail.

Telescoping steering wheel
If steering wheel is telescoping, make sure that the steering wheel is in the minimum position or in a position such that the steering wheel lock can be easily applied.

INSTALLATION

Table 10.1 Steering Wheel Lock Kit Components

Part Number	Description	Qty
S-001050	Steering Wheel Lock	1
S-001040	Steering Wheel Lock Decal	1
R-21167	Speed Decal	1

1. Ensure the front wheels are pointing straight ahead and the steering wheel is centered before installation.

2. The steering wheel lock consists of one steering wheel lock patch with RAFNA logo and three adhesive back strips.

3. Without removing the protective backing, position one adhesive back strip on top of the steering column cover and another on the steering wheel. The strips should be close enough together so that the patch will cover both when the steering wheel lock is engaged. Ensure that the adhesive back strips do not interfere with any devices, such as the hazard light button on the steering column cover or the air bag cover on the steering wheel. Modify the adhesive back strips as required to clear any obstructions. Mark their locations on the steering column cover and the steering wheel.

4. Without removing the protective backing, position the third adhesive back strip in a convenient location on the dash (so that it does not interfere with the view and/or operation of the vehicle). This adhesive back strip will serve as a holder when the steering wheel lock is disengaged. Mark the location.

5. Scuff the three areas previously marked with medium / fine sand paper. The areas should be free of dust, dirt, and any oily residue. Thoroughly clean the areas with denatured alcohol or a similar non-oil-based degreaser that will not react with the plastic. Let the degreaser dry.

6. Take care when placing the adhesive back strips; once they are applied, they should not be removed. Do not touch the adhesive with your fingers. Removing the adhesive back strips once installed or touching the adhesive may cause poor adhesion.

7. Peel off the protective backing from the adhesive back strips. Firmly press them into place as previously located. Do not disturb the adhesive back strips for 24 to 30 hours to allow the adhesive to fully cure.

8. Store the steering wheel lock patch on the adhesive back strip located on the dash.

9. Stick the steering wheel lock decal in a highly visible spot on the dashboard.

10. Stick the maximum speed decal in a highly visible spot, within clear sight of the operator, on the dashboard.

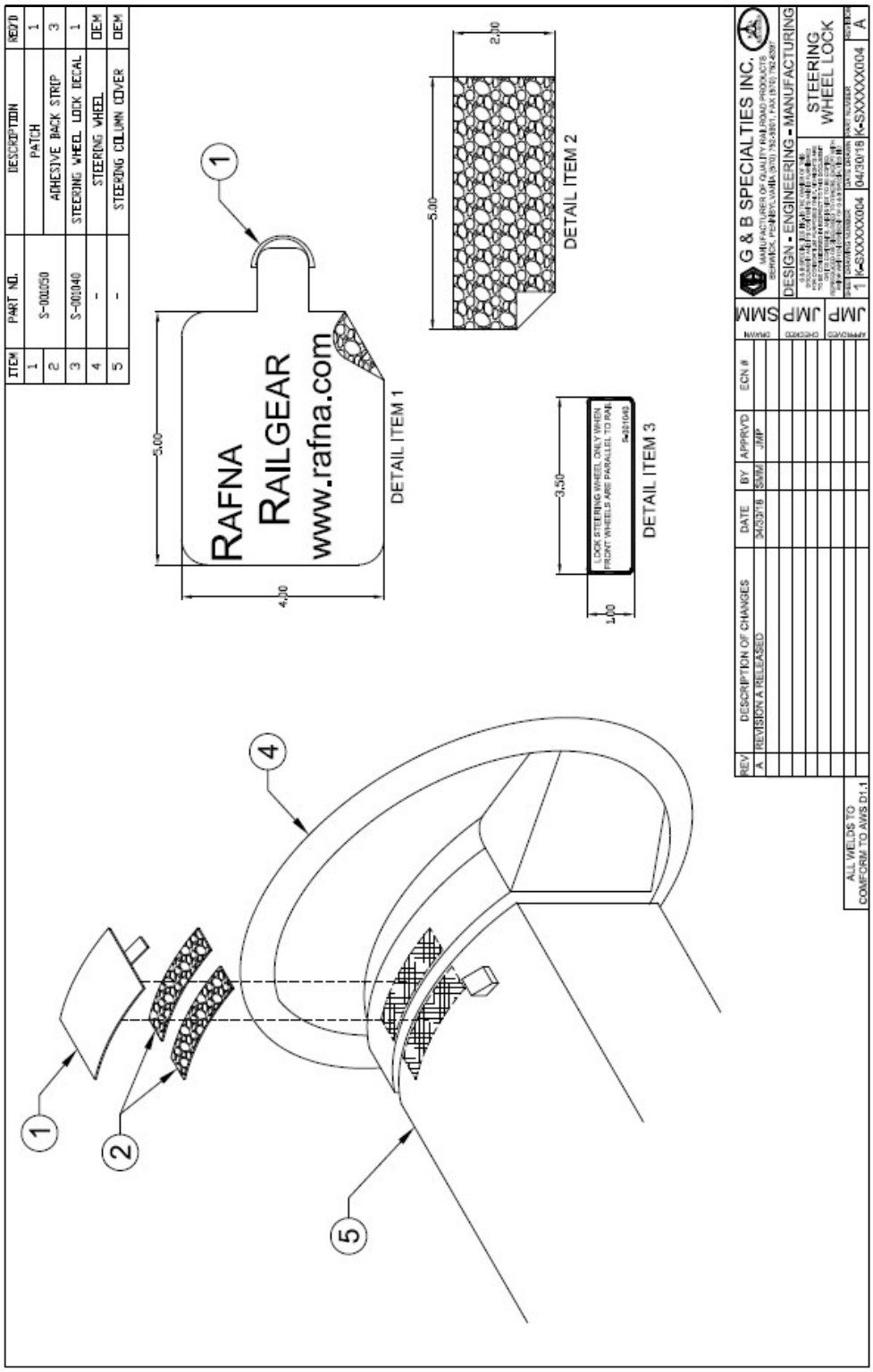


Figure 10-1 Steering Wheel Lock

R-21167 THIS VEHICLE IS EQUIPPED WITH
A RAIL CONVERSION UNIT
RAFNA MODEL
R-1110/1130/1150
30 MPH / 48 KM/H
RECOMMENDED MAXIMUM SPEED ON RAIL
Railway company rules governing rail travel must be observed at all times.

OPERATION

The following procedure details the steering wheel lock operation.

1. Placing The Vehicle On The Track:
   a) Engage the steering wheel lock after both the front and rear railgear are fully deployed and prior to rail travel.
   b) Turn the steering wheel until the front tires point straight ahead.
   c) Position the patch portion of the steering wheel lock onto the adhesive back strips affixed to the steering wheel and steering column cover. Press firmly into place. When installed on the adhesive back strips the patch should restrict the steering wheel from turning.

2. Traveling On Rail:
   a) The steering wheel lock must be engaged at all times while on rail.

3. Removing The Vehicle From The Track:
   a) Disengage the steering wheel lock after both the front and rear Railgear are fully retracted in the road position and prior to road travel.
   b) Firmly grasp the steering wheel lock patch's d-ring and peel it off the adhesive back strips.
   c) Store the patch on the adhesive back strip which serves as the holder located on the dash.

SERVICE OF STEERING WHEEL LOCK

Take care when removing the Patch. Due to certain plasticizers in the steering wheel steering column cover and dash, along with the vehicle's operating environment, the adhesive back strips may peel off and be removed. If the adhesive back strips do peel off, replace the strips with new ones at the earliest convenience.

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11.0 RAILGEAR OPERATION AND MAINTENANCE

RAILGEAR OPERATION

Check to be sure that the railgear is in good operating condition. Inspections should include:

- All air and hydraulic fittings
- All air and hydraulic hoses
- Brake operation
- Railgear parts for damage
- Rail wheel wear
- Hydraulic fluid level

Engage Front Railgear

1. Drive truck into position to line up front Railgear with the rail.
2. Engage trucks parking brake to prevent the truck from rolling.
3. Engage PTO or electric pump.
4. Remove locking pins.
5. Engage front Railgear.
6. Stow the pins in locking hole.

Engage Rear Railgear

1. If the Railgear has air brakes, turn the valve on.
2. Engage the PTO or electric pump.
3. Remove the locking pins.
4. Engage the Railgear.
5. When the Railgear is fully extended, replace the locking pins.

On Track

- Do not exceed **30 MPH** while on track. All railroad rules should be observed
- Be aware that some railgear is designed so that it does not operate crossing circuits
- Reduce speed at crossings, curves, branch lines, switches and frogs
- Traction is reduced on track; tire damage may result if the wheels are allowed to spin
- Braking distance is increased while on track. Do not slide the truck tires or wheels on rail
- Do not exceed rated load of equipment

Removing Railgear from Track

1. Be sure that the PTO is engaged
2. Engage the truck parking brake
3. Leave the truck running and in neutral
4. Remove Locking Pins
5. Lift both sets of railgear
6. Both sets of railgear must have the locking pins reinstalled
7. Disengage the switch that controls the railgear Air Brakes
8. Disengage the truck PTO before moving truck

RAILGEAR MAINTENANCE

If your hi-rail vehicle is heavily used or operated under extreme conditions, the inspections listed below may need to be performed more frequently than stated.

Daily

- Visually inspect for hydraulic fluid leaks
- Visually inspect all hoses for wear or damage
- Visually inspect railgear units for damaged or worn parts
- Check and make sure that all threaded fasteners are secured
- Inspect wheel flanges for excessive wear
- Ensure that the railgear unit hydraulic system and brakes (if equipped) are in good operating condition

Weekly

Perform standard daily inspection points as listed above, and then check the following:

- Grease and lubricate all grease fittings on front and rear railgear and guide wheels
- Check level of hydraulic oil and all other fluids.
- Check air pressure in tires and inflate to proper inflation pressure (if required).

Bi-annually

Perform standard daily and weekly inspection points as listed above, and then check the following:

- Remove the hubcaps from the rail wheels and inspect for deterioration or loss of wheel bearing grease
- Clean the strainer / filter in the hydraulic power unit tank
- Rail test for proper traction and adjust as needed
- Rail test for proper braking and adjust as needed
- Check Railgear alignment

Lubrication

Grease fittings are provided at all railgear lubrication points. The recommended lubricant for all lubrication points on this railgear is Esso Lonax EP2 grease or equivalent. In cold weather, -20F or colder, Shell Darina XL102 or equivalent may be used.

12.0 PARTS

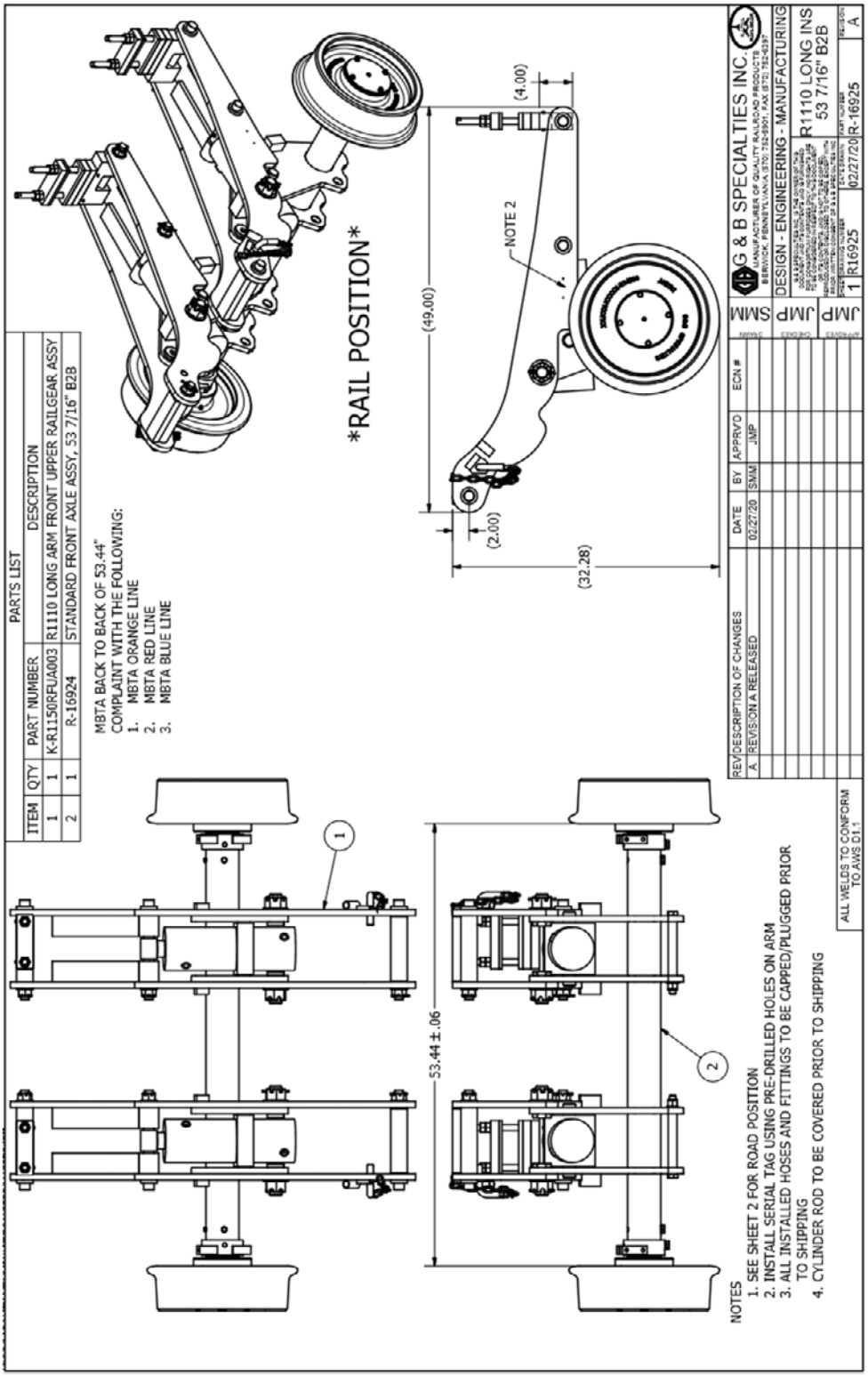


Figure 12.1: R-16925 Sheet 1 (R-1110 Rotating Front Standard Lift, MBTA Compliant)

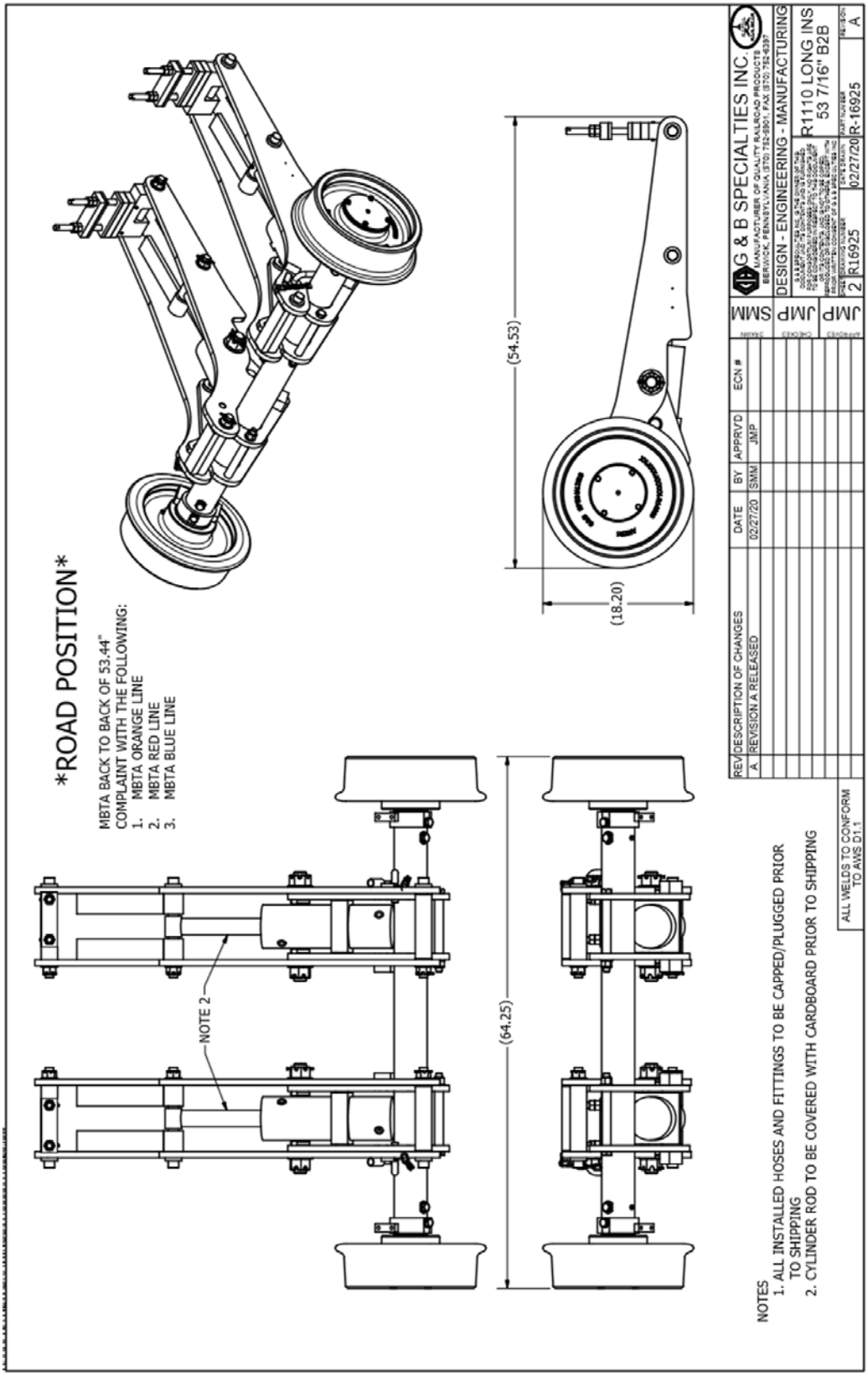


Figure 12.2 R-16925 Sheet 2 (R-1110 Rotating Front Standard Lift, MBTA Compliant)

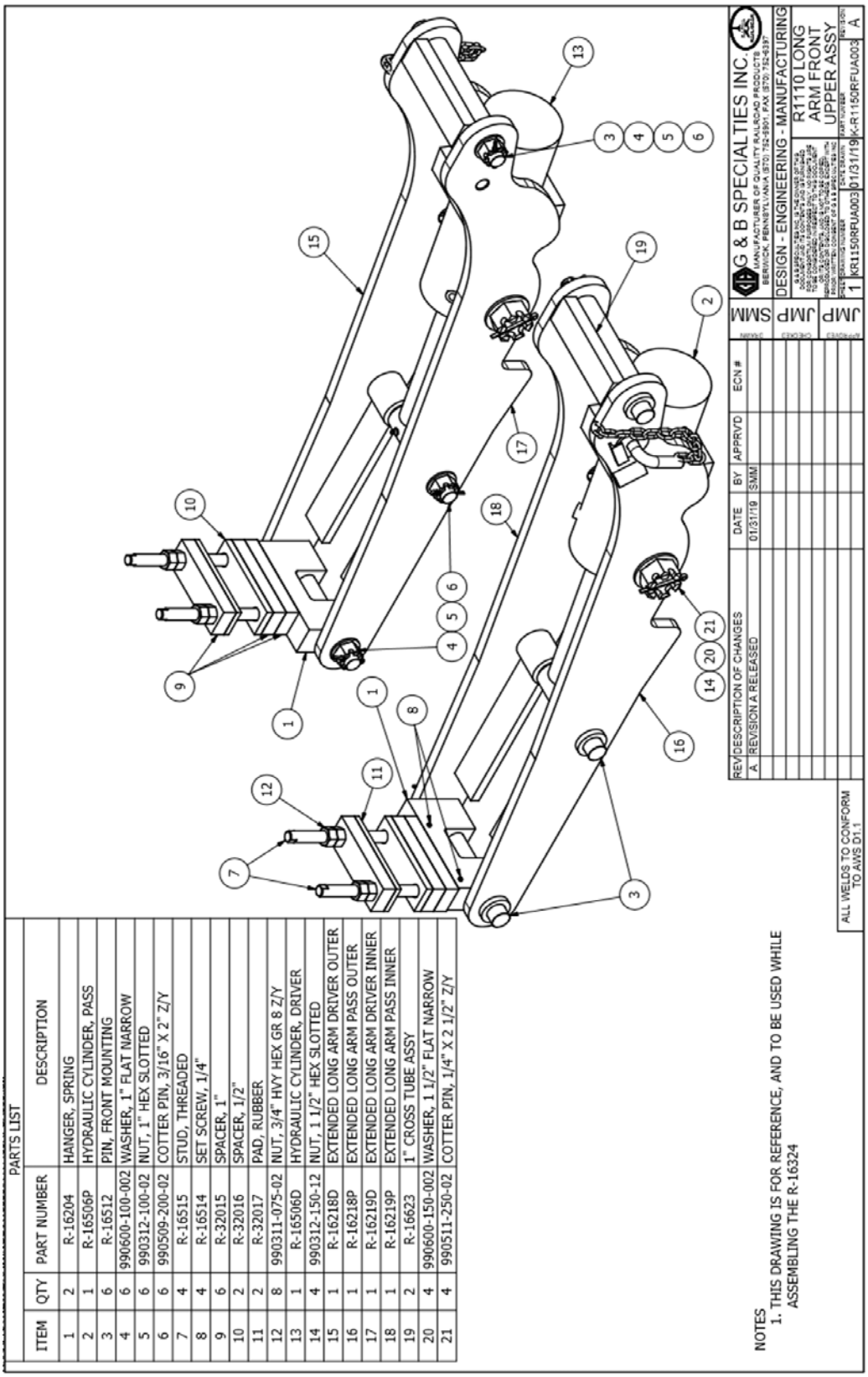


Figure 12.3 K-R1150RFUA003 (Standard Lift Rotating Front Upper Assy)

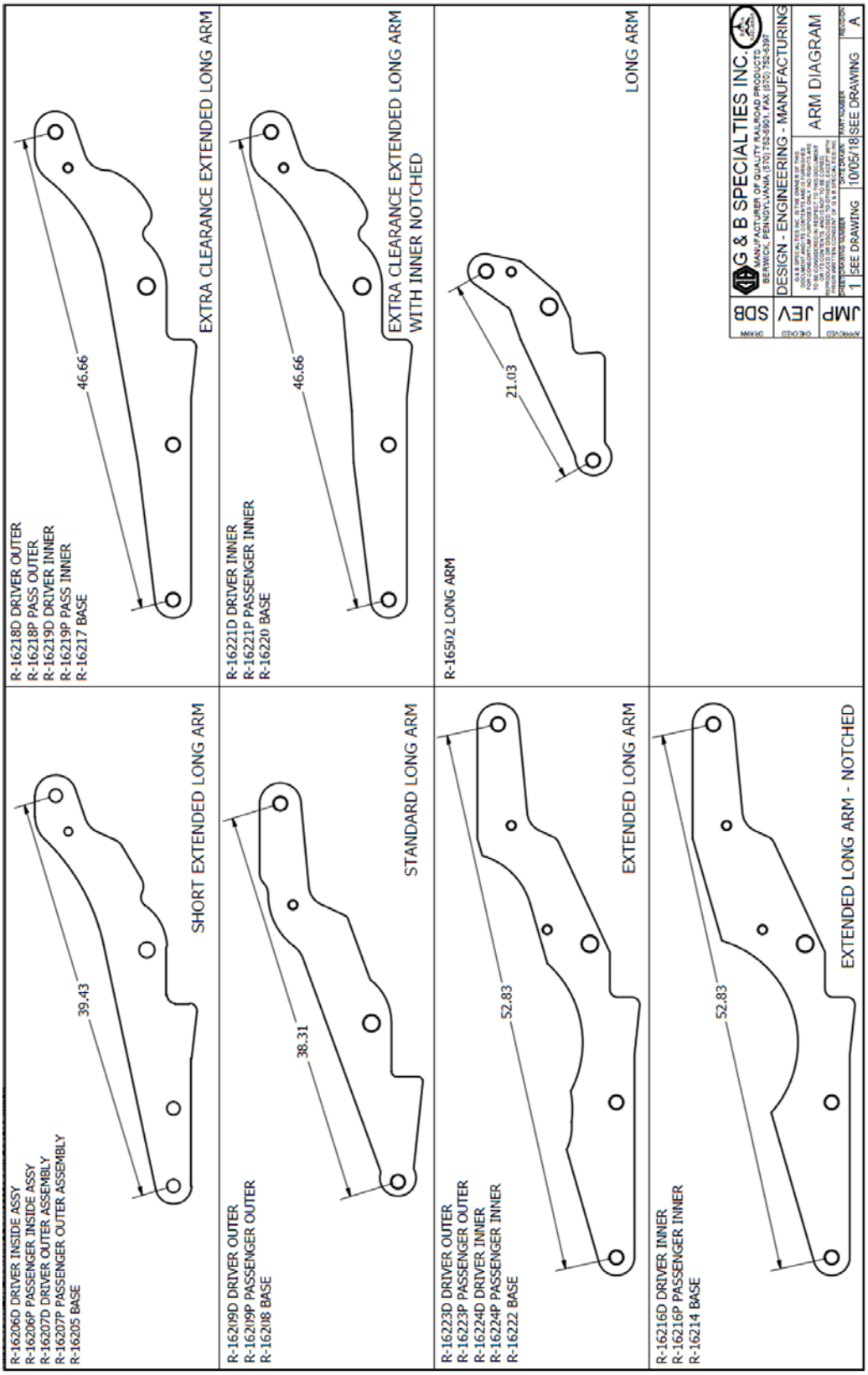


Figure 12.4: Lift Arm Profiles

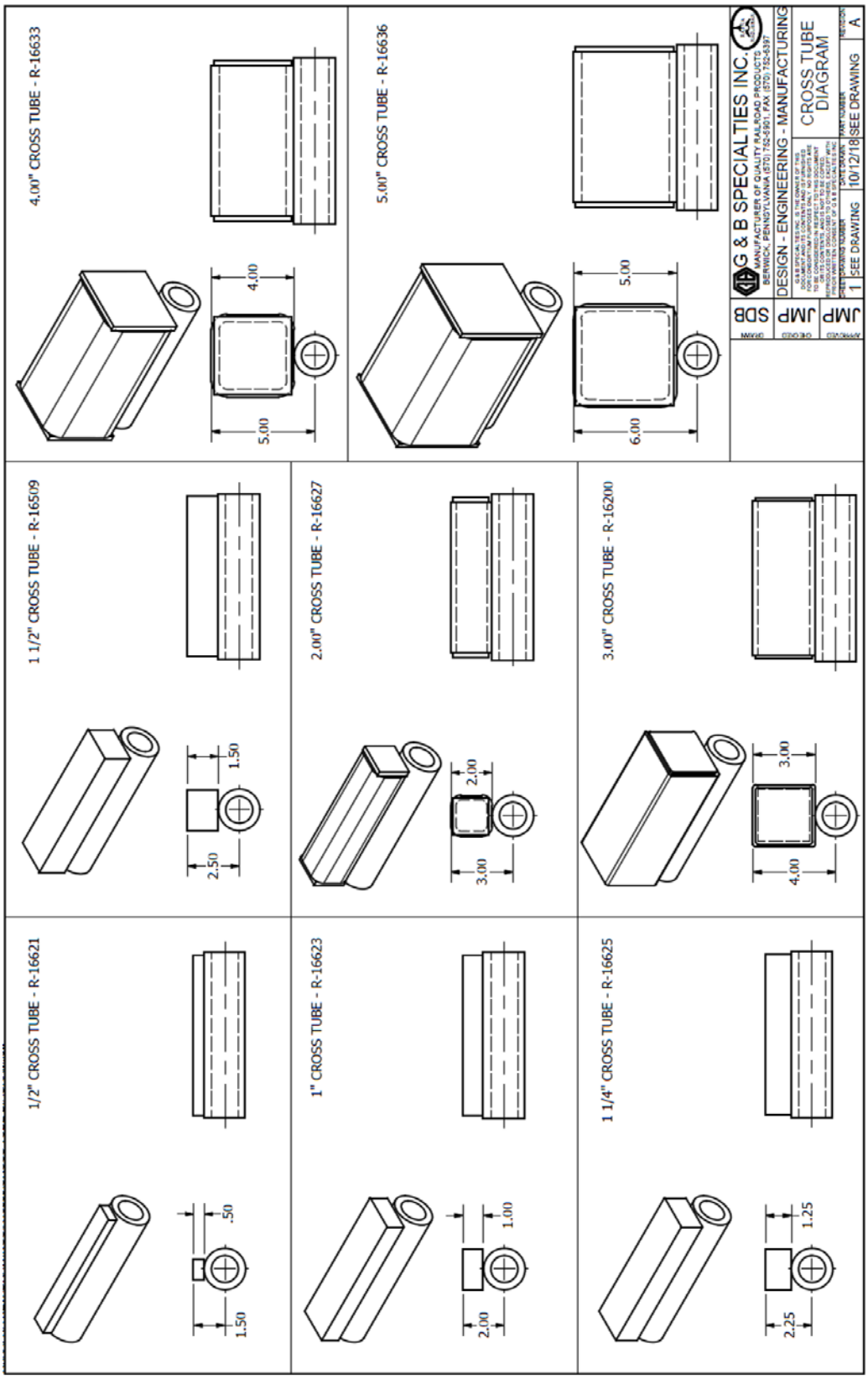


Figure 12.5: Compatible Cross Tubes

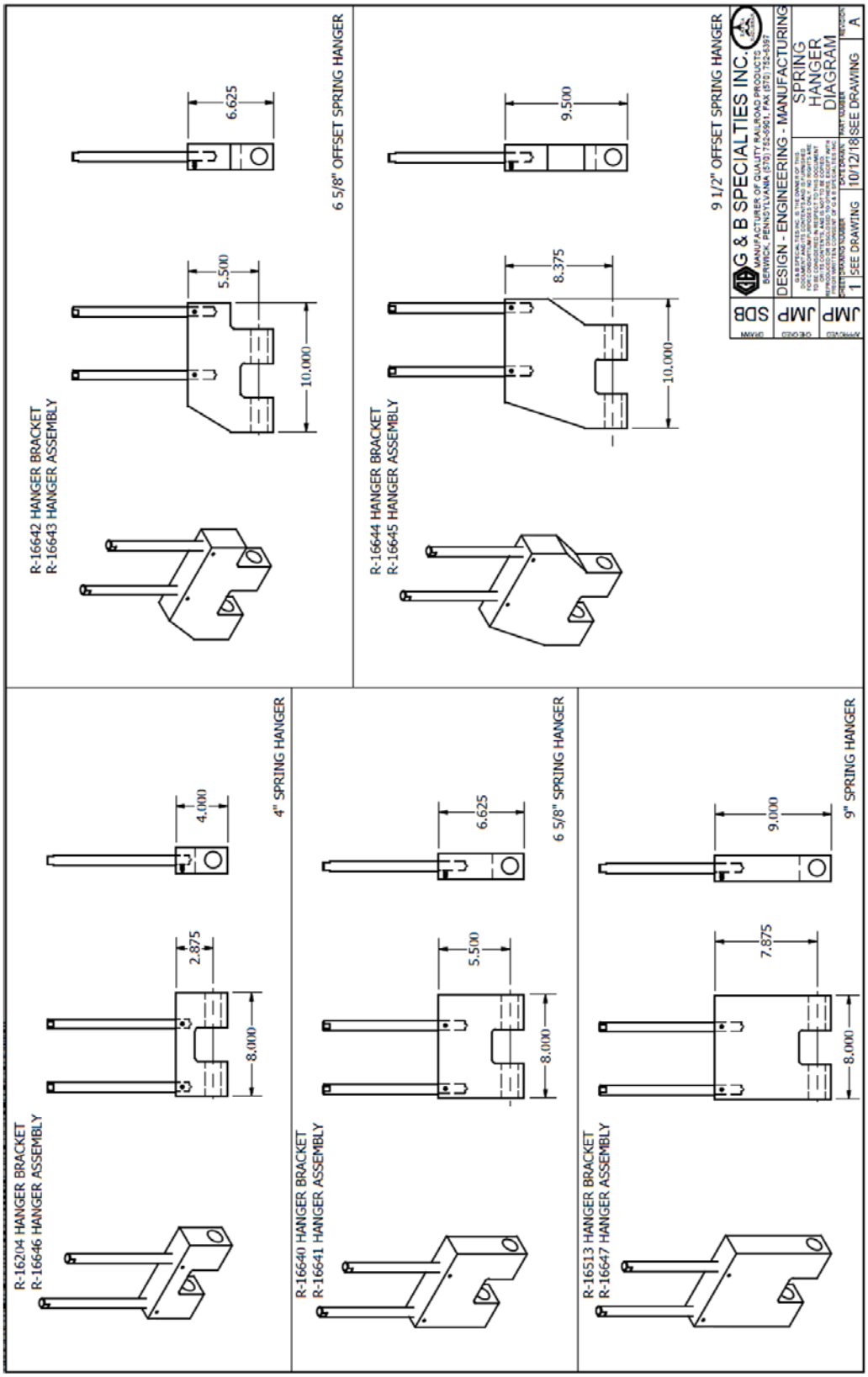


Figure 12.6: Compatible Spring Hangers

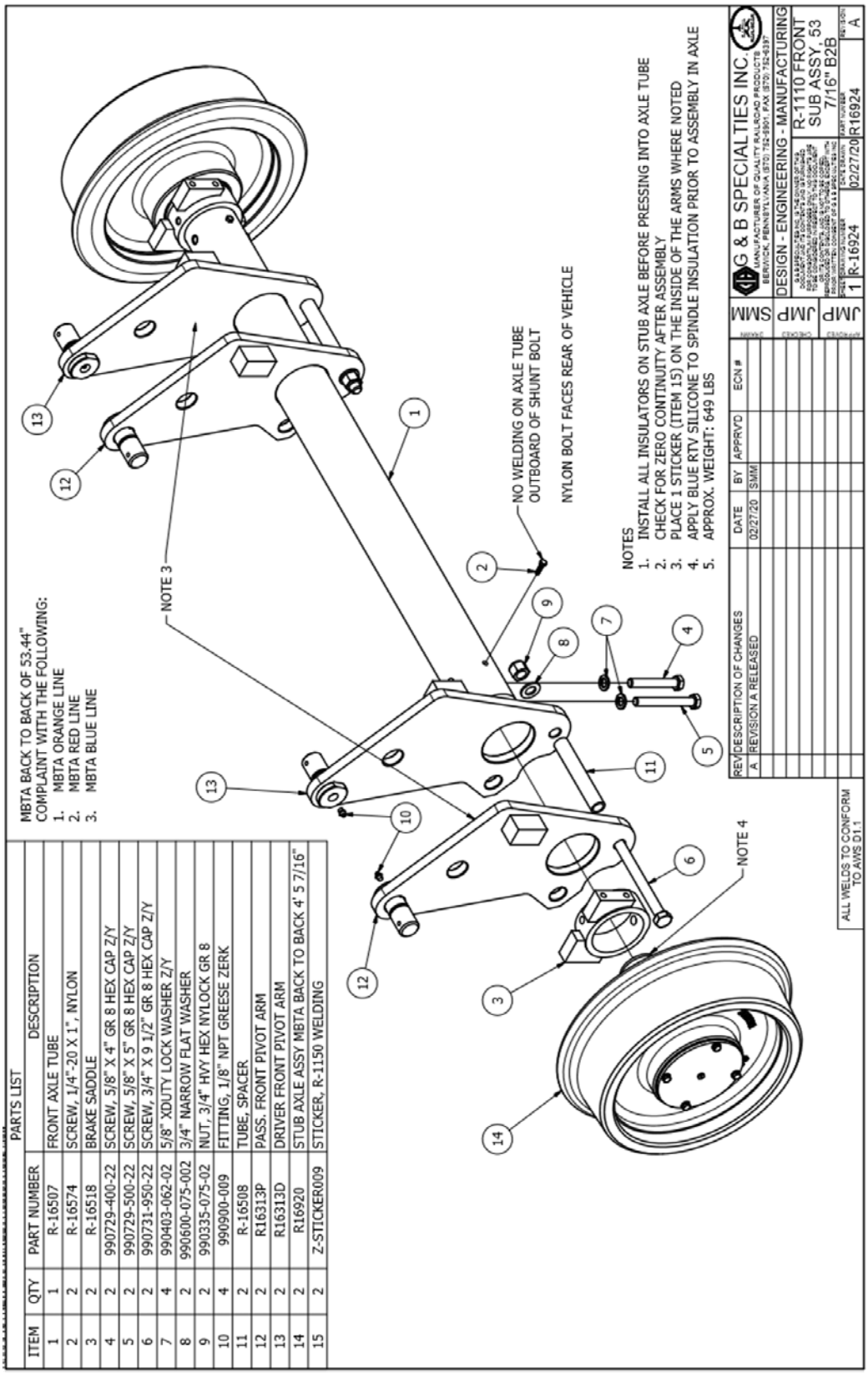


Figure 12.7: R-16924 (Standard Lift Rotating Front Axle)

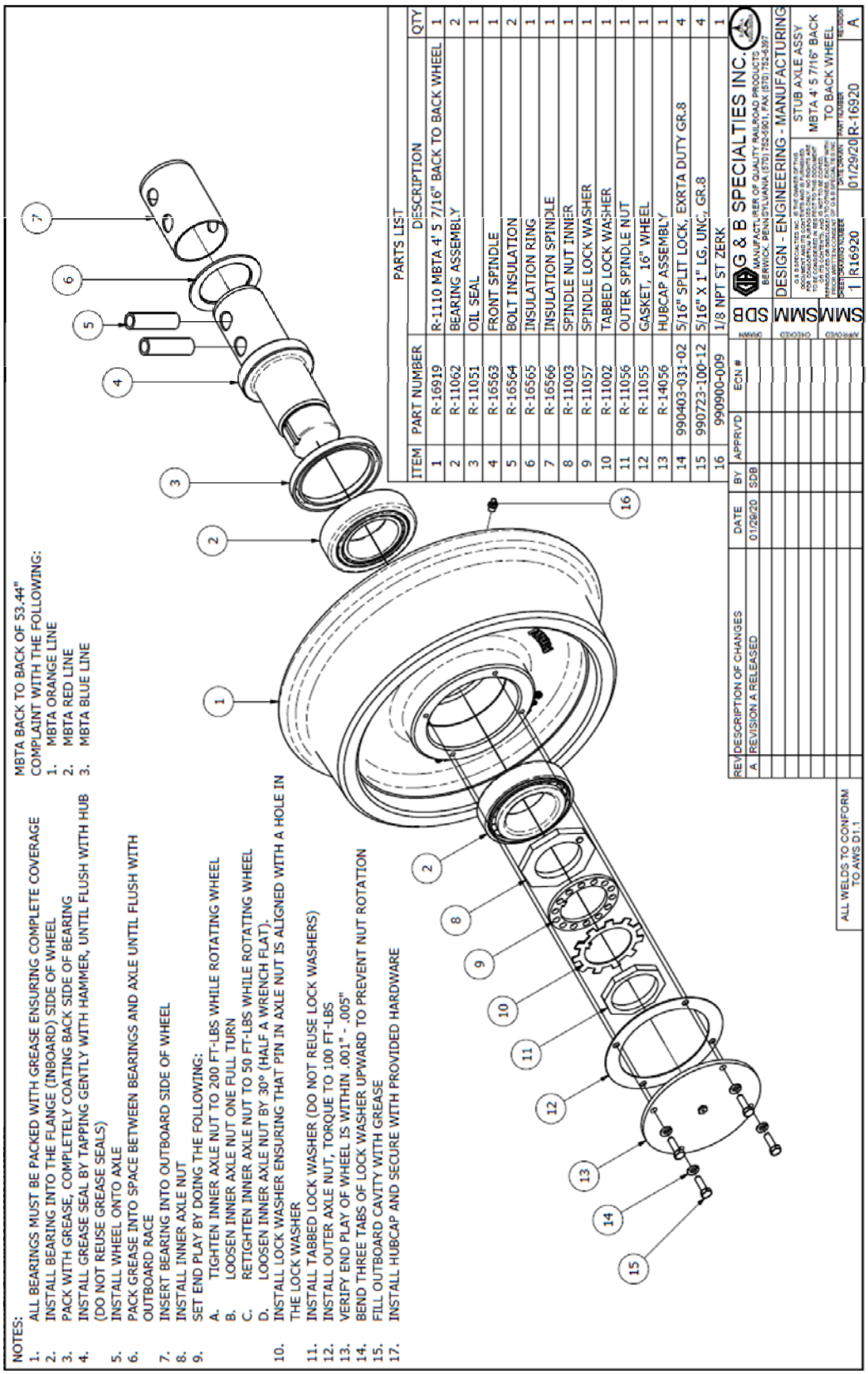


Figure 12.8: R-16920 (MBTA Modified Stub Axle Assy)

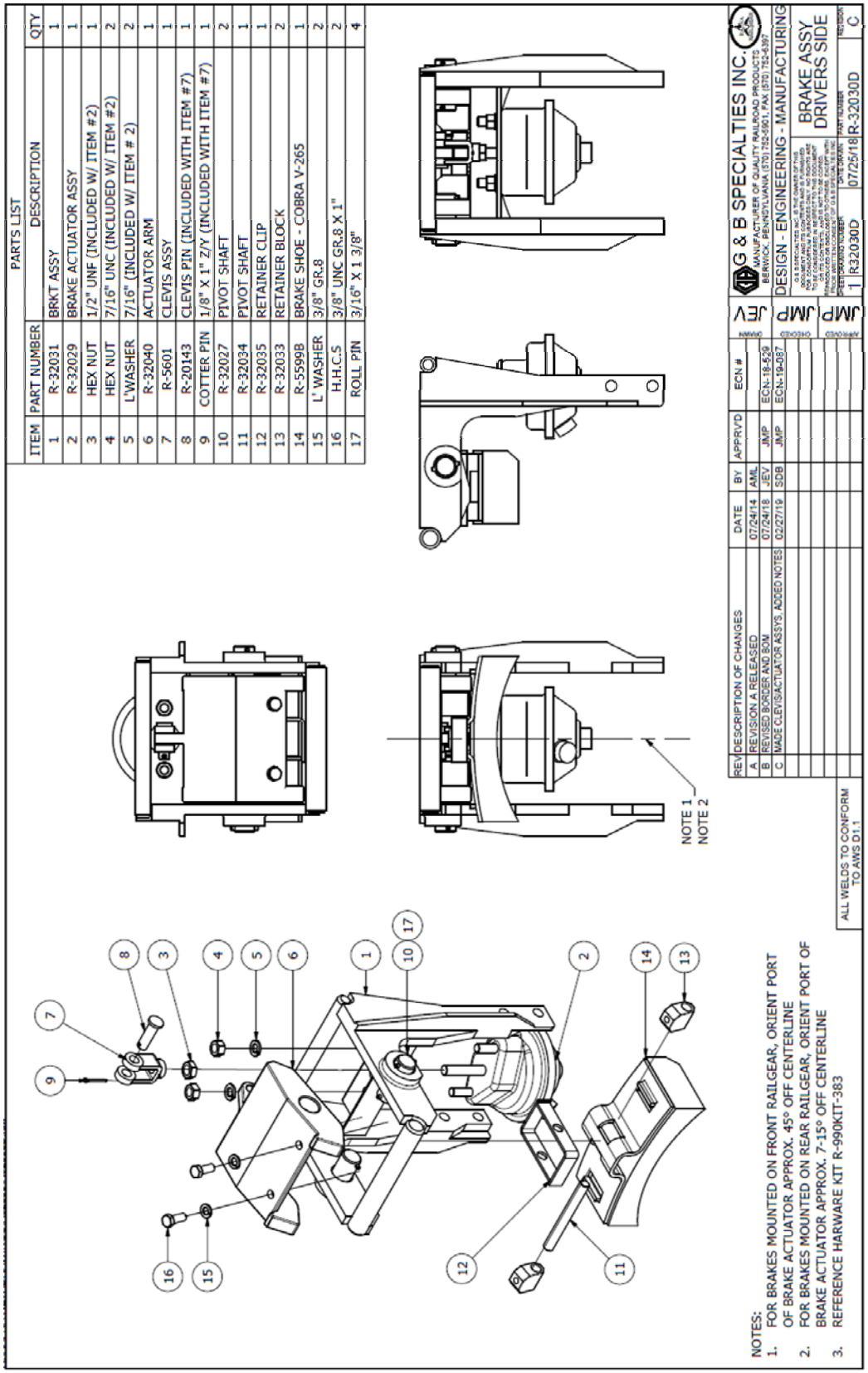


Figure 12.9: R-32030D (R-1110 Driver Side Front Brake Assy)

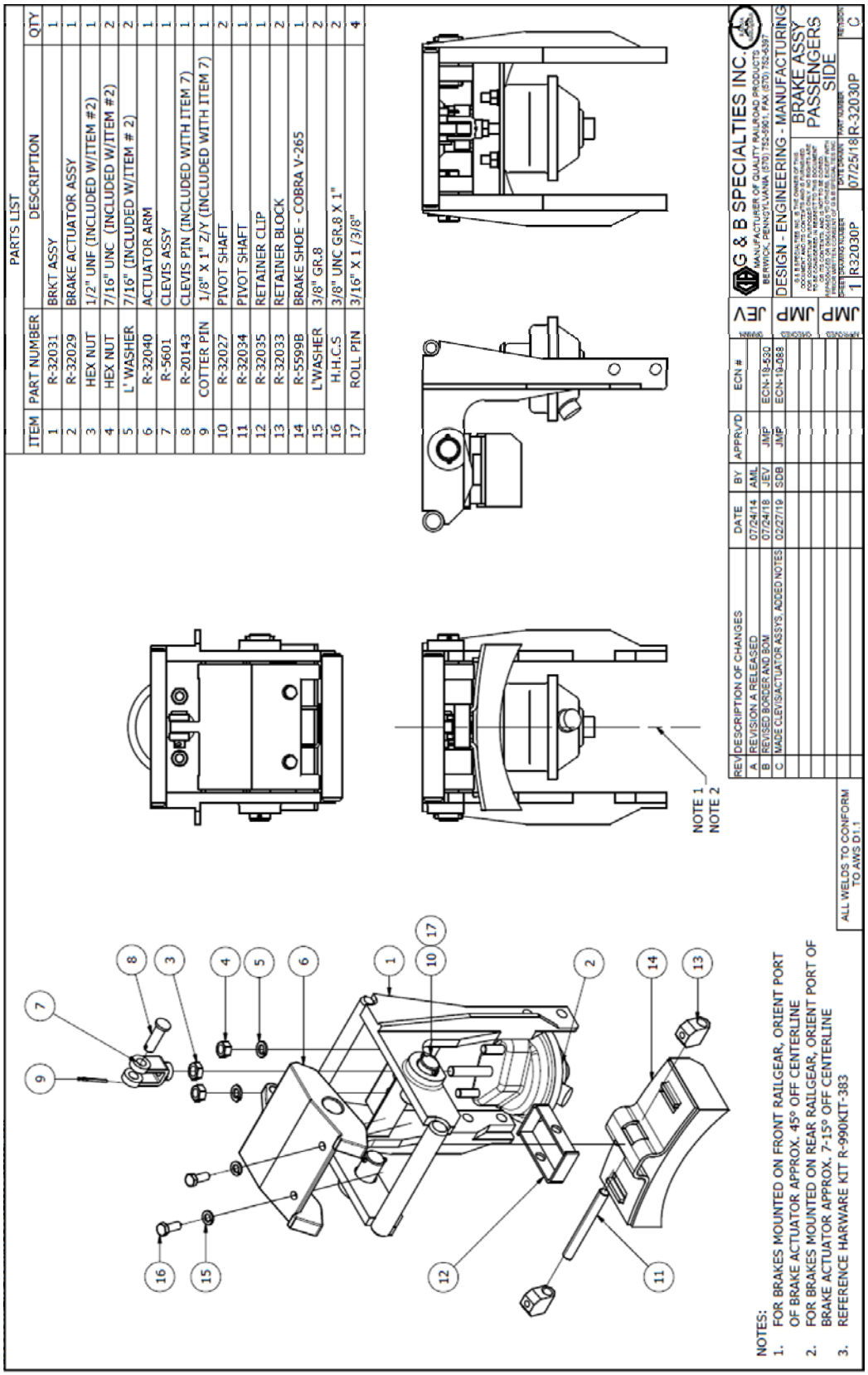


Figure 12.10: R-32030P (R-1110 Passenger Side Front Brake Assy)

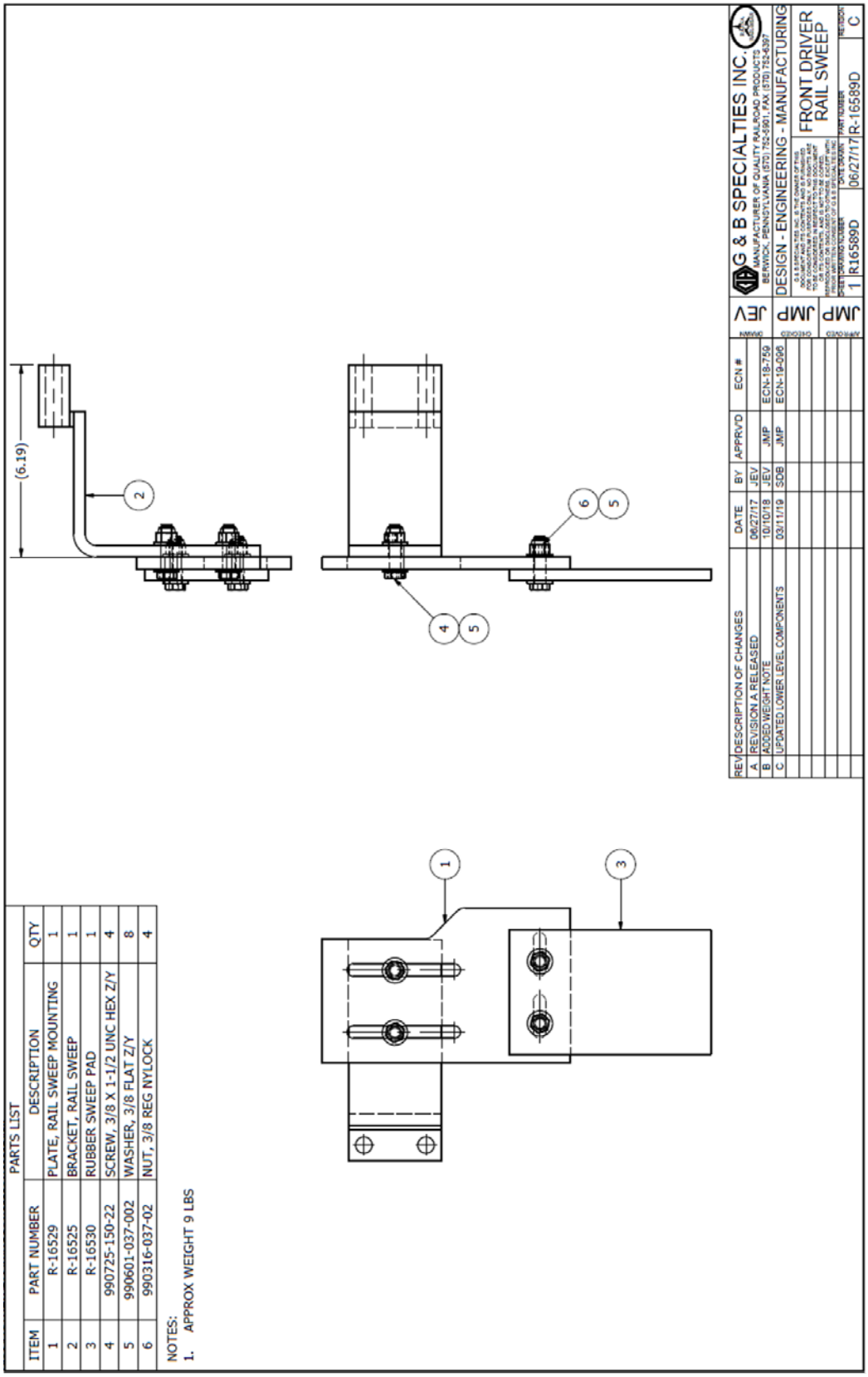


Figure 12.11: R-16589D (Front Driver Rail Sweep)

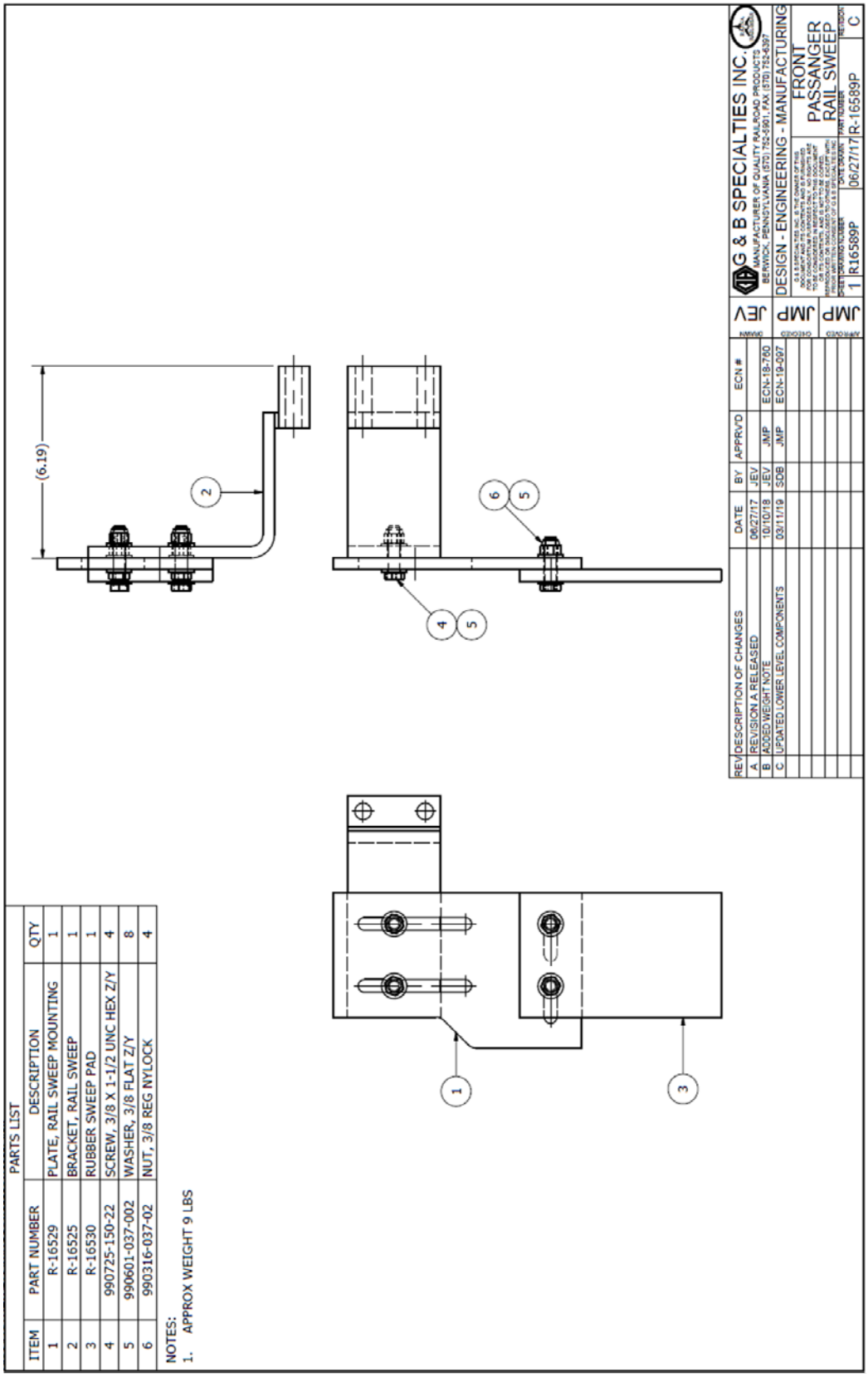


Figure 12.12: R-16589P (Front Passenger Rail Sweep)

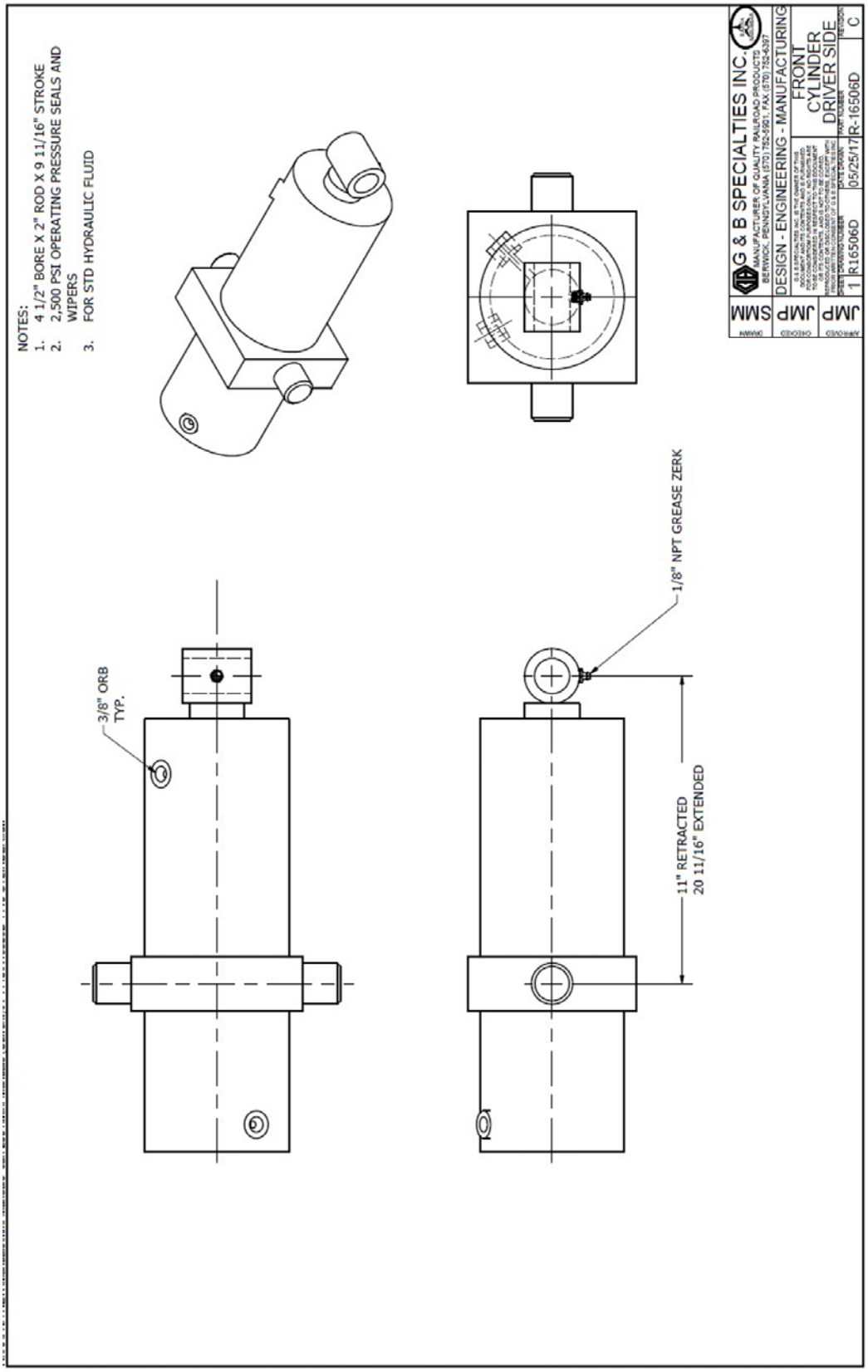


Figure 12.13: R-16506D (Rotating Front Driver Side Hydraulic Cylinder)

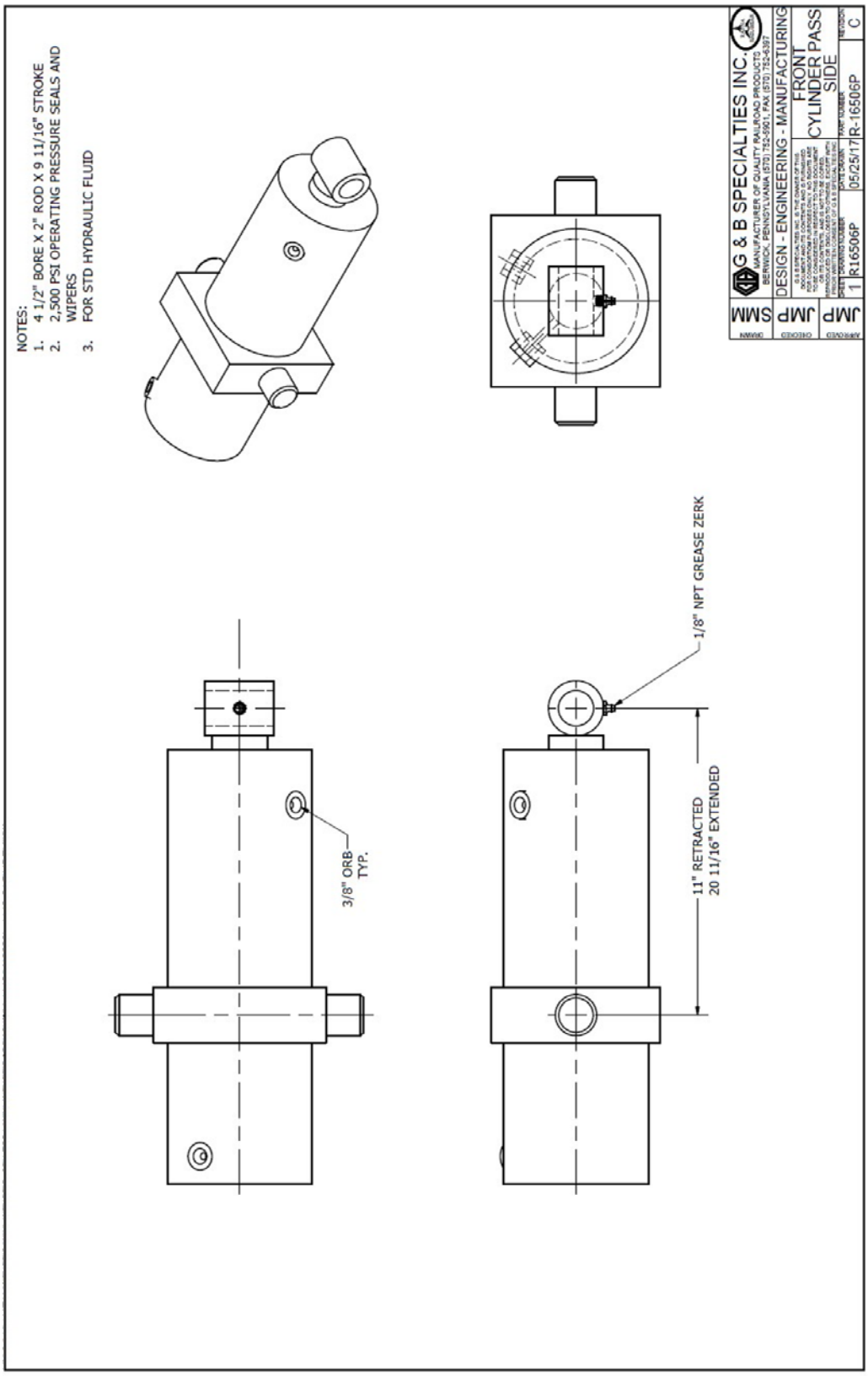
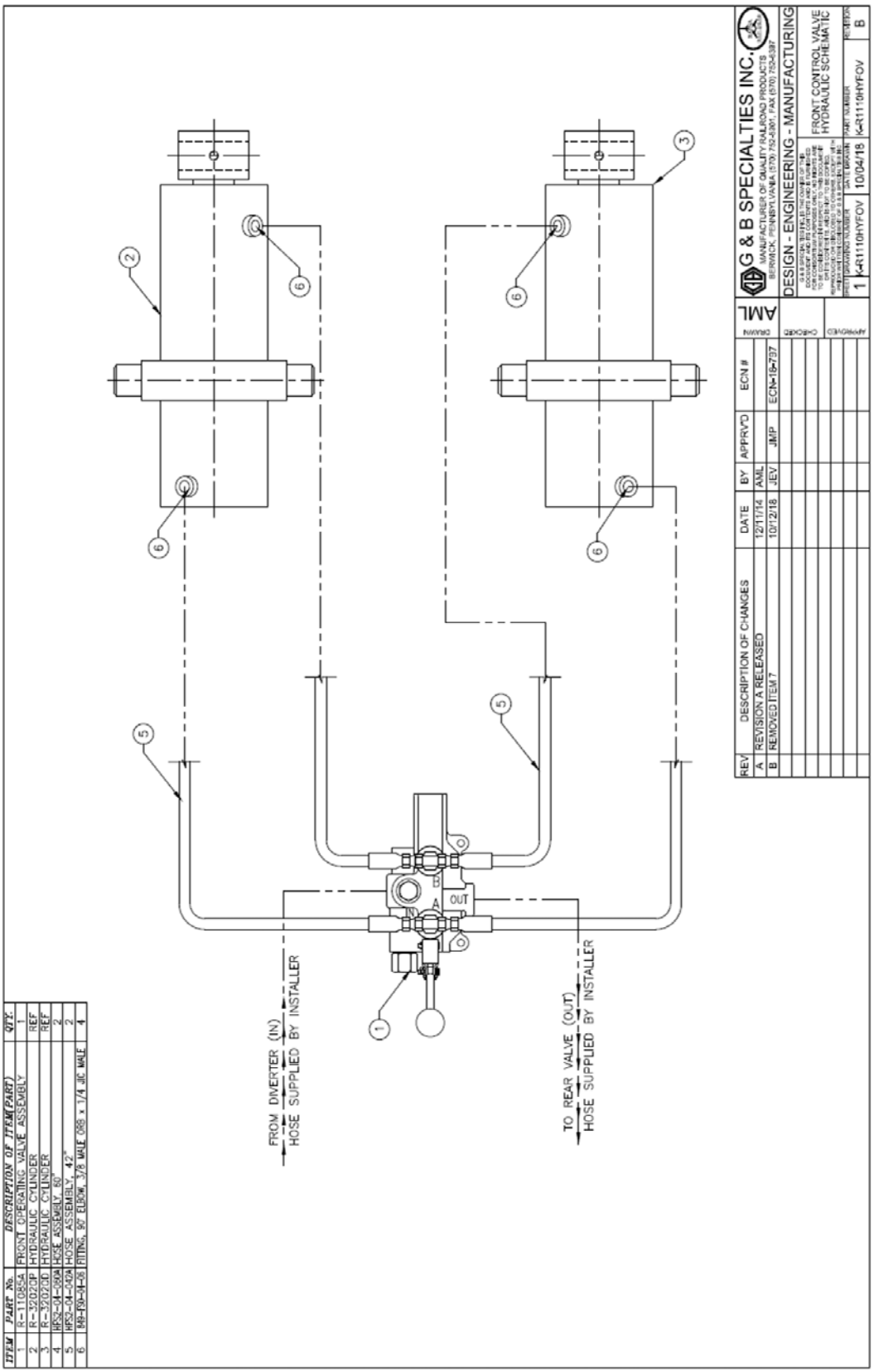
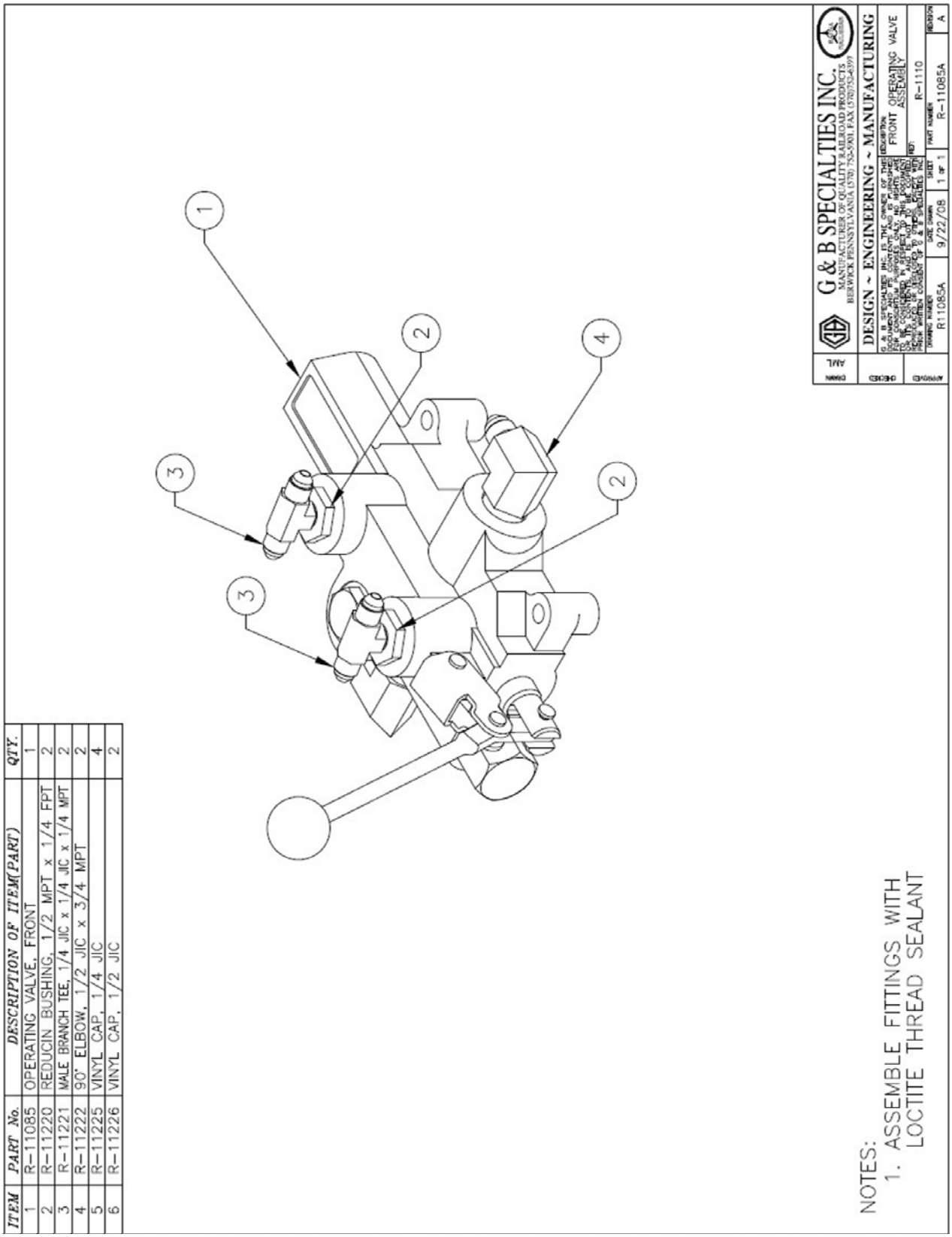


Figure 12.14: R-16506P (Rotating Front Passenger Side Hydraulic Cylinder)



ITEM	PART No.	DESCRIPTION OF ITEM (PART)	QTY.
1	R-110854	FRONT OPERATING VALVE ASSEMBLY	1
2	R-3202DP	HYDRAULIC CYLINDER	REF
3	R-3202DD	HYDRAULIC CYLINDER	REF
4	HPS2-04-060A	HOSE ASSEMBLY, 60"	2
5	HPS2-04-042A	HOSE ASSEMBLY, 42"	2
6	M8-F09-04-06	FITTING, 90° ELBOW, 3/8 MALE ORB x 1/4 JIC MALE	4

Figure 12.15: K-R1110HYFOV (Front Hydraulic Schematic)



ITEM	PART No.	DESCRIPTION OF ITEM(PART)	QTY.
1	R-11085	OPERATING VALVE, FRONT	1
2	R-11220	REDUCIN BUSHING, 1/2 MPT x 1/4 FPT	2
3	R-11221	MALE BRANCH TEE, 1/4 JIC x 1/4 JIC x 1/4 MPT	2
4	R-11222	90° ELBOW, 1/2 JIC x 3/4 MPT	2
5	R-11225	VINYL CAP, 1/4 JIC	4
6	R-11226	VINYL CAP, 1/2 JIC	2

Figure 12.16: R-11085A (Front Hydraulic Operating Valve)

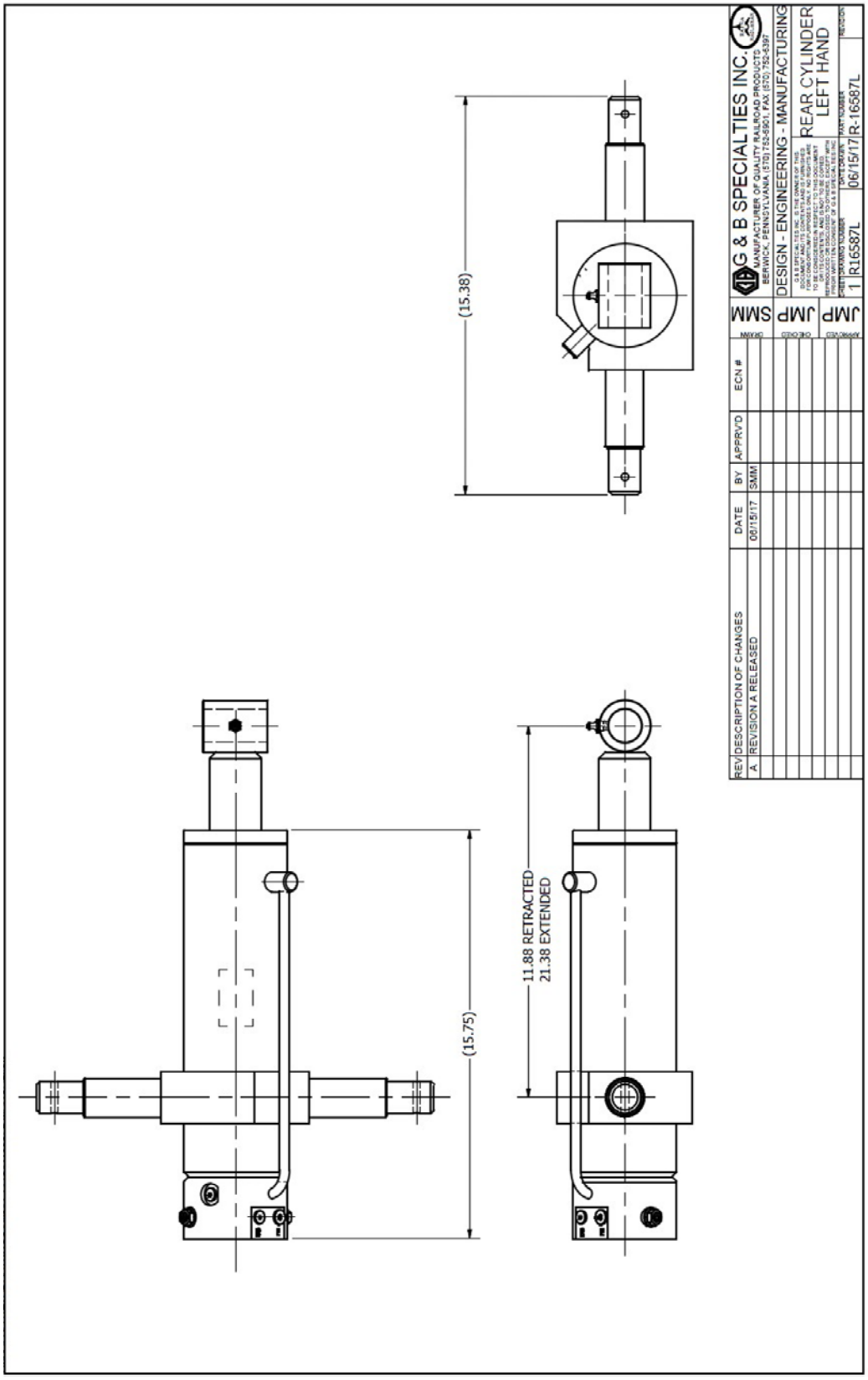


Figure 12.17 R-16687L/R (Rear Hydraulic Cylinder Reference)

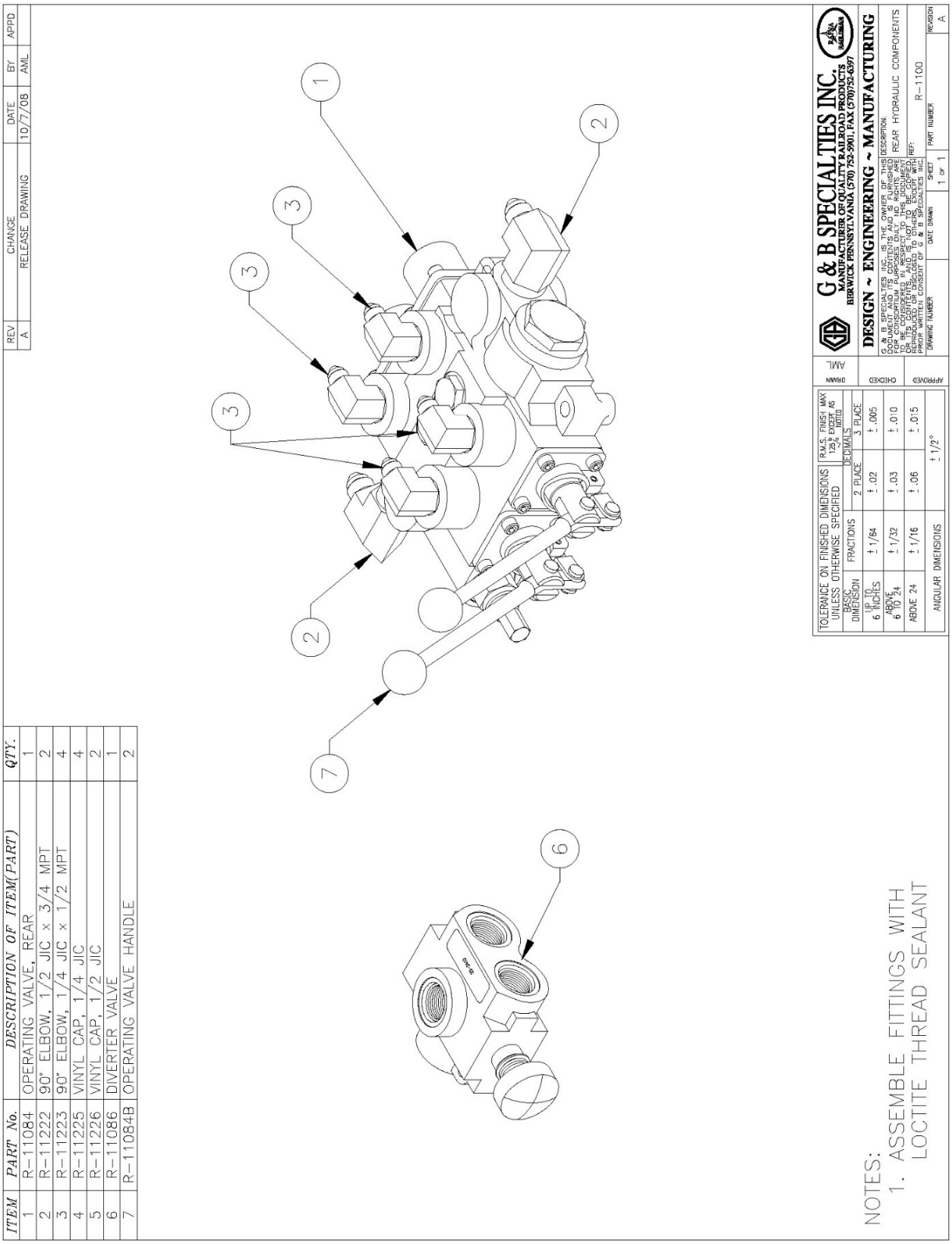


Figure 12.18: R-11084 (Rear Railgear Hydraulic control Valve Assembly Reference)

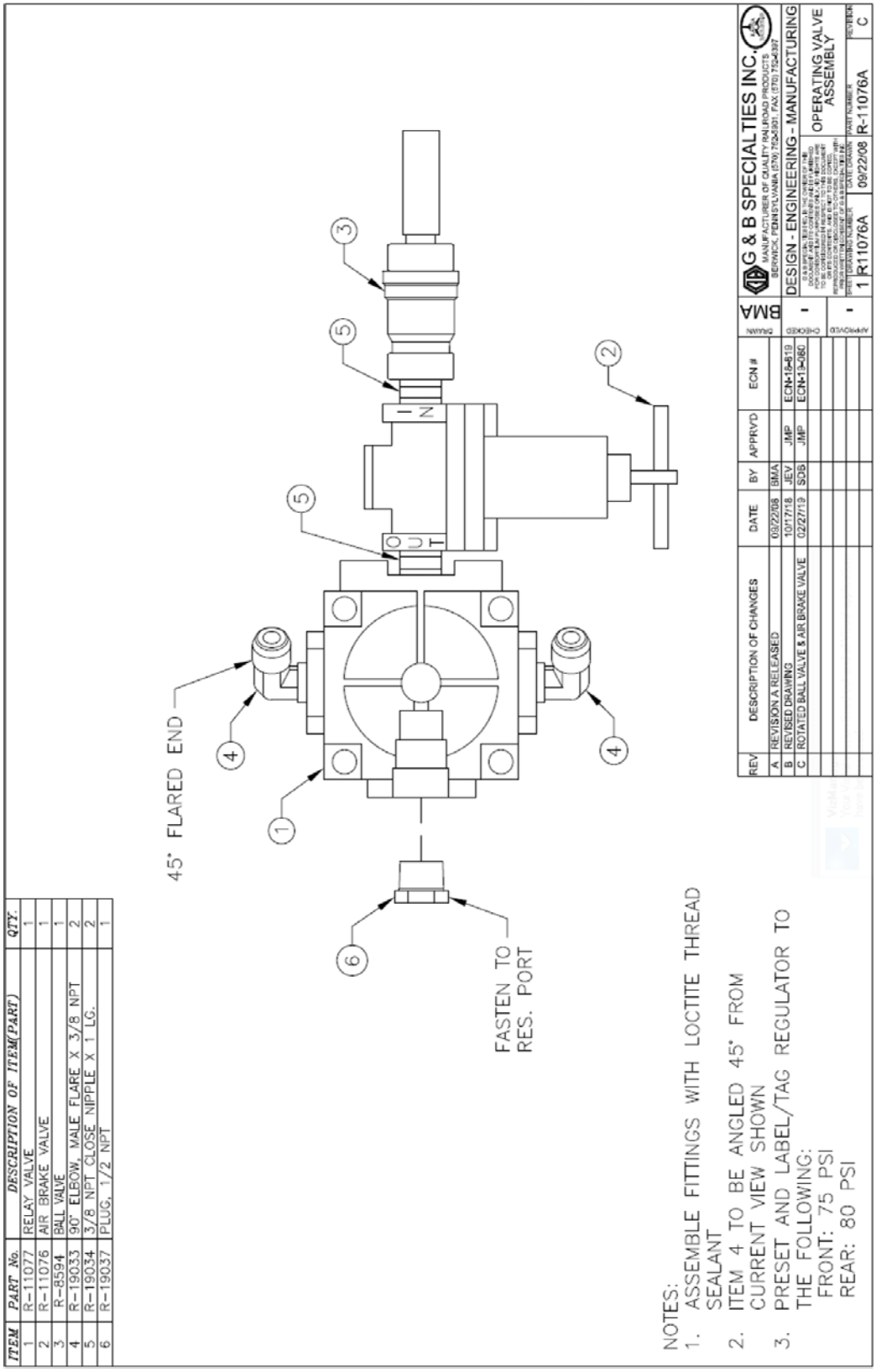


Figure 12.19: R-11076A (Air Brake Control Valve Assembly)

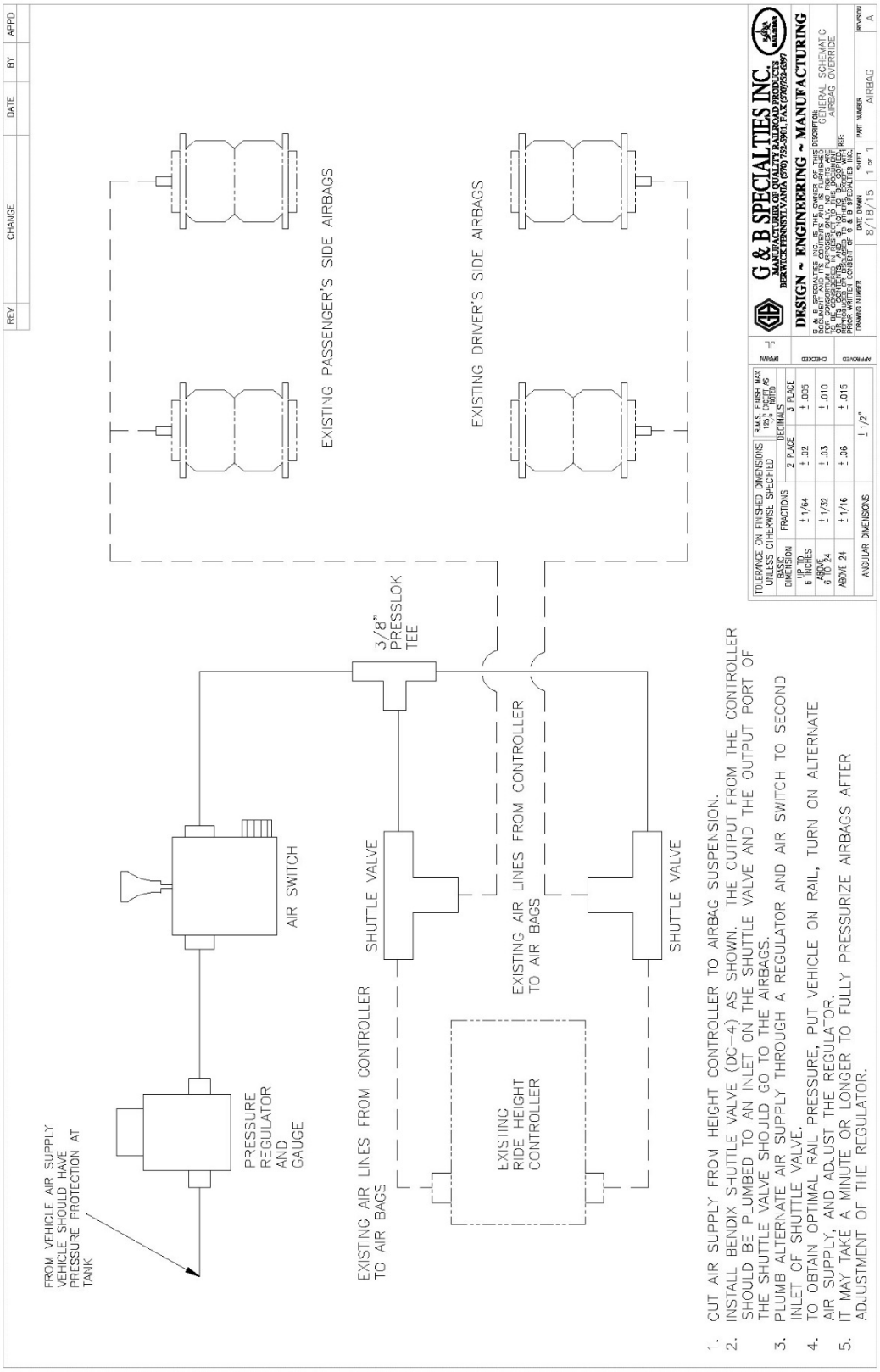
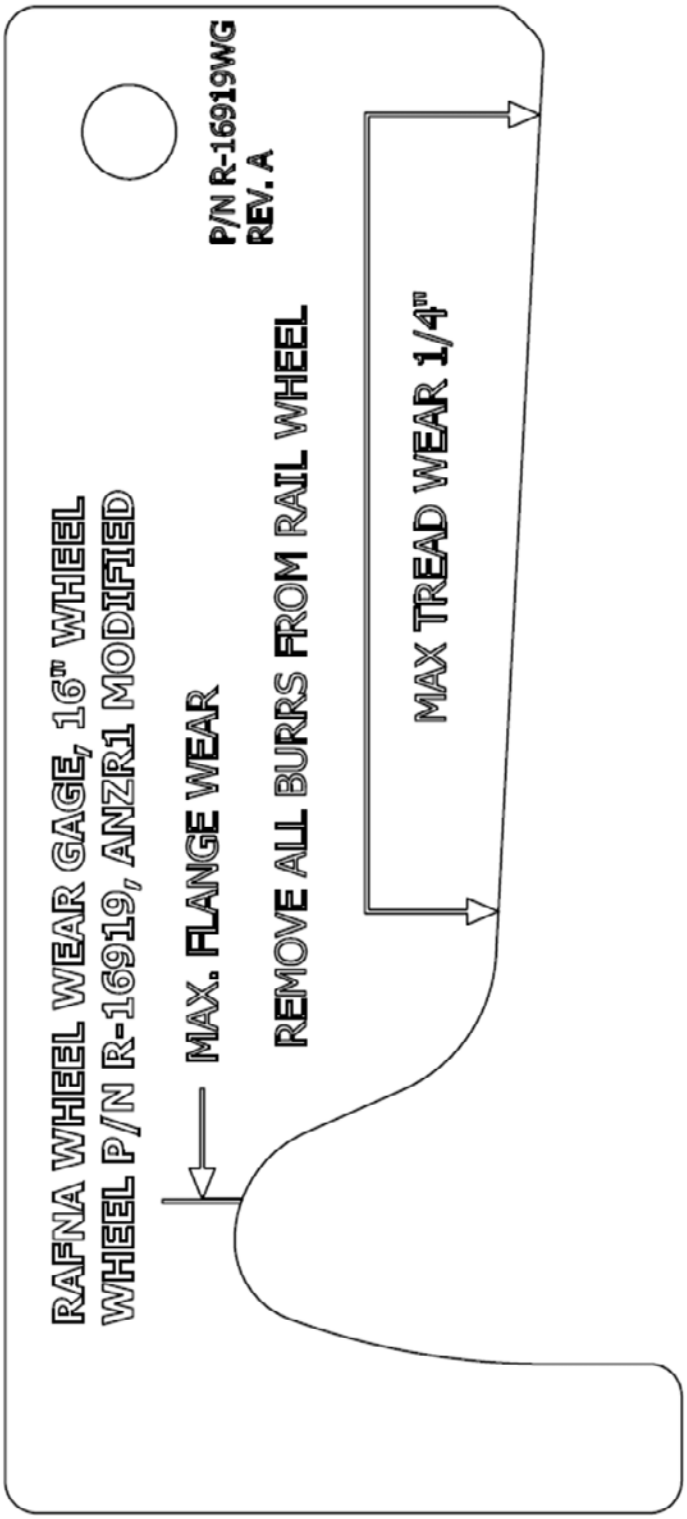


Figure 12.20: Reference (Airbag Override Schematic)



Not Shown to Scale

Figure 12.21: R-16919WG (Front Railgear Wheel Wear Gage, MBTA Compliant)

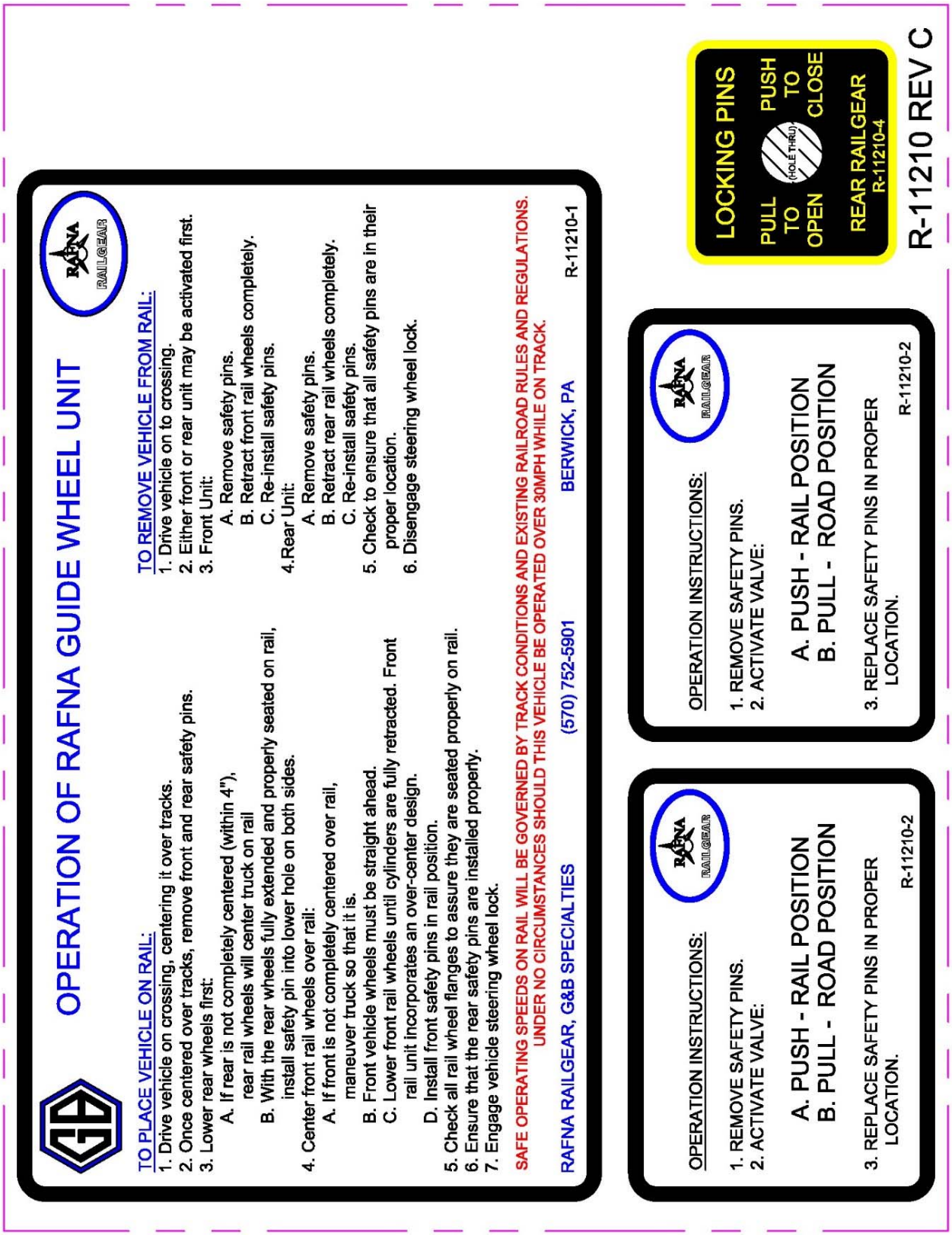


Figure 12.22 Decals

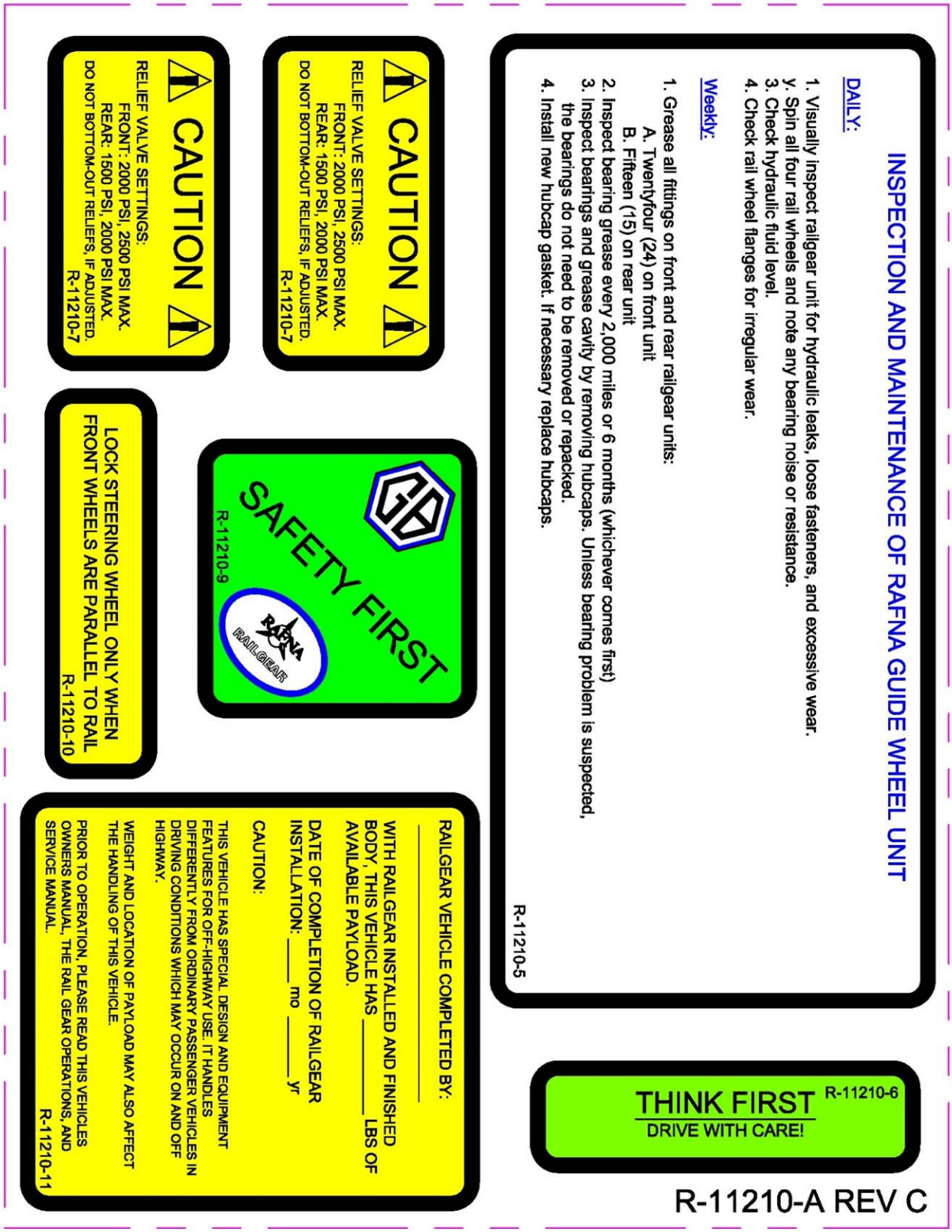


Figure 12.23 Decals, Continued

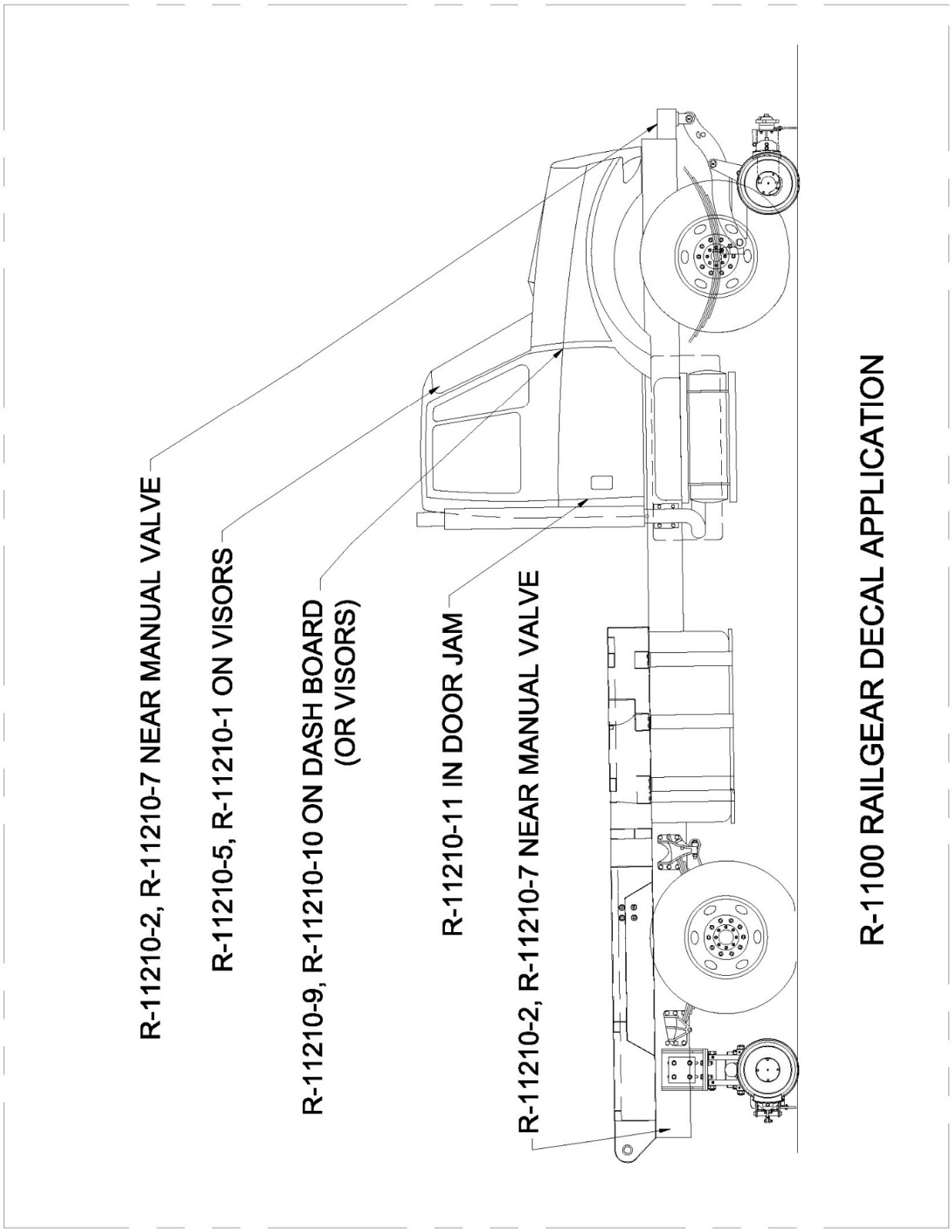


Figure 12.24 Decal Locations

VEHICLE MAKE: _____ VEHICLE MODEL: _____

VEHICLE YEAR: _____ VEHICLE VIN #: _____

VEHICLE UNIT #: _____

FRONT RAILGEAR SERIAL #: _____

REAR RAILGEAR SERIAL #: _____

ALIGN REAR RAILGEAR

A1 & A2 MUST BE EQUAL WITHIN 1/16"

A1 = _____
A2 = _____

B1 & B2 MUST BE EQUAL WITHIN 1/8"

B1 = _____
B2 = _____

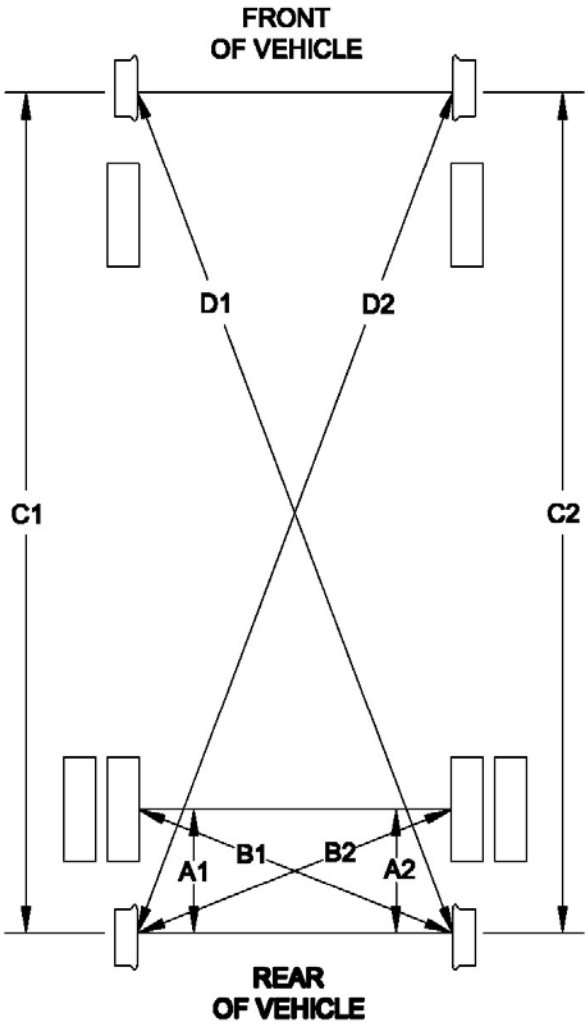
ALIGN FRONT RAILGEAR TO REAR

C1 & C2 MUST BE EQUAL WITHIN 1/8"

C1 = _____
C2 = _____

D1 & D2 MUST BE EQUAL WITHIN 1/4"

D1 = _____
D2 = _____



RAIL WHEEL FLANGE TO GROUND CLEARANCE

LEFT FRONT _____
RIGHT FRONT _____
LEFT REAR _____
RIGHT REAR _____

VEHICLE WHEEL

RAIL WHEEL

INSTALLER/INSPECTOR SIGNATURE: _____

Figure 12.25 Alignment Chart