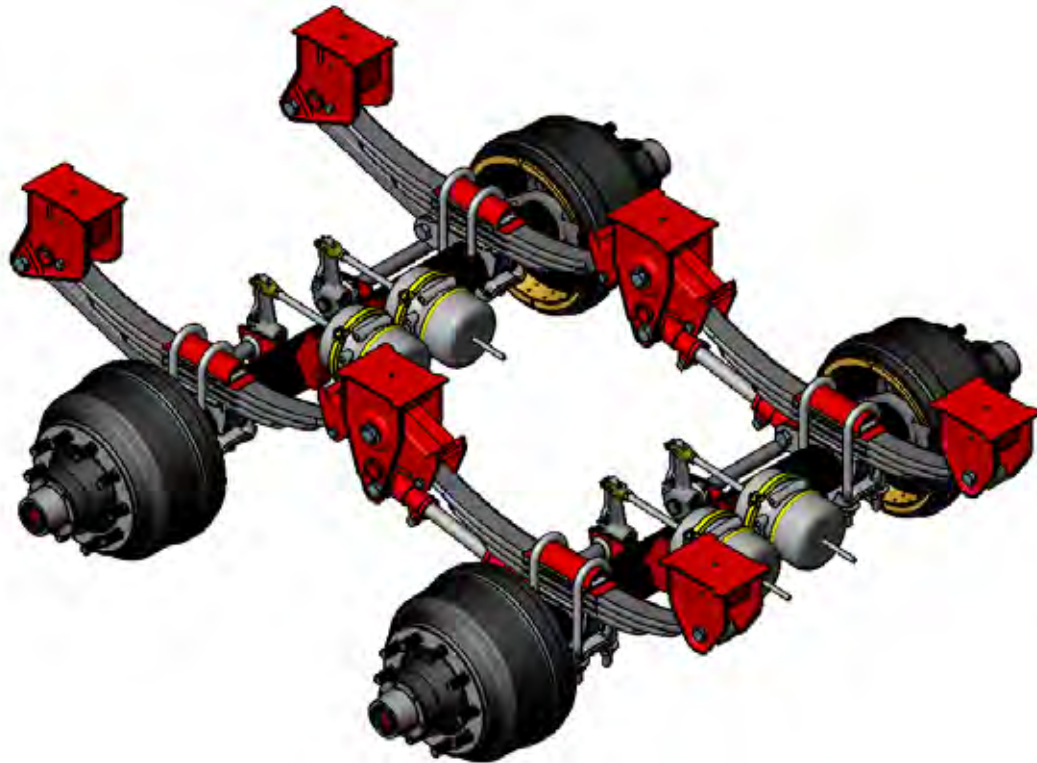




**Watson** Suspension Systems

## **MS2200, MS2500, and MS3000 Suspension Installation Manual**

### **ON/OFF HIGHWAY SUSPENSION SYSTEM**



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[www.WatsonSuspensions.com](http://www.WatsonSuspensions.com)

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This informational document describes features that may not be currently available. Contact a Watson & Chalin sales office for information on feature and product availability.

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## About

This manual contains information about the installation of the Watson & Chalin Trailer Mechanical Suspension Product Line and must be available for review by the installer to ensure proper safety, installation, and adjustments. The following models are discussed in this manual:

- MS2200
- MS2500
- MS3000

**Important:** Read and understand the entire manual before beginning the installation process or service of any components. Use this manual in conjunction with any corresponding drawings that come with Watson & Chalin suspensions upon delivery.

## Notices Used in this Manual

Observe the notices used in this document:

**NOTE:** Notes are used to indicate important information. This information may be repeated in other areas of the manual.

**CAUTION** – Cautions are used to indicate a potentially hazardous situation, which, if not avoided, may result in injury and/or damage to the equipment or other property.



**WARNING:** Warnings are used to indicate a potentially hazardous situation, which, if not avoided, could result in serious injury or death.



**DANGER:** Danger is used to indicate a potentially hazardous situation, which, if not avoided, will result in serious injury or death.

## Safety Notices

Read all safety statements before starting any work.

Before installing, adjusting, or conducting maintenance on this equipment, it is important to use and wear proper protection. Recommended safety equipment when operating and maintaining this equipment includes earplugs, eye protection, and a hard hat.

**NOTE:** Additional safety equipment may be required depending on the operating environment and worksite conditions.

Only qualified and trained personnel should install, maintain, and service this equipment. It is recommended that this equipment be inspected regularly for conditions that may impair proper usage of the equipment. Verify that all repairs have been completed and inspected prior to using the equipment under load.

## Local, State, and Federal Regulations

It is the responsibility of the installer and user to follow all local, state, and federal safety regulations. Improper use of this equipment may result in personal injury, property damage, and/or damage to the equipment.

## Modifications to Equipment

Any modifications made to this equipment may void any warranty and relieve the manufacturer of liability of any resulting injury or damage.

**Note:** Obtain approval from the vehicle manufacturer before making changes to the vehicle frame. Most vehicle manufactures prohibit cutting or welding on the vehicle frame, as it will void the manufacturer's warranty.

## Intended Use

The Watson & Chalin Trailer Mechanical Suspension is intended for use with trailers. Use of this equipment in any other manner is considered to be contrary to the intended use of the attachment and may void the warranty.

## Installer Responsibility

**Note:** Obtain approval from the vehicle manufacturer before making changes to the vehicle frame. Most vehicle manufactures prohibit cutting or welding on the vehicle frame, as it will void the manufacturer's warranty.

The suspension system installer is responsible for the following:

- Determine the correct location of the suspension to provide the proper vehicle load distribution as to not exceed the rated capacity of the components involved.
- Ensure the installation of the correct brake system components to guarantee proper braking performance. Brake installation must comply with FMVSS121 specifications.
- Verify that the suspension system is appropriate for the vehicle. Check the specifications on the suspension system.
- Obtain approval from the vehicle manufacturer before making changes to the vehicle frame.
- Verify that the vehicle chassis is rated for the additional weight of the axle and increased load.
- Verify that the suspension operates within run range.
- Verify the vehicle frame width is within the allowable mounting range of the suspension and that the vehicle crossmembers are correctly positioned.



**DANGER:** PROPER AXLE ATTACHMENT IS REQUIRED FOR SAFE OPERATION OF THE VEHICLE.



**DANGER:** DO NOT MODIFY OR ALTER ANY WATSON & CHALIN SUSPENSION COMPONENTS WITHOUT PROPER AUTHORIZATION FROM QUALIFIED WATSON & CHALIN PERSONNEL.



**DANGER:** DO NOT WELD ANY SUSPENSION COMPONENTS EXCEPT WHEN SPECIFIED BY WATSON & CHALIN.

## Model Identification

**Note:** Always use the assembly model number when contacting Watson & Chalin.

Each suspension assembly has an identification plate located on the left side (driver's side) bracket assembly. The plate includes the model number, serial number, and capacity (in pounds) for the assembly. Record the model and serial number for future reference.

The identification plate is a rectangular form with a rounded border. At the top left is the Watson & Chalin logo, consisting of the letters 'WC' in a stylized font above the words 'WATSON & CHALIN'. To the right of the logo is the phone number '1-800-445-0736'. Below the logo and phone number are several input fields: 'SERIAL' followed by a long rectangular box; 'MODEL' followed by a rectangular box; 'DWG' followed by a rectangular box; 'CAPACITIES/lbs' followed by a rectangular box; 'SUSPENSION' followed by a rectangular box; 'BRAKE' followed by a rectangular box; and 'AXLE' followed by a rectangular box. There are small circles on the left and right sides of the form, possibly indicating where it would be attached to a bracket.

Figure 1: Identification Plate

## Overload Warning



**WARNING** Do not overload the vehicle.

Overloading is the practice of transporting cargos that surpass the specified vehicle or component rating. Overloading can cause component failure resulting in accidents causing injury or death.

## Torque Definitions

FP – Foot-Pounds (NM – Newton-Meters)

## Weld Specifications

- When welding hangers to the frame use AWS E7018 electrode specifications for proper results.
- Contact axle manufacturer for pre-heat requirements.

## Installation Instructions

The installation of suspension hangers is similar in all cases.

**⚠ WARNING** Specific welding procedures are required for installations.

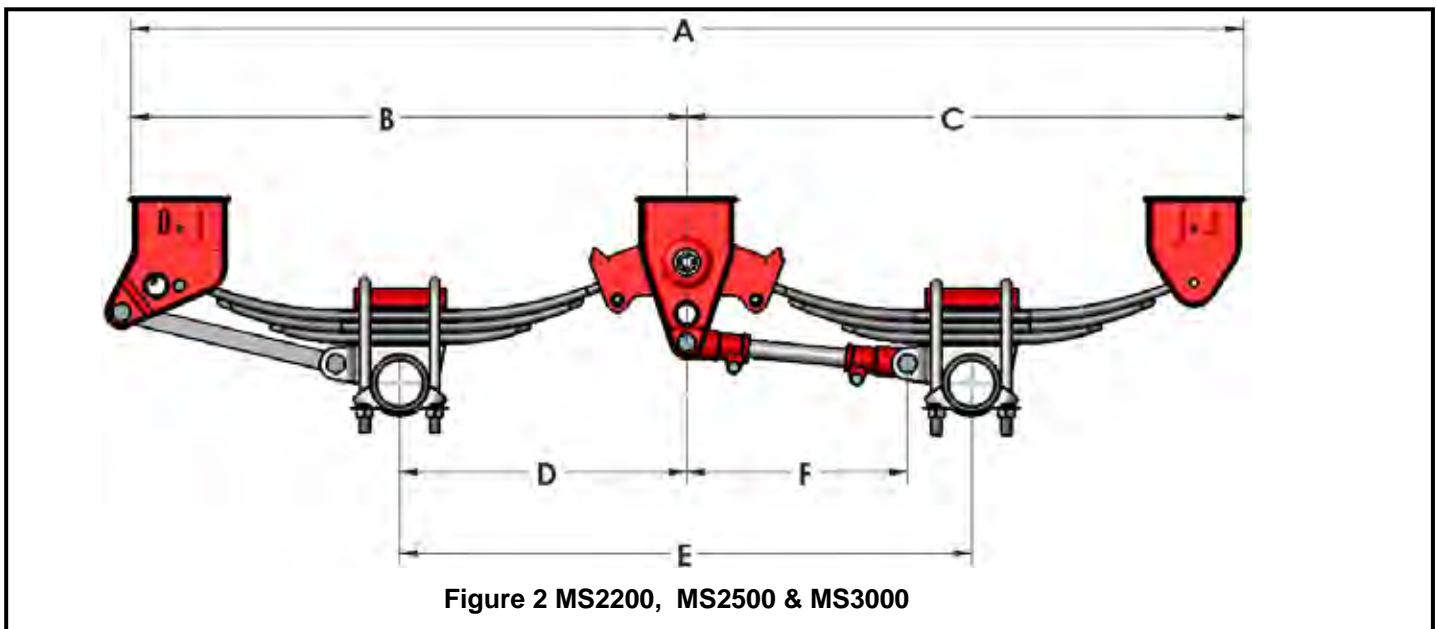
**NOTE:** The ground must be level and smooth.

### Brake Cam Location Requirements

Brake camshafts are located to the rear of the axle and chambers underneath the axle within 20° of centerline. The installer must check for adequate clearances if the brake camshafts are located in a different position. Ensure that the axle seats provide brake chamber and brake camshaft assembly clearances.

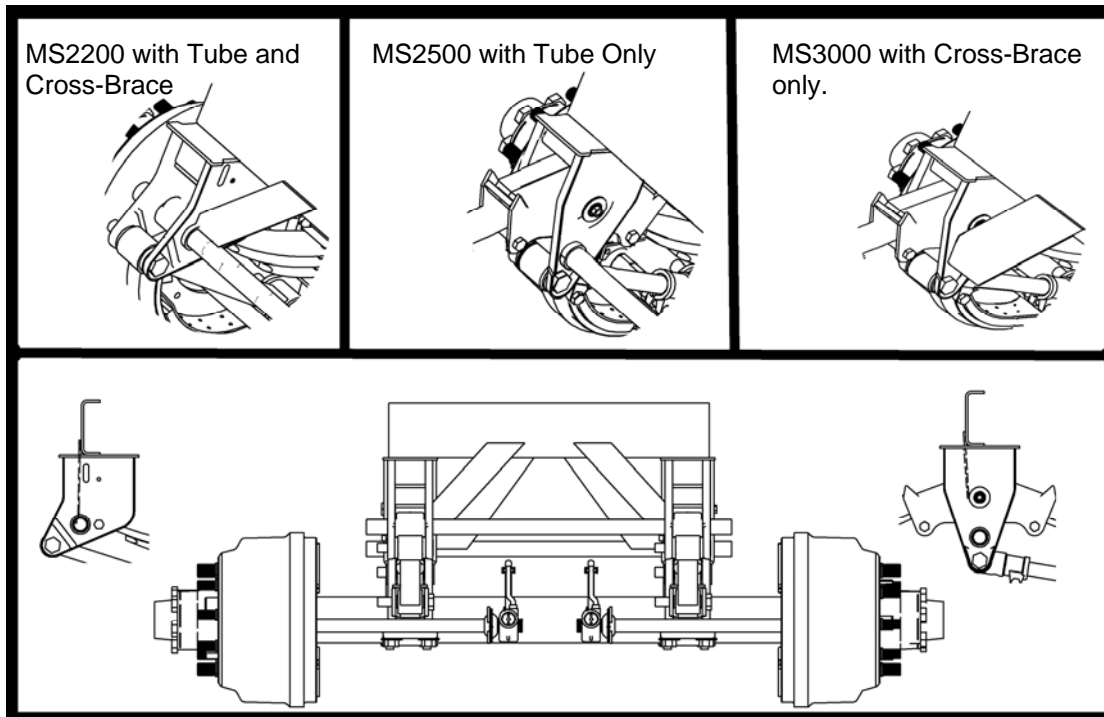
### Hanger Installation

1. For all models, the hanger center-to-center dimension is based on the axle spread requirement. Mark the centerline of the equalizer from the king pin on the sub-frame. The following figures show the typical setups for MS2200, MS2500, and MS3000. Location of the centerline will vary based on axle centers.



2. Locate and mark the front of the front hanger from the centerline of the equalizer.
3. Locate and mark the rear of the rear hanger from the centerline of the equalizer.
4. Clamp or tack weld the hangers in position to sub-frame. Verify that the brackets are secure both horizontally and vertically. Verify that the hangers are square in the frame. Hanger centers should be in line within 1/16".

Add 1.25" OD. schedule 40 pipe cross tube (supplied by installer) to front and center hangers of models MS22XX and MS25XX. (NOT REQUIRED FOR MS3000). Add ¼" (minimum) steel braces (supplied by installer) to front and center hangers of MS22XX and MS3000 (NOT REQUIRED FOR MS25XX).



**Figure 3 Hanger Installation**

5. The hangers shown (Figures 3) reflect the minimum required reinforcement. When suspension is mounted on the sub-frame, or subjected to heavy-duty service, hanger bracing should be increased accordingly. Gusset material must be ¼" minimum
6. Ensure brackets are square with the frame and secure both horizontally and vertically.

**Non-bolted Flanged Brackets**

- a. Flanged brackets clamp or tack weld the hangers into the proper position.
- b. Hanger center lines should be within +/- .06" (1.6mm) laterally and longitudinally.

**Bolted Flanged Brackets**

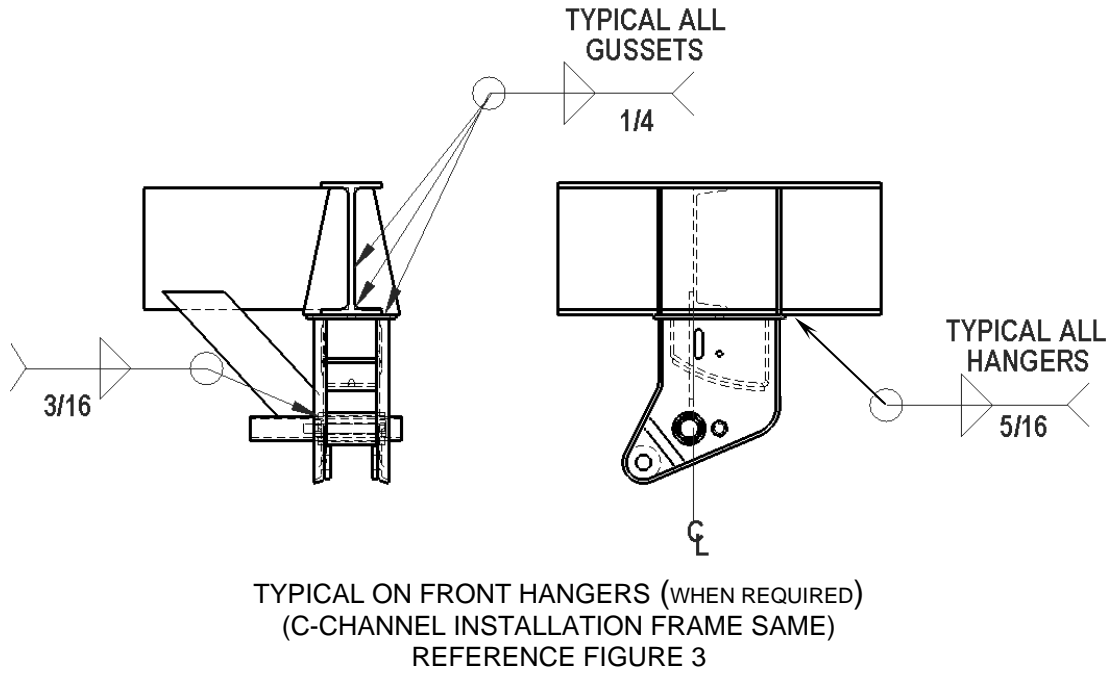
- a. Drill and ream all holes in frame and hangers for bolts.
- b. Install and tighten all fasteners.

**NOTE:** Fasteners must be SAE grade-8, .625" (5/8) minimum, with suitable locknuts and flat structural washers. On aluminum frames, backing plates should be used and properly treated to prevent electrolysis.

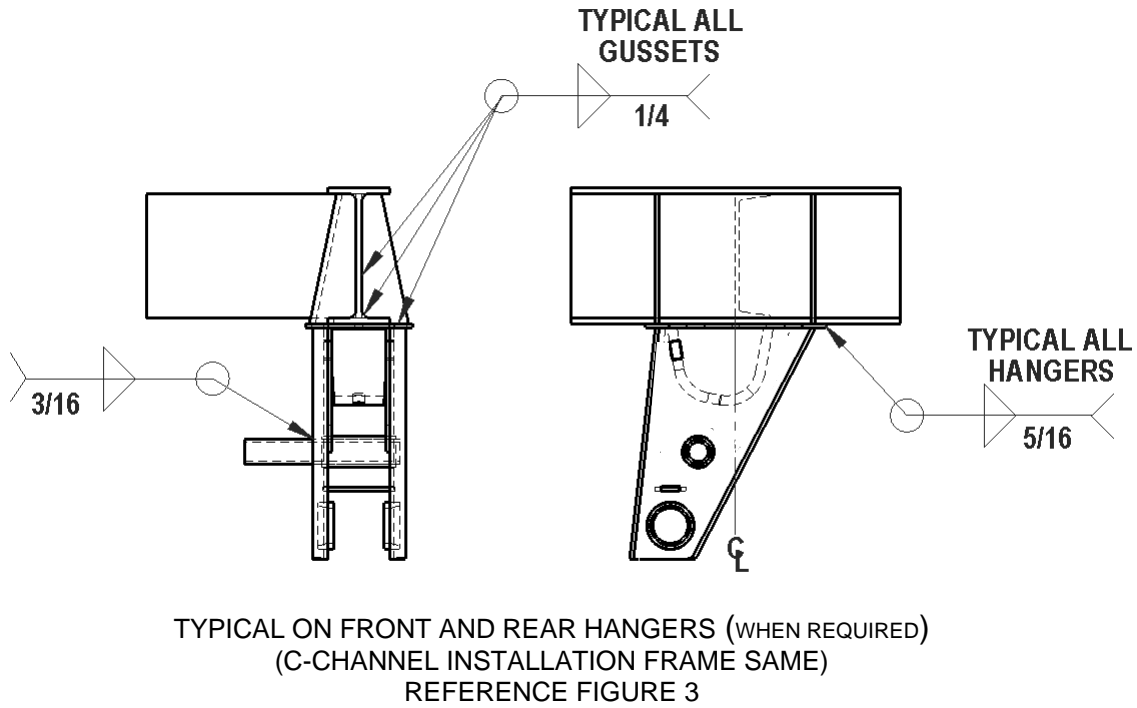
7. Tighten flange mount hanger fasteners per torque chart.



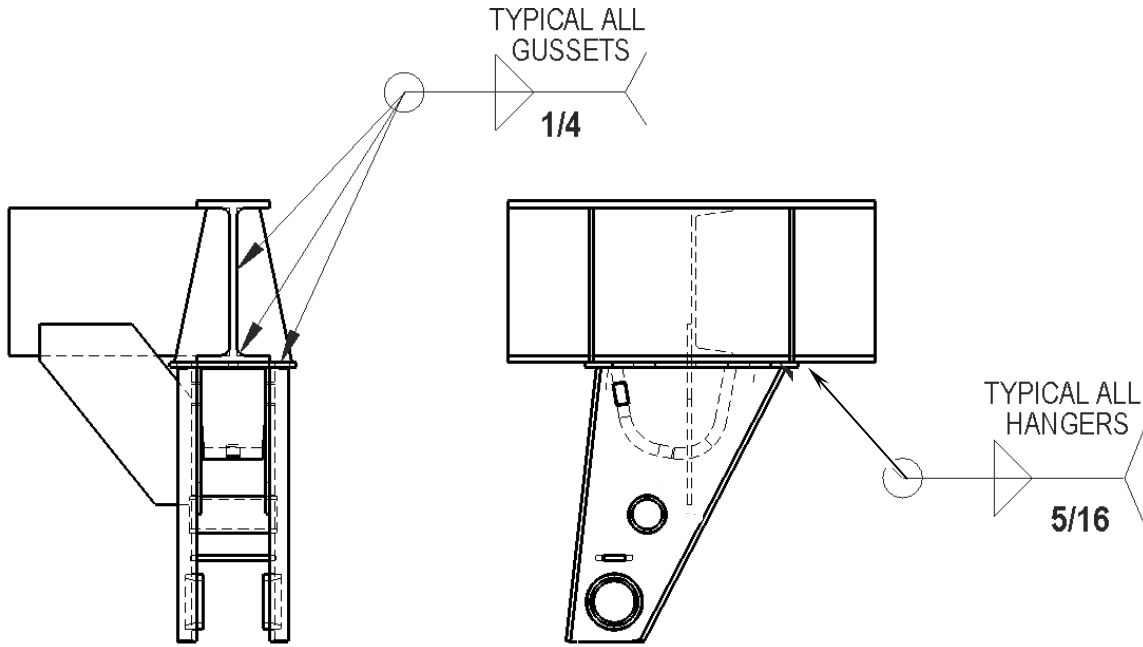
**NOTE:** Front hanger installations shown typical for all hangers.



**Figure 4 MS2200 Hanger Installations (Cross-Tube and Brace)**

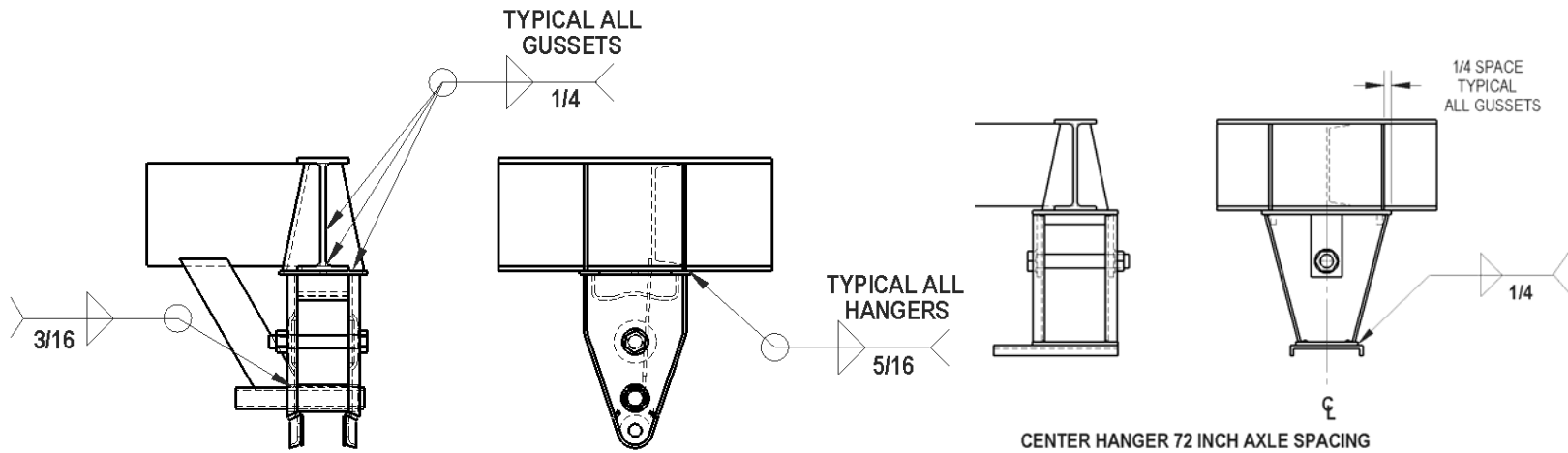


**Figure 5 MS2500 Hanger Installations (Cross-Tube)**



TYPICAL ON FRONT AND REAR HANGERS (WHEN REQUIRED)  
(C-CHANNEL INSTALLATION FRAME SAME)  
REFERENCE FIGURE 3

**Figure 6 MS3000 Hanger Installations (Brace)**



TYPICAL ON CENTER HANGERS (WHEN REQUIRED)  
(C-CHANNEL INSTALLATION FRAME SAME)  
REFERENCE FIGURE 3

**Figure 7 MS2200 Center Hanger (Cross-Tube and Brace)**

## Axle Seat Installation

**NOTE:** Review the entire installation procedures below before beginning the axle seat installation.

**WARNING:** If axle seats are not parallel the vehicle may lean to one side.

1. If the axle is Cambered, locate and mark the upper camber line on the axle.
2. Position the axle seats on the axle at the correct spring center spacing. This should be the same distance as the distance between right (CURB) side hanger's center line and left (ROAD) side hanger's center line.
3. If the axle is Cambered, the center line of spring bolt hole on the axle seat must pass through the axle camber line.
4. Upper surface of axle seats must be parallel to each other to within +/- 1/16", or the trailer could lean.

**NOTE:** Check for clearance with the brake chamber and camshaft.

5. Check fit of axle seats and bottom plates before welding.
6. Securely clamp the Axle seats in position and tack weld front and rear (Do not tack weld in the "No Weld Zone" which will include the axle camber line).

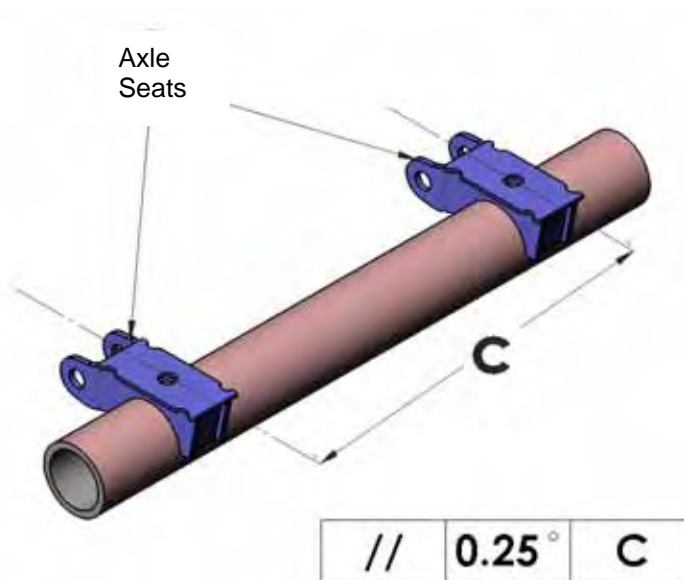
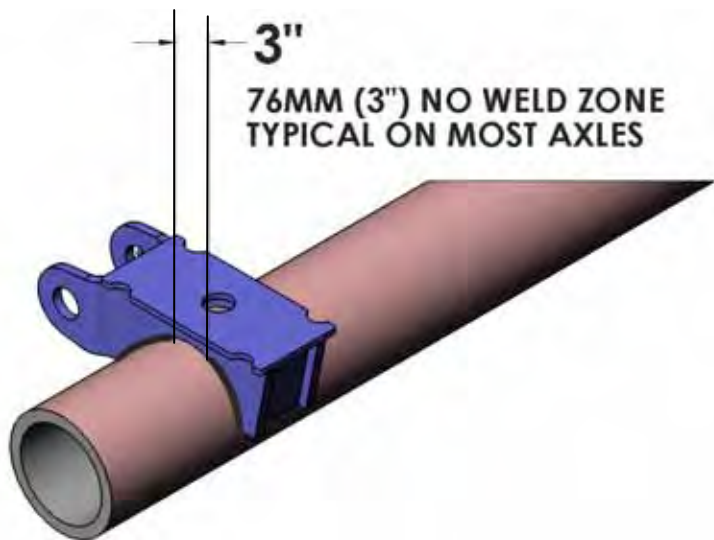


Figure 8 Axle Assembly

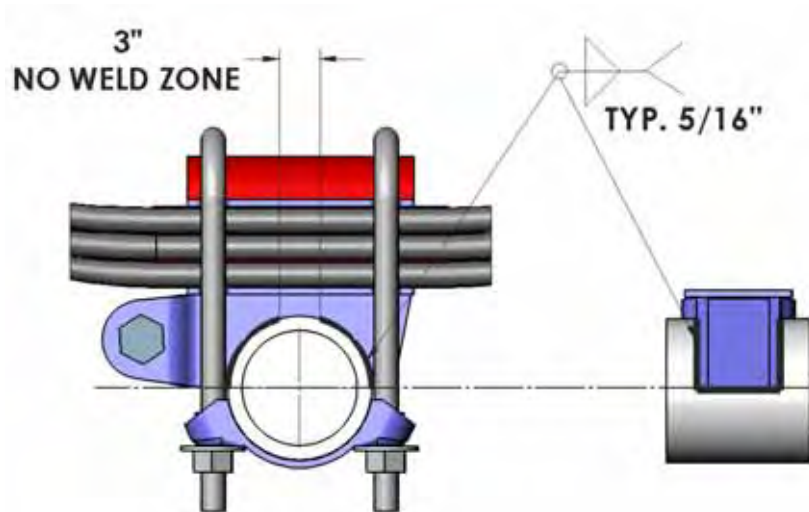
7. Weld the axle seats to the axle. Do not weld 1 ½" each side of the axle center line. The spring beams and U-bolts should not be attached to the seat during weld.



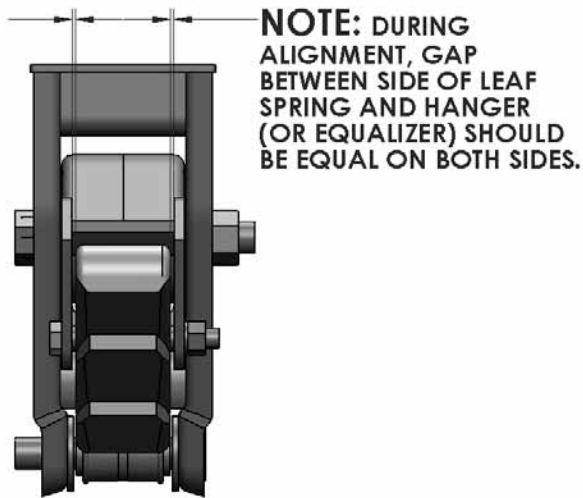
**Figure 9 No Weld Zone**

8. Position spring on axle seat. Refer to drawings or figure 12 for proper orientation of spring hooks. Secure the spring in place with the top and/or bottom plate, U-bolts, and nuts provided.
9. Recheck springs for proper spring spacing and alignment. Tighten U-bolts per torque chart.

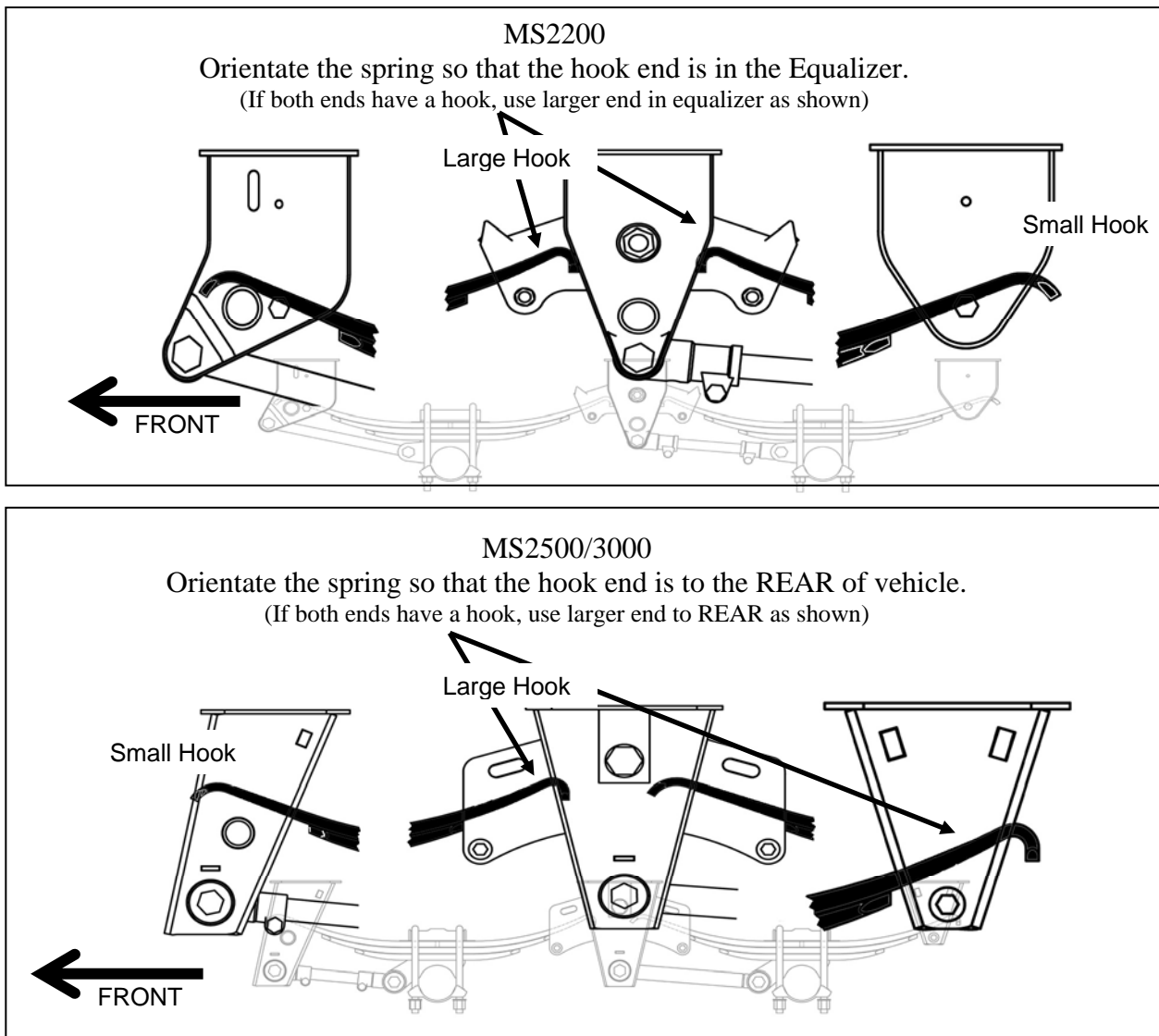
**NOTE:** Spring liners needed on the top side only when one, two, or three leaf springs is used. If axle seat spacers are used they must be welded to the axle seat, front and rear.



**Figure 10 Leaf Springs on Axle (No Weld Zone)**



**Figure 11 Equal Spacing Between Side of Leaf Spring and Hanger**

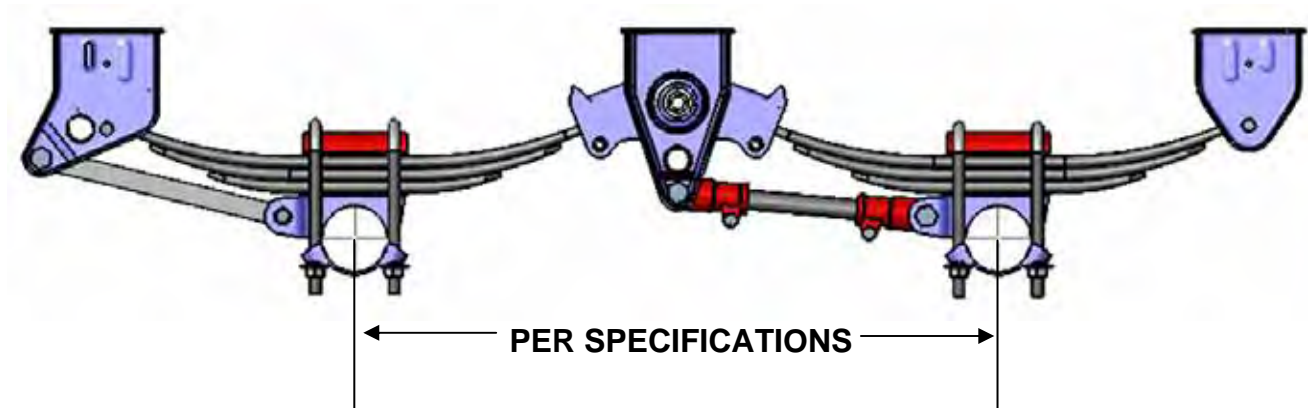


**Figure 12 Spring Hook End Orientation**

## Axle to Hanger Assembly Installation and Preliminary Alignment

1. Position the axle and spring assembly between the hangers.
2. Secure the torque arms between the front and center hangers.
3. Install the spring rollers and bolts (1/2" or 5/8", see drawing) in the equalizer and rear hanger.

**NOTE:** See assembly drawings for dimensions and special installation requirements.



**Figure 13 Axle to Hanger Assembly**

4. Check to see that springs are seated, interference-free and on all bearing surfaces. Install fasteners to hold torque arms. Do not apply torque.
5. Position the frame at the desired mounting height and perform preliminary rough alignment by centering axle laterally, and aligning axles squarely with respect to the frame to within 1/8".
6. Torque arm attaching fasteners can now be tightened per the torque chart. (For Model MS2500 see Figure 15 for Special Bushing Installation Instructions)

**NOTE:** Do not tighten the Torque Arm adjustable eye end clamp bolts at this time.

## Final and In-Service Suspension Alignment Instructions

Before performing the following procedure, make sure the ground is level and smooth.

1. Release the brake system and pull the trailer forward while staying straight to prevent and/or release any suspension binding.
2. Use of an axle extension's and "Bazooka" type king pin post, or a suitable optical alignment device, is recommended for optimum results. Rotate the adjustable torque arm tube to align the front axle.
3. When the axles are aligned to  $\pm 1/8$ " tighten the torque arm clamp fasteners on the front axle per torque chart. Align the rear axle with the front axle to  $\pm 1/16$ ".

**NOTE:** Left side and right side axle measurements should be equal to within  $\pm 1/16$ ". When the axles are aligned, tighten the adjustable torque arm clamp fasteners on the rear axle per the torque chart.

4. Recheck the alignment after an initial loaded run-in period (approximately 1000 miles (1600 km)).

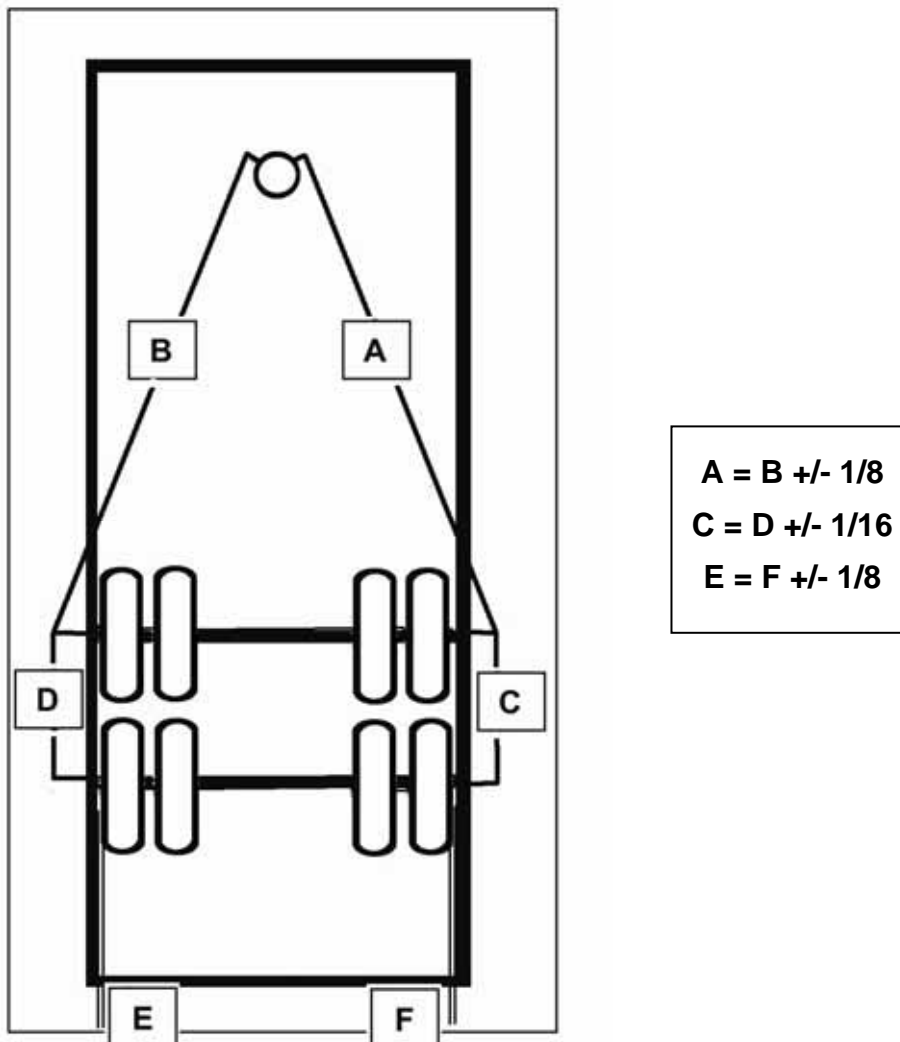


Figure 14 Axle Alignment

## Maintenance Schedules

Leaf Spring Suspensions require scheduled maintenance to ensure continue trouble-free performance.

Recommended Maintenance Schedule	
Pre-service inspection	
First service inspection after 1000-3000 miles (1600 – 4800 KM)	
Annual “C” Inspections	
During replacement of any parts.	
Upon discovery of any loose components.	
Torque Requirements	
Tighten 7/8” U-bolt nut	400-450 FP (540-610 NM)
Tighten 3/4” U-bolt nut	200-250 FP (271-340 NM)
Tighten 1 ¼” equalizer thru bolt	1400-1500 FP (1900-2035 NM)
Tighten 7/8” torque arm fastener	500-550 FP (680-745 NM)
Tighten 5/8” torque arm fastener	150-200 FP (200-270 NM)
Tighten 5/8” or 1/2” spring retainer nuts (spring retainers should freely roll in hangers and equalizers.)	25-30 FP (35-41 NM)
Visual Inspection	
Loose or missing fasteners.	
Cracks in hangers or axle connection brackets.	
Springs, not centered in hangers and equalizers.	
Torque values are specified with clean, lightly oiled fasteners, and should only be verified with a calibrated torque wrench. Failure to follow these instructions could void the warranty and may result in subsequent injury.	

FP = foot-pounds (NM = Newton-Meters)

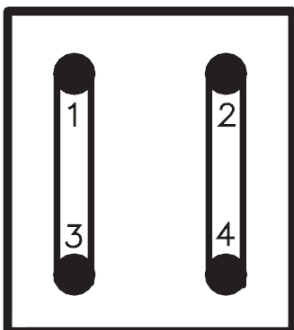


Figure 16 U-Bolt Torque Pattern



## **Fasteners**

- Immediately tighten any and all loose fasteners. Check all components for wear and ensure mounting holes are not worn or egg shaped.
- When replacing a fastener, ensure the threads are clean, lightly oiled and not deformed. Consult the maintenance section for the correct torque specification.
- Use a calibrated torque wrench to ensure an accurate torque reading.

## **Alignment**

Check and adjust the alignment if required after the first 1000 – 3000 loaded-miles (1600 – 4800 KM) of operation and every 12 months thereafter.

## **Bushings**

Inspect rubber bushings during all recommended maintenance schedules for large splits, tears, and major wear. Rubber is attacked by sun, oils, and greases. Replace any bushings which have noted damage.

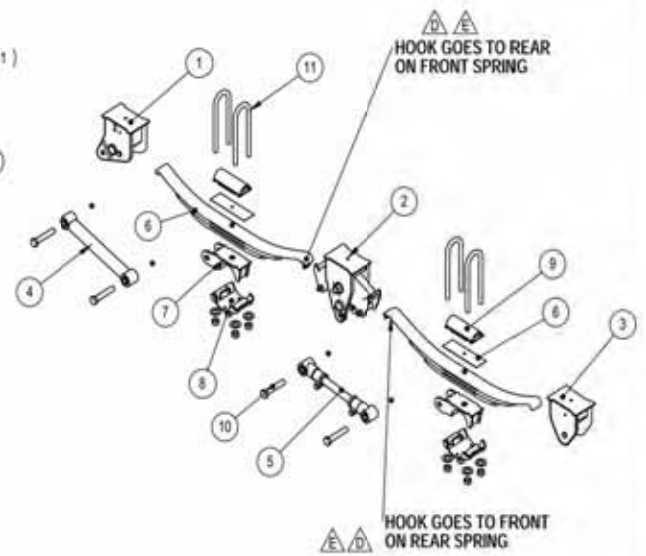
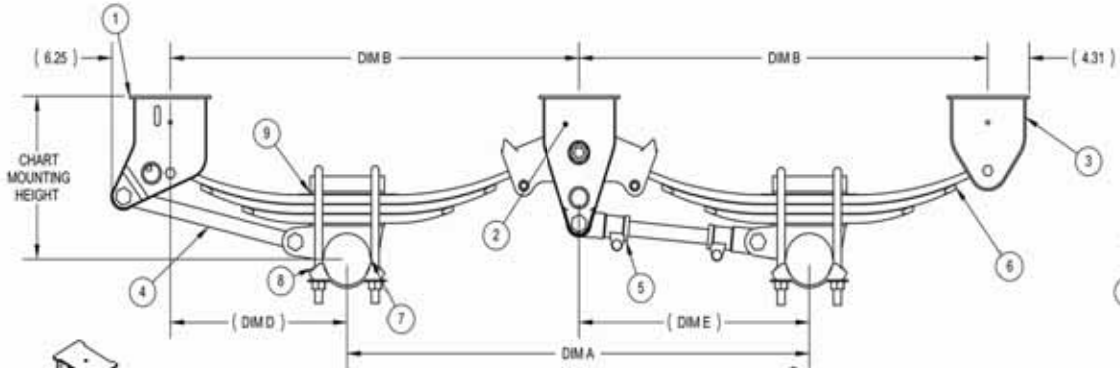
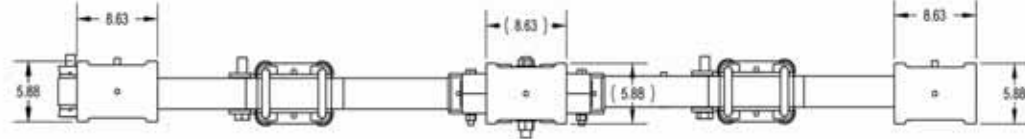
**NOTE:** If any of the above defects are noted, have vehicle checked by a qualified mechanic.

REV.	DESCRIPTION	ECN	DATE	BY
A	NEW DRAWING	C-5646	7/13/2008	TEG
B	CHANGED UNDERSLUNG AXLE SEAT, ADDED SIDE MOUNT	C-5724	8/14/2008	TEG
C	ADDED 1.25" AXLE SEAT AND UBOLT FOR UNDERSLUNG	C-6033	12/18/2008	TEG
D	ADDED NOTE FOR HOOKS ON SPRINGS	C-6266	3/11/2009	TEG
E	REVERSED HOOK NOTE	7214	10/5/2009	TEG

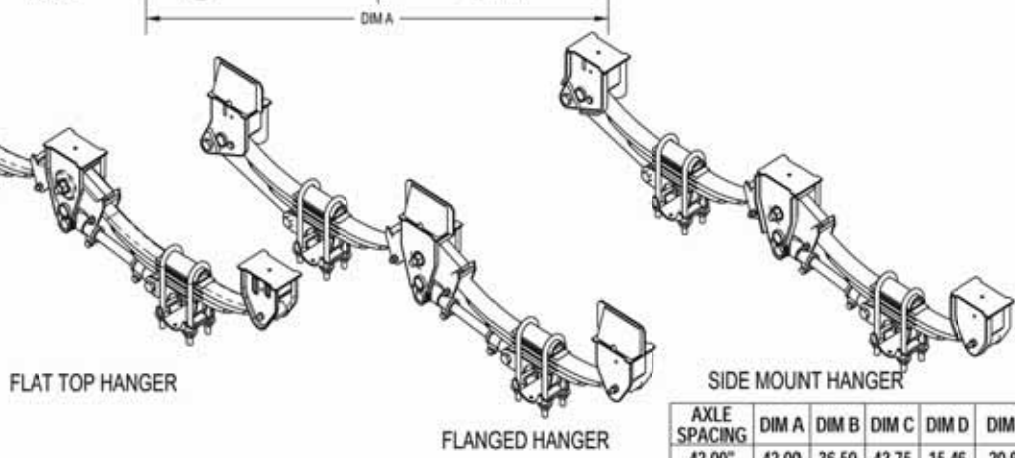


ITEM NO.	QTY	PART NUMBER	DESCRIPTION
1	2	CHART	FRONT HANGER ASSEMBLY MS2200
2	2*	920662-49	EQUALIZER ASSEMBLY MS2200
3	2	CHART	REAR HANGER ASSEMBLY MS2200
4	2*	CHART	FIXED TORQUE ROD MS2200
5	2*	CHART	ADJUSTABLE TORQUE ROD MS2200
6	4*	CHART	LEAF SPRINGS MS
7	4*	CHART	AXLE SEAT UPPER MS2200
8	4*	CHART	LOWER AXLE SEAT MS2200
9	4*	CHART	UPPER U-BOLT PLATE MS2200
10	4	FW66-08	HARDWARE PACK MS220X
11	2*	CHART	U-BOLT HARDWARE PACK MS2200

\* QTY SHOWN FOR 2 AXLE UNIT. QTY CHANGES PER AXLE COUNT.



MOUNTING HEIGHT TOP MOUNT	
SPRING	MULTI AXLE
54	16.00
55	14.50
56	13.75
64	16.00
65	13.75
24	16.00
25	14.50
26	13.75
63	13.75
60	16.00
.75 SEAT HEIGHT	



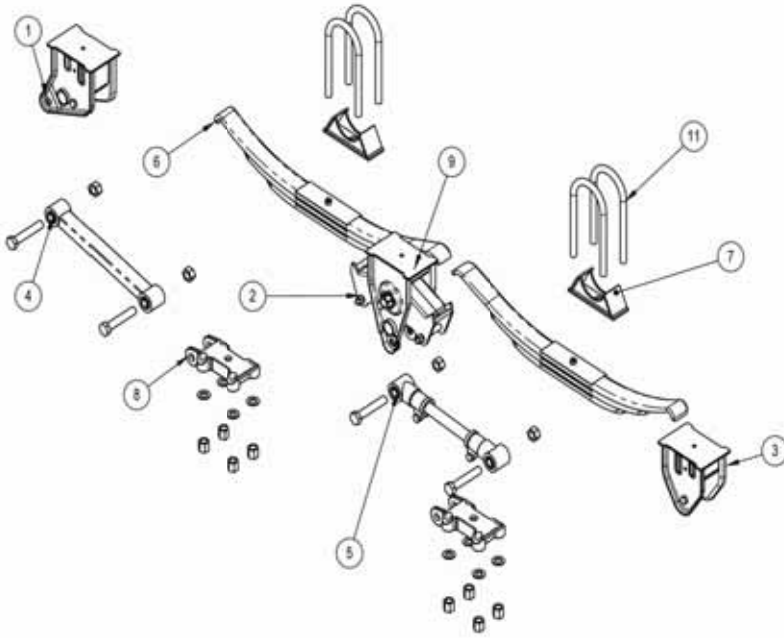
AXLE SPACING	DIM A	DIM B	DIM C	DIM D	DIM E
42.00"	42.00	36.50	42.75	15.46	20.96
49.00"	49.00	43.50	49.75	18.96	24.46
53.00"	53.00	47.50	53.75	20.96	26.46

## MS220XT TOP MOUNT

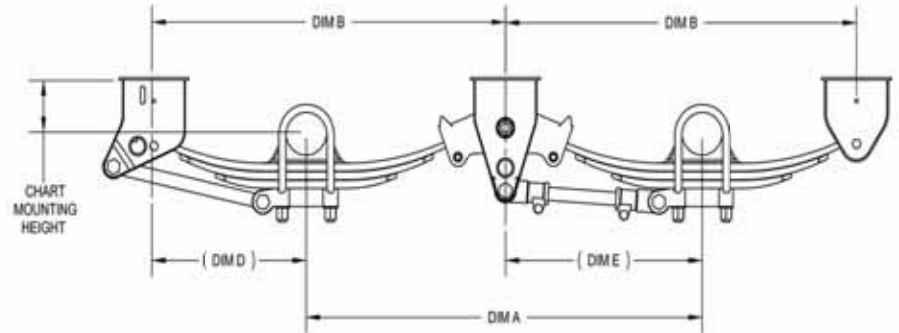
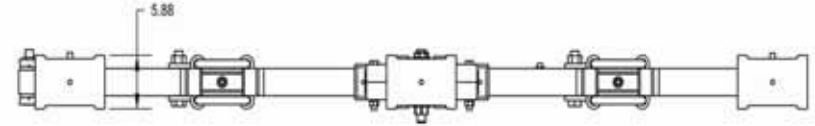
SEE PAGE 2 FOR UNDERSLUNG  
SEE PAGE 3 FOR CHARTS

TOLERANCES (EXCEPT AS NOTED)		DESCRIPTION: MS220X SPRING SUSPENSION ASSEMBLY	
DECIMAL	± .06	PREVIOUS ASSY	-
FRACTIONAL	± 1/16	SUSPENSION MODEL	MS220X
ANGULAR	± 1°	DATE	07/17/08
		DRAWN BY	TEG
		ISSUE	B
		DRAWING NO.	MS220X
		SHEET	1 OF 3
		SCALE	1:12





ITEM NO.	QTY	PART NUMBER	DESCRIPTION
1	-	CHART	FRONT HANGER ASSEMBLY MS2200
2	-	920662-49	EQUALIZER ASSEMBLY MS2200
3	-	CHART	REAR HANGER ASSEMBLY MS2200
4	-	CHART	FIXED TORQUE ROD MS2200
5	-	CHART	ADJUSTABLE TORQUE ROD MS2200
6	-	CHART	LEAF SPRINGS MS
7	-	CHART	AXLE SEAT MS220XU 5" DIA
8	-	CHART	SPRING SEAT CASTING
9	-	CHART	UPPER U-BOLT PLATE MS2200
10	-	FW66-08	HARDWARE PACK MS220X
11	-	CHART	U-BOLT HARDWARE PACK MS2200



MOUNTING HEIGHT UNDERSLUNG **	
SPRING	MULTI AXLE
54	7.00
55	5.50
56	4.50
64	6.50
65	4.25
24	7.50
25	6.00
26	5.25
63	5.75
60	6.50

\*\* FOR STANDARD .50" AXLE SEAT HEIGHT ADD DIFFERENCE FOR TALLER SEATS.

MS220XU UNDERSLUNG

AXLE SPACING	DIM A	DIM B	DIM C	DIM D	DIM E	DESCRIPTION:
42.00"	42.00	36.50	42.75	15.46	20.96	MS2202 UNDERSLUNG SPRING SUSP
49.00"	49.00	43.50	49.75	18.96	24.46	
53.00"	53.00	47.50	53.75	20.96	26.46	

DATE:	SCALE:	DRAWN BY:	SIZE:	DRAWING NO:
07/17/08	1:14	TEG	B	MS220X



# MS220 X FT 49 T 5R 07 54

MODEL NUMBER

NUMBER OF AXLES	
OPTION	DESCRIPTION
1	SINGLE AXLE
2	TANDEM AXLE
3	TRIDEM AXLE
4	QUAD AXLE


HANGER STYLE OPTIONS				
OPTION	DESCRIPTION	ITEM #1	ITEM #2	ITEM #3
FT	FLAT TOP MOUNT	920613	920662-49	920615
FL	FLANGE MOUNT	920692-10/-20	920693	920694-10/-20
SM	SIDE MOUNT	920714-10/-20	920715-10/-20	920716-10/-20

QTY DEPEND ON NUMBER OF AXLES

AXLE SPACING			
OPTION	DESCRIPTION	ITEM # 4	ITEM #5
42	42.00" SPACING 2 AXLE	N/A	N/A
49	49.00" SPACING 2 AXLE**	990348	990349
53	53.00" SPACING 2 AXLE	N/A	N/A

U-BOLT PACKS TOP MOUNT	
DESCRIPTION	ITEM # 11
2.25-3.25 UB RANGE (10.75")	16090-01
3.26-4.25 UB RANGE (11.75")	16090-02
4.26-5.25 UB RANGE (12.75")	16090-03
5.26-6.25 UB RANGE (13.75")	16090-04
6.26-7.25 UB RANGE (14.75")	16090-05
7.26-8.25 UB RANGE (15.75")	16090-06

ADD UB-XX NUMBER TO GET U-BOLT PACK NUMBER TOP MOUNT ONLY!

U-BOLT PACKS UNDERSLUNG	
DESCRIPTION	ITEM #
U-BOLT KIT UNDERSLUNG	16004-08
U-BOLT KIT UNDERSLUNG 1.25" SEAT	16004-13 

SEAT HEIGHT OPTIONS		
OPTION	DESCRIPTION	ITEM # 7
07	0.75" SEAT UB-0.75	940209-07
12	1.25" SEAT UB-1.25	940209-12
17	1.75" SEAT UB-1.75	940209-17
22	2.25" SEAT UB-2.25	940209-22
27	2.75" SEAT UB-2.75	940209-27
32	3.25" SEAT UB-3.25	940209-32
37	3.75" SEAT UB-3.75	940209-37
42	4.25" SEAT UB-4.25	940209-42
47	4.75" SEAT UB-4.75	940209-47
000	UNDERSLUNG SEAT	940227
012	UNDERSLUNG SEAT 1.25	940227-125 

SPRING TYPE OPTION		
OPTION	DESCRIPTION	ITEM #6
54	3 LEAF 20,400 CAP 2.00" DEF 354-00 UB-2.5 (HIGH)	91275-540
55	3 LEAF 20,400 CAP 1.72" DEF 355-00 UB-2.5 (MED)	91275-550
56	3 LEAF 20,400 CAP 1.50" DEF 356-00 UB-2.5 (LOW)	91275-560
64	3 LEAF 22,000 CAP 1.27" DEF 365-00 UB-3.0 (HIGH)	91275-650
65	3 LEAF 22,000 CAP 0.82" DEF 365-01 UB-3.0 (LOW)	91275-651
24	2 LEAF 20,400 CAP 1.77" DEF 324-01 UB-2.0 (HIGH)	91275-241
25	2 LEAF 20,400 CAP 1.70" DEF 325-01 UB-2.0 (MED)	91275-251
26	2 LEAF 20,400 CAP 1.28" DEF 326-01 UB-2.0 (LOW)	91275-261
63	1 LEAF 20,400 CAP 1.65" DEF 363-00 UB-1.5 (LOW)	91275-630
60	1 LEAF 20,400 CAP 1.55" DEF 360-00 UB-1.5 (HIGH)	91275-600
66	8 LEAF 24,000 CAP 1.72" DEF 752-01 UB-4.0 (LOW)	91394-752

AXLE TYPE OPTIONS			
OPTION	DESCRIPTION	ITEM # 8	ITEM # 9
SR	5.00" ROUND AXLE TOP MOUNT	940210	940211
	5.00" ROUND AXLE UNDERSLUNG	19675	N/A
SS	5.00" SQUARE AXLE	N/A	N/A

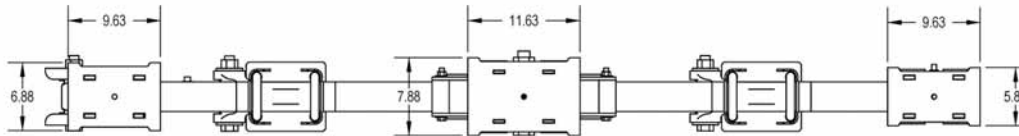
MOUNTING STYLE	
OPTION	DESCRIPTION
T	TOP MOUNT
U	UNDERSLUNG

HARDWARE PACKS FOR REPLACEMENT PARTS		
OPTION	DESCRIPTION	PART #
01	SINGLE AXLE	16087-01
02	TANDEM AXLE	16087-02
03	TRIDEM AXLE	16087-03
04	QUAD AXLE	16087-04

\*\* SHOWS STANDARD OPTION

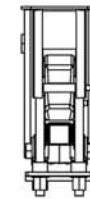
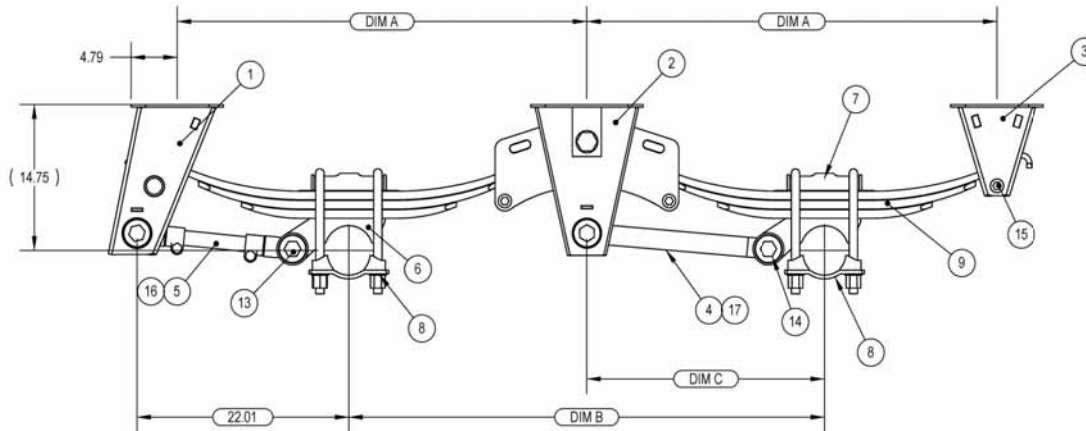
DESCRIPTION: MS2200 CONFIGURATION		
SHEET: 3 OF 3		
DATE: 11/22/06	SCALE: 1:1	DRAWN BY: TEG
SEE: B	DRAWING NO: MS220X	

REV.	DESCRIPTION	ECN	DATE	BY
A	NEW DRAWING	C-6037	1/23/2009	TLK
B	ADDED BOLT ON OPTION	7124	7/20/2009	TEG



ITEM NO.	QTY	PART NUMBER	DESCRIPTION
1	2	CHART	FRONT UNDERMOUNT HANGER
2	2	CHART	CENTER HANGER W/EQUALIZER MS250X
3	2	CHART	REAR UNDERMOUNT HANGER
4	1	990351-18.88	FIX TORQUE ROD
5	1	990352-16.25	ADJUSTABLE TORQUE ROD
6	4	CHART	AXLE SEAT CASTING
7	4	91289	TOP PLATE U-BOLT CASTING
8	4	940212	AXLE PLATE
9	4	CHART	LEAF SPRINGS MS
10	4	CHART	U-BOLT KIT MS
11	1	16100-01	FRONT HANGER HARDWARE PACK MS250X
12	1	16100-02	CENTER HANGER W/EQUALIZER HARDWARE PACK MS250X
13	1	16100-03	REAR HANGER HARDWARE PACK MS250X
14	2	91550	EQUALIZER BUSHING MS250X (REF ONLY)
15	16	91292	TORQUE ROD BUSHING MS250X (REF ONLY)
16	1	990351-16.25	FIX TORQUE ROD
17	1	990352-18.88	ADJUSTABLE TORQUE ROD

\*\* QUANTITIES SHOWN ARE FOR 2 AXLE



SPECIAL CHARACTERISTICS SYMBOL LEGEND	
(X.XX)	WIC CRITICAL DIM
** X.XX	DESIGNATES A ± .125 TOL
* X.XX	DESIGNATES A KEY CUSTOMER CHARACTERISTIC
KEY CUSTOMER CHARACTERISTICS SYMBOLS	
WIC	NAVISTAR/INTERNATIONAL
F	FREIGHTLINER
M	MACK TRUCKS
P	PACCAR

NOTE: PARENTHESIS ( ) DENOTES REFERENCE DIMENSION

TOLERANCES (EXCEPT AS NOTED)			DESCRIPTION: MS250X MAIN ASSEMBLY		
DECIMAL	± .06	PREVIOUS ASSY:	-	SHEET:	1 OF 2
FRACTIONAL	± 1/16	SUSPENSION MODEL:	MS250X	SCALE:	1:12
ANGULAR	± 1°	DATE:	01/23/09	DRAWN BY:	TLK
AXLE SPACING	DIM A	DIM B	DIM C	SIZE:	B
49	42.50	49.00	18.00	DRAWING NO.:	MS250X
54	45.25	54.50	18.00	WATSON & CHALIN MANUFACTURING, INC. Watson Suspension Systems	
60	48.00	60.00	18.00		

\* SHOWS STANDARD OPTION

# MS25 49 2T FT 5R 075 10

AXLE SPACING	
OPTION	DESCRIPTION
49	49" SPACING*
54	54" 1/2 SPACING
60	60" SPACING

SPRING TYPE OPTION		MOUNT HEIGHT**		ITEM #9	ITEM #10
OPTION	DESCRIPTION	SINGLE AXLE	MULTI-AXLE		
04	3 LEAF 11,000 CAP	15.00	14.75	TRA 2291	19606-02
08	7 LEAF 9,000 CAP	13.00	14.00	TRA 2256	N/A
09	8 LEAF 11,000 CAP	14.50	14.75	TRA 2270	N/A
10	9 LEAF 13,000 CAP	15.00	15.25	TRA 2297	N/A
99	3 LEAF 11,000 CAP	17.50***	17.25***	TRA 3384	19606-05***

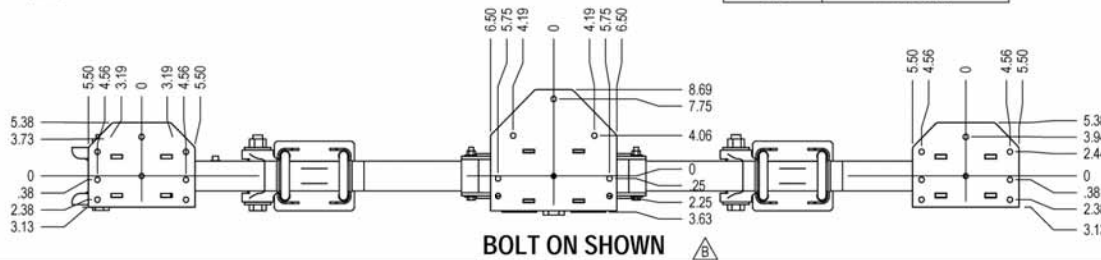
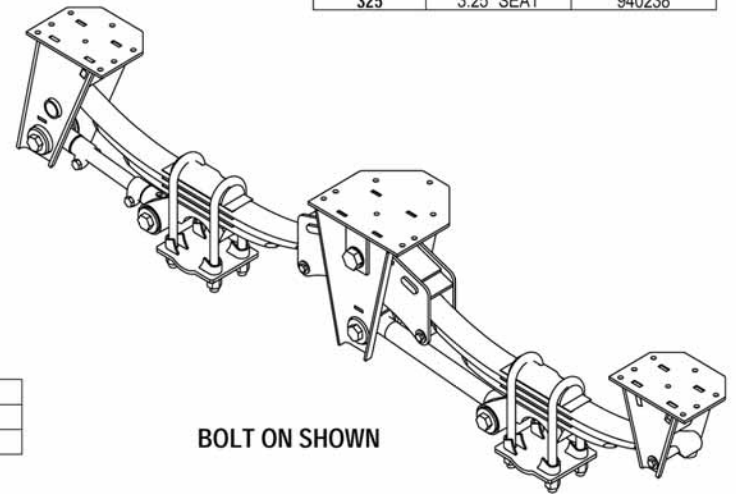
\*\* BASED ON 0.75" SEAT  
\*\*\* BASED ON 3.25" SEAT

SEAT HEIGHT OPTIONS		
OPTION	DESCRIPTION	ITEM #6
075	0.75" SEAT*	91286
325	3.25" SEAT	940238

AXLE & MOUNT				
OPTION	DESCRIPTION	ITEM #1	ITEM #2	ITEM #3
1T	1 AXLE TOP MOUNT	920727	N/A	920729
2T	2 AXLE TOP MOUNT	920727	920737	920729
3T	3 AXLE TOP MOUNT	920727	920737	920729
⚠	BOLT ON HANGERS	920727B-10 920727B-20	920737B	920729B-10 920729B-20

HANGER STYLE OPTIONS	
OPTION	DESCRIPTION
FT*	FLAT TOP MOUNT
FB	BOLT ON MOUNT

AXLE TYPE OPTIONS	
OPTION	DESCRIPTION
5R	5" ROUND



DESCRIPTION: MS250X CONFIGURATION				 Watson Suspension Systems
SHEET: 2 OF 2				
DATE: 02/09/08	SCALE: 1:12	DRAWN BY: TLK	SIZE: B	DRAWING NO: MS250X

# MS2500 TWO PIECE BUSHING INSTALLATION

## TWO-PIECE TORQUE ARM BUSHING ASSEMBLY PROCEDURE

Place Compression Washer and Rubber Bushing on head of Torque Arm bolt, and insert through openings in Hanger or axle seat and through Torque Arm end opening. Lubricants ARE NOT recommended, but if absolutely necessary, use soap and water, or just plain water.

**Do not use any Petroleum-Based Lubricants.**

Place second Bushing, and second Compression Washer on other end of Torque Arm Bolt. Start Nut on Bolt by hand.



Figure 15



Figure 15

Tighten nut, partially, until all air gaps are removed between the two Compression Washers.

Center and hold the Torque Arm in as close to the middle of Hanger gap as possible.

Carefully tighten the locknut to achieve a torque value between 140-160 ft. lbs. (190-220 Nm). Be sure to always keep an equal buildup of rubber on each side of the Torque arm, and the Compression Washers. If the rubber has not built up equally, or the Torque Arm is not centered, it is strongly recommended to repeat the above steps.

**Do not exceed the specified torque values. The rubber will likely settle, resulting in torque readings lower than the specified values in subsequent checks.** Ensure the assembly is tight and that there are no loose parts or gaps between washer, hangers and rubber bushings.

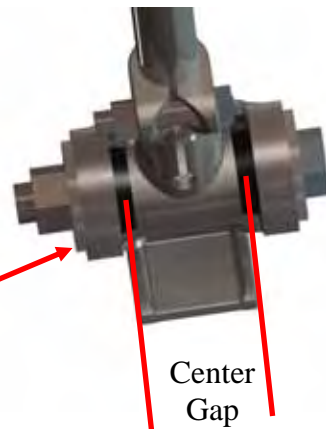
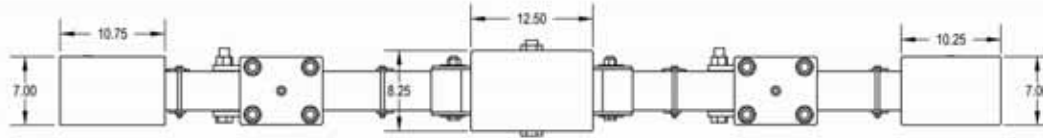


Figure 15



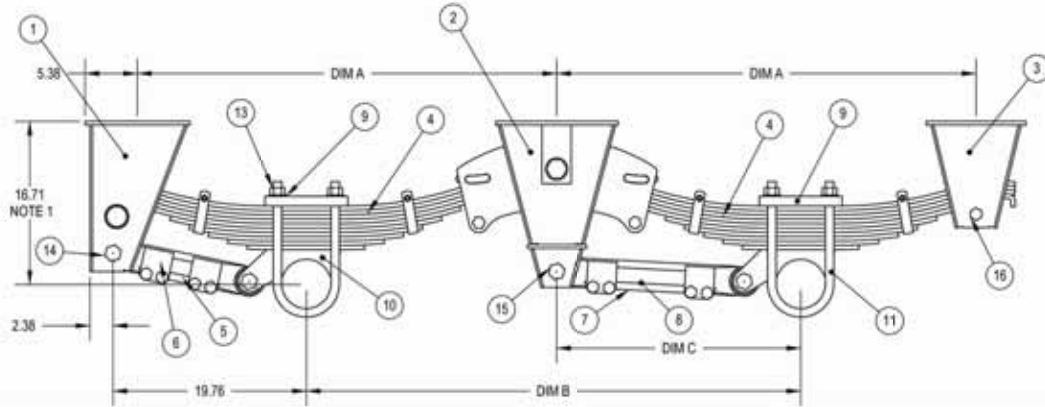
Figure 15

REV.	DESCRIPTION	ECN	DATE	BY
A	NEW DRAWING	S-4088	1/21/2009	TEG



ITEM NO.	QTY	PART NUMBER	DESCRIPTION
1	2	920081	HANGER SUB-FRONT
2	2**	CHART	CENTER HANGER WITH EQUALIZER
3	2	920082	HANGER SUB-REAR
4	4**	17141	LEAF SPRING
5	1	990044-01	TORQUE ARM RIGID
6	1	990049-01	TORQUE ARM ADJUSTABLE
7	1**	CHART	TORQUE ARM RIGID
8	1**	CHART	TORQUE ARM ADJUSTABLE
9	4**	CHART	U-BOLT TOP PLATE
10	4**	CHART	AXLE SEAT, CASTING
11	8**	CHART	U-BOLT 1.12 X 7.50
12	16**	17010	WASHER FLAT .88 X 1.75 X .12
13	16**	11457	NUT LOCK .875 UNF
14	1	16098-01	HARDWARE PACKS MS300X LESS U-BOLTS FRONT
15	1**	16098-02	HARDWARE PACKS MS300X LESS U-BOLTS CENTER
16	1	16098-03	HARDWARE PACKS MS300X LESS U-BOLTS REAR
17	8**	17171	PIVOT BUSHING (REF ONLY)
18	2**	17172	EQUALIZER BUSHING 13805-01 (REF ONLY)

\*\*QUANTITIES SHOWN FOR 2 AXLE



NOTE: PARENTHESIS ( ) DENOTES REFERENCE DIMENSION

NOTES:

1. APPROXIMATE FULL LOAD DEFLECTION IS 1.38" ±.125"
2. CAPACITY 2 AXLE 60,000-3 AXLE 90,000.
3. SEE 190034 FOR COAL MOD MS300X.

TOLERANCES (EXCEPT AS NOTED)	DESCRIPTION	MS300X MAIN ASSEMBLY	
DECIMAL ± .06	PREVIOUS ASSY	-	SHEET 1 OF 2
FRACTIONAL ± 1/16	SUSPENSION MODEL	MS300X	SCALE 1:12
ANGULAR ± 1°	DATE	01/21/09	DRAWN BY TEG
	SIZE	B	DRAWING NO. MS300X





# MS300X-XX-XXX

MODEL NO.

- MS3001
- MS3002
- MS3003
- ECT.

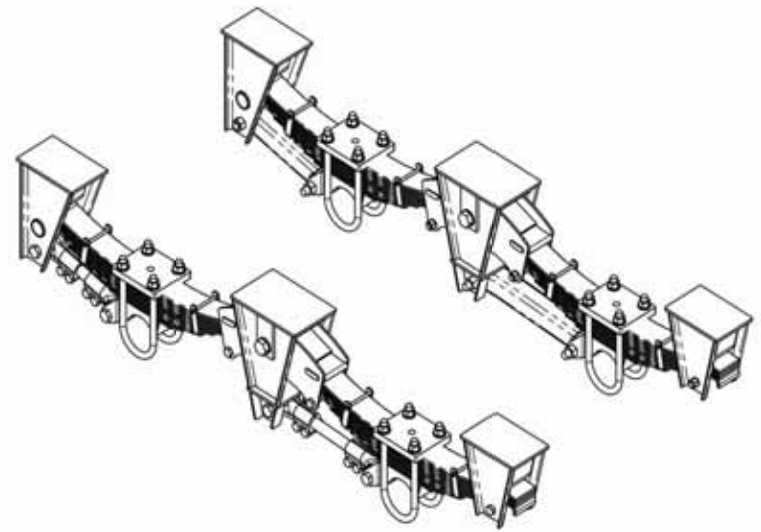
AXLE SPACING

- 50
- 54
- 60


AXLE DIA.

- 500
- 575

AXLE CENTERS	DIM A	DIM B	DIM C	ITEM # 2	ITEM # 7	ITEM # 8
50.00	43.00	50.00	25.07	920730-042-01	990049-02	990044-02
54.00	45.00	54.00	27.09	920730-042-02	990049-03	990044-03
60.00	48.25	60.00	30.32	920730-042-03	990049-04	990044-04



AXLE DIA.	ITEM # 9	ITEM # 10	ITEM # 11
5.00	90377-01	17753	SP0218-01
5.75	90377	17195	SP0218-02

DESCRIPTION: CONFIG DRAWING MS300X				 <small>Watson &amp; Chalin</small> <small>Watson Suspension System</small>
SHEET: 2 OF 2				
DATE: 01/21/09	SCALE: 1:16	DRAWN BY: TEG	SIZE: B	DRAWING NO: MS300X

**⚠ WARNING: DO NOT APPLY TORQUE TO THE BOLT HEAD SIDE OF CONNECTION**

**(Non-Plated Clean Lubricated Thread) Torque Requirements:** Apply torque to nut side of connection as specified in Table 1 below. Specified torque values are intended for non-plated lubricated threads. Use of dry or plated threads may result in bolted connection loosening prematurely and is not recommended.

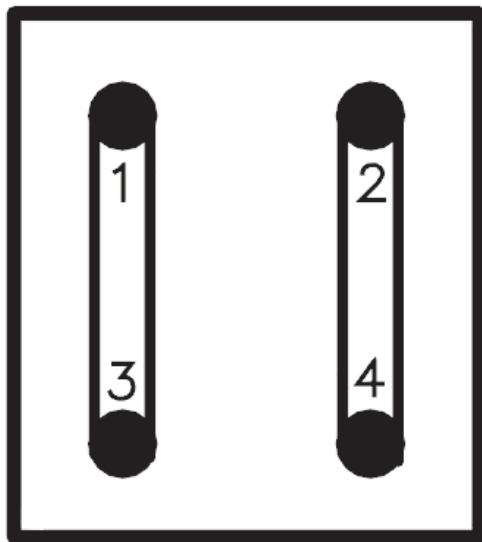
**Table 1: Cap Screw/Bolt (Grade 8 UNF) Torque Requirements**

Cap screw/Bolt Size	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/8"	1 1/4"
Torque MIN ft*lbs.	25	50	150	300	500	700	900	1400
Torque MAX ft*lbs.	35	75	200	350	550	800	1000	1500

**NOTE:** Torque Values do not apply to air springs or lower grade fasteners.

The minimum re-torque requirement for all fasteners is after the first 1,000 to 3,000 miles (1,600 - 4,800 kms) of operation, and again with all the annual inspections thereafter.

Tighten 7/8" U-bolt nut, use pattern as shown in Figure 16	400-450 FP (540-610 NM)
Tighten 3/4" U-bolt nut, use pattern as shown in Figure 16	200-250 FP (271-340 NM)



**Figure 16 U-Bolt Torque Pattern**

**INSTALLER RESPONSIBILITIES**

Installer is responsible for installing the product in accordance with Watson & Chalin specifications and installation instructions as well as establishing and providing proper vehicle components and attachments. Installer is also responsible for establishing and verifying all clearance for suspension components, brake components, axles, wheels, tires, and other vehicle components to ensure a safe and sound operation.



Watson Suspension Systems

## TWO YEAR - 200,000 MILE WARRANTY MS SERIES Mechanical suspensions

ITEM	MONTHS	MILEAGE	COVERAGE
MAJOR COMPONENTS MANUFACTURED BY WATSON & CHALIN	0-12	0-100,000	PARTS & LABOR
	12-24	100,001-200,000	PARTS ONLY

**ALL OTHER COMPONENTS, INCLUDING SPRINGS, ARE UNDER THE ORIGINAL EQUIPMENT MANUFACTURERS WARRANTY.**

When properly installed and assembled, Watson & Chalin Manufacturing, Inc. (Watson & Chalin) warranties each suspension to be free from defects in material and workmanship with normal use and service, subject to the limitations herein provided. The sole responsibility of Watson & Chalin under this warranty is to repair or replace, at the company factory, any parts which it manufactures that have been examined by Watson & Chalin and deemed as defective. These parts must be returned to Watson & Chalin, with transportation charges prepaid (no COD or collect shipments will be accepted), within the time schedule indicated above, following the original installation.

There are no other warranties expressed or implied of merchantability or otherwise. This warranty does not apply to failures resulting from improper installation, neglect, accident, misuse, or operation beyond the rated capacity of the suspension system or the vehicle to which it is attached. Nor does this warranty apply to any parts which have been altered or repaired without the express written consent of Watson & Chalin, and in no event shall Watson & Chalin be liable for incidental or consequential damages of any nature. Watson & Chalin must authorize all repairs at a cost determined and approved by Watson & Chalin before any repairs are started. To obtain an RGA #, (Return Goods Authorization), contact Watson & Chalin at:

**WATSON & CHALIN MANUFACTURING, INC.**  
725 E. UNIVERSITY DRIVE  
McKINNEY, TEXAS 75069  
(972) 547-6020 (800) 445-0736 FAX (972) 542-0097

10/21/09