Bolt Tightening Torque

Hexagon Bolt

1) Thread type: Metric thread
Unified thread
2) Bolt strength: 8.8 (8T) ~ 10.9 (11T)
3) Thread pitch: Metric thread: Coarse pitch thread (C), fine pitch thread (F)
Unified thread: Coarse pitch thread (UNC), fine pitch thread (UNF)

(N-m)

Type	Bolt size			Bolt strength	
	Nominal Dimension	Nominal Dia.	Pitch	8.8 (8T)	10.9 (11T)
Metric thread	M8	8	(C) 1.25	26	38
	M10	10	(C) 1.5	53	76
			(F) 1.25	55	80
	M12	12	(C) 1.75	90	132
			(F) 1.25	96	142
	M14	14	(C) 2.0	142	206
			(F) 1.5	152	221
	M16	16	(C) 2.0	216	314
			(F) 1.5	226	330
	M18	18	(C) 2.5	299	436
			(F) 1.5	324	476
	M20	20	(C) 2.5	417	608
			(F) 1.5	451	662
	M22	22	(C) 2.5	559	814
			(F) 1.5	598	878
	M24	24	(C) 3.0	721	1,030
			(F) 2.0	770	1,128
	M27	27	(C) 3.0	1,030	1,520
			(F) 2.0	1,128	1,618
	M30	30	(C) 3.5	1,422	2,109
			(F) 2.0	1,569	2,256
	M33	33	(C) 3.5	1,912	2,844
			(F) 2.0	2,059	3,040
Unified thread	5/16	05	18 UNC	25	35
	3/8	06	16 UNC	44	65
	7/16	07	14 UNC	71	103
	1/2	08	13 UNC	103	147
	9/16	09	12 UNC	147	216
	5/8	10	11 UNC	201	294
	3/4	12	10 UNC	358	525
	7/8	14	9 UNC	554	809
	1	16	8 UNC	868	1,275

Note: Tighten the bolts according to the above list, unless otherwise specified.

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Fuel Tank

Removing and reinstalling fuel tank

1. Removing fuel tank

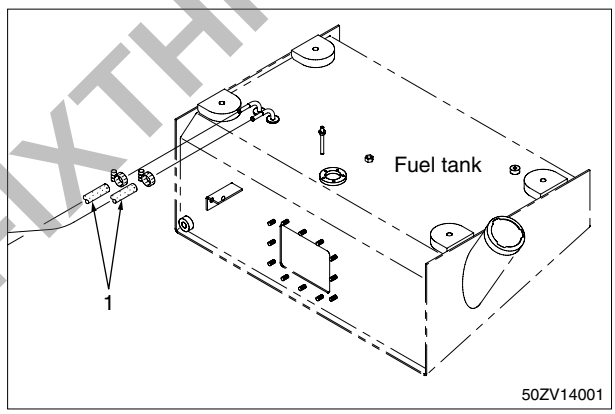
⚠ WARNING

Unexpected movement of machine could cause an accident resulting in injury or death. Be sure to observe the following items before starting fuel tank removal:

- **Position machine on level ground, and apply parking brake.**
- **Lower bucket to ground, and block tires with chocks, etc. to prevent them from moving.**
- **Remove the engine key, and hang a "DO NOT START ENGINE !" tag on the steering wheel.**

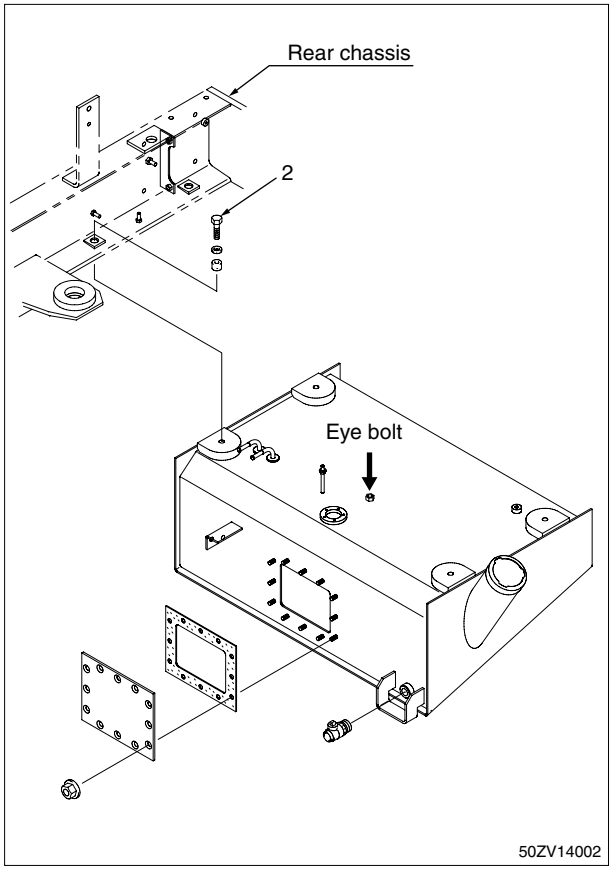
Before starting work:

- Drain fuel from the fuel tank. (Fuel tank capacity: 131 ℓ (35 gal))
- Remove the engine room.
- Remove the radiator.



1) Put a matchmark on fuel hoses (1) and disconnect them from the fuel tank.

2) Disconnect the level sensor electrical line coupler.
Fix eye bolt (M12) to the fuel tank and attach sling to fuel tank. Then remove bolt (2) and slowly lower the fuel tank.
: Fuel tank: 80 kg (175 lbs)
Torque for assembly:
: Bolt (4): 436 N-m (44.5 kgf-m) (322 lb-ft)



2. Reinstalling fuel tank

For reinstallation, follow the above procedure in the reversed direction.

Note: After reinstallation, be sure to completely bleed air from the fuel line.

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Hydraulic Pump Assembly

Removing and reinstalling hydraulic pump assembly

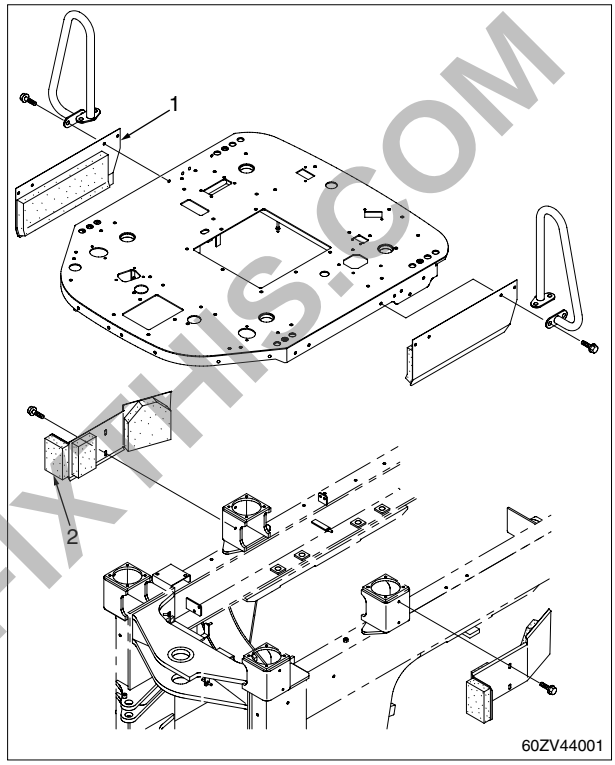
1. Removing hydraulic pump assembly

⚠ DANGER

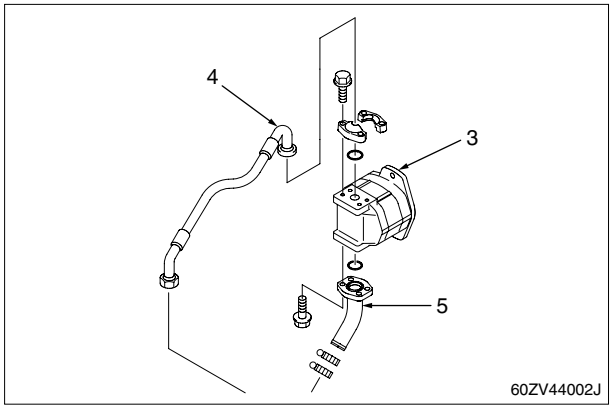
Entering the articulation area while engine is running may cause serious injury or death.
So, when entering the area, stop the engine and place "DO NOT START " or "DO NOT OPERATE" tag on steering wheel.

⚠ CAUTION

Removing hoses and plugs without bleeding residual pressure could cause injury or burns from hot oil under pressure.
Before removing hoses and plugs, relieve residual pressure. Relieve internal pressure from hydraulic tank to prevent oil from spraying.



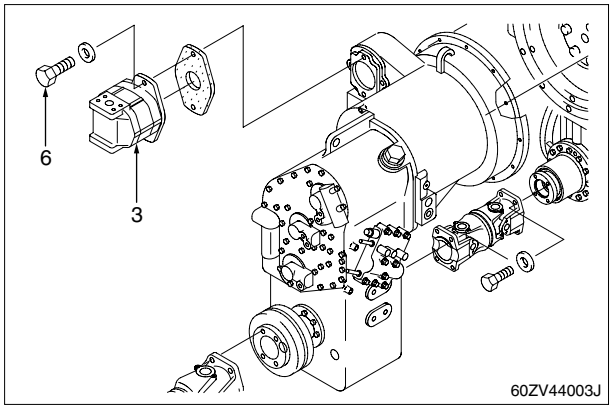
1) Remove covers (1)(2).



2) Disconnect outlet hose (4) and suction pipe (5) from hydraulic pump (3).

Note: Cover the disconnected pipe with vinyl, cap or plugs to protect from dust and dirt.

3) Remove hydraulic pump retainer bolt (6) and remove the pump.
Torque for assembly:
: (6): 89.7 N-m (9.15 kgf-m) (66.2 lb-ft)
: Hydraulic pump: Approx. 6.5 kg (14 lbs)

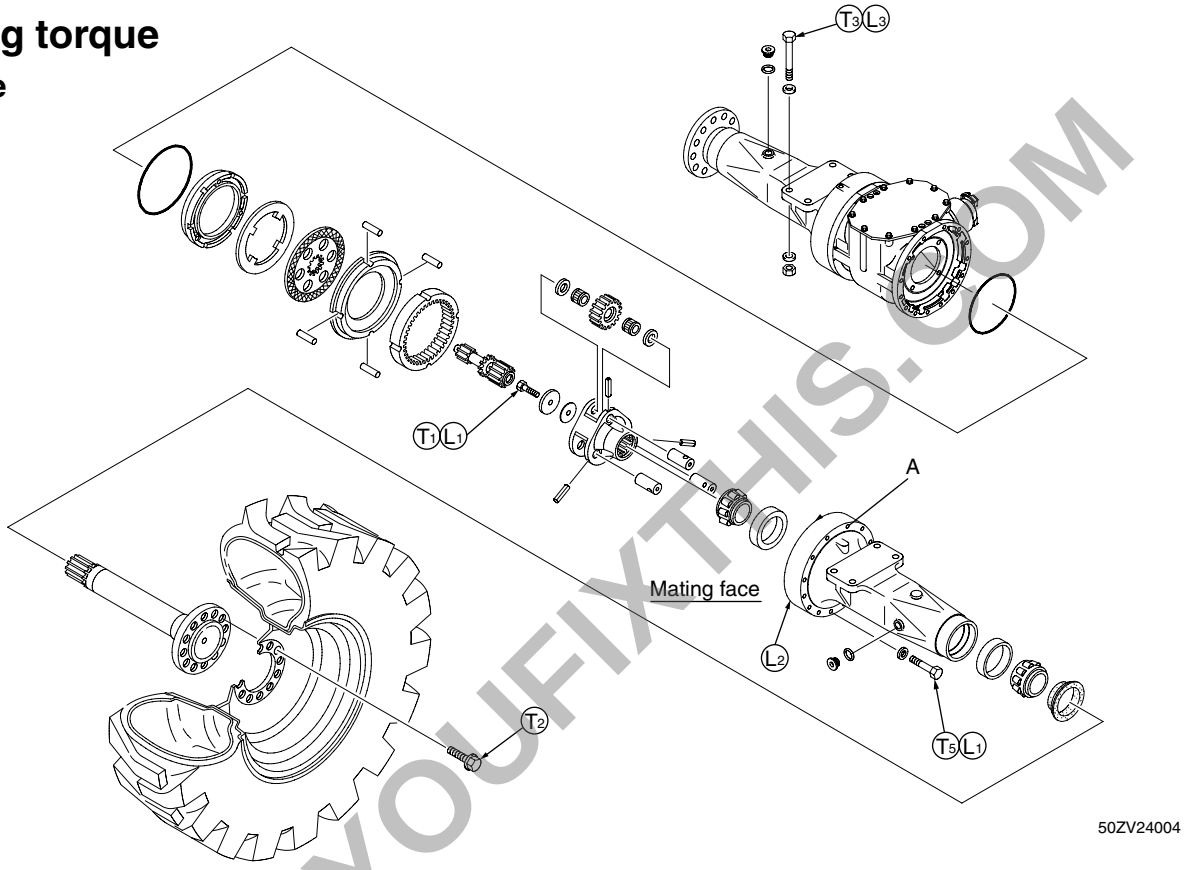


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Axle Assembly

Tightening torque

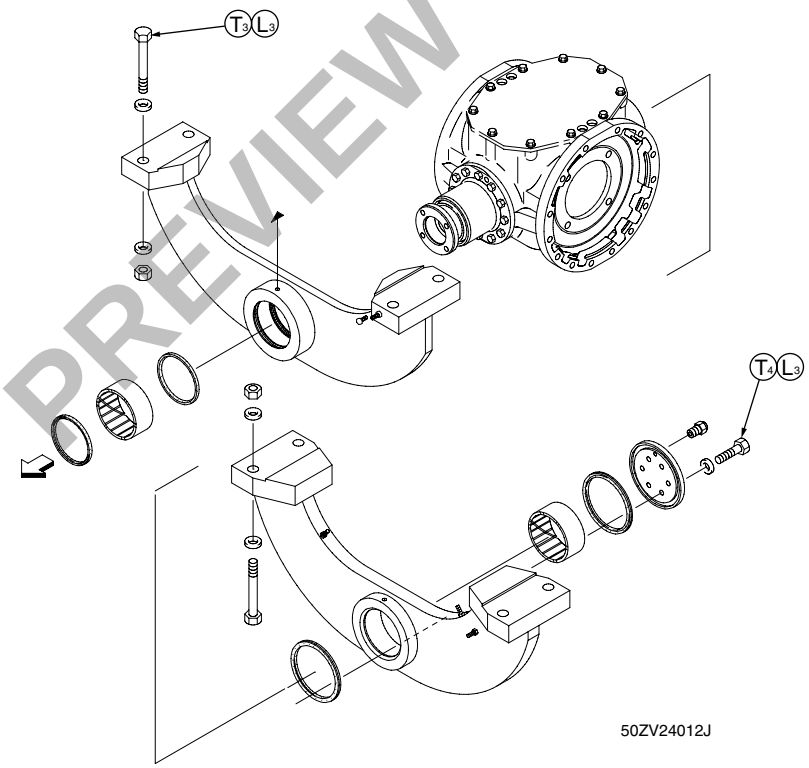
1. Front axle



50ZV24004

2. Rear axle

Note: Unspecified tightening torque is equal to the one for front axle.



50ZV24012J

: Bolt tightening torque

T_1: 314 N-m (32.0 kgf-m) (232 lb-ft)

T_2: 892 N-m (91.0 kgf-m) (658 lb-ft)

T_3: 721 N-m (73.5 kgf-m) (532 lb-ft)

T_4: 132 N-m (13.5 kgf-m) (98 lb-ft)

T_5: 206 N-m (21.0 kgf-m) (152 lb-ft)

:

L_1: Screw lock agent (Three Bond 1327) application

L_2: Liquid gasket (Three bond 1215) application

L_3: With lubrication oil (Engine oil or gear oil)

Preload of section (A): 52~73 N(5.3~7.4 kgf) (11.7~16.3 lbf)

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(kgf-m)

Type	Bolt size			Bolt strength	
	Nominal Dimension	Nominal Dia.	Pitch	8.8 (8T)	10.9 (11T)
Metric thread	M8	8	(C) 1.25	2.7	3.9
	M10	10	(C) 1.5	5.4	7.8
			(F) 1.25	5.6	8.2
	M12	12	(C) 1.75	9.2	13.5
			(F) 1.25	9.8	14.5
	M14	14	(C) 2.0	14.5	21.0
			(F) 1.5	15.5	22.5
	M16	16	(C) 2.0	22.0	32.0
			(F) 1.5	23.0	33.7
	M18	18	(C) 2.5	30.5	44.5
			(F) 1.5	33.0	48.5
	M20	20	(C) 2.5	42.5	62.0
			(F) 1.5	46.0	67.5
	M22	22	(C) 2.5	57.0	83.0
			(F) 1.5	61.0	89.5
	M24	24	(C) 3.0	73.5	105.0
			(F) 2.0	78.5	115.0
	M27	27	(C) 3.0	105.0	155.0
			(F) 2.0	115.0	165.0
	M30	30	(C) 3.5	145.0	215.0
			(F) 2.0	160.0	230.0
	M33	33	(C) 3.5	195.0	290.0
			(F) 2.0	210.0	310.0
Unified thread	5/16	05	18 UNC	2.5	3.6
	3/8	06	16 UNC	4.5	6.6
	7/16	07	14 UNC	7.2	10.5
	1/2	08	13 UNC	10.5	15.0
	9/16	09	12 UNC	15.0	22.0
	5/8	10	11 UNC	20.5	30.0
	3/4	12	10 UNC	36.5	53.5
	7/8	14	9 UNC	56.5	82.5
	1	16	8 UNC	88.5	130.0

Note: Tighten the bolts according to the above list, unless otherwise specified.

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Engine Room

Removing and reinstalling engine room

1. Removing engine room

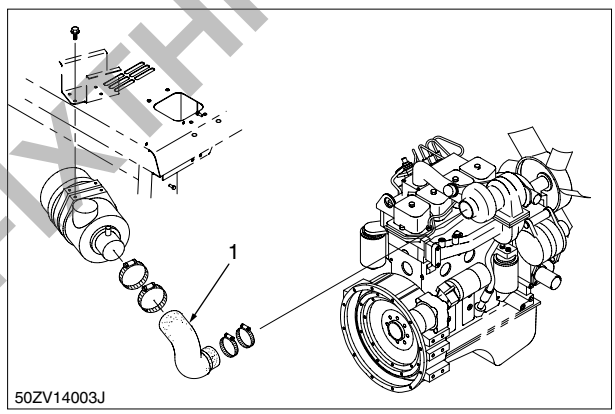
⚠ WARNING

Unexpected movement of machine could cause an accident resulting in injury or death. Be sure to observe the following items before starting engine room removal:

- **Position machine on level ground, and apply the parking brake.**
- **Lower bucket to ground, and block tires with chocks, etc. to prevent them from moving.**
- **Remove engine key, and hang a "DO NOT START ENGINE !" tag on steering wheel.**

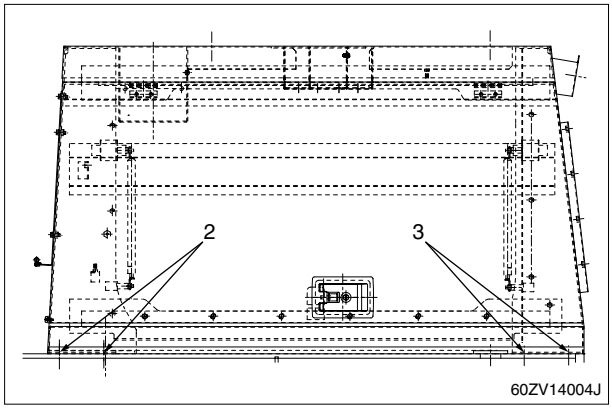
Before starting work:

- Remove the brake oil tank together with the hose from the engine room. Cap off parts of tank to avoid dust ingression. Cap off lines to tank for same reason.



1) Disconnect hose (1) between the air cleaner and the engine.

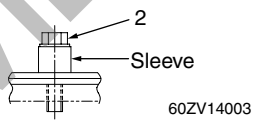
Note: Cover the hose and port of the engine to protect the engine from dust and dirt.



2) Remove bolts (2)(3) from the engine room.

Torque for assembly:

: Bolt (2)(3): 94 N-m (9.6 kgf-m) (69 lb-ft)



3) Suspend the engine room with a sling.

: Engine room: 155 kg (340 lbs)

Note: Slowly lift the engine room while checking that there are no obstacles.

2. Reinstalling engine room

For reinstallation, follow the above procedure in the reversed direction.

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Hydraulic Cylinder

Removing and reinstalling boom cylinder

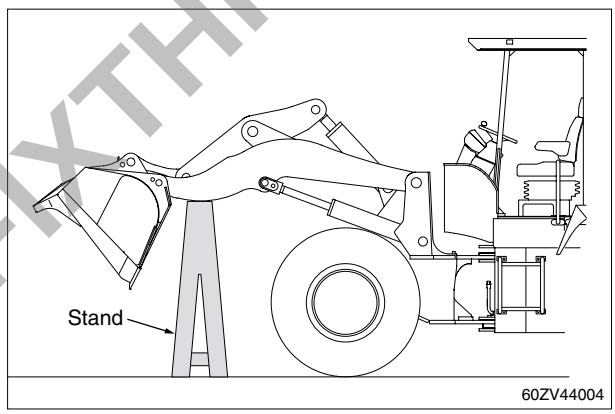
1. Removing boom cylinder

(The illustration shows the left side of the machine.)

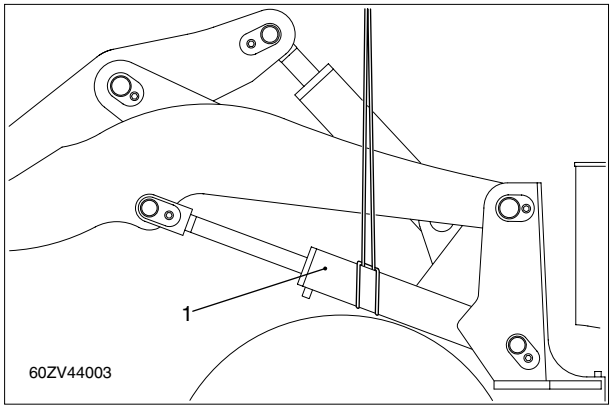
⚠ WARNING

Unexpected movement of machine, bucket, or boom during service work could cause serious injury or death. To prevent such an accident, observe the following items:

- **Park machine on level ground, and apply the parking brake. In addition, block tires with chocks to prevent wheels from moving.**
- **Raise the boom until it is horizontal, and then place stand under the boom to support it.**
- **Relieve the internal pressure from the loading line, and also relieve the internal pressure from the hydraulic tank to prevent the oil from spouting out.**
- **Use a stepladder or work platform, and do not stand on the machine.**

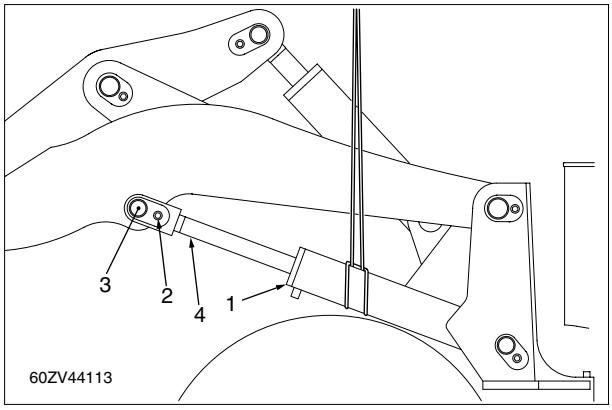


- Clean the area around the cylinder and piping.



Note: Relieving residual pressure from pipe

1. Raise the boom. When the boom is approximately 30 cm (1 foot) above stand, stop the engine.
2. Tilt the bucket all the way down. With the lever held in down position, lower the boom onto the stand. Move the bucket and boom levers back and forth to fully relieve the pressure.
3. Open the cap of the hydraulic tank to vent residual pressure.
   Leave hydraulic tank cap loosely on top of tank opening.



1) Attach sling to boom cylinder (1).
   Remove lock bolt (2) and pin (3).
   Retract the cylinder to shorten piston rod (4).
   : Boom cylinder: 55 kg (120 lbs)

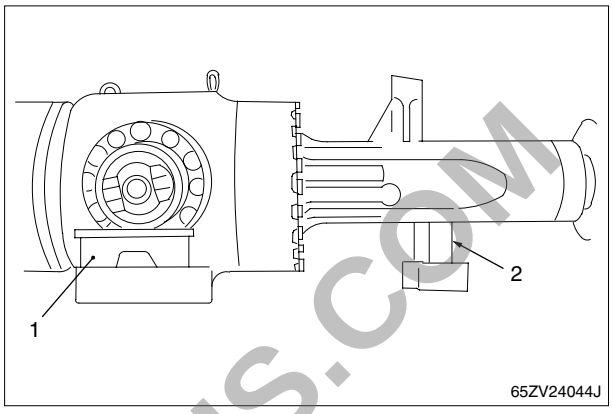
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Disassembling and reassembling front axle

1. Disassembling front axle

Before starting work:

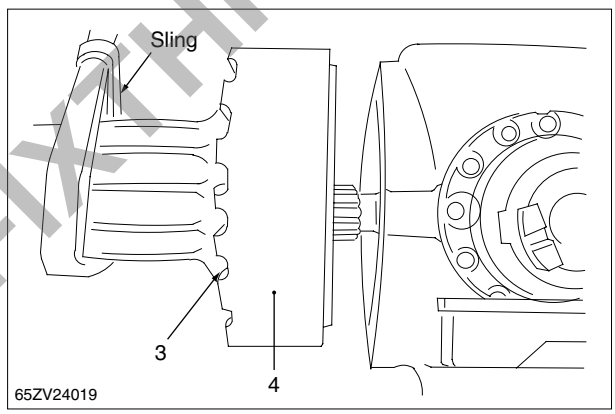
- Remove axle assembly from chassis.
  Refer to "Removing front axle assembly".
- Drain gear oil
  : Gear oil: 20 ℓ (5.3 gal)
  (front, rear each)
- Place axle assembly on work table using support (1)(2).



1) Attach sling to axle housing (4) and remove bolts (3).
Separate axle housing (4) from differential assembly.

Note: Striking axle housing lightly by hammer may help to separate it from differential assembly.

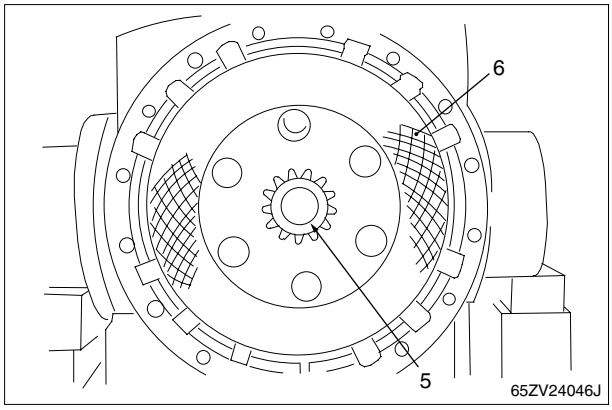
: Axle housing: 130 kg (290 lbs)



⚠ WARNING

Hitting the parts quenched such as bearing, shaft, pin and tooth by a steel-hammer may cause a breakage resulting in injury or death.
- Keep persons away from working area.
- Use a support plate in case a steel hammer is used.
- Use a copper-hammer or a plastic hammer.
- Always wear protection goggles.

2) Remove sun gear (5) and disc plate (6).



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(lb-ft.)

Type	Bolt size			Bolt strength	
	Nominal Dimension	Nominal Dia.	Pitch	8.8 (8T)	10.9 (11T)
Metric thread	M8	8	(C) 1.25	19.5	28
	M10	10	(C) 1.5	39	56
			(F) 1.25	40	59
	M12	12	(C) 1.75	66	97
			(F) 1.25	70	105
	M14	14	(C) 2.0	105	150
			(F) 1.5	110	160
	M16	16	(C) 2.0	160	230
			(F) 1.5	165	245
	M18	18	(C) 2.5	220	320
			(F) 1.5	235	350
	M20	20	(C) 2.5	305	450
			(F) 1.5	330	490
	M22	22	(C) 2.5	410	600
			(F) 1.5	440	650
	M24	24	(C) 3.0	530	760
			(F) 2.0	565	830
	M27	27	(C) 3.0	760	1,120
			(F) 2.0	830	1,190
	M30	30	(C) 3.5	1,050	1,550
			(F) 2.0	1,160	1,660
	M33	33	(C) 3.5	1,410	2,100
			(F) 2.0	1,520	2,240
Unified thread	5/16	05	18 UNC	18.0	26
	3/8	06	16 UNC	32	47
	7/16	07	14 UNC	52	76
	1/2	08	13 UNC	76	105
	9/16	09	12 UNC	110	160
	5/8	10	11 UNC	150	215
	3/4	12	10 UNC	265	385
	7/8	14	9 UNC	410	595
	1	16	8 UNC	640	940

Note: Tighten the bolts according to the above list, unless otherwise specified.

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Floor Board

Removing and reinstalling floor board

1. Removing floor board

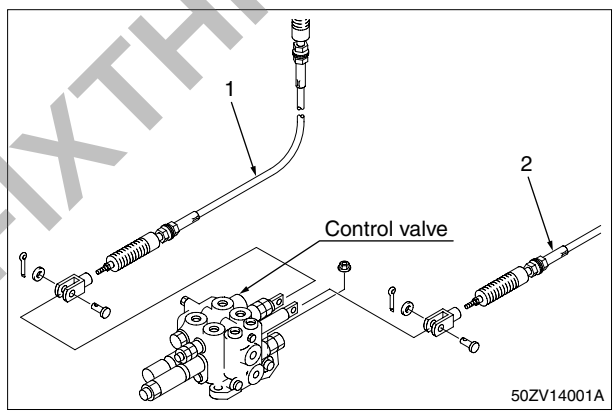
⚠ WARNING

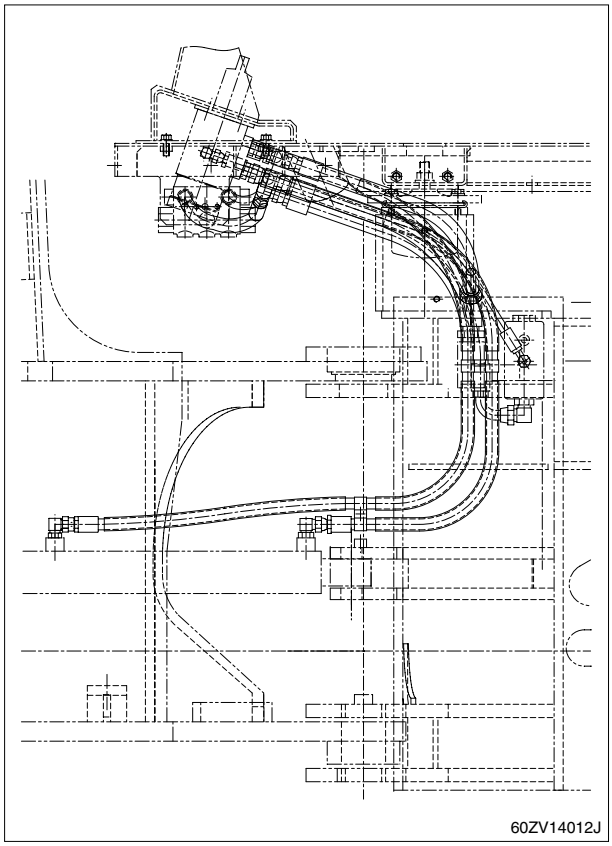
Unexpected movement of machine could cause an accident resulting in injury or death.
- **Position machine on level ground, and block tires with chocks, etc. to prevent them from moving.**
- **Lower bucket to ground, and release residual pressure from hydraulic oil tank and lines.**
- **Disconnect the ⊖ side of the battery.**
- **Disconnect the ⊕ side of the battery.**

Before starting work:
- Remove deck from both the right and left sides of machine.
- Remove the cab.
- Disconnect hose and electrical couplers between the floor board and chassis.
- Recover air conditioner refrigerant (option) using the proper recovery method.

Note: Before disconnecting electrical couplers, hoses and pipes, put matchmarks on them to help with reassembly.
Prepare a drain pan for the oil.
Cover the disconnected hoses and pipes with vinyl to protect them from dust and dirt.

1) Disconnect cables (1)(2) for the control valve at the control valve side.





2) Disconnect the hose between the Orbitrol® and the steering cylinder, the hose between the Orbitrol® and the cushion valve and the hose between Orbitrol® and the priority valve.
: Hydraulic oil about 0.5 ℓ (1/8 gal)

Note: Cover the disconnected hoses with plastic caps or plug to protect them from dust, water and dirt.

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Removing and reinstalling bucket cylinder

1. Removing bucket cylinder

⚠ WARNING

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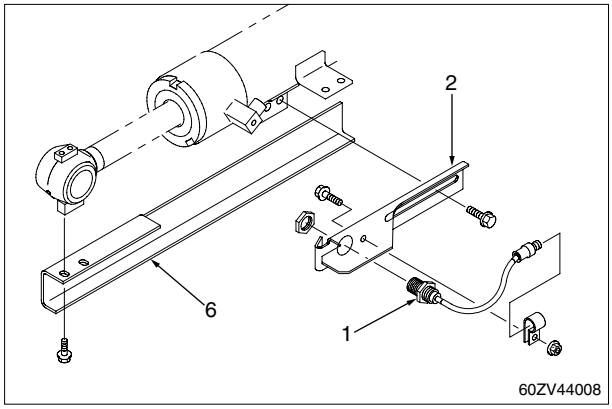
- **Park machine on level ground, and apply the parking brake. In addition, block tires with chocks to prevent wheels from moving.**
- **Place boom and bucket on ground.**
- **Relieve the internal pressure from the loading line, and also relieve the internal pressure from the hydraulic tank to prevent the oil from spouting out.**
- **Use a step, and do not stand on the machine.**

- Clean the area around the cylinder and piping.

Note: Relieving residual pressure from pipe

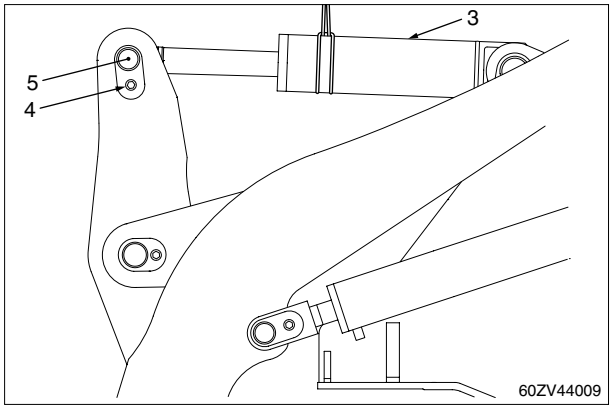
1. Lower the boom and bucket to the ground.
2. Stop the engine and move the bucket and boom levers back and forth.
3. Open the cap of the hydraulic tank to relieve the residual pressure.

1) Remove the coupler of bucket positioner proximity switch (1), and then remove bracket (2).



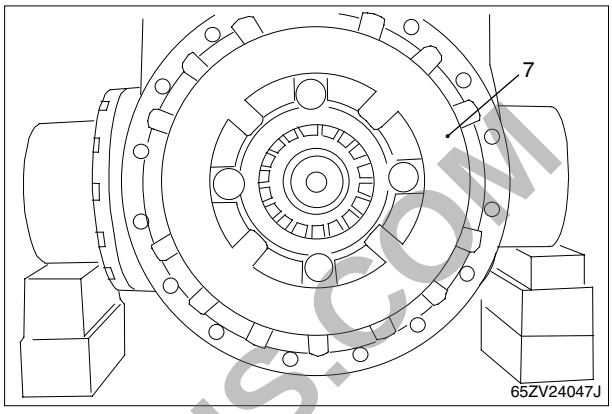
2) Attach sling to bucket cylinder (3).
After that, remove lock bolt (4) and pin (5).
: Bucket cylinder: 45 kg (100 lbs)

3) Remove rod (6), for the bucket positioner.

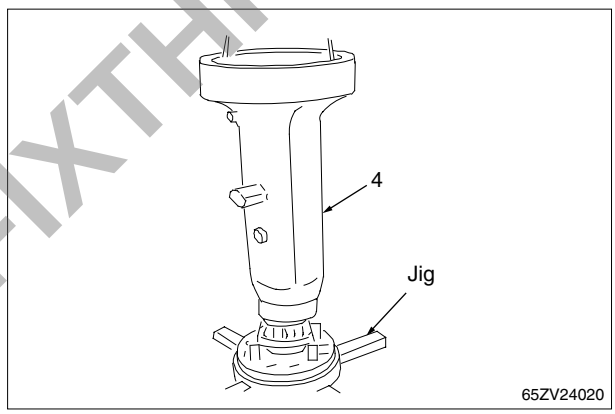


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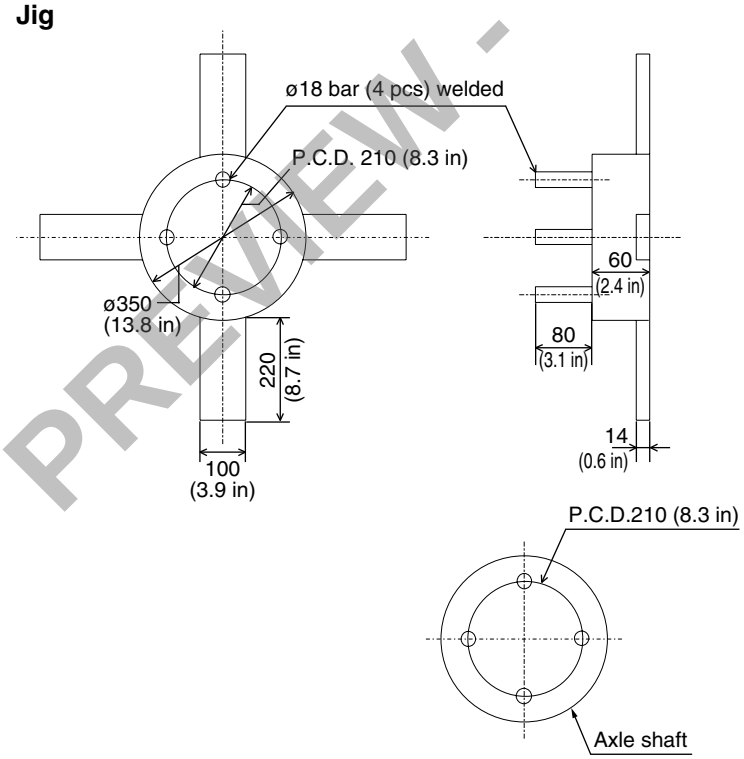
3) Remove steel plate (7).



4) Attach sling to axle housing (4) and install jig to end.



Jig



50ZV24002A

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