19/03/2024 Differential and Bevel Gear (Front and Rear) - Disassemble (UENR4227-16)

SMCS - 3256, 3258 i10135287

Disassembly Procedure

Table 1

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
A	1U-7502	Repair Stand	1
B	439-3938	Link Bracket As	2
C	456-4371	Lever Hoist	1
D	1P-5546	Crossblock	1
E	6V-3160	Double Acting Cylinder	1
F	1P-0520	Driver Group	1
H	6V-4070	Spanner Wrench	1
J	8B-7551	Bearing Puller	1
K	5F-7343	Bearing Puller Gp	1

Start By:

a. Remove the front or rear differential assembly. Refer to Differential and Bevel Gear (Front and Rear) - Remove and Install .

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

1. Apply location marks on all housings and case assemblies for assembly purposes.

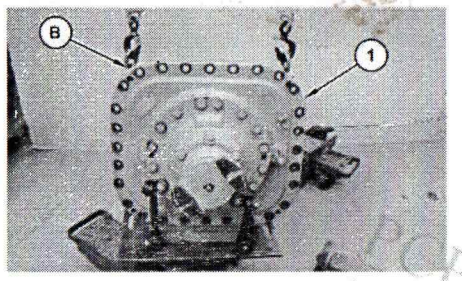

Illustration 1 g03865438

2. Attach Tooling (B) and a suitable lifting device to differential and bevel gear asse
The weight of differential and bevel gear assembly (1) is approximately 322 kg (

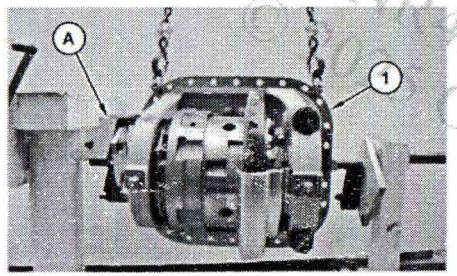

Illustration 2 g03865440

3. Position and place differential and bevel gear assembly (1) onto Tooling (A). Rer
Tooling (B) and the suitable lifting device.

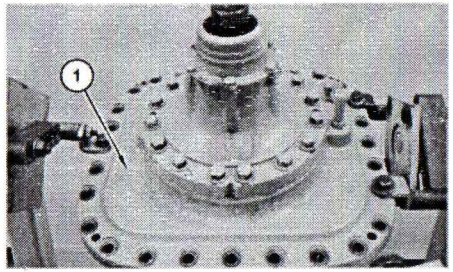

Illustration 3 g03865449

4. Rotate differential and bevel gear assembly (1) by 90 degrees.

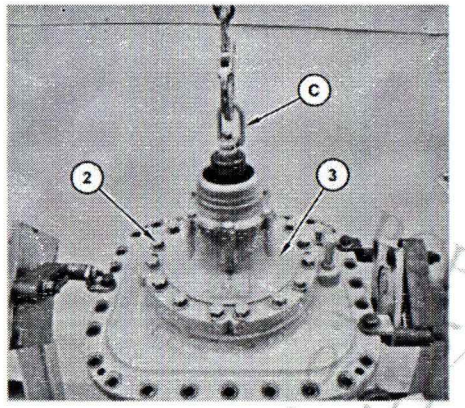

Illustration 4 g03865468

5. Attach Tooling (C) and a suitable lifting device to the yoke. The weight of pinion housing (3) is approximately 75 kg (165 lb). Remove bolts (2).

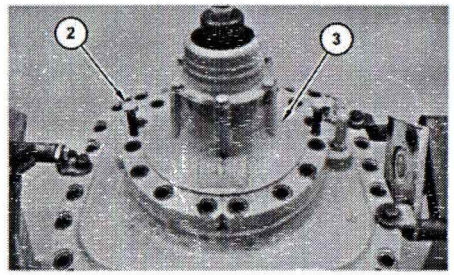

Illustration 5 g03865471

6. Install two bolts (2) in the threaded holes of pinion housing (forcing bolt holes). Tighten two bolts (2) evenly to separate pinion housing (3). Remove pinion housing (3).

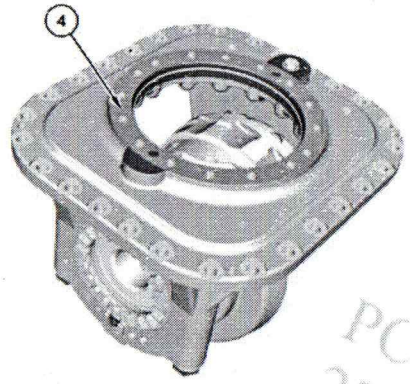

Illustration 6 g03865526

7. Remove shims (4).

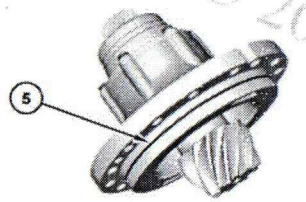

Illustration 7 g03865544

8. Remove O-ring seal (5).

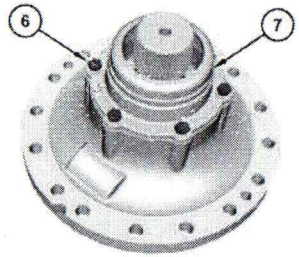

Illustration 8 g03865553

9. Position the pinion housing onto suitable cribbing.
10. Remove bolts (6) and retainer (7).

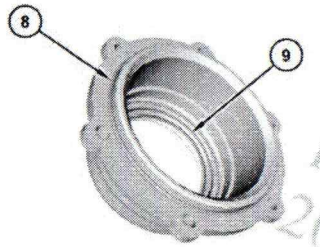

Illustration 9 g03865904

11. Remove O-ring seal (8) and lip seal (9).

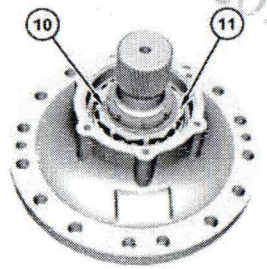

Illustration 10 g03865905

12. Remove retaining ring (10) and locking washer (11).

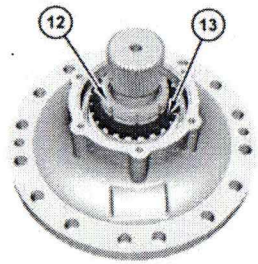

Illustration 11 g03865906

13. Use Tooling (H) (not shown) to remove locknut (12). Remove locknut (12) and n
washer (13).

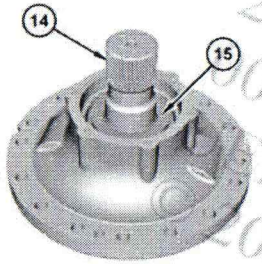

Illustration 12 g03865972

14. Use a suitable press to remove pinion shaft (14) from bearing cone (15).

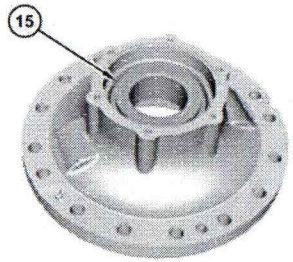

Illustration 13 g03865973

15. Remove bearing cone (15).

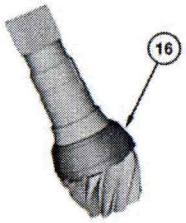

Illustration 14 g03865974

Typical Example

16. Use a suitable press and Tooling (J) (not shown) to remove bearing cup (16).

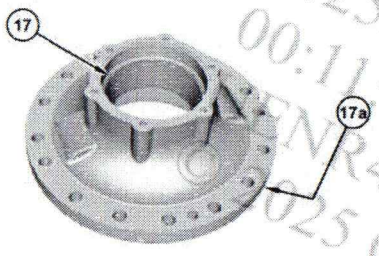

Illustration 15 g03865975

17. Remove bearing cup (17) and bearing cup (17a).

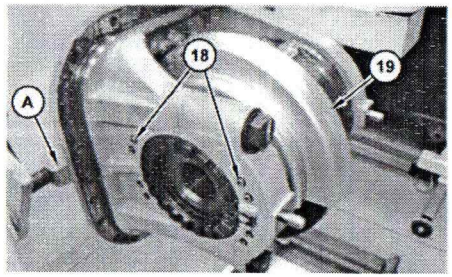

Illustration 16 g03865976

18. Rotate the carrier and differential assembly by 90 degrees on Tooling (A).

19. Remove four bolts (18) and guard (19).

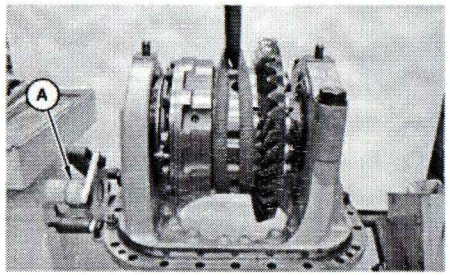

Illustration 17 g03865999

20. Use a suitable lifting device to position the carrier and differential assembly on To
The weight of the carrier and differential assembly is approximately 234 kg (516

21. Rotate the carrier and differential assembly an additional 90 degrees on Tooling

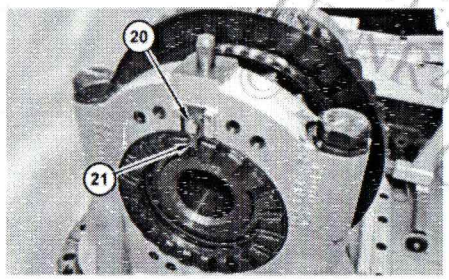

Illustration 18 g03866003

22. Remove bolt (20) and lock (21). Repeat for the opposite side.

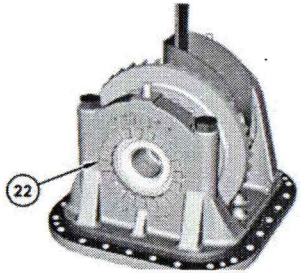

Illustration 19 g03866009

Do not remove suitable lifting device from the carrier and differential assembly.

23. Remove adjusting ring (22). Repeat for the opposite side.

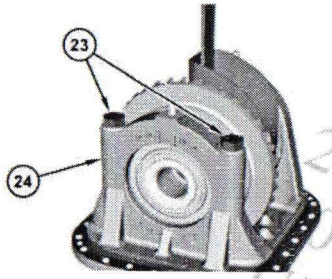

Illustration 20 g03866014

24. Remove bolts (23) and bearing cap (24).

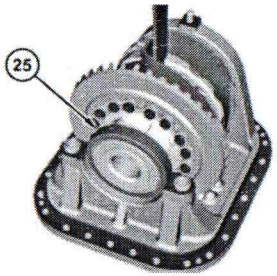

Illustration 21 g03866037

25. Remove bearing cup (25).

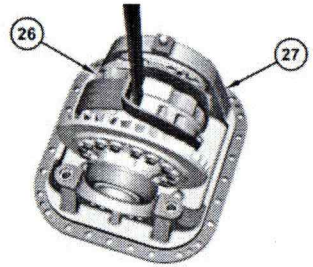

Illustration 22 g03866038

26. Use the suitable lifting device to remove differential assembly and bevel gear (2 carrier assembly (27). The weight of differential assembly and bevel gear (26) is approximately 115 kg (254 lb).

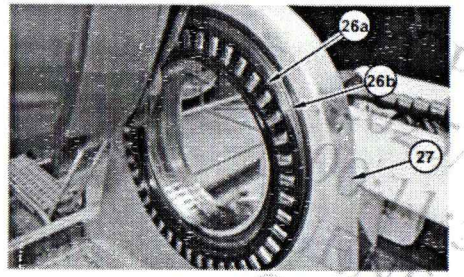

Illustration 23 g03866235

27. Remove bearing (26a) from carrier assembly (27). Remove bearing race (26b).

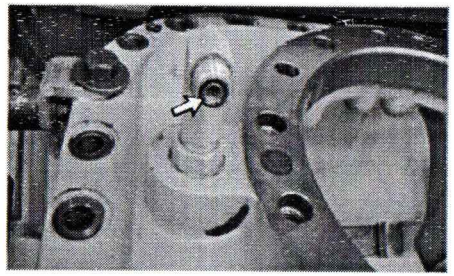

Illustration 24 g03866236

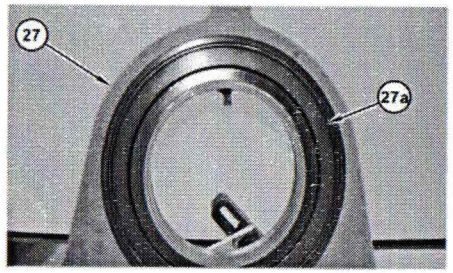

Illustration 25 g03866237

⚠ WARNING

Personal injury can result from air pressure against the piston.

The piston can come out of the housing assembly with force when air pressure is applied.

To prevent possible personal injury, the piston must be retained in the housing assembly when applying air pressure.

28. Apply air pressure to remove clutch piston (27a) from carrier assembly (27). Remove clutch piston (27a).

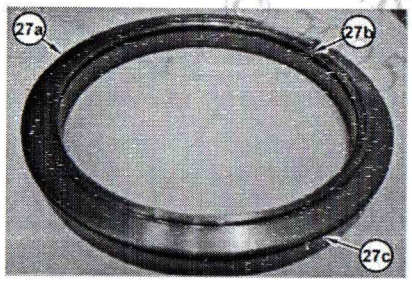

Illustration 26 g03868985

29. Remove D-ring seal (27b) and D-ring seal (27c) from clutch piston (27a).

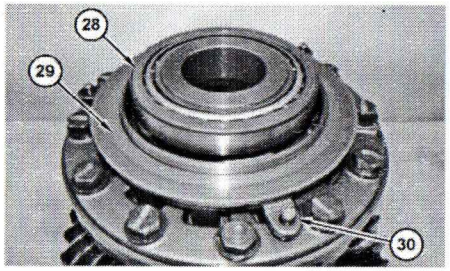

Illustration 27 g06636611

30. Position the differential assembly and bevel gear on suitable cribbing (not shown

31. Remove bearing cup (28) and O-ring seals (30).

32. Remove thrust ring (29).

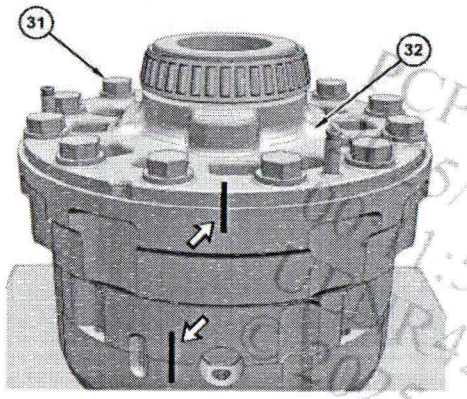

Illustration 28 g06637042

Typical Example

Note: Mark the orientation of the housing joints prior to disassembly for the asse purposes.

33. Remove bolts (31) and top clutch housing (32).

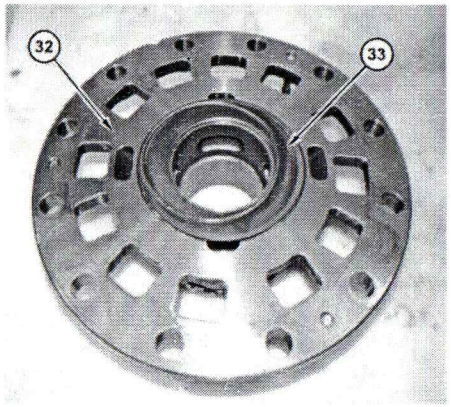

Illustration 29 g06637152

34. Remove thrust washer (33) form back side of top clutch housing (32).

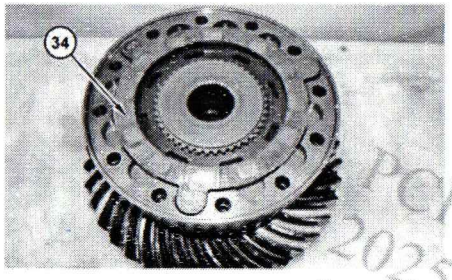

Illustration 30 g03866103

35. Remove thrust plate (34).

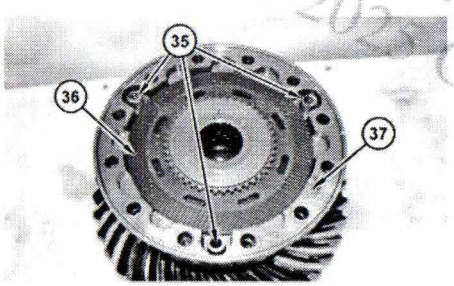

Illustration 31 g03866114

36. Remove springs (35), eight friction discs (36), and eight separator plates (37).

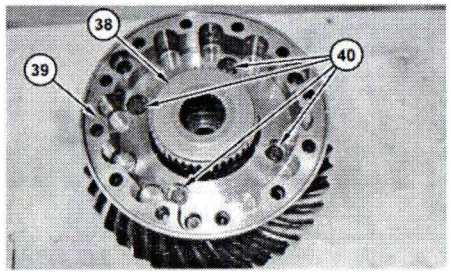

Illustration 32 g03866119

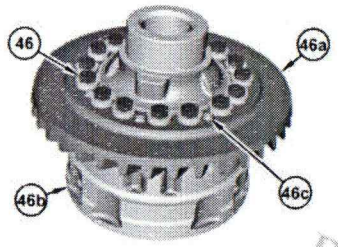

Illustration 33 g03870565

37. Remove gear (38) and bolts (40).

38. Remove spring pins (46c). Remove bolts (46). Remove bevel gear (46a) from di
housing (46b) and separate housing (39).

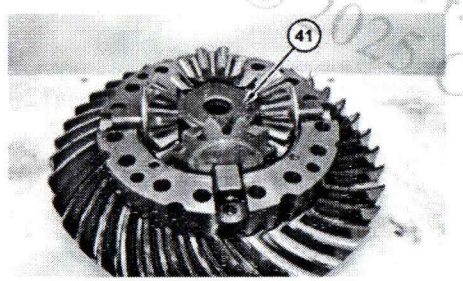

Illustration 34 g03866124

39. Remove spider gear assembly (41).

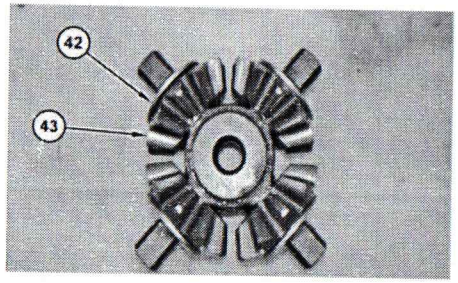

Illustration 35 g03866131

40. Remove thrust washers (42) and gears (43).

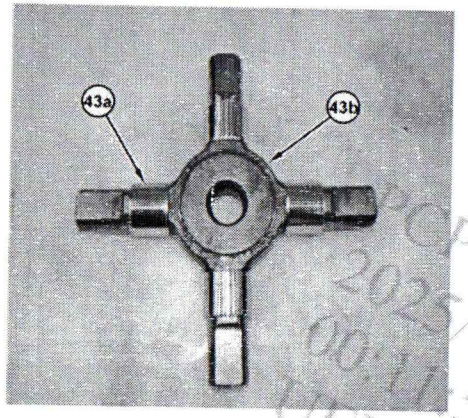

Illustration 36 g03870010

41. Remove gear sleeves (43a) from spider (43b).

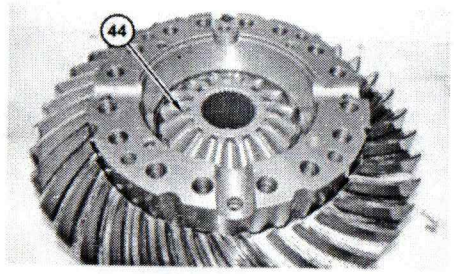

Illustration 37 g03866169

42. Remove gear (44).

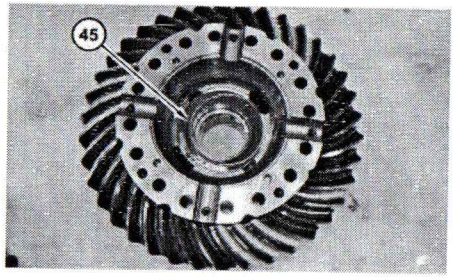

Illustration 38 g03866175

43. Remove thrust washer (45).

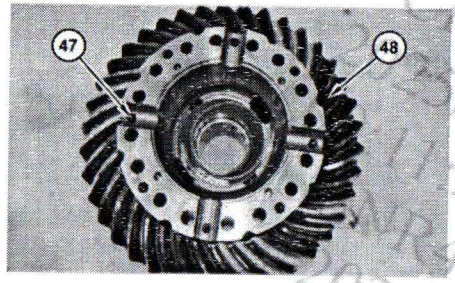

Illustration 39 g03866231

44. Remove roll pins (47) and bevel gear (48).

SMCS - 3256, 3258

i10016954

Assembly Procedure

Table 1

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
A	1U-7502	Repair Stand	1
B	439-3938	Link Bracket As	2
C	456-4371	Lever Hoist	1
D	1P-5546	Crossblock	1
H	6V-4070	Spanner Wrench	1
L	-	Grease	-
M	9S-8864	Plate	1
	5P-8715	Forcing Bolt	1
N	350-7768	Electric Hydraulic Pump Gp (115 V)	1
	350-7769	Electric Hydraulic Pump Gp (230 V)	1
	478-3993	Torque Wrench	1
P	9U-5017	Torque Wrench	1
R	8T-5096	Tool Group	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

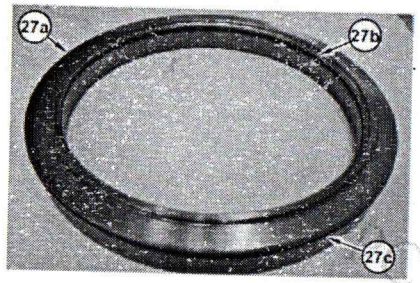

Illustration 1 g03868985

1. Install D-ring seal (27b) and D-ring seal (27c) in clutch piston (27a). Apply a li of Tooling (L) to D-ring seal (27b) and D-ring seal (27c).

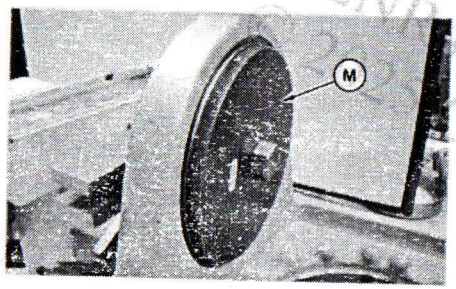

Illustration 2 g03866988

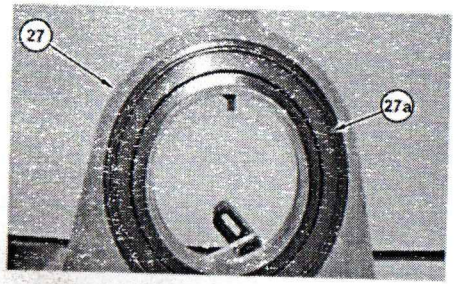

Illustration 3 g03866237

2. Use Tooling (M) to install clutch piston (27a) into carrier assembly (27).

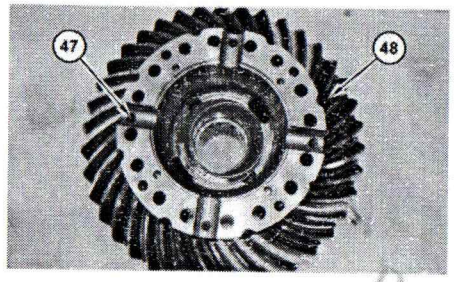

Illustration 4 g03866231

3. Install roll pins (47) into bevel gear (48).

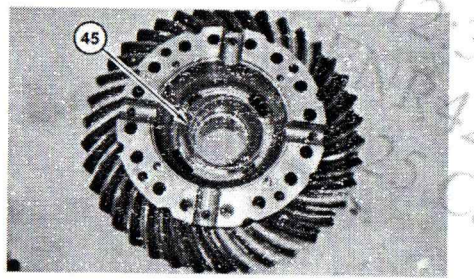

Illustration 5 g03866175

4. Install thrust washer (45).

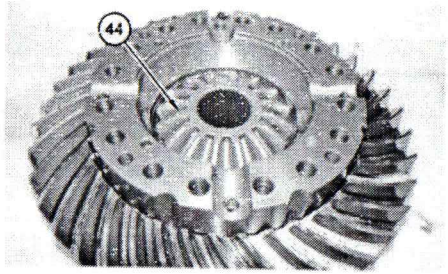

Illustration 6 g03866169

5. Lubricate gear (44) with the lubricant that is being sealed. Install gear (44). Make sure that gear (44) turns freely.

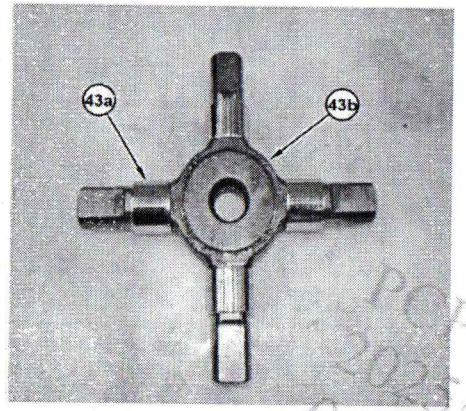

Illustration 7 g03870010

6. Lubricate spider (43b) with the lubricant that is being sealed. Lubricate bearing (43a) with the lubricant that is being sealed. Install bearing sleeves (43a) on sp

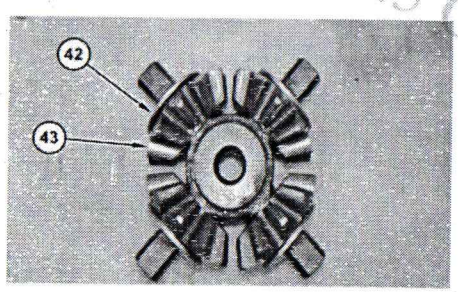

Illustration 8 g03866131

7. Lubricate gears (43) and thrust washers (42) with the lubricant that is being sea gears (43) and thrust washers (42). Make sure gears (43) turn freely.

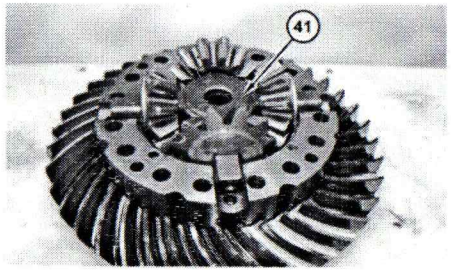

Illustration 9 g03866124

8. Install spider gear assembly (41).

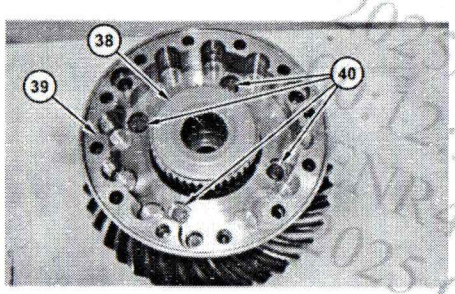

Illustration 10 g03866119

Note: Align the housing to the orientation as marked during the disassembly.

9. Align and install housing (39). Lubricate gear (38) with the lubricant that is being sealed. Install gear (38) and bolts (40). Make sure that gear (38) turns freely.

10. Perform the following procedure to control preload accurately and backlash setting:

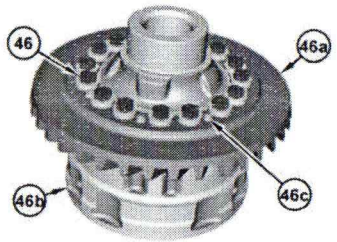

Illustration 11 g03870565

Note: Do not install all bolts (46) until the following procedure is completed

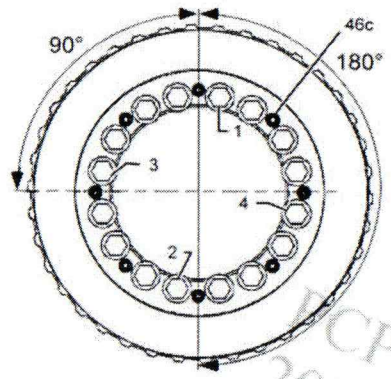

Illustration 12 g03870679

a. Raise bevel gear (46a) to a temperature between 70° C (158° F) and 120° Install bevel gear (46a) to differential case (46b).

b. Install spring pins (46c) to align bevel gear (46a) to differential case (46b).

c. Install four bolts (46) as indicated by callouts (1) through (4) in Illustration 1 bevel gear (46a) to differential case (46b), tighten four bolts (46) in the patte indicated by callouts (1) through (4). Tighten four bolts (46) to a minimum to 70 N·m (52 lb ft).

d. Install remaining bolts (46) loosely (a minimum of one to two revolutions).

e. Confirm bevel gear (46a) is seated in differential case (46b).

f. Allow bevel gear (46a) to cool to a temperature of 30° C (86.° F) or less.

g. Loosen four initially tightened bolts (46) as indicated in Illustration 12 .

h. Tighten bolts (46) to a final torque of 95 ± 10 N·m (70 ± 7 lb ft). Turn bolts (additional 180 degrees ± 10 degrees.

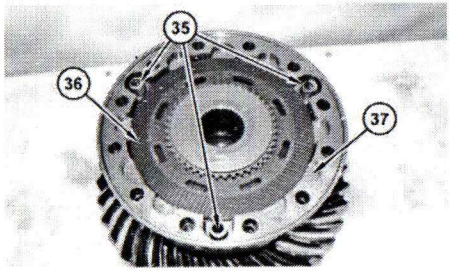

Illustration 13 g03866114

⚠ WARNING

Improper assembly of parts that are spring loaded can cause bodily injury.

To prevent possible injury, follow the established assembly procedure and wear protective equipment.

11. Thoroughly coat eight separator plates (37) and eight friction discs (36) with the lubricant that is being sealed.
12. First install bottom separator plate (37), then install one friction disc (36). Continue in this way until you install the last friction disc (36) at the top.
13. Install springs (35).

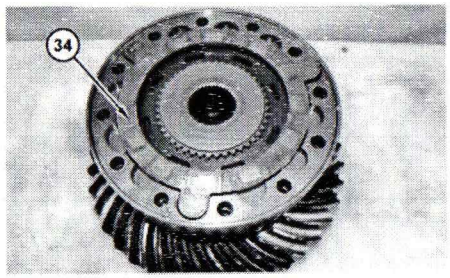

Illustration 14 g03866103

14. Install thrust plate (34).

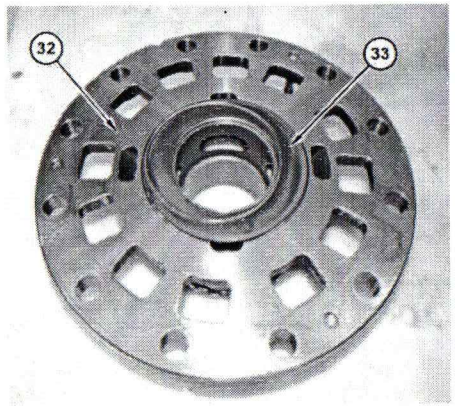

Illustration 15 g06637152

15. Lubricate thrust washer (33) with the lubricant that is being sealed. Install thrust on back side of top clutch housing (32).

Illustration 16 g06783402

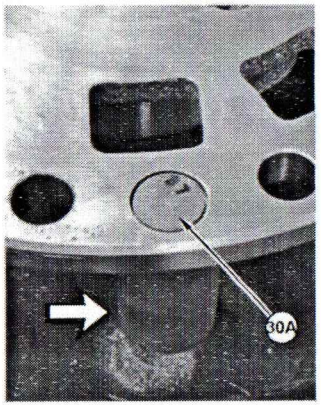

Illustration 17 g06783403

16. Lower the temperature of dowels (30A). Use a suitable hammer to install dowels (30A). Support the housing when installing the dowels.

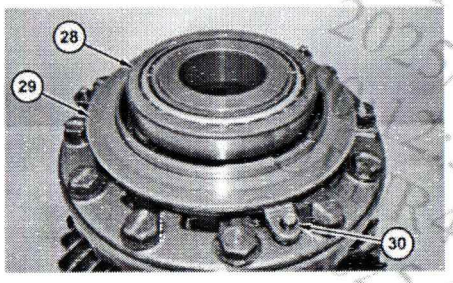

Illustration 18 g06789571

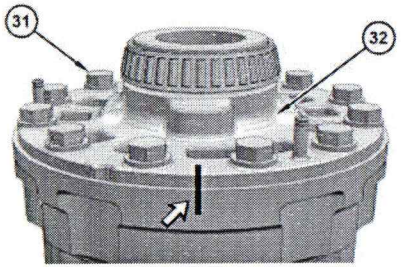

Illustration 19 g06637164

17. Install thrust ring (29).

18. Install O-ring seals (30) and bearing cup (28).

    Note: Align the housing to the orientation as marked during the disassembly.

19. Align and install top clutch housing (32).

20. Install bolts (31). Tighten bolts (31) to a torque of 270 ± 40 N·m (200 ± 30 lb ft).

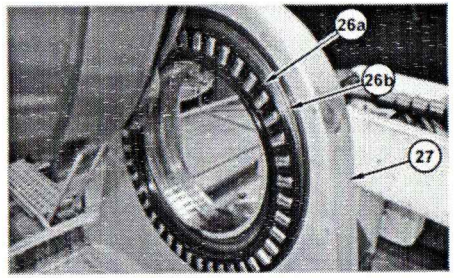

Illustration 20 g03866235

21. Install bearing race (26b). Install bearing (26a) on to carrier assembly (27).

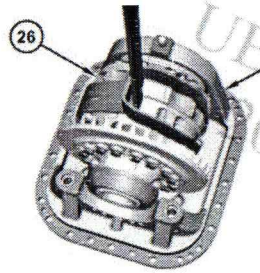

Illustration 21 g03866038

22. Use a suitable lifting device to install differential assembly and bevel gear (26) in assembly (27). The weight of differential assembly and bevel gear (26) is approx 115 kg (254 lb).

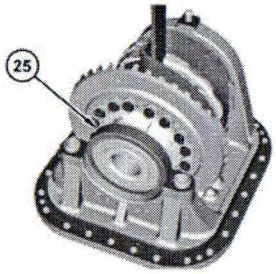

Illustration 22 g03866037

23. Install bearing cup (25).

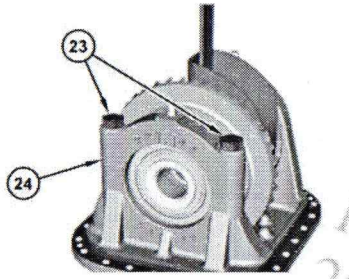

Illustration 23 g03866014

24. Install bearing cap (24). Tighten bolts (23) to a torque of 70 N·m (50 lb ft).

Note: This torque is the initial torque for bolts (23).

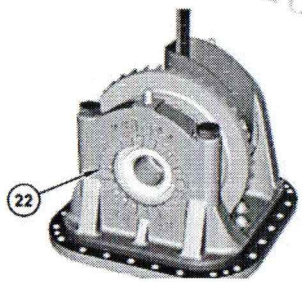

Illustration 24 g03866009

25. Install adjusting ring (22). Repeat for the opposite side. Ensure that adjusting ring freely.

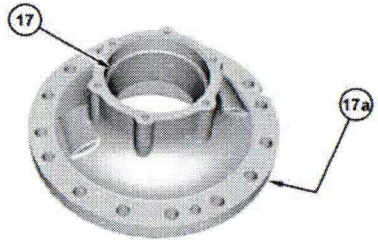

Illustration 25 g03865975

26. Install bearing cup (17) and bearing cup (17a).

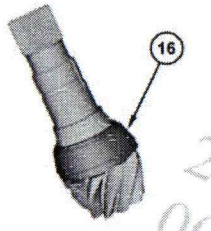

Illustration 26 g03865974

27. Raise the temperature of bearing cone (16). Install bearing cone (16) on pinion s

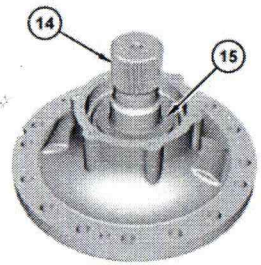

Illustration 27 g03865972

28. Install bearing cone (15). Install pinion shaft (14).

29. Perform the following Steps for setting backlash:

a. Secure the pinion housing in a suitable holding fixture.

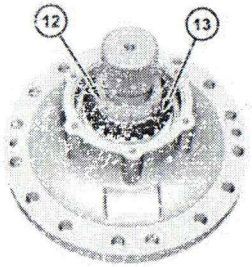

Illustration 28 g03865906

b. Install notched washer (13) and locknut (12). Tighten locknut (12) until you attain a rolling torque of 0.67 to 1.35 N·m (6 to 12 lb in).

Note: Rotation of the pinion is critical to achieve a proper seating of all the components.

c. Rotate the pinion several times to ensure that the bearings are fully seated.

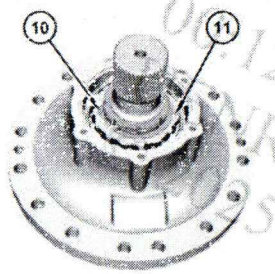

Illustration 29 g03865905

d. Install locking washer (11) so the tabs line up with the notches on the notched washer. Locking washer (11) has eight different positions to align the tabs with the notches in the notched washer. If locking washer (11) does not fully align with the notched washer, position locking washer (11) so that locking washer (11) is very close to fitting into the notches of the notched washer. Tighten the locknut until locking washer (11) notches of the notched washer.

e. Measure the rolling torque again to confirm that the rolling torque is still 0.67 to 1.35 N·m (6 to 12 lb in).

f. If the rolling torque is still 0.67 to 1.35 N·m (6 to 12 lb in), then install retainir into the groove of the locknut that is closer to the locking washer. Make sure retaining ring (10) is fully seated in the groove.

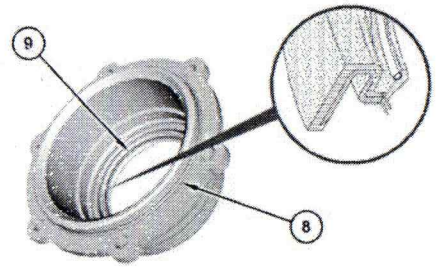

Illustration 30 g06550667

30. Install lip seal (9) with the spring facing up. Lubricate lip seal (9) with the lubricar being sealed. Install O-ring seal (8).

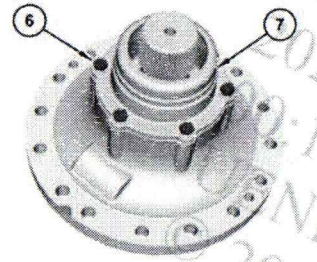

Illustration 31 g03865553

31. Install retainer (7) and bolts (6).

https://sis2.cat.com/#/print-preview/service/552b8253-64cd-4ce4-ae81-92e119b0f2ec

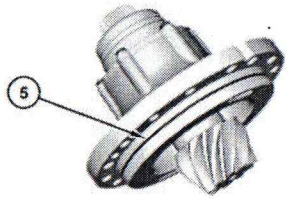

Illustration 32 g03865544

32. Install O-ring seal (5).

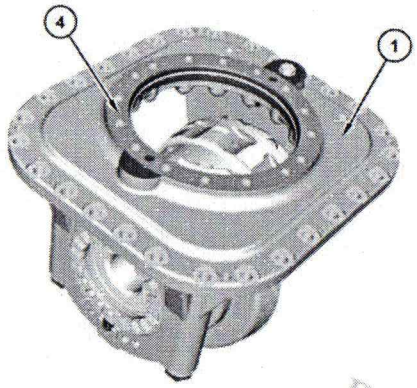

Illustration 33 g03867030

33. Rotate and reposition differential and bevel gear assembly (1) by 90 degrees.

Note: Use the original shims (4) or provide new shims (4) that are the same thickness as the original shims that were removed.

Note: If original shims (4) are not available, then install 80 percent of the new shim pack. In this case, you will be required to adjust the thickness of shims (4) after you determine the tooth contact pattern.

34. Install shims (4) in the differential and bevel gear assembly (1).

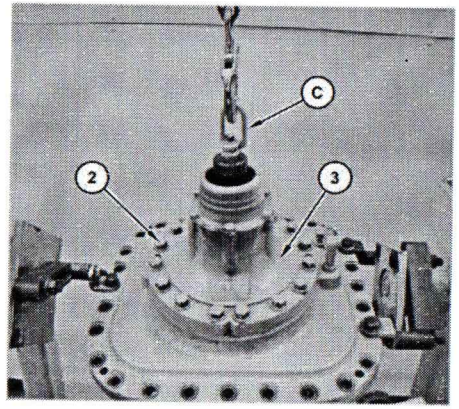

Illustration 34 g03865468

35. Attach suitable Tooling (C) and a suitable lifting device to the yoke. The weight o housing (3) is approximately 75 kg (165 lb).

36. Install pinion housing (3) and bolts (2). Tighten bolts (2) to a torque of 270 ± 40 N (199 ± 30 lb ft).

37. Perform the following procedure to set bearing end play and to set backlash of th gear.

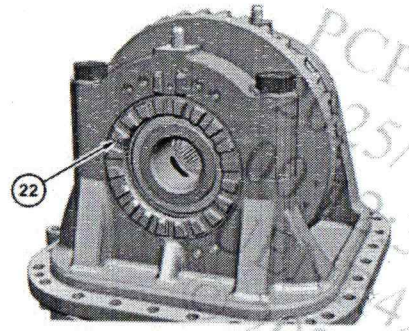

Illustration 35 g06588820

a. The bearing cups have adjusting rings (22). Adjusting rings (22) are used for bearing end play and for setting the back lash of the bevel gear.

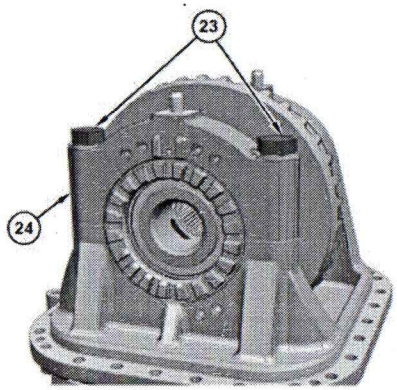

Illustration 36 g06588826

b. Ensure that bolts (23) for bearing caps (24) are tightened to a torque of 70 N·m (50 lb ft).

c. Move both adjusting rings to a position that maintains gear backlash, but not a tight gear mesh. Make sure to maintain a slight bearing end play.

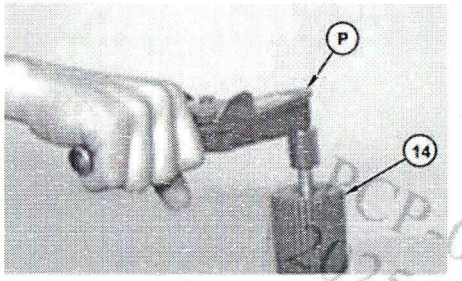

Illustration 37 g03872142

d. Position the differential and bevel gear so that pinion shaft (14) is in a vertical position. Install a suitable bolt in pinion shaft (14). Use Tooling (P) to tighten the bolt until pinion shaft (13) turns.

e. Measure the overall rolling torque of the differential and the pinion shaft. Record that number.

f. Advance the adjusting ring that is next to the bevel gear while you oscillate t gear to a zero backlash position. Then, back off the adjusting ring to the nea position (a maximum of one lug on the adjusting ring).

g. Advance the adjusting ring that is opposite the bevel gear while you rotate th gear set. Monitor the torque that is required to rotate the pinion shaft until a registered over the torque measured in Step 37e .

h. This position is the seated position. Advance the adjusting ring and rotate th gear until the overall rolling torque is 1.20 to 2.48 N·m (11 to 22 lb in) above torque achieved in Step 29b .

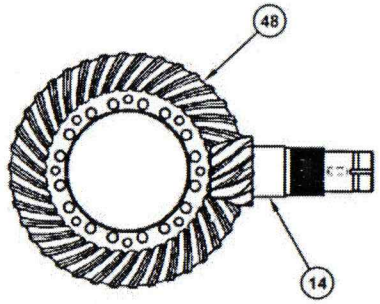

Illustration 38 g03871700

(14) Pinion shaft

i. Measure the backlash in three equally spaced positions around bevel gear (of the three measurements are not equal to the specified backlash of 0.36 ± (0.014 ± 0.005 inch), then retract the adjusting rings or advance the adjustin equally to preserve the preload. Repeat this Step until the backlash at all thr locations is 0.36 ± 0.12 mm (0.014 ± 0.005 inch).

j. Check the tooth contact between the pinion shaft and the bevel gear.

Note: Tip for checking backlash is to hold pinion still while moving gear.

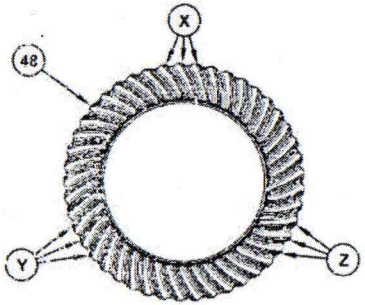

Illustration 39 g03871429

(48) Bevel gear

k. To check the tooth contact between pinion shaft (14) and bevel gear (48), coat bevel gear (48) with a suitable rouge compound in three locations that are 120 degrees apart, as indicated by Locations (X) (Y), and (Z).

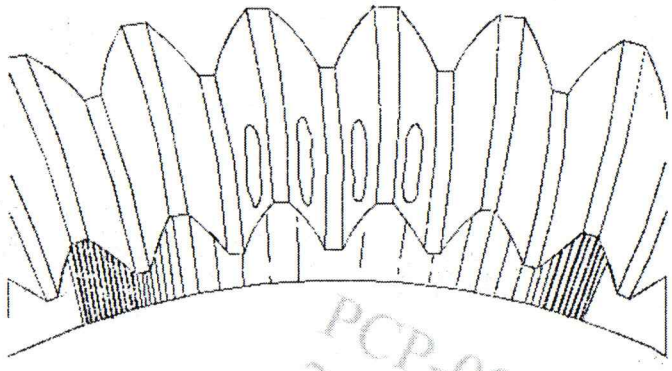

Illustration 40 g02659550

Acceptable tooth contact pattern

i. Rotate the pinion shaft in both directions. The acceptable bevel gear contact pattern percentages are 60 percent from heel for convex, and 55 percent from heel for concave. Refer to Illustration 40 .

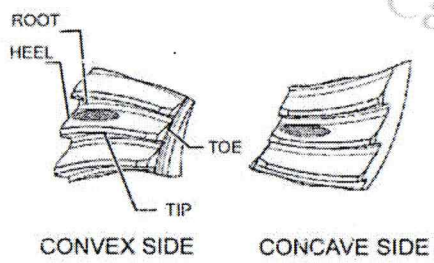

Illustration 41 g03871720

Unacceptable tooth contact pattern

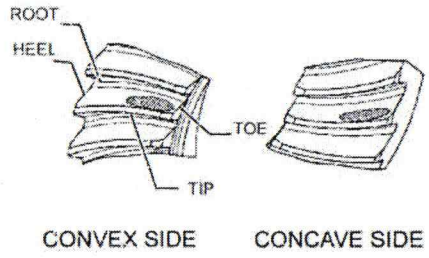

Illustration 42 g03871722

Unacceptable tooth contact pattern

m. Inspect the tooth contact pattern. If the tooth contact pattern appears like the contact pattern in Illustration 41 , then some shims will need to be added and contact pattern will need to be rechecked. If the tooth contact pattern appear tooth contact pattern in Illustration 42 , then some shims will need to be rem

Note: If the shims are adjusted, repeat Step 33 through Step 37m .

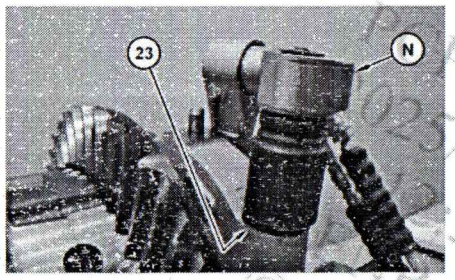

Illustration 43 g03869469

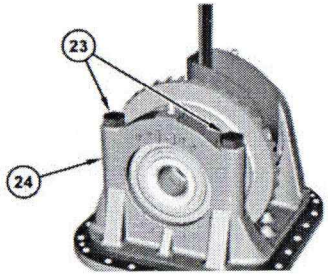

Illustration 44 g03866014

38. Use Tooling (N) to tighten bolts (23) to a torque of 1800 ± 200 N·m (1328 ± 148 lb ft).

Note: After final torque of bolts (23), re-check the gear backlash. Final torque may reduce backlash and take the backlash out of spec.

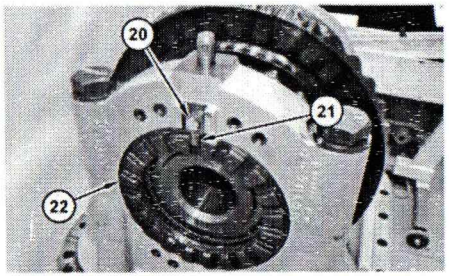

Illustration 45 g03870871

39. Install lock (21) and bolt (20) that secure locking ring (22). Repeat for the other side.

40. The rolling torque for the complete system should not exceed 4 N·m (35 lb in).

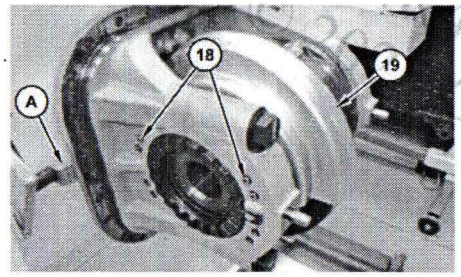

Illustration 46 g03865976

Illustration used for bolt locations.

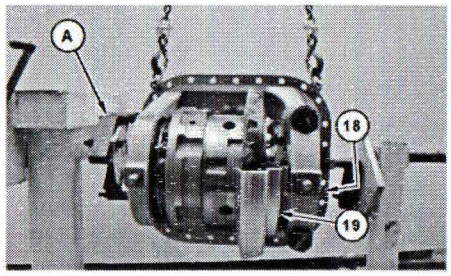

Illustration 47 g07615705

41. Rotate the carrier and differential assembly by 90 degrees on Tooling (A).

42. Install guard (19) and four bolts (18) as shown in Illustration 47 .

End By:

a. Install the front or rear differential and bevel gear. Refer to Differential and Bevel (Front and Rear) - Remove and Install .

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Nomor Formulir / *Form Number*	SHE.SHE.FRM.005.R04

ANALISIS LINGKUNGAN KESELAMATAN KERJA / *JOB SAFETY ENVIRONMENT ANALYSIS*

Pekerjaan / *Task*	DA Differential LFJ	Nomor JSEA / *JSEA Number*	1	Halaman / *Page*	1	Dari / *Of*	

Tanggal Pembuatan JSEA / *Date of JSEA*	17/12/2025	Departemen / *Dept*	SMUN 1 SGS	Tempat Kerja / *Work Location*	Workshop TAB

Disusun Oleh / *Compiled By*	Faiz	TTD / Sign		Review Oleh / *Reviewed By*		TTD / *Sign*		Atasan / *Superior*		TTD / *Sign*	

Apakah Anda sudah terlatih untuk melakukan pekerjaan ini ? / *Are you properly trained to complete these task ?* ☐ Ya / *Yes* ☐ Tidak / *No*

Apa yang Anda perlukan untuk memastikan bahwa pekerjaan selesai tanpa adanya kecelakaan kerja ? / *What do you need to ensure this job is completed incident free ?*

Tools yang digunakan sudah sesuai dengan Manual

Siapa yang bertanggung jawab untuk menghentikan pekerjaan jika terjadi perubahan pekerjaan atau gangguan kondisi lingkungan kerja ? / *Who is responsible for Stop Work Authority if change job or workplace distraction could ?*

ABCD-1 (Technician Leader) / Mr. X (Customer)

Apakah Anda memerlukan peralatan LOTO ? / *Are you need LOTO Equipments ?* ☑ Ya / *Yes* ☐ Tidak / *No*

Apakah Anda mengetahui ERP/MERP dari pekerjaan yang sedang dilakukan? ☑ Ya / *Yes* ☐ Tidak / *No* ***Jika tidak, silahkan tambahkan dalam urutan langkah tugas diawal***

Kondisi Lingkungan / *Environmental Conditions*	Cuaca / *Weather*	Cerah	Medan / *Terrain*	Rata

Pengendalian Sumber Bahaya / *Hazardous Energy Control*					
	☐ Listrik / *Electrical*	☑ Gravitasi (Benda jatuh,tertimpa) / *Gravitation (Falling objects, struck down)*	☐ Pneumatik / *Pneumatic*
	☐ Hidraulik / *Hydraulic*	☑ Mekanis / *Mechanical*	☐ Panas / *Thermal*

APD yang diperlukan / *Required PPE*					
	☑ Helm / *Safety Helm*	☐ Pelindung Muka / *Face shield*	☑ Kacamata / *Safety Glass*
	☑ Sarung Tangan / *Hand Gloves*	☐ Pelindung Pernafasan / *Respiratory Protection*	☐ Perlindungan Kejatuhan / *Fall Protection*
	☑ Sepatu / *Safety Shoes*	☐ Pelindung Telinga / *Hearing Protection*	☐ Lain-Lain / *Other .....*

Hal yang perlu dipertimbangan dalam mengidentifikasi bahaya / *These to consider in identify hazards* :

1. **Bahaya Keselamatan** : Kondisi tidak aman yang dapat menyebabkan injury atau kematian seperti terjepit, terpeleset/terjatuh, tertimpa dll.
   Safety Hazard : unsafe conditions that can cause injury or even death, such as spill/falls, pinch point, struck by, etc.
2. **Bahaya Fisik** : Listrik, Api/ledakan, Kebisingan, Radiasi, Panas, Tekanan, Terjepit, Tersandung/Terjatuh, Tertimpa, Getaran.
   Physical Hazards : Electrical, Fire/Explosion, Noise, Radiations, Thermal, Pressure, Pinch Point, Slips/Falls, Struck by, Vibration.
3. **Bahaya Kimia** : Terhirup, terkena kulit, injeksi, tertelan, terserap.
   Chemical Hazards : Inhalation, skin contact, injection, ingestion, absorption.
4. **Bahaya Biologi** : Patogen yang ditularkan melalui darah, jamur, tanaman/serangga/hewan.
   Biological Hazards : bloodbone pathogens, mold, Plant/Insect/Animals
5. **Bahaya Ergonomi** : Gerakan berulang-ulang, beban yang berlebihan, Postur Janggal, Durasi kerja, Desain area kerja.
   Ergonomic Hazards : Repetitions, Forcefull extention, Awkward Posture, Duration , Work area desain.
6. **Bahaya Organisasi** : stres atau bahaya terkait dengan masalah tempat kerja yang menyebabkan efek jangka panjang atau pendek, beban kerja yang berat dan kekerasan ditempat kerja.
   Organizational hazards: stressors or hazards associated with workplace issues that cause long or short term effects heavy workloads, stressful inieractions and workplaces violence.

No	Urutan Dasar Langkah Tugas / *Job Steps* (* Maksimum 15 Langkah / *Maximum 15 Steps*)	Bahaya Yang Terkait / *Potential Hazard(s)*	Tindakan Perbaikan / *Recommended Action*
1	Walk Around Inspection	1.1 Tersandung Komponen	1.1.1 Perhatikan langkah
			1.1.2 Memakai safety shoes
		1.2 Terpeleset oli tercecer	1.2.1 Dibersihkan dengan absorbent Pad
2	Prepare Tools	2.1 Terjepit laci Tools	2.1.1 Hindari area jepit
			2.1.2 Tutup laci pelahan
			2.1.3 Memakai Safety Gloves
		2.2 Kaki terlindas tool box	2.2.1 Menjaga jarak antara kaki & toolbox
			2.2.2 Memakai Safety Shoes
		2.3 Toolbox menimpa benda kiri	2.3.1 Menarik atau yang aman
			2.3.2 Tetap fokus saat mendorong toolbox
		2.4 Shackle & webbing terbakar	2.4.1 Gunakan alat bantu untuk mengangkat
			2.4.2 Memakai Safety Shoes
3	Doing Assemble	3.1 Differential terbakar saat Pemasangan bearing	3.1.1 Jangan menghindari tools
		3.2 Tool Slip saat membuka bolt	3.2.1 Menarik ukuran yang pas dengan bolt
			3.2.2 Posisikan tools tepat diatas bolt dg benar
			3.2.3 Dorong membuka dengan diberikan
4	Doing Lifting	4.1 Komponen terbakar saat diangkat	4.1.1 Memasang attachment dengan benar

Bagian Dari / *Part Of*	SHE.SHE.SOP.003.R04

Trakindo CAT

Nomor Formulir / Form Number	SHE.SHE.FRM.005.R04

ANALISIS LINGKUNGAN KESELAMATAN KERJA / *JOB SAFETY ENVIRONMENT ANALYSIS*

Pekerjaan / *Task*	DA Differential	Nomor JSEA / *JSEA Number*		Halaman / *Page*	1	Dari / *Of*	
Tanggal Pembuatan JSEA / *Date of JSEA*	16 Des 2025	Departemen / *Dept*	Service	Tempat Kerja / *Work Location*	Workshop Alat berat.		
Disusun Oleh / *Compiled By*	Rifai	TTD / *Sign*		Review Oleh / *Reviewed By*		TTD / *Sign*	
Atasan / *Superior*		TTD / *Sign*					

Apakah Anda sudah terlatih untuk melakukan pekerjaan ini ? / *Are you properly trained to complete these task ?* ☑ Ya / *Yes* ☐ Tidak / *No*

Apa yang Anda perlukan untuk memastikan bahwa pekerjaan selesai tanpa adanya kecelakaan kerja ? / *What do you need to ensure this job is completed incident free ?*

Tools yang digunakan sudah sesuai dengan Manual

Siapa yang bertanggung jawab untuk menghentikan pekerjaan jika terjadi perubahan pekerjaan atau gangguan kondisi lingkungan kerja ? / *Who is responsible for Stop Work Authority if change job or workplace distraction could ?*

ABCD-1 (Technician Leader) / Mr. X (Customer)

Apakah Anda memerlukan peralatan LOTO ? / *Are you need LOTO Equipments ?* ☑ Ya / *Yes* ☐ Tidak / *No*

Apakah Anda mengetahui ERP/MERP dari pekerjaan yang sedang dilakukan? ☐ Ya / *Yes* ☐ Tidak / *No* ***Jika tidak, silahkan tambahkan dalam urutan langkah tugas diawal***

Kondisi Lingkungan / *Environmental Conditions*	Cuaca / *Weather*		Medan / *Terrain*	

Pengendalian Sumber Bahaya / *Hazardous Energy Control*					
	☐ Listrik / *Electrical*	☑ Cravitasi (Benda jatuh,tertimpa) / *Gravitation (Falling objects, struck down)*	☐ Pneumatik / *Pneumatic*		
	☐ Hidraulik / *Hydraulic*	☑ Mekanis / *Mechanical*	☐ Panas / *Thermal*		

APD yang diperlukan / *Required PPE*					
	☑ Helm / *Safety Helm*	☐ Pelindung Muka / *Face shield*	☑ Kacamata / *Safety Glass*		
	☑ Sarung Tangan / *Hand Gloves*	☐ Pelindung Pernafasan / *Respiratory Protection*	☐ Perlindungan Kejatuhan / *Fall Protection*		
	☑ Sepatu / *Safety Shoes*	☐ Pelindung Telinga / *Hearing Protection*	☐ Lain-Lain / *Other .....*		

Hal yang perlu dipertimbangan dalam mengidentifikasi bahaya / *These to consider in identify hazards* :

1. **Bahaya Keselamatan** : Kondisi tidak aman yang dapat menyebabkan injury atau kematian seperti terjepit, terpeleset/terjatuh, tertimpa dll.
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2. **Bahaya Fisik** : Listrik, Api/ledakan, Kebisingan, Radiasi, Panas, Tekanan, Terjepit, Tersandung/Terjatuh, Tertimpa, Getaran.
   Physical Hazards : Electrical, Fire/Explosion, Noise, Radiations, Thermal, Pressure, Pinch Point, Slips/Falls, Struck by, Vibration.
3. **Bahaya Kimia** : Terhirup, terkena kulit, injeksi, tertelan, terserap.
   Chemical Hazards : Inhalation, skin contact, injection, ingestion, absorption.
4. **Bahaya Biologi** : Patogen yang ditularkan melalui darah, jamur, tanaman/serangga/hewan.
   Biological Hazards : bloodbone pathogens, mold, Plant/Insect/Animals
5. **Bahaya Ergonomi** : Gerakan berulang-ulang, beban yang berlebihan, Postur Janggal, Durasi kerja, Desain area kerja.
   Ergonomic Hazards : Repetitions, Forcefull extention, Awkward Posture, Duration , Work area desain.
6. **Bahaya Organisasi** : stres atau bahaya terkait dengan masalah tempat kerja yang menyebabkan efek jangka panjang atau pendek, beban kerja yang berat dan kekerasan ditempat kerja.
   Organizational hazards: stressors or hazards associated with workplace issues that cause long or short term effects heavy workloads, stressful interactions and workplaces violence.

No	Urutan Dasar Langkah Tugas / *Job Steps* (* Maksimum 15 Langkah / *Maximum 15 Steps*)	Bahaya Yang Terkait / *Potential Hazard(s)*	Tindakan Perbaikan / *Recommended Action*
1.	Walk around inspection.	1.1 Area kerja sempit & banyak komponen	1.1.1 Pindahkan barang yang tidak digunakan
		1.2 Tersandung pallet engine	1.2.1 Pindahkan pallet & engine ke tempat aman
			1.2.2 berjalan di area yang aman
			1.2.3 Memakai safety ~~shoes~~ shoes.
2.	Prepare tool	2.1 Terjepit laci tools	2.1.1 hindari titik jepit
			2.1.2 tutup perlahan
			2.1.3 Memakai safety gloves.
		2.2 Kaki terlindas ban toolbox	2.2.1 Menjaga jarak antara kaki dan toolbox
			2.2.2 Memakai safety shoes.
		2.3 toolbox menabrak benda lain	2.3.1 mencari area yang aman
			2.3.2 Tetap fokus saat menarik toolbox
		2.4 Alat lifting terjatuh (shackle, webbing)	2.4.1 Gunakan alat bantu jika berat.
			2.4.2 memakai safety shoes.
3.	Doing Disassamble	3.1 differential terjatuh saat pembukaan torsi	3.1.1 Jangan membuka bolt dengan dihentak
		3.2 tool slip saat membuka bolt	3.2.1 Mencari ukuran yang pas dengan bolt
			3.2.2 Posisikan tools tepat di sisi bolt dengan benar
			3.2.3 Jangan membuka dengan dihentak
4.	Doing lifting	4.1 komponen terjatuh saat diangkat	4.1.1 memasang attachment dengan benar.

Bagian Dari / *Part Of*	SHE.SHE.SOP.003.R04

Trakindo CAT

Nomor Formulir / Form Number	SHE.SHE.FRM.005.R04

ANALISIS LINGKUNGAN KESELAMATAN KERJA / JOB SAFETY ENVIRONMENT ANALYSIS

Pekerjaan / Task	DA Differential	Nomor JSEA / JSEA Number	1	Halaman / Page	1	Dari / Of	
Tanggal Pembuatan JSEA / Date of JSEA	17/12/2025	Departemen / Dept	SMKN 1 SGS	Tempat Kerja / Work Location	Workshop TAB		
Disusun Oleh / Compiled By	Sultan	TTD / Sign		Review Oleh / Reviewed By		TTD / Sign	
Atasan / Superior		TTD / Sign					

Apakah Anda sudah terlatih untuk melakukan pekerjaan ini ? / *Are you properly trained to complete these task ?* ☑ Ya / Yes ☐ Tidak / No

Apa yang Anda perlukan untuk memastikan bahwa pekerjaan selesai tanpa adanya kecelakaan kerja ? / *What do you need to ensure this job is completed incident free ?*

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Apakah Anda mengetahui ERP/MERP dari pekerjaan yang sedang dilakukan? ☑ Ya / Yes ☐ Tidak / No ***Jika tidak, silahkan tambahkan dalam urutan langkah tugas diawal***

Kondisi Lingkungan / *Environmental Conditions*	Cuaca / *Weather*		Medan / *Terrain*	

Pengendalian Sumber Bahaya / *Hazardous Energy Control*	☑ Listrik / *Electrical*	☑ Gravitasi (Benda jatuh,tertimpa) / *Gravitation (Falling objects, struck down)*	☐ Pneumatik / *Pneumatic*		
	☐ Hidraulik / *Hydraulic*	☑ Mekanis / *Mechanical*	☐ Panas / *Thermal*		
APD yang diperlukan *Required PPE*	☑ Helm / *Safety Helm*	☐ Pelindung Muka / *Face shield*	☑ Kacamata / *Safety Glass*		
	☑ Sarung Tangan / *Hand Gloves*	☐ Pelindung Pernafasan / *Respiratory Protection*	☐ Perlindungan Kejatuhan / *Fall Protection*		
	☑ Sepatu / *Safety Shoes*	☐ Pelindung Telinga / *Hearing Protection*	☐ Lain-Lain / *Other*		

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Ergonomic Hazards : Repetitions, Forcefull extention, Awkward Posture, Duration , Work area desain.

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Organizational hazards: stressors or hazards associated with workplace issues that cause long or short term effects heavy workloads, stressful interactions and workplaces violence.

No	Urutan Dasar Langkah Tugas / *Job Steps* (* Maksimum 15 Langkah / *Maximum 15 Steps*)	Bahaya Yang Terkait / *Potential Hazard(s)*	Tindakan Perbaikan / *Recommended Action*
1	Walk Around inspection	1.1 tersandung : Wood block	1.1.1 Letakkan pada tempat yang benar
			1.1.2 fokus saat bekerja
			1.1.3 berjalan diarea jalan bukan area kerja
		1.2 Tawuda tercecer	1.2.1 lap menggunakan Absorbent pad
2.	Prepare tool	2.1 terjepit : loci tools	2.1.1 Hindari titik jepit
			2.1.2 tutup perlahan
			2.1.3 memakai safety gloves
		2.2 kaki tertindas ban toolbox	2.2.1 menjaga jarak antara kaki dan toolbox
			2.2.2 memakai Safety shoes
		2.3 toolbox menabrak benda lain	2.3.1 mencari area yang aman
			2.3.2 tetap Fokus saat menarik toolbox
		2.4 Alat lifting terjatuh (shackle, webbing)	2.4.1 gunakan alat bantu jika berat
			2.4.2 memakai Safety Shoes
3.	Doing Disassamble	3.1 differential terjatuh saat pembukaan torsi	3.1.1 jangan membuka bolt dg dihantak
		3.2 tool slip saat membuka bolt	3.2.1 mencari ukuran yang pas dengan bolt
			3.2.2 posisikan tools tepat disisi bolt dg benar
			3.2.3 Jangan membuka dg dihantak