

F239/F280

F.239 C & D AND F.280 A & B FINAL DRIVES

WORKSHOP OVERHAUL SCHEDULE

1. This Workshop Overhaul Schedule for the above-mentioned Final Drives replaces forthwith any previously issued.

2. The classification of repairs are :-  
LIGHT ATTENTION  
GENERAL

3. Periods

120/144,000 miles )  
24/30 months ) LIGHT ATTENTION

240/288,000 miles )  
48/60 months ) GENERAL

4. Inspection

- (i) Is necessary at 125/150,000 miles to ensure that only a Light Attention is required, should any untoward wear be revealed a General Repair must be done.
- (ii) 'Red Label' procedure is used to ascertain reason for failure before scheduled life is attained, where this is obscure.

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>FINAL DRIVE</u>	Ensure that the lift in the main axle bearings is within the acceptable limits.	See Data Section Item 1.
	Remove inspection cover, examine the primary and reverse pinion assembly, exchange if unduly worn.	See Data Section Item 2.
	Examine sump for debris.	
	Test for lift in front bearing of crown bevel wheel.	See Data Section Item 3.

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F.239/F.280 FINAL DRIVES

INDEX TO GENERAL REPAIR SECTION

Axle Assembly	- Sheet 1
Final Drive	- Sheet 2
Primary and Reverse Bevel Pinion Assemblies	- Sheets 3 and 4
Crown Bevel Wheel and Shaft Assembly	- Sheet 5
Piston Air Cylinder Shaft and Fork Assembly	- Sheet 6

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>AXLE ASSEMBLY</u>		
Axle Gear	<p>Check teeth for wear, pitting, fractures (crack detect). Renew spur wheels where major damage has been sustained or if damage is due to fatigue.</p> <p>Repair where damage comprises minor chipping or bruising or where odd teeth are badly damaged up to 25% of their length providing at least 5 undamaged teeth remain between any such teeth.</p> <p>Crack detect again.</p> <p>Renew pinion as necessary.</p> <p>The repair procedure to be adopted is as follows:- Stoning/Grinding and Honing of all sharp edges and rough areas. The resulting surface to be equivalent to that of the remaining teeth.</p> <p>Flaw detect again after repairs.</p>	
Bearings	<p>Check for wear between axle bearings and axle. Remove bearings and grind axle as necessary. Fit appropriate bearings.</p> <p>Examine for pitting and tracking, renew as necessary.</p>	See Data Section Item 4.
Centre & Side Bearing Housing	<p>Ensure bearings are a 'light interference' fit in bearing housing.</p> <p>Renew as necessary.</p>	
Split Clamping Ring	<p>Examine, repair or renew as necessary.</p>	See A.E.C. Drawing SK.35-139.
Oil Seal Housing and End Covers	<p>Examine, repair or renew as necessary.</p>	
Oil seals	<p>Renew.</p>	See Data Section Item 5.

GENERAL

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>AXLE ASSEMBLY</u>		
Axle Gear	<p>Check teeth for wear, pitting, fractures (crack detect). Renew spur wheels where major damage has been sustained or damage is due to fatigue. Repair where damage comprises minor chipping or bruising or where odd teeth are badly damaged up to 25% of their length providing at least 5 undamaged teeth remain between any such teeth. Check detect again. Renew pinion as necessary.</p> <p>The repair procedure to be adopted is as follows:- Stoning/Grinding and Honing of all sharp edges and rough areas. The resulting surface to be equivalent to that of the remaining teeth. Flaw detect again after repairs.</p> <p>Check for wear between axle bearings and axle. Remove bearings and grind axle as necessary. Fit appropriate bearings.</p>	See Data Section Item 4
Bearings	Examine for pitting and tracking, renew as necessary.	
Centre & Side Bearing Housing	Ensure bearings are a 'light interference' fit in bearing housing. Renew as necessary.	
Split Clamping Ring	Examine, repair or renew as necessary.	See A.E.C. Drawing SK.35-139
Oil Seal Housing and end Covers	Examine, repair or renew as necessary	
Oil Seals	Renew	See Data Section Item 5
	Check oil sealing areas on the axle. If damaged or grooved, grind to eliminate all damage, taking care to ensure that no debris enters the bearings if these are not removed. Apply colour coding to the axle.	See Data Section 5

AMENDMENT NO. 161 JUNE 1983

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>FINAL DRIVE</u>	Clean by appropriate process. Remove final drive from axle and strip completely.	
Direction Indicator Switch	Replace with a switch overhauled in accordance with WOSS 530/6. Check for correct operation when assembled on the final drive.	See Data Section Item 6.
Final Drive Casing	Examine. Measure crown bevel wheel roller bearing housings, bore out and sleeve as necessary. Measure casing bore for centre and side axle bearing housings with the casings bolted together and new joint in position, bore out and sleeve as necessary. Measure both axle bearing housings, renew as necessary. Check primary and reverse pinion assembly housing bores. Recondition as necessary. Check condition of torque arm mounting points, recondition with steel bush as necessary. Check condition of top inspection cover, correct any deformation of breather tube. Ensure all holes are clear and check studs for condition and security, renew studs as necessary. Paint interior as necessary.	See Data Section Item 7. See Data Section Item 8, and General Section Page 1. See Data Section Item 9. See Data Section Item 10. Oil resistant paint.
Torque Arm	Examine for fractures and wear, repair or renew or fit bushes as necessary.	See Data Section Item 11.

AMENDMENT NO. 161 cont'd. JUNE 1983

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
Torque Arm Suspension	Remove, clean and crack detect the reaction pin and link; renew items found fractured.  Examine the rubbers for deterioration. Renew any with permanent deformation or surface cracks. Examine the metallic components for damage. If the lower cup/shroud is damaged, machine in accordance with Appendix D.	
Locking Plunger Assembly	Examine, repair or renew as necessary. Check locking, plunger guide for fractures.	

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JULY, 1981

GENERAL

COMPONENT	WORK TO BE CARRIED OUT	REMARKS																					
<u>PRIMARY AND REVERSE BEVEL PINION ASSEMBLIES</u>																							
Pinions	Examine for defective teeth and crack detect all pinions; check condition of thread on pinions and locknuts. Recondition or renew as necessary.	See Data Section Item 12. Reconditioned pinions to be crack detected after machining. Ensure that building-up process does not upset condition of pinion.																					
Spigot Bearing	On re-assembly, correct end float to be obtained by use of shims.	See Data Section Item 13.																					
F239 Final Drive.	<table border="1"> <thead> <tr> <th>Shims BR Cat No</th> <th>AEC Part No</th> <th>Thickness</th> </tr> </thead> <tbody> <tr> <td>15/90153</td> <td>Z9/44854</td> <td>0.491" 12.47 mm</td> </tr> <tr> <td>15/90149</td> <td>Z9/44816</td> <td>0.5225" 13.27 mm</td> </tr> <tr> <td>15/90150</td> <td>Z9/44828</td> <td>0.5285" 13.42 mm</td> </tr> <tr> <td>15/90148</td> <td>Z9/44815</td> <td>0.5425" 13.78 mm</td> </tr> <tr> <td>15/90147</td> <td>Z9/44818</td> <td>0.5625" 14.29 mm</td> </tr> <tr> <td>15/90151</td> <td>Z9/44829</td> <td>0.6025" 15.30 mm</td> </tr> </tbody> </table>	Shims BR Cat No	AEC Part No	Thickness	15/90153	Z9/44854	0.491" 12.47 mm	15/90149	Z9/44816	0.5225" 13.27 mm	15/90150	Z9/44828	0.5285" 13.42 mm	15/90148	Z9/44815	0.5425" 13.78 mm	15/90147	Z9/44818	0.5625" 14.29 mm	15/90151	Z9/44829	0.6025" 15.30 mm	End of Shaft <u>NOT</u> threaded; use pinion AEC Part No F11830, BR Cat No 15/90172 and bearing rhp Part No MMRJ7/8, BR Cat No 43/34551
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F280 Final Drive	<p>Fit shim AEC Part No Z10/44809, BR Cat No 15/90249</p> <p>Secure bearing in pinion with circlip or with "LOCTITE 932", BR Cat No 7/60343.</p>	End of shaft threaded; use pinion AEC Part No F11843, BR Cat No 15/90243 and bearing Hoff Part No L5125 V 3 M BR Cat No 43/33476																					

MARCH 1984

GENERAL

## COMPONENT

## WORK TO BE CARRIED OUT

## REMARKS

PRIMARY AND REVERSE BEVEL  
PINION ASSEMBLIES

## Pinions

Examine for defective teeth and crack detect all pinions; check condition of thread on pinions and locknuts. Recondition or renew as necessary.

See Data Section Item 12. Reconditioned pinions to be crack detected after machining. Ensure that building-up process does not upset condition of pinion.

## Spigot Bearing

On re-assembly, correct end float to be obtained by use of shims.

See Data Section Item 13.

## F239 Final Drive

Shims BR Cat No	AEC Part No	Thickness
15/90153	Z9/44854	0.491" 12.47 mm
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15/90147	Z9/44818	0.5625" 14.29 mm
15/90151	Z9/44829	0.6025" 15.30 mm

End of Shaft NOT threaded; use pinion AEC Part No F11830, BR Cat No 15/90172 and bearing RHP Part No MM RJA 7/8 BR Cat No 43/34560.

## F280 Final Drive

Fit shim AEC Part No Z10/44809, BR Cat No 15/90249

Secure bearing in pinion with circlip or with "LOCTITE 932", BR Cat No 7/60343.

End of shaft threaded; use pinion AEC Part No F11843, BR Cat No 15/90243 and bearing Hoff Part No L5125 V 3 M BR Cat No 43/33476

QUALITY ASSURANCE MANAGER  
M & EE (BR HQ) DEPT.  
HOUSE, R.T.C. DERBY

AMENDMENT NO. 172  
JAN 1985

D.M.U. FINAL DRIVE - F.239/F.280  
GENERAL

QUALITY ASSURANCE MANAGER  
M & EE (BR HQ) DEPT.  
HOUSE, P.T.C. DERBY  
SHEET 3

COMPONENT

WORK TO BE CARRIED OUT

REMARKS

PRIMARY AND REVERSE BEVEL  
PINION ASSEMBLIES

Pinions

Examine for defective teeth and crack detect all pinions; check condition of thread on pinions and locknuts. Recondition or renew as necessary.

See Data Section Item 12. Reconditioned pinions to be crack detected after machining. Ensure that building-up process does not upset condition of pinion.

Spigot Bearing

On re-assembly, correct end float to be obtained by use of shims.

See Data Section Item 13.

F239 Final Drive.

Shims BR Cat No	AEC Part No	Thickness
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15/90147	Z9/44818	0.5625" 14.29 mm
15/90151	Z9/44829	0.6025" 15.30 mm

End of shaft NOT threaded; use pinion AEC Part No. F11830, BR Cat No. 15/90172 and bearing rhp Part No. MMRJA7/8, BR Cat No. 43/34560. Secure bearing on shaft using 'Loctite 641', BR Cat No. 7/60416.

F280 Final Drive

Fit shim AEC Part No Z10/44809, BR Cat No 15/90249

Secure bearing in pinion with circlip or with "LOCTITE 932", BR Cat No 7/60343.

End of shaft threaded; use pinion AEC Part No F11843, BR Cat No 15/90243 and bearing Hoff Part No L5125 V 3 M BR Cat No 43/33476

JULY, 1979

GENERAL

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
Bearings, Taper Roller	Examine condition, particularly for chipped bearings. Renew as necessary.	See Data Section Item 15.
Distance Pieces (Bearings)	Examine for condition, renew as necessary. (See Engineering Instruction MD 298)	
Bearing, Ball (Input)	Examine condition, particularly for chipped bearings. Renew as necessary.	See Data Section Item 16.
Bearing Housings (Inner, Outer and Input)	Examine bores for wear and ensure studs and stud holes are in good condition. Recondition or renew as necessary.	See Data Section Item 17.
Driving Shaft	Examine for condition and alignment, ensure proper fit of bearings. Special attention to be given to splines by checking freedom of sliding dog on shaft.  Recondition or renew as necessary.	See Data Section Item 18.
Flange Coupling	Examine condition of splines and oil seal sleeve; renew oil seal sleeve as necessary. Renew oil seals.  Check flange for distortion and driving bolt holes for elongation; recondition or renew as necessary.	See Data Section Item 19.  See Data Section Item 19.

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
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PRIMARY AND REVERSE BEVEL  
PINION ASSEMBLIES

(Continued)

End Covers

Examine to ensure face will be oiltight.

Sliding Dog

Check striking fork groove for wear.

See Data Section Item 20.

Build up worn dog teeth and machine, crack detect before and after.

See Appendix B.

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COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>CROWN BEVEL WHEEL AND SHAFT ASSEMBLY</u>		
Bevel Wheel and Pinion	Examine for defective teeth on bevel wheel and pinion. Grind pinion teeth tips to size as necessary. Crack detect.	See Data Section Item 21
	Apply a "push-off" load of 12 Tons to the bevel wheel and pinion.	If the gear wheels move on the shaft, recondition in accordance with Appendix 'E'
Distance Piece	Examine for wear, renew as necessary.	See Data Section Item 22.
Roller and Ball Bearings	Check races and balls for pitting, renew whole bearing as necessary.	See Appendix C
Shaft	Examine and check for alignment.	See Data Section Item 23.
Outer Bearing Housing	Examine for fractures and stripped withdrawal hole threads. Recondition or renew as necessary.	
Assembly	When assembling bevel wheel shaft, secure distance piece, roller bearing inner race and ball bearing inner race using 'Loctite 270'.	

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>CROWN BEVEL WHEEL AND SHAFT ASSEMBLY</u>		
Bevel Wheel and Pinion	Examine for defective teeth on bevel wheel and pinion Grind pinion teeth tips to size as necessary  Crack detect bevel wheel using the magnetic particle method  If any cracks are found then bevel wheel to be scrapped	See Data Section Item 21
	Apply a "push-off" load of 12 Tons to the bevel wheel and pinion	If the gear wheels move on the shaft, recondition in accordance with Appendix 'E'
Distance Piece	Examine for wear, renew as necessary	See Data Section Item 22
Roller and Ball Bearings	Check races and balls for pitting, renew whole bearing as necessary	See Appendix C
Shaft	Examine and check for alignment  Crack detect shaft ultrasonically paying attention to the keyway area. If any cracks are found then shaft to be scrapped	See Data Section Item 23
Outer Bearing Housing	Examine for fractures and stripped withdrawal hole threads. Recondition or renew as necessary.	
Assembly	When assembling bevel wheel shaft, secure distance piece, roller bearing inner race and ball bearing inner race using 'Loctite 270'.	

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>PISTON AIR CYLINDER SHAFT AND FORK ASSEMBLY</u>	Strip completely, mark parts to ensure correct re-assembly.	
Striking Fork	Examine for wear and crack detect. Recondition or renew as necessary.	See Data Section Item 24.
Neutral Locking Plate	Check isolating plunger slot for wear, recondition or renew as necessary.	See Data Section Item 25.
Air Cylinders	Check bores for wear, bore out and fit liner as necessary	See Data Section Item 26.
Air Pistons	Examine visually for wear, recondition or renew as necessary. Renew seals.	See Appendix A for reclamation process.
Air Piston Shaft	Check for alignment, renew if distorted.	See Data Section Item 27.
Oil Trough	Check welding at seams, repair as necessary.	



## WORK TO BE CARRIED OUT

## REMARKS

Renew all joints.

Ensure correct mesh of crown and bevel wheels with primary and reverse pinions to secure adequate backlash.

See Data Section Item 28.

Ensure correct end float of spigot bearing in original design.

See Data Section Item 29.

Check clearance of striking fork in forward and reverse positions.

See Data Section Item 30.

Carry out adjustments to directional switch cams to ensure that the indicator lights will show the appropriate condition of mesh, between the sliding dog and the primary and reverse pinions, using temporary connection of air supply to simulate working conditions.

See Data Section Item 31.

Refit breather tube, dipstick and drain plugs.

Fit sump.

Fit inspection cover and blanking plate.

Final clean and paint.

Fit masking tape and/or covers to openings to prevent ingress of dirt, and apply protection to prevent rusting.

DATA

ITEM NO	COMPONENT	MINIMUM	MAXIMUM	REMARKS	ITEM NO
LIGHT ATTENTION					
1	Main Axle Bearings	- Lift	- Solid End	0.002"	1
			- Packing End	0.006"	
2	Primary and Reverse Pinions	- Backlash	0.012"	0.015"	2
3	Crown Bevel Wheel	- Lift in Front Bearing		0.005"	3
GENERAL REPAIR					
AXLE ASSEMBLY					
4	Axle Gear	- Standard Axle Diameters (at Bearing)			4
		- Standard	6.492"	6.500"	<p><u>NOTE</u></p> <p>Where axles are worn on the bearing seat below the maximum diameter, provided the surface is smooth, the appropriate bearing is to be fitted using 'LOCTITE Bearing fit' No 641, Cat No 7/60416.</p> <p>Before applying the Loctite, both surfaces must be thoroughly degreased.</p>
		- 1st Undersize	6.474"	6.482"	
		- 2nd Undersize	6.464"	6.472"	
		- 3rd Undersize	6.454"	6.462"	
		- Bearing Sizes (relative to each axle diameter)			
		- Standard	6.498"		
		- 1st Undersize	6.480"		
		- 2nd Undersize	6.470"		
		- 3rd Undersize	6.460"		

ITEM NO.	COMPONENT	MINIMUM	MAXIMUM	REMARKS	ITEM NO.
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5 AXLE ASSEMBLY (Continued)  
 Oil Seals

5



ROUTE	INSTN.
A2	

Axle Standard	Axle Diameters		Colour Code of Axle	Oil Seal - Parts List No.			
	Maximum	Minimum		Type D.1		Type D.1 with Dust Lip	
				James Walker Part No.	BR Cat No.	James Walker Part No.	BR Cat No.
1st (original)	6.250"	6.240"	None	111900-1	15/254	111900-5	15/228
2nd	6.239"	6.225"	White	111900-1	15/254	111900-5	15/228
3rd	6.224"	6.200"	Green	111900-2	15/255	111900-6	15/225
4th	6.199"	6.175"	Blue	111900-3	15/256	111900-7	15/226
5th	6.174"	6.150"	Yellow	111900-4	15/257	111900-8	15/227

6 Direction Indicator Switch

Test Details

24V supply. Manually obtain 3/4 engagement of dog clutch and pinion and check that directional indicator light operates. (See Swindon Drawing W.3393 for details of test rig).

6

7 Final Drive Casing  
 Crown Bevel Wheel Roller  
 Bearing Housing - Inside Diameter

7.248" 7.250"

7

8 Casing Bore for Centre Axle Bearing Housing - Inside Diameter  
 Casing Bore for Side Axle Bearing Housing - Inside Diameter  
 Centre Axle Bearing Housing - Outside Diameter  
 Side Axle Bearing Housing - Outside Diameter

9.500" 9.502"  
 10.124" 10.127"  
 9.495" 9.500"  
 10.123" 10.125"

8

To be measured with the casings bolted together and new joint in position Bearing housings to be assembled with 'LOCTITE 270'

ITEM NO	COMPONENT	MINIMUM	MAXIMUM	REMARKS	ITEM NO																																																														
5	<u>AXLE ASSEMBLY</u> (Continued) Oil Seals				5																																																														
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6	Direction Indicator Switch	Test Details		24 V supply. Manually obtain 3/4 engagement of dog clutch and pinion and check that directional indicator light operates. (See Swindon Drawing W.3393 for details of test rig)																																																															
7	Final Drive Casing Crown Bevel Wheel Roller Bearing Housing - Inside Diameter		7.248"	7.250"	7																																																														
8	Casing Bore for Centre Axle Bearing Housing - Inside Diameter		9.500"	9.502"	To be measured with the 8 casings bolted together and new joint in position Bearing housings to be assembled with 'LOCTITE 270'																																																														
	Casing Bore for Side Axle Bearing Housing - Inside Diameter		10.124"	10.127"																																																															
	Centre Axle Bearing Housing - Outside Diameter		9.495"	9.500"																																																															
	Side Axle Bearing Housing - Outside Diameter		10.123"	10.125"																																																															

ITEM NO.	COMPONENT	MINIMUM	MAXIMUM	REMARKS	ITEM NO.
	Final Drive Casing (Continued)				
9	Primary and Reverse Pinion Assembly Housing - Bore	7.010"	7.015"	Assemble torque arm to casing and ream fixing holes for fitted bolts where necessary.	9
10	Torque Arm Mounting Points - Fixing Hole Diameter		0.750"		10
11	Torque Arm - Fixing Bolt Hole Diameter		0.750"		11
	- Fulcrum Pin Hole Diameter	1.000"	1.0015"	Renew bush and ream fulcrum pin hole where necessary.	
<u>PRIMARY AND REVERSE BEVEL PINION ASSEMBLIES</u>					
12	Pinions - Bearing Seal Diameter - Inner	3.375"	3.376"		12
	- Outer	3.2495"	3.2505"		
13	Pinion Assemblies - End Float	0.005"	0.007"		13
	- Shim Sizes		0.005"		
			0.016"		
			0.040"		
14	Spigot Bearing - Housing Bore - BR Cat. No. 43/34554	2.250"	2.2505"		14
15	Bearings, Taper Roller - Pressing-on Load	4-Tons	5-Tons		15
16	Bearing, Ball (Input) - Pressing-on Load		1-Ton		16

ITEM NO.	COMPONENT	MINIMUM	MAXIMUM	REMARKS	ITEM NO.
	<u>PRIMARY AND REVERSE BEVEL PINION ASSEMBLIES</u> (Continued)				
17	Bearing Housings - Bore	6.374"	6.375"		17
	- Inner				
	- Outer	5.5125"	5.5135"		
	- Input	5.000"	5.001"		
18	Driving Shaft - Run-out		0.003"		18
	- Input Bearing Seat Diameter	2.249"	2.250"		
	- Spigot Bearing Seat Diameter	0.874"	0.875"		
	- Male Spline Width	0.344"			
	- Female Spline Width		0.358"		
	- Spline Backlash		0.004"	Ensure backlash of assembly by selection.	
19	Flange Coupling - Male Spline Width	0.344"			
	- Female Spline Width		0.358"		
	- Spline Backlash		0.004"	Ensure backlash of assembly by selection.	
	- Coupling Face Run-out		0.010"		
	- Bolt Hole Diameter	0.375"	0.390"		
20	Sliding Dog - Striking Fork Groove Width	0.9375"	0.9575"		20
	- Striking Fork Clearance	0.040"	0.050"		
	<u>CROWN BEVEL WHEEL AND SHAFT ASSEMBLY</u>				
21	Bevel Wheel and Pinion - Pressing-on Load	15-Tons	20-Tons		21
22	Distance Piece - Length	0.650"	0.656"		22
23	Shaft - Run-out		0.003"		23

D.M.U. Final Drive - F.239/F.280

DATA SECTION

SHEET 5

ITEM NO.	COMPONENT	MINIMUM	MAXIMUM	REMARKS	ITEM NO.
<u>PISTON AIR CYLINDER SHAFT AND FORK ASSEMBLY</u>					
24	Striking Fork - Width	0.860"	0.875"		24
25	Neutral Locking Plate - Slot Width	0.750"	0.760"		25
26	Air Cylinders - Bore	2.375"	2.380"	See Appendix 'A' for reclamation process.	26
27	Air Piston Shaft - Run-out		0.003"		27
<u>ASSEMBLY</u>					
28	Crown and Bevel Wheels - Permissible Backlash	0.012"	0.015"		
	- Shim Sizes		0.005"		
	-		0.012"		
	-		0.024"		
29	Spigot Bearing - End Float	0.031"	0.093"	For shoulder type bearings, adjustment can be made at spigot distance piece if clearance between spigot distance piece and shoulder of roller bearing is not between these limits.	29
30	Direction Indicator Switch - Air Pressure Settings - Make		75lbs/sq.in.		30
	- Break		60lbs/sq.in.		



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DATA SECTION

Schedule of Lubricants

Components	Lubricant	B.R. Cat. No.
Final Drive Gearbox	Shell Talona 972 or Esso Estor HD40	9/27/20560 9/27/15765
Isolating Plunger	Shell Talona 945 or Esso Estor HD30	9/27/20550 9/27/18600

APPENDIX A.

AIR CYLINDERS - REPAIR PROCEDURE

When the brass air cylinders on these units become scored or worn proceed as follows:-

1. Bore cylinder to 2.499" Max: 2.498 "Min.
2. Press into cylinder, cast iron liner (B.R. Cat. No. 15/95858) - 2.500 " external diameter; 2.375" internal diameter.
3. Shorten liner to length of cylinder, minus 1/32 in.
4. Machine  $\frac{1}{4}$ " internal chamfer on outer face of liner at included angle of 30.
5. Finally, peen over end of cylinder body to eliminate movement between liner and cylinder.

APPENDIX B

F. 239. Final Drives. - Sliding Dog Welding Repair.

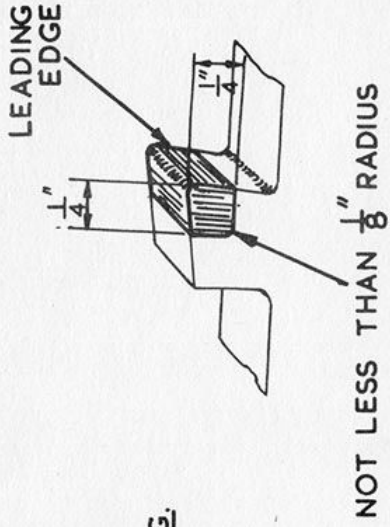
This Appendix details the procedure to be followed when refurbishing the teeth of Sliding Dogs (Drawing D19244 attached) for F239 final drives.

The repair requires the depositing by the Oxy-acetylene welding process of hard surfacing alloy "Stellite No.6" on the repair areas of those teeth which have been chipped and/or badly worn in service.

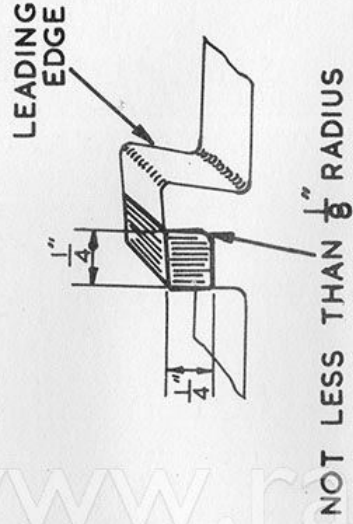
The procedure to be followed is:-

1. Clean, crack detect and identify teeth which are cracked and/or require building up to profile on the leading and/or trailing edges.
2. Grind each tooth which requires reconditioning in accordance with the attached sketches. If any cracks have not been removed when the specified amount of metal has been ground off, then such sliding dogs are to be scrapped.
3. Pre-heat the whole sliding dog to 250° - 300°C. and maintain within this temperature range during the whole of the welding process. Deposit by the Oxy-acetylene process "Stellite No.6" hard surfacing alloy, on the repaired land (S) to give a deposit which is proud of the top, leading and trailing faces. A gauge should be used to prove that sufficient build up has been made. Stellite No.6 rods, 1/8"dia., can be obtained against Catalogue No. 9/46/48610.
4. Control the rate of cooling of the finished welded dog by immersion in a heated sand bath, heated lime, vermiculate.
5. Grind all faces of the reconditioned teeth to the dimensions given in Drawing D19244 using an aluminium oxide grinding wheel on a machine equipped with an index register.
6. Crack detect and inspect.
7. De-magnetise.

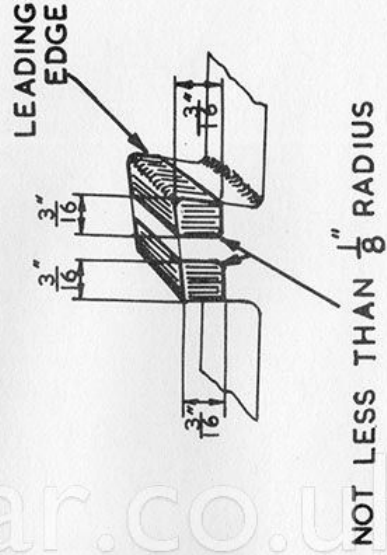
APPENDIX 'B' (Continued)



A. ONLY LEADING EDGE  
REQUIRES RECONDITIONING.



B. ONLY TRAILING EDGE  
REQUIRES RECONDITIONING.



C. LEADING AND TRAILING  
EDGES BOTH REQUIRE  
RECONDITIONING.

RECONDITIONING OF SLIDING DOGS  
BY WELDING

APPENDIX C

A.E.C. F. 239 Final Drives, Crown Wheel Bearings  
Repair Procedure.

Where Crown wheel bearings have to be replaced the following procedure is to be adopted:-

1. Machine the crown wheel bearing bore in the final drive casing to give a clearance fit of 0.0005 - 0.0015".
2. Fit new roller bearing - Ransome & Marles LRJA4E 7 $\frac{1}{4}$ " O/D, 4" I/D., 1 $\frac{1}{4}$ " wide, single spot - to crown wheel shaft and replace pinion on shaft.
3. Fit crown wheel assembly into appropriate location in gear casing,
4. Fit bearing housing and locating bearings together with associated shims (as necessary); also retaining nut.
5. Tighten retaining nut on end of crown wheel shaft.
6. Adjust for gear teeth clearance and mesh between crown wheel and pinions as required.
7. After ensuring correct clearances between gear teeth, remove crown wheel and pinion assemblies from gear casing.
8. Clean outer track of new roller crown wheel bearing and corresponding bore in gear casing to ensure ideal preparation for the application of "Loctite".
9. Apply "Loctite Bearing Fit" resin to outer track of new bearing and corresponding bore in gear casing, as per "Loctite" application instruction.
10. Re-fit crown wheel and pinion assemblies in gear casing, together with associated components.
11. Finally, ensure correct clearances and tooth mesh between crown wheel and pinion gear teeth.

NOTE:

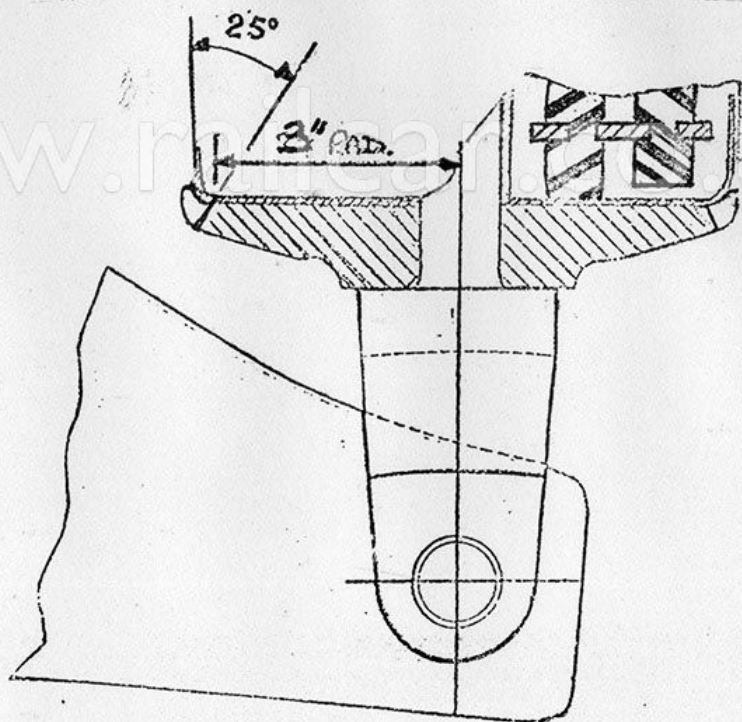
If wear in crown wheel bearing housing is such that the dimension in Item 1 cannot be achieved then the existing method of fitting a sleeve in the bore should be adopted. Procedure for fitting new roller bearing (LRJA4E) will then be as per Items 1 to 11.

## APPENDIX D

REPAIR PROCEDURE FOR F.239 FINAL DRIVE TORQUE  
ARM SUSPENSION ASSEMBLIES

## TORQUE ARM SUSPENSION:

Where there is evidence of the top side of the bottom plate striking the rim of the steel shroud attached to the bogie, the bottom plate should be machined to the dimensions shown in the sketch below.



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APPENDIX 'E'

CROWN WHEEL & SPUR GEAR/SHAFT REPAIR

The MINIMUM interference fit between the shaft and gear wheels shall be not less than 0.015". With standard sized shafts and gears, this will necessitate selective fitting.

Where gears have been pushed off the shaft, and are suitable for re-use, their bores shall be examined for scoring and size. If scored, or outside the dimension shown in TABLE 1 below, the bore shall be bored in accordance with Drawings TPE-A2-9006283 for the pinion and TPE-A1-9005101 for the bevel wheel.

Gears which have bored-out bores are to be built into assemblies with 1st or 2nd oversize shafts manufactured to drawing TPE-A1-9005102. Any shaft not conforming to the dimensions shown in TABLE 1, is scored on the gear seat, has a key way damaged such that the key cannot be properly fitted or damaged threads must not be used.

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TABLE 1SHAFT AND GEAR BORE SIZES

	Shaft Dia 'A'	Bevel Gear	Shaft Dia 'B'	Pinion
Standard	2.5115"	2.509"	2.5015"	2.499"
	2.512"	2.510"	2.502"	2.500"
1st Oversize	2.5215"	2.519"	2.5115"	2.509"
	2.522"	2.520"	2.512"	2.510"
2nd Oversize	2.5315"	2.529"	2.5215"	2.519"
	2.532"	2.530"	2.522"	2.520"

SHAFT DETAILS

Standard AEC Part No F1/15213. BR Cat No 15/99014

1st Oversize BR Drg No TPE-A1-9005102/2 BR Cat No 15/1643

2nd Oversize BR Drg No TPE-A1-9005102/3 BR Cat No 15/1644

PINION DETAILS

Standard AEC Part No F23710 BR Cat No 15/90176

1st Oversize BR Drg No TPE-A2-9006283/2 BR cat No 15/1647

2nd Oversize BR Drg No TPE-A2-9006283/3 BR Cat No 15/1648

BEVEL GEAR DETAILS

Standard AEC Part No F11934 BR Cat No 15/1640

1st Oversize BR Drg No TPE-A1-9005101/2 BR Cat No 15/1641

2nd Oversize BR Drg No TPE-A1-9005101/3 BR Cat No 15/1642.