Appendix 'A'

DIRECTOR GENERAL BORDER ROADS
GENERAL MAINTENANCE INSTRUCTION NO. 173
ON
DESCRIPTION OF SCHMIDT SNOW CUTTER TYPE VF 5L-3

GENERAL

1. The Schmidt Snow Cutter has been designed for snow clearing operations in all types of terrain and operating conditions. It is fitted on a heavy duty four wheel drive UNIMOG truck type 425 1700K rated at 170 HP at 2600 according to DIN specifications.

2. The snow cutter attachment powered by a separate 260 HP (DIN) diesel engine is fitted in front of the truck. It is provided with two rotating cutter drums which can be lifted by 90 cms independently, hydraulic jacks thus providing the facility to tilt the snow cutter latterly matching with road camber. On the rear portion of the truck is mounted the power unit, which operators the snow cutter through a drive line of propeller shaft. All the controls are fitted in the operators cabin.

CARRIER VEHICLE

3. The Carrier vehicle is a standard two axle, four wheel drive heavy duty UNIMOG truck having 4 pneumatic wheels of size 14.5 24. The vehicle is fitted with Daimler – BEZ 6 cylinder, 4 stroke direct injection water cooled diesel engine rated at 170 HP at 2600 RPM according to DIN specification. The drive to the front and rear axle is taken through a conventional clutch synchromesh gear box, auxiliary gear box, propeller shaft and differentials. The gear box caters for 8 forward and 8 reverse speed. The auxiliary gear box provides 8 working speed and 8 crawler speeds. A wide range of 24 operating speeds therefore available speed from 0.11 Km/Hr to 86 Km/Hr depending upon the ork load/road conditions. The engine also drives a hydraulic pump for the operation of steering system as well as a compressor for pneumatic brakes. Vehicle suspension system consists of coiled springs and shock absorbers. The electrical system of the vehicle is based on 12 volts. It is also provided with a start pilot as cold starting aid. The chassis of the vehicle is not provided with body in the rear except hood for the cutter engine. A cabin is provided and gauges within easy reach of the operator. The cabin is provided with warm air heating system using a heater with fan. Wind screens are electrically heated to avoid

frosting action. The gross vehicle weight is 10,500 Kg. An emergency exit has been provided on the roof of the cabin.

CUTTER ENGINE

4. The snow cutter is powered by a DAIMLER-BENZ type OM 355A model 355,968, diesel engine. It is a turbo charged water cooled 6 cyl eng rated at 290 HP at 2200 RPM. The engine is pressure lubricated by a lubricating oil pressure pump, the oil pressure being indicated by the oil pressure gauge provided in the operators cabin. It is provided with a 24 volts electrical system consisting of a alternator rectifier, voltage regulator and two 12 Volts batteries. The engine is also provided with a cold starting aid device.

THE CUTTER DRIVE

5. The drive to the cutter drums is provided by the cutter engine via a main 7F cons constant mesh six speed gear box type AK6-80, ZF splitter gear box type GV-90 mounted in front of the main gear box, chain drive flanged to the rear of the splitter gear box, and under floor power with jointed propeller shafts, and an angle drive.

SNOW CUTTER

6. The snow cutter is rotating with two rotating cutter drums as the clearing parts mounted to its front. The cutter drums of 1.1 m dia and 2.8 m length, which are fully exposed, are driven and supported in the front drive housing which also carries the ejection chute. The rotating cutter drums are equipped with blades which bite into the snow and cut it off in the shape of snow chips. This cutting of snow chips take place across the entire width and over the total front face of the cutter drums. The snow chips gripped by the cutter drum blades are conducted in half a turn to the centre of the ejection cups. From here they are ejected tangentially through the ejection chute, which is designed to permit a 360 degree rotation. The cutter drum seed and thereby the ejection distance of the snow can be selected in 4 different stages ranging from 6 to 25 mtrs.

7. With the help of top lifting hydraulic cylinders mounted behind the front of housing to each side of the attachment beam, the snow cutter drums can be independently raised. It also helps to incline the drums longitudinally to match the road camber. A shear pin safety device is provided to protect each drum in case it hits a hard object.

8. A hydraulically operated tipping platform has been provided on the top of the front and besides rejection chute. With its help, accumulated snow deposited during

clearance operations is thrown forward thus restoring the original field of vision. Ront end flaps situated at the upper front face of the front housing prevent the forward ejection of snow through the cutter drums. Two cutting blades are attached to the right and left sides of the front end housing to cut off layer of snow protruding the front and housing, ie, boundary walls, snow grifts etc.

THE OPERATOR'S CABIN

9. The operators cabin mounted on the vehicle chassis is of sheet metal frame structure design. It has two seats, one for the operator and the other as auxillary seat. It houses all the controls for the operators of the vehicles as well as snow cutter. It is provided with electrically heated front wind screen and also a cab heating device.

An emergency exit has been provided in the cabin roof. Following control levers/gauges are provided in the cabin within easy beach of the operator :-

(a) Ignition switch cutter engine
(b) RPM meter guage – 2200 RPM for cutter engine
(c) Cooling water temperature guage cutter engine range 50-120 C
(d) Oil pressure guage 0-10 Kg/cm^2 cutter engine
(e) Fuel guage cutter engine
(f) Engine stop button cutter engine
(g) Switch flashing beacon
(h) Switch working flood light
(i) Switch right heated wind screen
(j) Switch left heated wind screen
(k) Throttle control lever cutter engine
(l) Clutch lever for cutter engine
(m) Hand brake
(n) Spliter gear box speed selection lever
(o) Switch for right lifting cyl for snow cutter assy
(p) Switch for operation of tipping plate form
(q) Switch left lifting cyl for snow cutter assy
(r) Switch for operating the working flood light
(s) Switch chute rotating device
(t) Control light for battery charging
(u) Switch driver cab heating
(v) (i) Injection system start pilot cutter engine

(ii) Injection system start pilot carrier engine

(w) Starter switch

(x) Switch wind screen/spray

(y) Ignition/light switch

(z) Combined instrument for :-

(i) Air brake pressure warning light

(ii) Blinker warning lights (2)

(iii) Oil pressure guage

(iv) Air pressure guage

(v) Brake system

(vi) Water temperature guage

(vii) High beam control

(viii) Fuel tank guage

(ix) Battery charging control light

(aa) Hand throttle

(bb) Gear shift lever

(cc) Differential lock

(dd) Forward and reverse gear

(ee) Auxilary gear box lever-working and crawler group

(ff) Gear selection lever-cutter drive.

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Appendix 'B'

SNOW CUTTER SCHMIDT, MODEL VF-5-L3
OPERATING INSTRUCTIONS

GENERAL

1. Snow Cutter Schmidt, Model VF 5-L3 build on UNIMOG type U-1700K vehicle powered by Daimler Benz type OM352A, 6 Cyl, Water cooled, turbo charged diesel engine and having single stage cutter powered by Daimler Benz type OM 355A, 6 Cyl water cooled, turbocharged diesel engine with mechanical drive, hydraulic lifting/lowering device, tiltable plate form, swiveling ejection chute and side wall auger.

2. Operation Inimog Veh M 1700K – Check before starting,

(a)	Engine	-	Do not add oil above top mark of dipstick
(b)	Coolant	-	Upto 2/3 of expansion tank
(c)	Fuel	-	Use funnel with strainer For fuel grade please see Remarks column of Appx 'D'
(d)	Steering reservoir Oil	-	Dipstick mark
(e)	Brake fluid	-	Upto 2/3 of containers
(f)	Main transmission oil	-	
(g)	Differential oil	-	Front and rear axles
(h)	Hub reduction gear-Oil		Front and rear axles
(i)	Any external leakage		
(l)	Electrolite in battery	-	15 mm above plates, Sp. Gr. 1.285 Use Distilled water
(m)	Tyre pressure	-	Front 6, Rear 4.5 Kgs/Cm^2
(n)	Check compressed Air system	-	Anti freeze unit adjusting handle summer /winter position.

3. <u>Unimog Veh Engine 0M352A</u> : For starting the engine

(a)	Ensure transmission in idle position		
(b)	Ignition key in position for ignition on	-	1
(c)	Press clutch down	-	To connect electric circuit to starter motor
(d)	Ignition key in position and turn right For starting.	-	2

Note : Use start pilot below. 15^0C – Actuate starter and simultaneously operate start pilot until the engine is running. Air pump 1 to 2 strokes per second only.

4.	<u>Unimog Veh Engine OM352A</u>		:	After starting, check :-
	(a)	Oil pressure	-	Min 0.6 Kgs/Cm^2 at idle speed and 2 to 5 Kgs/Cm^2 at normal speed.
	(b)	Steering for function	-	Free play 40 mm
	(c)	Supply Air pressure	-	18 Kgs/Cm^2
	(d)	Break pressure (Double guage)	-	6 Kgs/Cm^2
	(e)	Max operating temp of Coolant.	-	95^0C
5.	<u>Unimog Veh Engine OM352A</u>		:	After stopping :-
	(a)	Run Eng at increased idle	-	To bring temp below 90^0C
		Speed for one to two min	-	For oil circulation in turbocharger Unit.
	(b)	Stop engine by pressing button of exhaust brake system		
6.	<u>Snow Cutter VF5-L3</u>		:	Check before starting.
	(a)	Engine Oil	-	Do not add oil above top mark of dipstick
	(b)	Coolant	-	Fins must be covered
	(c)	Fuel		
	(d)	Hydraulic Oil	-	Must be in upper part of the guage
	(e)	Electrolyte in Battery	-	15 mm above plates
	(f)	Transmission oil with front mounted splitter gear box at over flow plug	-	No over filling, clean breather.
	(g)	Rear chain drive oil	-	At control plug
	(h)	Spur gearing oil	-	At control plug
	(i)	Drive for cutter drum oil	-	Dipstick mark
	(j)	Disengage clutch lever	-	Lever in upper position.

7.	<u>Cutter Engine OM355A</u>	:	For starting the engine
	(a)	Ensure clutch lever in disengaged position	
	(b)	Ignition key in position -1 for ignition on	
	(c)	Ignition key in position -2 and turn right for starting	

Note : 1. The batteries of the cutter engine can – for starting also be coupled with the Veh battery by inserting and fixing the key in the battery main switch.

2. Use start pilot below – 15 0 C. Actuate starter and simultaneously operate start pilot until the engine is running. Air pump 1 to 2 strokes per second only.

8. Cutter Engine OM355A : After starting, check :-
   (a) Oil pressure - Min 0.6 Kgs/Cm^2 at idle speed and 2 to 5 Kgs/Cm^2 at normal speed.
9. Cutter Engine OM355A : For stopping
   (a) Run engine at increased Idle for one to 2 minutes - To bring temp below 90^0C For oil circulating in turbocharger Unit.
   (b) Press stop button of Cutter engine -
   (c) Max operating temp of coolant - 95^0C
10. Preparation for Snow Clearance Operation
   (a) Fit non skid chains with sufficient play
   (b) Mount ejection Chute
   (c) Undo transport safety device
   (d) Remove safety pins and unlock cabin in device left and right
   (e) Check all hydraulic hoses couplings for tightness
   (f) Check rear chain drive for correct tension
   (g) Rotate cutter drums by hand for free movement
   (h) Start cutter engine and warm up
   (j) check the following hydraulic operations :-
      (i) Cutter head raising and lowering.
      (ii) Cutter head tilting left and right
      (iii) Chute rotation - 360^0
      (iv) Tilting platform
      (v) Working light
      (vi) Floating position
      (vii) Cutter engine hood
      (viii) Auger operation clock wise rotation
   (k) Select gear for desired ejection width.:-

Gear	Speed	Ejection width
3	Slow	5-6 Mtrs
3	High	7-8 Mtrs

4	Slow	11-13 Mtrs
4	High	15-17 Mtrs

Note : Shorter the ejection width best clearance results :-

(l) Engage clutch : Keeping the engine throttle in idling position

(m) Check rotation of cutter drums at various speeds

(n) Check drum distance : Distance between cutter drums and snow deflector measured at approx 250 mm from cutting edge not to exceed 12 mm.

(o) Adjust skid shoes for height to support the lowered cutter head.

(p) See the condition of the Cutter head : from centre of the fixing screw of the cutting edge to cutting edge 50mm

(q) Check for tightness of fixing screws

(r) Check shear pins for serviceability

(s) Ensure no bends in safety rings, cutter blades, and scoop blades

(t) Hook the transport safety device in its position on rear of the cutter head.

(u) Fix rear lights in side the cutter engine hood.

11. Important points during Snow Clearance

(a) Select 4x4 wheel drive - Turn switch to 4x4 position

(b) Select appropriate gear of Unimog Veh - Generally for normal snow clearance use 3rd or 4th gear with working group.

- If during cutting operation the engine revolution of cutter engine drops below 1900 RPM, veh speed is too high

(c) Never try to put fast frozen cutter drums back into operations, cutter engine clutch will be damaged. Stop cutter engine and disengage clutch - Turn cutter drum by hand

(d) Keep throttle of cutter Engine in full opened position - Revolution counter within green limit (1900 to 2200 RPM)

(e) While working on bends :-

(i) Do not use differential lock

(ii) Use very low speed

(iii) Follow diagonal approach to clear maximum distance

(iv) Raise slightly the out side of cutter head

(f) While cutting in layers :-

(i) Understand the machine, obtain confidence and experience to handle the Unimog and snow cutter

(ii) Work with 3rd gear fast of cutter engine

(iii) Move snow cutter forward with 4th or 5th crawler gear of veh

(iv) Do not cut more than 1 Mtr depth :-

(aa) Dia of the cutter drum - 1 Mtr

(bb) More depth will cause wheel spinning

(cc) Over loading will damage cutter engine clutch

(v) Raise snow cutter assy slightly while reversing.

(vi) Machine must be in level position

(vii) Reduce air pressure in all four tyres when cutting in avalanche Areas – front 2 Kgs/CM^2, Rear 1.8 Kgs/CM^2

(viii) Start from mountain side when cutting in two tracks.

(ix) The second track must already be prepared next to the first On the second pass.

(x) If the machine leans excessively to the valley side due to the Snow layers on that side giving way, the snow must be thrown under the out side wheel of the Unimog.

(xi) Do not allow wheels to spin if so reverse the machine and cut a new track.

(xii) When front wheels sink, make the machine float and fill up the holes formed with extra snow.

(xiii) Adjust snow cutter head when working in hard packed snow : Decline slightly the cutter head to the front by loosening the tightening lock nuts. If machine works too low slightly tilt the cutter head upwards.

(g) While climbing steep gradient :-

(i) Use differential lock only : Do not forget to disengage while climbing up straight differential lock immediately after the straight slope.

(h) While coming across obstacles or stones :- (i) Always be alert to hear any knocking sound against cutter drum blades – Depress the clutch pedal immediately and reverse the veh few yards. Check if shear pin has been broken and remove the stone or obstacle (ii) Increase vigilance of operator is required when clearing in unfamiliar areas.

12. Transport Drive

(a) Remove ejection chute and fix next to cutter engine underneath the cutter engine hood.
(b) Lift cutter head and suspend the transport safety
(c) Lock cabin holding device left and right
(d) Travel at 20 Kms per hour speed only
(e) Carry spare wheel separately

13. Raising Cutter Engine Hood

(a) Use manual operation
(b) Swing up grill
(c) Open two stop valves
(d) Grips pointing backward
(e) Operate hand pump valve with rod
(f) For lowering open hand pump valve & close to stop valves.

14. Other Points

(a) Tighten all hydraulic coupling fully other wise hydraulic oil will start overheating.
(b) While disengaging differential lock, first bring it to 4x2 position and then to 4x2 position
(c) On Indian Road condition, drive machine always in 4x4 drive and in 4^{th} and 5^{th} gear only
(d) Keep cutter engine clutch always in engaged position when machine not in use.
(e) Adjust Dvr's mirrors properly before marching
(f) Check all the screw with yellow marking daily
(g) Before replacing hydraulic oil, keep all hydraulic system in closed position.
(h) Always engage hand brake when veh is parked.

15. Running in instructions

(a) Do not put full load on engine for first 10-20 hours of operation
(b) Carry out first engine oil change after 20 hours operation
(c) Check for any foreign metal in oil sump when you change first eng oil
(d) Tighten cylinder head bolts/nuts after 20 hours operation.

(e) Check valve clearance and adjust after 20 hours operation
(f) Check and tighten V Belts
(g) Check pipes, tubes for tight seating, leaks and oil lines on the turbo charger.
(h) Adjust free play of clutch and brake pedals
(i) Grease all the grease points

Appendix 'C'

SNOW CUTTER SCHMIDT MODEL VF-L-3
MAINTENANCE LUBRICATION AND PERIODICITY OF OIL CHANGES

Srl No	Maintenance Jobs	8 hrs or daily	Operating hours Grade of oil			Indian equivalents IOC	Cap-acity Ltrs	System of Lub
			50	Operating Hrs as under	Recommended by manufacturer			
UNIMOG VEH								
1	Check oil level in engine	✓						
2	Change oil in engine end replace elements with every oil change			After every 100 Hrs	Above +5 ^0C 20W-40	Servo Super 20W-40 or Servo Pride 20W-40	15	Force feed
					From -15 ^0C to +20 ^0C 10W-30	Servo Super 10W-30		
					From -10 ^0C to +20 ^0C 15W-40	Servo Super 20W-40		
					From 20 ^0C to 0 ^0C Below -10 ^0C	Servo Super 20W-40 10W-30		

Srl No	Maintenance Jobs	8 hrs or daily	Operating hours Grade of oil			Indian equivalents IOC	Cap-acity Ltrs	System of Lub
			50	Operating Hrs as under	Recommended by manufacturer			
3	Check oil level in transmission	✓						
4	Check oil level in transmission			After every 800 Hrs	SAE-80 all season	Servo Gear HP-80 Servo Gear Super-80	12.5	Force feed and splash
5	Check oil level in front and rear axle and hub reduction	✓						
6	Change oil in front and rear axle hub reduction			After every 800 Hrs	SAE-90 all season	Servo Super HP-90 Servo Gear Super-90	0.6 (Each hub reduction 2.5 (each	
7	Check oil level in steering reservoir	✓						
8	Change oil in steering replace filter			After every 2400 Hrs	SAE-10W all season	Servo Ultra 10W all reasons	3.25	Splash
9	Check brake fluid level	✓			Brake fluid DOT 3, 4	Servo brake fluid Super HD	1.0	

Srl No	Maintenance Jobs	8 hrs or daily	Operating hours Grade of oil			Indian equivalents IOC	Cap-acity Ltrs	System of Lub
			50	Operating Hrs as under	Recommended by manufacturer			
10	Lubricate joint on shat from clutch to transmission	✓		After every 200 Hrs	Grease multi grade	Servo Grease MP		Grease Gun
11	Lubricate Steering knuckle brgs			After every 200 Hrs	-do-	-do-		-do-
CUTTER SIDE								
12	Check oil level in engine	✓						
13	Change oil in engine change elements and 'O' rings as for vehicle engine			After every 100 Hrs	Same as for Veh Engine at Srl No. 02		20.5	Force feed
14	Check oil level in transmission with working crawler gear group	✓						
15	Change oil in transmission with working crawler gear group			After every 500 Hrs	SAE-80 all seasons	Servo gear HP-80 Servo gear Super 80	15	Splash

Srl No	Maintenance Jobs	8 hrs or daily	Operating hours Grade of oil			Indian equivalents IOC	Cap-acity Ltrs	System of Lub
			50	Operating Hrs as under	Recommended by manufacturer			
16	Check oil in rear chain drive	✓						
17	Change oil in rear chain drive			After every 200 Hrs	SAE-80 All seasons	Servo Gear HP-80	4.5	Force Feed
18	Check oil level in spur gearing	✓						
19	Check oil level in spur gearing			After every 200 Hrs	-do-	-do-	0.5	-do-
20	Check oil in drive for cutter drum	✓						
21	Change oil in drive for cutter drums			After every 200 Hrs	-do-	Servo gear	7.5	Splash
22	Check oil in Hyd Tank	✓						
23	Check oil in Hyd Tank			After every 200 Hrs	SAE-10	Servo System HLP-36 SAE-20	25	
24	Lubricate sharing system for cutter drums			After every 50 Hrs	Grease roller bearings	Servo Greases MP		Grease Gun
25	Lubricate intermediate brgs			-do-	-do-	-do-		-do-

Srl No	Maintenance Jobs	8 hrs or daily	Operating hours Grade of oil			Indian equivalents IOC	Cap-acity Ltrs	System of Lub
			50	Operating Hrs as under	Recommended by manufacturer			
26	Lubricate slide between cutter head and veh			-do-	-do-	-do-		Apply manually
27	Lubricate turning device			-do-	-do-	-do-	-do-	Grease Gun
28	Lubricate points of rotation on cyls			After every 50 Hs	Grease roller bearings	Servo Grease MP		-do-
29	Lubricate lifting cyls upper & lower connection			-do-	-do-	-do-		-do-
30	Lubricate carden shafts			-do-	-do-	-do-		-do-
31	Lubricate tube of wearing pad			-do-	-do-	-do-		-do-
32	Lubricate points of rotation on head light			-do-	-do-	-do-		-do-
33	Lubricate points of rotation on tension			-do-	-do-	-do-		-do-
34	Lubricate linkages control levers & flexible drive shaft			-do-	SAE-10W	SS-10		Grease Gun

Srl No	Maintenance Jobs	8 hrs or daily	Operating hours Grade of oil			Indian equivalents IOC	Cap-acity Ltrs	System of Lub
			50	Operating Hrs as under	Recommended by manufacturer			
35	Grease alternators			After every 500 Hrs by Wksp Pers	Grease roller brearings	Servo Grease MP		Manually
36	Grease ring gear on fly wheel			-do-	-do-	-do-	-do-	-do-
37	Clear dry type air cleaner element	✓						
38	Renew dry type air cleaner element			After 3 cleaning service				
39	Measure play in & check turbocharger			After every 3000 Hrs				

Note : (a) First 50 Hrs maint task must be performed with the assistance of Wksps rep.

(b) Minimum maint job once a year. Oil change in transmission and brake fluid change, if not already done.

(c) Minimum maint jobs every 2 years : (i) Oil change in Hyd and Steering system, unless already done.

(ii) Renew filter element o dry ail cleaner

(iii) Renew engine breather filter.

(d) Change oils while still hot.