

Scope of work for "Overhauling of Cummins Make Diesel Engines (Type N-743L, N-855R, KTA-19R & VTA-1710L) for the period of 03 years".

1.0 Scope of work

1.1.0 Overhauling of Tower wagon diesel engines including all spares to be supplied by the Firm as per list enclosed at annexure A to D. Spares for overhauling of engine Model VTA-1710-L & KTA 19R will supplied by Railway as per annexure E and F. Spares shall be replaced as per joint note made during dismantling and spares shall be replaced in prence of representative of Sr. DEE /EMU /GZB. Payment to the firm shall be done accordingly of the spares replaced.

1.2 All the overhauling procedures shall be done as per OEM manual.

1.2.1 Cylinder Block

It is to be inspected for any visible abnormality and then put in chemical tanks with heaters for cleaning. The block should be taken out of the tank after 24 hrs. After cleaning, the Cam Bushes should be replaced and block is finally checked for main bore with the help of main bore tool.

1.2.2 Crank Shaft

Crank Shaft is to be cleaned and checked on surface plate for bend. The allowable bend limits are removed and then crankshaft is ground on crankshaft grinder.

1.2.3 Cylinder Heads

Cylinder heads are dismantled and its components like valves, guides, seats sleeves etc. are to be checked. The worn out parts are to be replaced, valve guides are to be pressed on hydraulic press and valves and seats are to be properly faced for correct sealing. New injector sleeve is to be fitted with radial drilling machine. Cylinder heads and water pressure are to be tested for any leakage. After assembly, the cylinder heads are to be vacuum tested.

1.2.4 PT Pump/ Injector

PT pump & injectors are to be mounted on calibration machines and the calibration to be checked as per the desired code details provided by the manufactures. Gear Pump pressure is to be checked separately on calibration machine. The Barrel Plunger clearance of injectors is to be checked on leakage tester. The worn out parts are to be replaced and PT pump and injectors are to be calibrated on calibration machine.

1.2.5 Conn. Rod

Connecting rods are to be checked on a fixture for bend or twist. The connecting bush is to be replaced in case worn out and new bush is to be fitted with connecting rod bush cutting machine.

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- 1.2.6 Cam follower
The Cam follower shaft and rollers are to be checked and rollers are shrunk fitted with liquid nitrogen.
- 1.2.7 Rocker Housing
These are to be checked for lever, bush and shaft replacement, and the worn out components are to be replaced.
- 1.2.8 Water Pump
These are to be repaired by replacing the worn out parts.
- 1.2.9 Lube oil pump.
These are required to be overhauled for the worn out parts.
- 1.2.10 Lube Oil Cooler.
It is to be pressure tested for leakage and is to be replaced if there is excessive sludge or in cases the cooler belongs to seized engine.
- 1.2.11 Vibration Damper
It is to be checked for its eccentricity / external condition and replaced accordingly, if required.
- 1.2.12 Air compressor
To be overhauled and worn out / defective parts to be replaced or replaced it with new one if it is found beyond economical repair.
- 1.2.13 Throttle
The engine RPM setting on each throttle will be set by the firm at the time of commissioning of the engine.
- 1.2.14 Turbo Charger
Turbo Charger is to be dismantled, cleaned and re assembled by using the repair kit/any other part required. After assly, its radial and axial clearances are to be checked.
- 1.2.15 Cylinder liner/piston rings
Cylinder liner/piston and rings are to be checked and replaced as per the procedure laid down by the Manufacturer.
- 1.2.16 All the sub-assemblies as above one are to be repaired, overhauled and tested as per OEM manual. The engine is to be overhauled and tested on the tower wagon as per the procedure laid down by the manufacturer and records to be kept and to be handed over to Railway representative at the time of tested.
- 1.2.17 Cleaning/ overhauling of Radiator if any abnormalities found in radiator the firm should rectify and attend accordingly. All valves, switches, gauges, sensors, RPM meter with hour

meter, hose pipes, solenoid valves and sensors etc. mounted on the engine should be replaced.

- 1.3 Due to technical and operational constraint, it may not be possible for Railway to offer all the engines as mentioned in the offer at a time. The contractor shall in no case will claim it as a right.
- 3.0 Procedure for overhauling, commissioning and testing of Engine.
- 3.1 The overhauling work of diesel engines shall be carried out as per OEM's manual. (OEM means Original Equipment Manufacturer i.e. M/s Cummins).
- 3.2 Removal of engine from Tower wagon base rail/chassis by contractor staff in presence of Railway staff & loading, unloading of engines at Railway site will be carried out by the contractor. Required infrastructure like lifting trolley (Hydraulic or related machinery required by the contractor for unloading of engine from Tower wagon will be arranged by the Contractor). Contractor will dismantle all connections like fuel, water pump & safety connections and transmission /alternator if attached with engine. Contractor will carry the engine and radiator to firm's premises with his own manpower and transport within 07 days after intimation through letter. The engine and radiator shall be dismantled at firm's premises and a joint note shall be prepared in between Railway and firm representative within ten days of handing over of engine to access the parts needs replacement and also during execution of work as per need basis. Removal, fitment and commissioning of engine before and after overhauling will be the responsibility of the contractor.
- 3.3 Contractor will replace all the parts found defective and worn out and must change as per OEM to be change as per requirement and joint note with genuine Cummins spares parts supplied by the railway.
- 3.4 All the gauges, sensors, filters, RPM meter with hour meter (new) will be provided by contractor and accessories of the engines like self-starter and alternator shall be kept by the contractor safely under his custody. Any loss / breakage of the component at the works of the contractor shall be the responsibility of the contractor and shall be made good free of cost, if there is any missing.
- 3.5 After overhauling of engine, it shall be mounted on tower wagon, assembled, tested and commissioned on Tower wagon as per standard practices prescribed in manual by contractor's staff at EMU Car Shed, Ghaziabad. The running trial shall be carried out in shed and at the time of turn out from shed to concerned depot. Contractor's staff will accompany the Tower wagon from EMU Car Shed to concerned depot to analyze any fault/working condition of Tower wagon.
- 3.6 The contractor shall ensure that spare/materials mentioned as Annexure A to D (to be supplied by contractor) has been deposited to Railway store for carrying out this work. Contractor will make entry of the material at RPF gate through challan and will submit to custody ward. spare/ materials after inspection and acceptance of material shall be handed

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over to the contractor for provisioning & overhauling of the engine on engine basis. All balance material supplied by contractor will remain with Railway as Railway property.

- 3.7 Unloading of un-overhauled engine & placement of overhauled engine on base rail/chassis will be carried out by contractor staff. Un-loading of un-overhauled engines shall be carried out within 04 days after lifting of Tower wagon. Contractor will also attach transmission /alternator along with engine as per necessity of work with his own manpower and proper alignment shall be done.
- 3.8 Contractor will carry out only engine related all necessary connections & successful load trial on Tower wagon within 07 days (up to destination).
- 3.9 Contractor will rectify all the problems being faced after overhauling of the engine due to poor performance of the work by the contractor or on account of any defective part used.

4.0 Quantity

S. No.	Type of Engine	Quantity
1	VTA 1710	05
2	N- 855R	04
3	N-743L	06
4	KTA-19R	01

Annexure-A

List of spares (Quantity per Engine) required for overhauling of Cummins Make Diesel Engines (VTA1710L) Supplied by Firm

S. No.	Part No.	Description	Quantity per Engine
1	KITAR 4221	SET MAIN BEARING	1
2	254608	GASKET,BREATHER	2
3	3872439	GASKET,FLANGE	1
4	3225660	CAP, DUST	2
5	4327021	SWITCH,TEMPERATURE	1
6	4055283	KIT,CONVERSION	2
7	3238204	ELEMENT,LUB OIL FILTER	3
8	3238493	KIT,FUEL FILTER AND RING	2
9	3406702	SLEEVE,INJECTOR	12
10	KIT3880567	PT PUMP REPAIR KIT(PTG AU	1
11	3879488	KIT,SUPER BYP.FILTER ELEM	1
12	3167218	INHIBITOR,CORROSION 10 LITERS	2
13	AX1013359	RADIWASH 3 LITERS	10
14	3238363	KIT,BARREL PLU CUP BIG	12
15	167157	BALL,CHECK	12
16	3045006	PLUG,INJECTOR ORIFICE	12
17	3081053	HOSE,PLAIN	2
18	4958495	GEAR,LUB OIL PUMPING	2
19	3236452	GEAR,LUB OIL PUMPING	1
20	111504	RING,RETAINING	1
21	3089056	SEAL,WATER PUMP	1
22	69142	RING,RETAINING	1
23	3545661	KIT,TURBO REPAIR 4LG	2

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24	3751240	RING,THRUST	4
25	3759618	PLATE,OIL SEAL	2
26	3056356	HARNESS,WIRING	2
27	2897691	SWITCH,PRESSURE	1
28	107981	CAP,FILLER	1
29	4056344	ELBOW,MALE ADAPTER	2
30	3878472	COMPRESSOR,AIR	1
31	AK 5042 SS	HOSE,FLEXIBLE	2
32	AK 5009 SS	HOSE,FLEXIBLE	4
33	AK10080 SS	HOSE,FLEXIBLE	1
34	AK16090 SS	HOSE,FLEXIBLE	1
35	180862	SLINGER,OIL	1
36	4071912	HOSE,FLEXIBLE	1
37	4071922	HOSE,FLEXIBLE	1
38	3872252	CONNECTOR,PIPE	4
39	3872278	CONNECTOR,PIPE	4
40	3872284	CONNECTOR,PIPE	2
41	3392445	TRANSDUCER	1
42	4926975	SENSOR,TEMPERATURE	1
43	4054653	BELT,VEE	2
44	178655	BELT,V	1
45	3247965	GASKET SET VTA-1710	1
46	3004056	SHAFT,IDLER	1
47	185112	BEARING,BALL	2
48	3021601	KEY,PLAIN WOODRUFF	2

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Annexure-B

List of spares (Quantity per Engine) required for overhauling of Cummins Make Diesel Engines (Type N- 855R) supplied by firm

S. No.	Part No.	Description	Quantity per Engine
1	3241328	LINER,CYLINDER	6
2	9235 1	BEARING,THRUST	1
3	43828 A	CLAMP,HOSE	4
4	132770	BUSHING	1
5	3026556	BEARING,THRUST	1
6	3026557	BEARING,THRUST	1
7	Q116391	BUSHING	1
8	118939	PIN,ROLL	18
9	4072072	PIN,CAM FOLLOWER ROLLER	6
10	3036933	ROLLER,CAM FOLLOWER	12
11	3065125	SHAFT,CAM FOLLOWER	6
12	3234408	PLUG,EXPANSION	6
13	69736	SCREW,CAM FOLLOWER SHAFT	6
14	218153	BUSHING	6
15	140330	BUSHING	12
16	168306	SCREW,SLOTTED SET	18
17	S 212	NUT,REGULAR HEXAGON	18
18	175830	PLUG,EXPANSION	6
19	135675	THERMOSTAT	1
20	186780	SEAL,THERMOSTAT	1
21	3880782	KIT,INJECTOR REPAIR-NT855	6
22	3054999	SCREEN,FILTER	6
23	152026	CLAMP,T BOLT	1
24	116935	CONNECTOR,MALE	4
25	63495 B	HOSE,PLAIN	1
26	187420	BUSHING	6
27	137075	SEAL,O RING	1
28	212668	KEY,SQUARE	1
29	3015665	SHAFT,TACHOMETER DRIVE	1
30	3046200	SPIDER,JAW COUPLING	1
31	163944	BUSHING	1
32	3034243	PUMP,GEAR FUEL	1
33	3234051	SCREEN	1
34	147901	WASHER,SEALING	2
35	3236450	GEAR,LUBRICATING OIL PUMP	1
36	177419	SHAFT,LUB OIL PUMP	1
37	177417	SHAFT,LUB OIL PUMP DRIVE	1
38	190397	SLEEVE,WEAR	1
39	3235591	NUT,HEXAGON FLANGE	1
40	3008947	SEAL,KEYWAY	1
41	3880626	KIT PISTON ASSE.&RING SET	6
42	3050394	SHAFT,WATER PUMP	1
43	S 16073	BEARING,BALL	2

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44	63495	HOSE,PLAIN	1
45	43828 B	CLAMP,HOSE	4
46	AR40132	PLUNGER,GOVERNOR	1
47	67185	HOSE,PLAIN	2
48	43828 D	CLAMP,HOSE	8
49	67369 C	HOSE,PLAIN	2
50	2870386	HOSE,FLEXIBLE	1
51	3235576	TUBE,CPR WATER OUTLET	1
52	208149	CORE,COOLER	1
53	3874265	GAUGE,TEMPERATURE	2
54	3874266	GAUGE,TEMPERATURE	2
55	3875311	LIGHT,INDICATOR	2
56	504395	SWITCH,PUSH BUTTON	2
57	125741	CLAMP,T BOLT	10
58	3030772	"HOSE,ELBOW"	1
59	213074	HOSE	2
60	AK10090 SS	HOSE,FLEXIBLE	1
61	AK10050 SS	HOSE,FLEXIBLE	1
62	2870878	HOSE,FLEXIBLE	1
63	70835	SHAFT,THROTTLE	1
64	3058383	BELT,V	2
65	3240573	VALVE,SOLENDID	1
66	4851	GEAR,FLYWHEEL RING	1
67	3231787	SEPARATOR,FUEL WATER	1
68	3873989	GAUGE,PRESSURE	2
69	2897691	SWITCH,PRESSURE	1
70	3881226	COMPRESSOR AIR	1
71	3254503	GAUGE,SIGHT	1
72	3801261	SET,MAIN BRG-0.010	1
73	3037045	DOWEL,RING	7
74	3880497	SHAFT,ACCESSORY DRIVE	1
75	3238493	KIT,FUEL FILTER AND RING	1
76	AK16028 46MS	HOSE,FLEXIBLE	2
77	3238204	ELEMENT,LUB OIL FILTER	1
78	3880582	CYLINDER HEAD REPAIR KIT	3
79	3874780	GASKET,FLYWHEEL HOUSING	1
80	167157	BALL,CHECK	6
81	3167218	INHIBITOR,CORROSION 10 LITERS	1
82	4055644	KIR,AIR CLEANER	1
83	140313	CLAMP,T BOLT	1
84	4327021	SWITCH,TEMPERATURE	1
85	3056356	HARNESS,WIRING	2
86	214951	BEARING,CONNECTING ROD	12
87	157870	BUSHING	6
88	3006738	SEAL,OIL	1
89	212601	SHAFT,FUEL PUMP DRIVE	1
90	S 16052	BEARING,BALL	1
91	3058555	BARREL,GOVERNOR	1
92	109333	PLUNGER,PRS REGULATOR	1

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93	3881680	GEAR,LUBRICATING OIL PUMP	1
94	3235592	WASHER,PLAIN	1
95	112302	RING,RETAINING	1
96	196844	SPACER,BEARING	1
97	3038997	OIL SEAL	1
98	3038998	SEAL,OIL	1
99	4397228	SEAL,WATER PUMP	1
100	3068466	GASKET,HAND HOLE	1
101	3803615	KIT,SEAL	1
102	67622	PLUG,PIPE	2
103	3254187	GASKET,LUB OIL PUMP	1
104	505062	HOSE,PLAIN	1
105	AX1013359	RADIWASH 3 LITERS	4
106	155789	HOSE,PLAIN	1
107	202517	TUBE,CPR WATER INLET	1
108	3801468	SET,LOWER ENGINE GASKET	1
109	147100	CONNECTION,FUEL CROSSOVER	2
110	AK 5060 SS	HOSE,FLEXIBLE	1
111	AK 5160 SS	HOSE,FLEXIBLE	1
112	3872278	CONNECTOR,PIPE	3
113	3872284	"CONNECTOR,PIPE"	3
114	AR41043	WEIGHT,CARRIER	1
115	4085738	BELT,V	1
116	3231408	TACHOMETER	1
117	107195	HOSE,PLAIN	2
118	3873542	BREATHER,CRANKCASE	1
119	3240088	CHECK VALVE FUEL FILTER	1
120	4024946	UPPER ENGINE GASKET SET	1
121	3062096	ROLLER,CAM FOLLOWER	6
122	3872812	INDICATOR,RESTRICTION	1
123	116936	ELBOW,MALE ADAPTER	3
124	KITBM68356	GASKET GOVERNOR SET	1
125	504975	SWITCH,KEY	2
126	100670	BUSHING	1
127	3231403	HOURLMETER	1
128	3874267	SENSOR,TEMPERATURE	2
129	3874264	TRANSDUCER	1
130	500287	SWITCH,OVERSPEED	1
131	500184	CABLE,FLEXIBLE DRIVE	1
132	3413619	SHIELD,DEBRIS	2
133	3231404	PICKUP,MAGNETIC	1
134	61554	HOSE,PLAIN	1
135	3030513	"HOSE,ELBOW"	1
136	3030790	HOSE,HUMP	2
137	AK 8090 SS	HOSE,FLEXIBLE	1
138	AK 4040 SS	HOSE,FLEXIBLE	1

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Annexure-C

List of spares (Quantity per Engine) required for overhauling of Cummins Make Diesel Engines (N-743L) Supplied by Firm

S. No.	Part No.	Description	Quantity per Engine
1	KIT4105156	KIT LINER PISTON & RING S	6
2	3236446	GEAR,LUBRICATING OIL PUMP	1
3	3240610	GEAR,LUBRICATING OIL PUMP	1
4	109333	PLUNGER,PRS REGULATOR	1
5	3006738	SEAL,OIL	1
6	3166497	PUMP,WATER	1
7	KIT3880581	CYLINDER HEAD REPAIR KIT	3
8	KIT3880567	PT PUMP REPAIR KIT(PTG AU	1
9	100670	BUSHING	1
10	167157	BALL,CHECK	6
11	3045006	PLUG.INJECTOR ORIFICE	6
12	3880497	SHAFT,ACCESSORY DRIVE	1
13	505062	HOSE,PLAIN	1
14	106276	SEAL,OIL	1
15	3238204	ELEMENT,LUB OIL FILTER	1
16	3238493	KIT,FUEL FILTER AND RING	1
17	3167218	INHIBITOR,CORROSION 10 LITERS	1
18	4055643	KIT,AIR CLEANER	1
19	4327021	SWITCH,TEMPERATURE	1
20	3056356	HARNESS,WIRING	2
21	AX1013359	RADIWASH 3 LITERS	2
22	2897691	SWITCH,PRESSURE	1
23	3801261	SET.MAIN BRG-0.010	1
24	3873542	BREATHER,CRANKCASE	1
25	KITBM50745	GASKET CYLINDER HEAD	1
26	KITBM62431	GASKET SET	1
27	3872812	INDICATOR,RESTRICTION	1
28	110827	RETAINER COOLER & RING	2
29	3062096	ROLLER,CAM FOLLOWER	6
30	BM30073	CONNECTION,FUEL INLET	6
31	3225041	LIGHT,INDICATOR	1
32	S 16093	BEARING,BALL	1
33	4926975	SENSOR,TEMPERATURE	2
34	4396218	PICKUP,MAGNETIC	1
35	AR 7944	COMPRESSOR,AIR	1

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36	177417	SHAFT,LUB OIL PUMP DRIVE	1
37	177419	SHAFT,LUB OIL PUMP	1
38	9097	GASKET,WATER PUMP	1
39	3034243	PUMP,GEAR FUEL	1
40	110848	CORE,COOLER	1
41	3019116	SEAL,O RING	2
42	116391	BUSHING	1
43	118939	PIN,ROLL	18
44	4072072	PIN,CAM FOLLOWER ROLLER	6
45	132770	BUSHING	1
46	135675	THERMOSTAT	1
47	168306	SCREW,SLOTTED SET	18
48	S 212	NUT,REGULAR HEXAGON	18
49	175830	PLUG,EXPANSION	6
50	218153	BUSHING	6
51	140330	BUSHING	12
52	186780	SEAL,THERMOSTAT	1
53	203426	PIN,ROLL	6
54	KIT3880779	KIT INJECTOR REPAIR -N743	6
55	203671	BEARING,CONNECTING ROD	12
56	3000175	HUB,JAW COUPLING	1
57	3026556	BEARING,THRUST	1
58	3026557	BEARING,THRUST	1
59	3036933	ROLLER,CAM FOLLOWER	12
60	3065125	SHAFT,CAM FOLLOWER	6
61	3232556	BUSHING	6
62	3234408	PLUG,EXPANSION	6
63	43828 A	CLAMP,HOSE	2
64	63495	HOSE,PLAIN	2
65	43828 B	CLAMP,HOSE	2
66	9235 1	BEARING,THRUST	1
67	BM30075	CONNECTION,FUEL DRAIN	6
68	67185	HOSE,PLAIN	4
69	43828 D	CLAMP,HOSE	4
70	178597	BELT,V	2
71	178570	BELT,V	1
72	178567	BELT,V	1
73	502881	AMMETER	1
74	AK16015 6MS	HOSE,FLEXIBLE	1
75	AK16025 6MS	HOSE,FLEXIBLE	2

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76	AK 16033 46MS	HOSE,FLEXIBLE	1
77	3030513	HOSE,ELBOW	1
78	2867240	HOSE,FLEXIBLE	1
79	2870386	HOSE,FLEXIBLE	1
80	AK 6045 SS	HOSE,FLEXIBLE	1
81	AK 6065 SS	HOSE,FLEXIBLE	1
82	S 16004 A	BEARING,BALL	1
83	4071829	GAUGE,TEMPERATURE	2
84	4071831	GAUGE,TEMPERATURE	2
85	4071832	GAUGE,PRESSURE	2
86	157870	BUSHING	6

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Annexure-D

List of spares (Quantity per Engine) required for overhauling of Cummins Make Diesel Engines (KTA-19R) Supplied by Firm

S. No.	Part No.	Description	Quantity per Engine
1	3088298	RING,LINER SEAL	6
2	3002834	BUSHING	7
3	4055283	KIT,CONVERSION	2
4	3238204	ELEMENT,LUB OIL FILTER	2
5	3238493	KIT,FUEL FILTER AND RING	2
6	3879488	KIT,SUPER BYP.FILTER ELEM	1
7	3167218	INHIBITOR,CORROSION 10 LITERS	1
8	3057139	ROD,PUSH	12
9	205439	RING,RETAINING	6
10	3642505	ROLLER,CAM FOLLOWER	6
11	3078218	SHAFT,CAM FOLLOWER	6
12	3238299	KIT,CYL HEAD REPAIR K6	6
13	3176773	SHAFT,ROCKER LEVER	6
14	167157	BALL,CHECK	6
15	3045006	PLUG,INJECTOR ORIFICE	6
16	KIT3880567	PT PUMP REPAIR KIT(PTG AU	1
17	4397228	SEAL,WATER PUMP	1
18	206948	SEAL,OIL	1
19	145623	SEAL,O RING	1
20	3042827	SHAFT,WATER PUMP	1
21	70183	RING,RETAINING	1
22	205258	RING,RETAINING	1
23	3545647	KIT,TURBO REPAIR HC5A	1
24	3523429	HOUSING,TUR BEARING	1
25	3523980	SLINGER,OIL	1
26	3591522	COLLAR,THRUST	1
27	3240746	COMPRESSOR,AIR	1
28	3873542	BREATHER,CRANKCASE	3
29	107981	CAP, FILLER	1
30	3392445	TRANSDUCER	1
31	4371769	KIT,LINER	6
32	3046200	SPIDER,JAW COUPLING	1
33	3056356	HARNESS,WIRING	2
34	4327021	SWITCH,TEMPERATURE	1
35	AX1013359	RADIWASH 3 LITERS	4
36	2897691	SWITCH,PRESSURE	1
37	216484	DIPSTICK	1

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38	3231403	HOURMETER	1
39	4055995	MUFFLER	1
40	S 16002	BEARING, BALL	1
41	4376512	KIT, LOWER ENGINE GASKET	1
42	4352578	KIT, UPPER ENGINE GASKET	1
43	KIT3238535	KIT PISTON ENGINE	6
44	3005886	SEAL, OIL	1
45	4926975	SENSOR, TEMPERATURE	1


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Annexure-E

List of Spares supplied by Railway for overhauling of engine Model VTA-1710-L

S. No.	Part No.	Description	Quantity per engine
1	3240239	GASKET SET	1
2	200601	BEARING,CONNECTING ROD	24
3	161825	PLUG,EXPANSION	6
4	S 679	WASHER,PLAIN	50
5	145701	VALVE,EXHAUST	24
6	135957	VALVE,INTAKE	24
7	172034	GUIDE,VALVE SPRING	48
8	211999	SPRING,VALVE	48
9	170296	GUIDE,VALVE SPRING	48
10	127554	COLLET,VALVE	96
11	127930	INSERT,VALVE	24
12	3006456	GUIDE,VALVE STEM	48
13	196641	SEAL,O RING	12
14	3872815	INSERT,VALVE	24
15	3034222	PUMP,GEAR FUEL	1
16	43764	CONNECTOR,MALE	1
17	43765	ELBOW,MALE ADAPTER	1
18	3241328	LINER,CYLINDER	12
19	9235 1	BEARING,THRUST	4
20	70437	BUSHING	28
21	3229096	GASKET,EXH OUT CONNECTION	2
22	3020190	SEAL,OIL	1
23	3020188	SEAL,OIL	1
24	3026556	BEARING,THRUST	3
25	3026557	BEARING,THRUST	3
26	116391	BUSHING	1
27	3000175	HUB,JAW COUPLING	1
28	3010617	SEAL,O RING	4
29	S 1059	COUPLING,PLAIN PIPE	1
30	132770	BUSHING	1
31	65259 A	SHIM	2
32	65259 B	SHIM	2
33	65259 C	SHIM	2
34	140330	BUSHING	24
35	218153	BUSHING	12

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36	168306	SCREW,SLOTTED SET	36
37	S 212	NUT,REGULAR HEXAGON	36
38	175830	PLUG,EXPANSION	8
39	BM71481	SHAFT,ROCKER LEVER	4
40	135675	THERMOSTAT	2
41	186780	SEAL,THERMOSTAT	2
42	3054999	SCREEN,FILTER	12
43	140332	CLAMP,T BOLT	4
44	3046419	ROD,PUSH	24
45	3046432	ROD,PUSH	12
46	108186	LOCKWIRE,TPT ROLLER PIN	24
47	108187	LOCKWIRE,TPT ROLLER PIN	12
48	213559	SOCKET,CAM FOLLOWER	36
49	3017511	ROLLER,TAPPET	12
50	4071443	PIN,TAPPET ROLLER	24
51	4071444	PIN,TAPPET ROLLER	12
52	142429	ELBOW,MALE ADAPTER	1
53	3025100	WASHER,PLAIN	24
54	69936	NUT,HEAVY HEXAGON	24
55	187420	BUSHING	12
56	199843	PLUNGER,PRS REGULATOR	1
57	180761	SHAFT,LUB OIL PUMP	2
58	190397	SLEEVE,WEAR	1
59	3200287	SEAL,KEYWAY	1
60	3232796	SHAFT,WATER PUMP	1
61	204193	SHAFT,LUB OIL PUMP DRIVE	1
62	3042353	STUD,DOUBLE END PLAIN	8
63	219138	NUT,REGULAR HEXAGON	8
64	3235591	NUT,HEXAGON FLANGE	1
65	43828 B	CLAMP,HOSE	4
66	3872813	INDICATOR,RESTRICTION	2
67	AK 5033 SS	HOSE, FLEXIBLE	1
68	AK 4040 SS	HOSE, FLEXIBLE	2
69	AK 6065 SS	HOSE, FLEXIBLE	2
70	AK 6036 SS	HOSE, FLEXIBLE	2
71	AK 8065 SS	HOSE, FLEXIBLE	1
72	2870878	HOSE, FLEXIBLE	1
73	AK10050 SS	HOSE, FLEXIBLE	1

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74	AK16030 SS	HOSE, FLEXIBLE	2
75	3241306	NOZZLE, PISTON COOLING	12
76	4073133	CAMSHAFT	1
77	4073134	CAMSHAFT	1
78	3226087	FLANGE, WELD	6
79	193552	DAMPER, VIBRATION	1
80	502881	AMMETER	1
81	124507	GEAR, FLYWHEEL RING	1
82	147389	SCREW, CROSSHEAD ADJUSTING	12
83	203131	NUT, HEAVY HEXAGON	12
84	146856	BOLT, CONNECTING ROD	12
85	3026832	HOSE, FLEXIBLE	2
86	3872299	CONNECTOR, PIPE	3
87	3030514	HOSE, ELBOW	2
88	3030792	"HOSE, HUMP"	2
89	3030772	"HOSE, ELBOW"	2
90	125741	CLAMP, T BOLT	4
91	140314	CLAMP, T BOLT	8
92	125739	CLAMP, T BOLT	2
93	500108 G	GAUGE, TEMPERATURE	1
94	4971772	GAUGE, TEMPERATURE	1
95	3875311	LIGHT, INDICATOR	1
96	180760	GASKET, LUB OIL PUMP COVER	1
97	123078	GASKET, WATER PUMP	1
98	204253	GASKET, LUB OIL PUMP	1
99	213358	FLANGE, CRANK SHAFT	1
100	185138	RETAINER, INJECTOR CUP	3
101	185139	ADAPTER, INJECTOR	3
102	214836	CORE, AFTERCOOLER	2
103	195256	GEAR, CAMSHAFT	1
104	195257	GEAR, CAMSHAFT	1
105	3028293	CROSSHEAD, VALVE	24
106	3059852	GEAR, CRANK SHAFT	1
107	KIT3238194	KIT PISTON RING SET V-28	12

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Annexure-F

List of Spares supplied by Railway for overhauling of engine Model KTA-19-R

S. No.	Part No.	Description	Quantity per engine
1	3880812	NOZZLE, PISTON COOLING	6
2	130083	BEARING, THRUST	4
3	3874693	SHAFT, IDLER	2
4	205841	BEARING, CONNECTING ROD	12
5	AR12271	SHELL, MAIN BEARING .010	1
6	3017961	ROD, PUSH	6
7	206808	SEAL, GROMMET	2
8	135675	THERMOSTAT	2
9	186780	SEAL, THERMOSTAT	2
10	190397	SLEEVE, WEAR	1
11	3200287 (181236)	SEAL, KEYWAY	1
12	3043909	BUSHING	6
13	3016826	ROLLER, CAM FOLLOWER	12
14	4009247	PIN, CAM FOLLOWER ROLLER	6
15	4009248	PIN, CAM FOLLOWER ROLLER	12
16	205438	LOCK WIRE, TPT ROLLER PIN	18
17	213559	SOCKET, CAM FOLLOWER	18
18	207226	BUSHING	6
19	207344	BUSHING	12
20	168306	SCREW, SLOTTED SET	18
21	S 212	NUT, REGULAR HEXAGON	18
22	3880785	KIT, INJECTOR REPAIR-KTA	6
23	3054999	SCREEN, FILTER	6
24	3034243	PUMP, GEAR FUEL	1
25	3026556	BEARING, THRUST	3
26	3026557	BEARING, THRUST	1
27	116391	BUSHING	1
28	3000175	HUB, JAW COUPLING	1
29	3236454	GEAR, LUBRICATING OIL PUMP	2
30	205080	PLUNGER, PRS REGULATOR	1
31	205052	SHAFT, IDLER	1
32	205065	SHAFT, LUB OIL PUMP	1
33	205061	GASKET, LUB OIL PUMP	1
34	205243	IMPELLER, WATER PUMP	1
35	S 16069	BEARING, BALL	1
36	3025887	SHAFT, WATER PUMP	1
37	3235591	NUT, HEXAGON FLANGE	1
38	3235704	HOSE, PLAIN	2

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39	3016142	HOSE,PLAIN	1
40	201989	CLAMP,V BAND	1
41	140315	CLAMP,T BOLT	2
42	147416	PLUG,EXPANSION	4
43	175830	PLUG,EXPANSION	4
44	3235156	GASKET,CAM FOL HOUSING	1
45	43828 D	CLAMP,HOSE	2
46	57185	HOSE,PLAIN	1
47	3872813	INDICATOR,RESTRICTION	1
48	3042353	STUD,DOUBLE END PLAIN	4
49	219138	NUT,REGULAR HEXAGON	4
50	203131	NUT,HEAVY HEXAGON	12
51	165006	SCREW,HEXAGON HEAD CAP	12
52	207233	TUBE,WATER TRANSFER	4
53	207378	TUBE,WATER TRANSFER	1
54	3081040	DAMPER,VIBRATION	1
55	147389	SCREW,CROSSHEAD ADJUSTING	12
56	3240573	VALVE,SOLENDID	1
57	3200738	MANIFOLD,FUEL	1
58	3013265	SCREW,FRACTURE RESISTANT	12
59	3007971	BEARING,CAMSHAFT THRUST	1
60	3010388	COVER,ROCKER LEVER	2
61	AK10050 SS	HOSE,FLEXIBLE	1
62	AK 6045 SS	HOSE,FLEXIBLE	1
63	AK 6065 SS	HOSE,FLEXIBLE	1
64	9539 A	HOSE,PLAIN	3
65	209773	CLAMP,HOSE	6
66	3246626	CHECK-VALVE DRAIN	1
67	3246625	CHECK-VALVE SUPPLY	1
68	AK 6054 ST	HOSE,FLEXIBLE	1
69	AK16028 6MS	HOSE,FLEXIBLE	2
70	AK 8065 MS	HOSE,FLEXIBLE	1
71	AK10070 MS	HOSE,FLEXIBLE	1
72	3030514	HOSE,ELBOW	1
73	140314	CLAMP,T BOLT	2
74	125741	CLAMP,T BOLT	1
75	3030768	HOSE,HUMP	1
76	178567	BELT,V	1
77	AK 5041 SS	HOSE,FLEXIBLE	1

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