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सत्यमेव जयते

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Government of India - Ministry of Railways
Research, Designs & Standards Organization,
LUCKNOW - 226011

No. EL/11.5.5/1

Dated: 16.08.2016

SPECIAL MAINTENANCE INSTRUCTION NO. RDSO/2016/EL/SMI/0294 (REV. '0')

1.0 Title:

Technical Scope of work for Annual Maintenance Contract (AMC) of GTO based Traction Converters (SR), Auxiliary converters (BUR) and MICAS based Vehicle Control units (VCU) of three phase locomotives.

2.0 Brief History

2.1 Presently, Indian Railways manufacture four classes of 3-Phase drive locomotives viz. WAG9, WAG9H, WAP5 and WAP7 based on the transfer of technology (ToT) from Switzerland (Now Bombardier Transportation). Under the ToT, technology was received to manufacture 3-Phase locomotives with GTO based traction and auxiliary converter and MICAS based VCU. However, CLW has already switched over to manufacturing of 3–Phase locomotives with IGBT based traction converter from financial year 2016-17 and auxiliary converter. At present about 750 locomotives are running with GTO based traction converters which are to be maintained in proper way so that with the time their reliability is ensured to the best extent possible.

2.2 As most of the GTO based Traction Converters (SR), Auxiliary converters (BUR) and MICAS based Vehicle Control units (VCU) are beyond warranty, a need is felt to provide a uniform technical scope of work for Annual Maintenance Contract (AMC) of SRs, BURs and VCUs. Zonal Railways have also requested time to time for uniform technical guidelines in this respect. This will help in getting continuous support from TOT partners for obsolescence management also.

2.3 During the meeting in Railway Board on 14.06.2016, RDSO was advised to prepare technical scope of work for Traction converter, Auxiliary converter and VCU. This as per item no- 1.10 of MOM issued vide letter no EL/11.5.5/5 dated 05.07.2016.

3.0 Definitions

Throughout this document, the terms:

a) **'AMC'** means the Annual Maintenance Contract.
b) **'SR'** means Traction converter
c) **'BUR'** means Auxiliary Converter

d) **'VCU' means** Vehicle Control unit
e) **'Contract'** means the contract for annual maintenance of Traction Converter fitted on 3 phase Electric locomotives
f) **'Contractor'** means the firm/company on whom the order for annual maintenance of GTO Based Auxiliary Converter fitted on 3 phase Electric locomotives is to be placed.
g) **'RDSO'** shall mean Research, Design and Standards Organization/Lucknow.
h) **'Minor Schedule'** The inspection schedule IA, IB, IC and
I) **Major Schedule'** The schedule MOH, IOH and POH
J) **'BDV'** means Break Down Voltage
h) **'DGA'** means dissolved gas analysis

4.0 **Object:**

To provide technical scope of work for Annual Maintenance Contract (AMC) of GTO based Traction Converter (SR), Auxiliary converter (BUR) and MICAS based Vehicle Control unit (VCU)

5.0 **Scope of work of AMC:**

5.1 This is a comprehensive Annual Maintenance Contract for GTO based SRs, BURs and MICAS based VCUs where Original Equipment Manufacturer (OEM)/Contractor shall at its own cost and expense attend, replace and install materials which get consumed, wear out due to ageing /use in the normal course of operation as well as attend failures/breakdowns /out of course repairs of SR, BUR and VCU units including components, assembly/ sub-assembly, electronic cards etc. for efficient and reliable operation of equipment under AMC. During the maintenance period OEM/Contractor shall arrange transport of man and material at its own cost as and when required for maintenance of the equipment.

5.2 The contract shall be comprehensive in nature wherein preventive as well as breakdown maintenance of SR, BUR and VCU units shall be carried out by the Contractor including the arrangement of spares, tools, consumables, technical expertise, man power and replacement of defective cards/equipment etc. The released defective cards, consumables, tools, items etc. will be Contractor's property. Contractor shall remove the same from the shed's premises with due authority/procedures.

5.3 However Valve set repair of SR's shall be carried out separately by Zonal Railways as per existing practice and it is not covered in this AMC. Repairing of valve sets of traction converters shall be as per SMI no.-RDSO/2010/EL/SMI/0265(Rev-0) or latest to be dealt with by Zonal Railways separately.

5.4 Railways will enter into AMC for SR, BUR and VCU units with manufacturers of GTO based SR and BUR units and MICAS based VCU.SR, BUR and VCU units under warranty shall not be included in scope of AMC. SR, BUR and VCU units beyond manufacturer's warranty shall only be included in scope of AMC. However, Railways may enter in to AMC contract for SR, BUR and VCU units covered under warranty, but in such cases, AMC for units still covered under warranty shall commence from the next day of completion of warranty period.

5.5 Present AMC by Railways for SR, BUR and VCU units beyond their warranty covers all the schedule works falling during the period of AMC.

5.6 AMC will be carried out for SR, BUR and VCU units in working condition.

5.7 The maintenance schedule of locomotives being followed by the Electric Loco Sheds shall be as per RDSO guideline no. No. EL/3.1.35/16 dated 30.03.2007 or latest. Railway administration may change the periodicity of schedule as per the requirement in that case revised schedule shall be followed. As on date the periodicity and time taken in various maintenance schedules is as follows:

Maintenance Schedule	WAP5/WAP7 locomotive		WAG9/WAG9H locomotive	
	Periodicity	Time taken*	Periodicity	Time taken*
Trip Inspection	3000 kms. or one trip, whichever is later	2 hrs	45 days	4 hrs
IA	90 days	6 hrs	90 days	6 hrs.
IB	180 days	6 hrs	180 days	6 hrs.
IC	270 days	8 hrs.	270 days	8 hrs.
MOH	18 months	6 working days	18 months	6 working days/ 8 working days for 2nd MOH
IOH	4½ yrs. ± 6 months or 12 lakh kms., whichever is earlier	11 working days (WAP7) / 20 working days (WAP5)	6 yrs. ± 6 months or 12 lakh kms., whichever is earlier	11 working days.
POH	9 yrs. ± 6 months or 24 lakh kms., whichever is earlier	28 days	12 yrs. ± 6 months or 24 lakh kms., whichever is earlier	28 days

5.8 The Zonal Railways shall clearly specify the number of locos due for major schedule (MOH/IOH/POH) during AMC.

5.9 The maintenance and support by the Contractor shall consist of periodical preventive checks as per the maintenance schedule of SR, BUR and VCU units given in Para 5.15 below for trouble free operation of the equipment as well as attending the failures/breakdown/out of course repair etc.

5.10 Contractor shall ensure that AMC maintenance schedule should match with the loco inspection schedules. i.e. IA, IB, IC, MOH, IOH, POH etc. The scope of maintenance by the Contractor shall be largely as per preventive maintenance schedule of the equipment, but shall include out of course attentions including breakdown, if any required, to ensure trouble free operation of the locomotive.

AMC shall not cover the SR, BUR and VCU unit's failures due to circumstances beyond the control of Contractor such as fire in locomotives, accident, earth quake, floods etc. However, in such circumstances payment for spares to be replaced by the Contractor will be made extra as per the price list of OEM submitted along with their offer.

5.11 Repair and Rehabilitation of electronic cards shall be as per RDSO guideline no. EL/G/2008/01, Rev-03 and STR no. RDSO/2008/EL/STR/0047, Rev-0 or latest.

5.12 Zonal Railways shall clearly specify the quantity of cards in loco sets due for rehabilitation during AMC to enable the Contractor to assess the quantum of work.

5.13 Testing of the equipment after repair shall be as per TC no. RDSO/2016/EL/TC/0135 Rev-0.

5.14 All optic fiber cables shall be replaced in POH schedule by the Contractor.

5.15 Rehabilitation of the PCB cards may be outsourced by the Contractor undertaking AMC to RDSO approved vendors. However, the responsibility for the performance during the AMC shall rest on the Contractor only.

5.16 All maintenance activities shall be carried out as per the schedule approved by Railways. In case of any abnormalities found during minor/major schedules, associated component/subassemblies shall be replaced/repaired by the Contractor. The activities to be covered under scope of work of AMC of SR, BUR and VCU units are given below in following tables.

(a) Table 1- Maintenance schedule of Traction Converter(SR)
(b) Table 2- Maintenance schedule of Auxiliary Converter(BUR)
(c) Table 3- Maintenance schedule of VCU
(d) Table 4- Maintenance schedule of Electronics cards

Table 1: Maintenance Schedule of Traction Converter (SR)

SN	Equipment	Maintenance schedule					
		IA	IB	IC	MOH	IOH	POH
1	Check the oil level indicator situated on the conservator (Expansion Tank). If the oil is below the minimum mark, top up with the specified oil. Check for any sign of leakage and attend the same. The oil shall be made available by Railways free	√	√	√	√	√	√
2	Visually examine oil pipe joints for leaks, loose or missing screws and correct as necessary.	√	√	√	√	√	√
3	Examine the flange joints for leaks, loose or missing screws. Check gaskets/oil seals, and replace if required. Check the condition of stucchi coupling and manifold joints for sign of oil leakage and attend the same as per the need.	√	√	√	√	√	√

Table 1: Maintenance Schedule of Traction Converter (SR)							
SN	Equipment	Maintenance schedule					
		IA	IB	IC	MOH	IOH	POH
4	Examine all electrical equipment of traction converter for signs of dirt, corrosion, damage etc. Remove all dust/dirt deposits from the connection insulators.	√	√	√	√	√	√
5	Check the cable connection of Sichem connectors of differential Amplifier provided below SR oil pump. Attention to Sichem connectors shall be done by Railways.	√	√	√	√	√	√
6	Clean the isolating blade and spring contact of earthing switch. Lightly lubricate it with the specified grease.	X	X	√	√	√	√
7	Clean the heat sink by vacuum cleaner.	X	X	√	√	√	√
8	Check the tightness of SR electronics PCB.	√	√	√	√	√	√
9	Ensure sealing of incoming cable gland of control card rack to avoid entry of dust /dirt.	X	X	√	√	√	√
10	Check the condition of silica gel. If pink replace with dry silica gel. The silica gel will be supplied by Railways free of cost.	√	√	√	√	√	√
11	BDV and DGA test of converter oil to be done and maintain the record for analysis purpose. Filter/change the oil if required.	√	√	√	√	√	√
12	Check the ventilation fans of traction converters electronics for its satisfactory working. The fans shall be replaced if found defective.	√	√	√	√	√	√
13	Replacement of ventilation fans of traction converters electronics for its satisfactory working.	X	X	X	X	X	√
14	Remove the converter cubicles. Clean the dust and dirt thoroughly including electronic cards by blowing/vacuum cleaner.	X	X	X	X	√	√

Table 1: Maintenance Schedule of Traction Converter (SR)							
SN	Equipment	Maintenance schedule					
		IA	IB	IC	MOH	IOH	POH
15	Visually inspect the MUB resistor for evidence of overheating; bending of resistor tapes, discoloration of the resistors or its case, or burn marks. Replace the MUB resistor assembly if damaged or defective or not within specified limit.	X	X	√	√	√	√
16	Measure the impedance of MUB resistors and attend/replace accordingly.	X	X	X	X	√	√
17	Visually inspect the traction converter earthing resistors for signs of overheating. Replace any resistor that is damaged or defective.	√	√	√	√	√	√
18	Clean the Series Resonant and DC Link capacitors and inspect for any sign of oil leakage, bulging etc. Measure the values and replaced if not within permissible range. Replace the capacitors if damaged/defective or not within specified limit.	X	X	X	√	√	√
19	Check the DC link and series resonant circuit capacitor bank electrical connections. Tighten the fasteners if necessary. Change if found defective.	X	X	X	X	√	√
20	Test the voltage indicators and current transducer. Replace, if required.	X	X	X	X	√	√
21	Overhaul the pre-charging and main contactors. Replace the rubber parts and other item as per requirement as recommended by OEM.	X	X	X	X	√	√
22	Visual inspection of contact tips of Electro-pneumatic and Electro-magnetic contactors and replace if required.	X	X	X	√	√	√
23	Check and clean the blade and spring contacts of earthing switch and lubricate. Check its connections for tightness and intactness. Attend it if required.	X	X	X	√	√	√

Table 1: Maintenance Schedule of Traction Converter (SR)							
SN	Equipment	Maintenance schedule					
		IA	IB	IC	MOH	IOH	POH
24	Testing the BDV of the converter oil and if BDV value is not normal then oil to be centrifuged on condition basis	X	X	X	√	√	√
25	Drain the oil from SR and conduct centrifuging of the oil.	X	X	X	X	√	√
26	Replace the converter cooling oil	X	X	X	X	X	√
27	Replace the air-cooling hoses, seals on the traction converter doors.	X	X	X	X	√	√
28	Over hauling of Earthing switch	X	X	X	X	X	√
29	Measure dB loss of Fiber-optic cable of SR. Clean, if required. In case the dB value is not within the specified limit then the fiber optic cable shall be replaced.	X	X	X	X	√	√
30	Blow the Gate Units of SR to remove any dirt.	X	X	X	√	√	√
31	Visual inspection of bushing of transformer. Contractor shall only inspect and intimate Railways. Any attention to bushing shall be done by Railways.	X	X	X	X	√	√
32	Testing of gate unit on test bench as per TC/135. Replace if found defective.	X	X	X	X	√	√

Table 2: Maintenance Schedule of Auxiliary Converter (BUR)							
SN	Equipment	Maintenance schedule					
		IA	IB	IC	MOH	IOH	POH
1	Check the working of ventilation fans of auxiliary converters and attend/replace the same as per need.	√	√	√	√	√	√
2	Replacement of ventilation fans of auxiliary converters.	X	X	X	X	X	√
3	Clean the dust by vacuum cleaner without opening modules.	√	√	√	√	√	√
4	Check the tightness of connections of control cards and attend the same as per requirement.	√	√	√	√	√	√

Table 2: Maintenance Schedule of Auxiliary Converter (BUR)							
SN	Equipment	Maintenance schedule					
		IA	IB	IC	MOH	IOH	POH
17	Clean the reactors and transformers in the auxiliary converter cabinets using compressed air. Remove all traces of dirt, dust and debris.	X	X	X	X	√	√
18	Clean all dirt and dust deposit from the terminal side of the phase reference transformer and Auxiliary surge arrester insulator. Cleaning is by means of blowing out and brushing off with a cloth.	X	X	X	X	√	√
19	Visually inspect the insulators in the auxiliary converters (BUR) 1, 2 & 3 for damage. Replace damaged insulators if found during check.	X	X	X	√	√	√
20	All re-grouping contactors, MOV to be checked and replace the same , if found defective	X	X	X	√	√	√

Table 3: Maintenance Schedule of VCU							
SN	Equipment	Maintenance schedule					
		IA	IB	IC	MOH	IOH	POH
1	Visually check physical damage and insulation defects	X	X	X	√	√	√
2	Check the tightness of all PCB cards and connections	√	√	√	√	√	√
3	Check the tightness of Fiber Optic Coupler.	X	X	X	√	√	√
4	Replace the back-up batteries in the vehicle control unit bus station diagnostic DIA.	X	X	X	X	√	√
5	Replace the seals in the UIC socket.	X	X	X	X	X	√
6	Reload the software to the vehicle control unit bus station computer EPROMs.	X	X	X	X	X	√
7	Examine the UIC Socket at both end of the locomotive to make sure the covers operate freely. Inspect electrical contacts and if necessary blow clean with compressed air.	X	X	X	√	√	√
8	Ensure working of instrument cooling fan and replace if required.	√	√	√	√	√	√
9	Replacement of instrument cooling fan.	X	X	X	X	√	√
10	Check setting of thermostat in VCU and attend the same if needed.	X	X	X	X	√	√
11	Visually check all the cards for any capacitor leakage. Blow the cards and remove any dirt.	X	X	X	X	√	√

Table 3: Maintenance Schedule of VCU							
SN	**Equipment**	**Maintenance schedule**					
		IA	**IB**	**IC**	**MOH**	**IOH**	**POH**
12	Measure dB loss of Fiber-optic cables interfacing with traction and auxiliary converters. Clean, if required. In case the dB value is not within the specified limit then the fiber optic cable shall be replaced.	X	X	X	X	√	√
13	Clean Heat Exchangers at the back of the electronic rack.	X	X	X	√	√	√

Table 4: List of cards for rehabilitation			
SN	**Card Detail**	**Number of card for loco set**	**Equipment**
1.	NS/AS controller(PPA988B02)	04	SR
2.	GTO Optical pulse card(AFB635B08)	04	
3.	Single board computer(PPB622B01)	02	
4.	Digital I/O board(URB177D15)	02	
5.	Power supply(KUA915B01)	02	
6.	Gate unit GVA587A01	30	
7.	Gate unit power supply(KYA924D01)	02	
8.	Single conditioning card(UAB630A36)	02	
9.	Single conditioning card(UAB630A91)	02	
10.	Single conditioning card(UAB630A93)	02	
11.	Power supply (KUC153A02)	03	BUR
12.	Controller board (PPB471A02)	03	
13.	Chopper Controller/GG/WRE Controller(RDB472A01)	03	
14.	Inverter Controller/Aux. Interface(UAB476B01)	03	
15.	Single Bus Coupler (UFB701A01)	03	
16.	GDU (XVB175B32)	09	
17.	Display computer board(PPB908A01)	02	VCU
18.	Digital I/O board(URB512D15)	08	
19.	Power supply VCU (KUB921A01)	04	

Table 4: List of cards for rehabilitation			
SN	**Card Detail**	**Number of card for loco set**	**Equipment**
20.	Diagnostic computer(PPB624A01)	01	
21.	Single board computer (PPB622B01)	06	
22.	BUS Coupler (UFB660A01)	02	
23.	ZVB Card	01	

5.17 In addition to above, modifications/reliability improvement measures/instructions related to SR, BUR and VCU units, issued by Railway Board/RDSO/Manufacturers from time to time shall be considered as part of scope of AMC. The cost of modification (material portion) will be borne Railways. However, labour portion including provision & testing is to be done free of cost by the Contractor. Contractor will carry out the required modifications and inform Railways and RDSO.

5.18 If any equipment under the AMC is required to be lifted from the locomotive the same shall be carried out by the Railways under the supervision of the Contractor. Necessary machinery and plant such as crane, welding plant, etc shall be given for attention of defects to the Contractor free of cost for the purpose of attending the defects of the equipment under AMC.

5.19 Above scope of works is for guidance. Railways may include any additional activities/works deemed necessary to ensure proper maintenance.

6.0 Responsibilities of Railways

6.1 The Railway authority shall permit the Contractor to work on SR, BUR and VCU units fitted on 3 phase electric locomotives under preventive maintenance or breakdown.

6.2 Railways shall nominate the Officer/Supervisor for supervision of the work done by the Contractor under the contract.

6.3 The necessary space, electricity, and water connection, oil centrifuging and DGA machines, setup as per TC/135, Diagnostic Tool etc, shall be provided by Railway free of cost at the nearest possible point of the site. However, any test setup, M&P, etc not available with the Railway shall have to be arranged by the Contractor for the purpose of AMC. In addition, a suitable covered space to store the tools and tackles shall be provided free of cost by the IR to the Contractor in the shed.

6.4 Railway shall mention the details of the equipment under AMC including the locomotive numbers covered under Annual Maintenance Contract. In case the home shed of the locomotive is shifted to any other location, the scope of AMC shall shift to new home shed of the locomotive.

6.5 Railways and the Contractor shall jointly arrive at the number of locomotives that are under AMC at the start of contract and a record shall be kept for this purpose.

6.6 Railways shall inform 24 hrs in advance regarding locomotives planned for scheduled repairs (i.e. IA/IB/IC/IC0/AOH/TOH/IOH/POH) so that Contractor can also plan and carry out the activities as per scope of work of AMC.

6.7 Railways shall also inform the Contractor regarding any line failures/breakdown of the locomotive and likely place (trip shed/ loco shed) and date where locomotive needs to be attended by the Contractor. This shall be done on best effort basis.

7.0 **Responsibilities of the Contractor**

7.1 The Contractor shall post qualified service engineers and arrange required materials exclusively for the execution of this contract at the Loco shed. The number of qualified engineer shall be at least 2 for up to 50 locomotives, at least 3for more than 50 locomotives. However, the Contractor shall depute adequate staff to ensure completion of the work within the specified time limit for maintenance as specified in Para 5.7.

7.2 Service Engineer shall carryout preventive maintenance on locos on all days and times including Sundays and Gazetted holidays depending upon availability of locomotive in the shed. Preventive maintenance will be carried out in shadow of scheduled maintenance of the locomotives.

7.3 Normally Service engineer shall be available in the shed during normal working hours to attend breakdown calls/ preventive maintenance. A backup service engineer shall be located at one of the Contractor's office and shall be available at the designated shed if required to attend the complaints in case of absence of service engineer at the designated shed.

7.4 The service engineer carrying out repair in the shed shall observe all safety and security rules prevailing at the place of work.

7.5 The Contractor shall keep adequate number of spare cards/components etc. to ensure timely replacement of defective cards/components. Failed cards/components are to be replaced with new/repaired cards/components.

7.6 Firm shall make Joint Note along with nominated shed officer/supervisor for each and every line failure and shed detection cases duly indicating the root cause of failure and corrective measures to be taken in the format as prescribed by RDSO. Investigation report in each case along with remedial action taken/to be taken shall be submitted to Railways & RDSO.

7.7 In no case loco will be given fit with any equipment in isolated condition.

7.8 In case of any SR, BUR and VCU unit's card found malfunctioning/behaving erratically showing fault intermittently (not permanent) it must be replaced by firm. The firm should carry out failure investigation at card/module level and submit the same to Railways from time to time.

7.9 In some cases, the actual problem is not established and in these cases, loco is required to be escorted by the maintenance personnel. Hence, in such cases escorting of loco by the Contractor's service engineer for finding the trouble, shall be ensured by the Contractor.

7.10 Firm service engineer should maintain the unit wise history of failure and other details and checks performed during the minor schedule in the form of check sheets which will be made as per RDSO guidelines and got approved from Railway Representative.

7.11 Scheduled work and testing if required should be carried out during the schedule and testing hours as specified by Railways. In addition to the schedule maintenance any other job card issued to the relevant equipment based on DDS message shall be attended by the firm in the scope of AMC.

7.12 After every attention to the SR, BUR and VCU units, the Contractor will give a report to the Railways giving details of activities carried out including details of components/sub-assemblies replaced.

7.13 Based on the quantum of work, the Contractor may need to provide the mobile maintenance team along with the adequate spares to attend the on-line failures so that the downtime of the locomotive can be reduced.

7.14 The Contractor shall quote the rates for comprehensive AMC (as specified in clause 5.1) considering both the break down & preventive maintenance (including spare materials, components, assemblies, labour, manpower, service, transportation etc.).

8.0 Place of work:

8.1 Minor schedule activities (IA/IB/IC/) will be carried out at the home shed of the locomotive.

8.2 Major schedule activities (MOH/IOH) will be carried out at the home shed of the locomotive.

8.3 Major schedule activities (POH) will be carried out at the POH shop where locomotive is undergoing POH as decided by the Railways. The work shall be certified by the nominated official of the POH shop.

8.4 Breakdown maintenance will normally be carried out at the nearest trip shed/loco shed where loco is sent after failure. If the locomotive cannot be attended at out stations, locomotive may be called to home shed.

9.0 Penalty Clause for AMC:

9.1 As soon as failure of equipment under AMC takes place, the same shall be informed to Contractor by Shed/Railway authority. Contractor shall attend the defects as early as possible but not exceeding 24 hours after the placement of locomotive in shed/trip shed covered under contract mutually agreed between parties (Railways and the Contractors).

9.2 For smooth execution of AMC by the Contractor, Zonal Railways may include suitable penalty clause as special condition of contract for AMC. However sample penalty clauses for guidance of Zonal Railways are given as under:

9.2.1 Downtime penalty for fleet of locomotives

a) Downtime on account of online failures of equipment under AMC shall be from the time the locomotive fails on line and reported to the Contractor till the loco is given ready for service.

b) The Contractor shall ensure that during the billing period (three months), combined downtimes of all the locomotives covered under AMC, on account of out of course repair and online failures of equipment under AMC does not exceed 1.5% of total loco hours for the locomotives covered in the AMC. Penalty for Downtime for the fleet of the locomotive shall be as under:

Down time	Penalty
1.5 % or less	NIL
1.5% to 5%	2% of the total monthly proportional bill
5% to 10%	5% of the total monthly proportional bill
More than 10 %	10% of the total monthly proportional bill

9.2.2 **Downtime penalty for individual locomotive**

a) Downtime on account of online failures of equipment under AMC shall be from the time the locomotive fails on line and reported to the Contractor till the loco is given ready for service.

b) The Contractor shall ensure that during the billing period (three months), individual downtime of all the locomotives covered under AMC, on account of out of course repair and online failures of equipment under AMC does not exceed 5% of loco hours for the locomotive covered in the AMC. Penalty for Downtime of the individual locomotive shall be as under:

Individual Loco Down time	Penalty
5 % or less	NIL
> 5%	5% of the individual loco's monthly proportional bill

9.2.3 Overall liability in any case shall not exceed 10% of the contract value

10.0 **Schedule of work**

The Contractor shall quote their offer as under for AMC

a. Cost per loco for comprehensive AMC for the work specified and also during IA/IB/IC/MOH/IOH/POH for GTO Traction Converter.

b. Cost per loco for comprehensive AMC for the work specified and also during IA/IB/IC/MOH/IOH/POH for GTO Auxiliary Converter.

c. Cost per loco for comprehensive AMC for the work specified and also during IA/IB/IC/MOH/IOH/POH for MICAS VCU.

d. Cost per loco for rehabilitation card as specified in Para 5.16 Table – 4.

It may be noted that the presently the AMC is comprehensive in nature. Therefore, no separate cost shall be paid for the repair of the PCB cards other than the cost of rehabilitation as quoted by the Contractor in present AMC for the cards due for rehabilitation. This may be taken into account while quoting the rate.

11.0 **Application to the Class of Locomotives:**

GTO based Traction Converter (SR), Auxiliary converter (BUR) and MICAS based Vehicle Control unit (VCU) fitted in 3-Phase electric locomotives type WAG9/WAG9H/WAP5/WAP7.

12.0 **Agency of Implementation:**

All Electric Loco Sheds Holding 3-Phase Electric Locomotives.

13.0 **Periodicity of Implementation:**

Minor Schedule Inspections (IA/IB/IC), MOH, IOH, POH Overhauling Schedules and any other unscheduled maintenance.

16/08/16

(Suresh Kumar)
for Director General (Elect.)

Encl: Nil