

East Central Railway

Office of
General Manager
(Signal & Telecomm)
ECR, Hajipur

No: ECR-HQOSnT(OTH)/07/2024
(CN- 279039)

Dated: 26.07.2024

CSTE/Works, CSTE/C/North/MHX,
CSTE/C/South/MHX, Dy.CSTE/Works
Sr.DSTEs
DHN,DDU,DNR,SEE,SPJ
East Central Railway

Sub: Quality improvement in execution of S&T works.

Ref: i) Signal policy no.- 10/2024 dt. 14/05/2024- Structured testing of EI/PI/RRI system before commissioning.

ii) Signal policy no. 12/2024 dt. 02/06/2024- Application format for PCSTE's approval for Non-interlocking of stations.

For insuring quality of execution of S&T works, a quality audit of the works is to be conducted before commissioning of any S&T works. For this purpose, executing agencies shall approach the HQ for nomination of a Officer for the quality audit. The audit performa as enclosed shall be submitted to the nominated officer who shall audit & submit the report with clear recommendation of additional works to be done for ensuring quality work to HQ with a copy to the executing agency.



(D.K. Chand)

Dy/CSTE/Signal/HJP

Table - I**Checklist for application for QA officer nomination**

S.No.	Description of documents	Status with PDC for incomplete work
1	Pre Quality Audit Inspection Report	
2	Pre-Commissioning Checklist for EI, IPS, UFSBI/SSBPAC, SSDAC/HASSDAC, MSDAC, Data Logger, LED, ELD, ELB, AFDAS etc.	
3	Cable Route Plan and Cable Core Chart	
4	Cable Depth Record in A4 Size,	
5	Joint Cable Meggering Record	
6	Joint Earth reading of the various earth provided; Earthing arrangement diagram	
7	Track Circuit Bonding Plan	
8	Signal Sighting Committee Report	
9	Implantation of Signal	
10	Testing record of Selection Table/Table of Control, FAT & SAT.	
11	Copy of CRS sanction/authorization letter	
12	Technical System Application Approval (TSAA) for Electronic Interlocking	
13	Inspection Certificates of RDSO for EI, UFSBI, IPS, Axle Counters, Data Loggers, Relays, Battery Chargers, Cables, ELDs etc.	
14	Works to be done during pre-NI & NI alongwith Green Notice	
15	Work ready for interlocking certification for CSTE's approval, if required.	

Signature of Dy.CSTE (applying officer)
(Executing Agency)

Table – 2

Status of Pre-Commissioning checklist filled by executing officials & OEM

OR

Status of Pre-Commissioning checklist noted during QA

S. N.	ITEM	Available (Yes/No)	Deficiencies noted in these and PDC for rectification	Observations
i	IPS			
ii	LED Signal (Integrated)			
iii	Data Logger			
iv	SSDAC/HASSDAC			
v	Earth Leakage Detector			
vi	ELB			
vii	UFSBI/SSBPAC			
viii	AFDAS			
ix	Electronic Interlocking			
x	MSDAC			
xi	Any other			

(Name, Designation and Signature
of applying authority)

OR

(Name, Designation and Signature
of QA officer)

Table - 3

Pre-Quality Audit Inspection Report/QA Inspection Report

i.c.with _____ station on date _____

S.N.	ITEM	Observation	PDC for rectification
a)	Earth and SPD		
i	IPS provided with B&C class SPD connected to earth with earth resistance less than 1 ohm.		
ii	Earth of Resistance less than 1 ohm for Electronic equipment's with equipotential bonding as per RDSO guidelines.		
iii	Separate earth for Block instruments.		
iv	Earthing of Signals and location boxes.		
v	Earthing/soldering of Cable armors.		
vi	Appropriate Gauge Earth wire (Green Color) provided between Earth Pit to MEBB, MEBB to SEBB and SEBB to Equipment as per RDSO guidelines.		
vii	Nuts/Bolts/Washers used for connection to MEBB/SEBB/ Equipment should be of rust free material.		
viii	Standard size Copper strip to be provided as MEBB and SEBB/ Parametric Bus Bar as per RDSO guidelines.		
ix	All SPDs are indicative type		
b)	Signal		
i	Joint Signal Sighting of new signals has been done.		
ii	Retroreflective Number plates provided		
iii	LED Signal provided (Main, Route, Shunt, C-On, A/AG Marker etc.)		
iv	Implantation of Signal given		
v	If Implantation of Signal is less than 2.36 mtr ladder should be blanked off to a height of 300mm between 2060mm and 2360mm above rail level by providing a metal sheet around the signal post including ladder.		
vi	All openings of Signal unit provided with suitable gaskets and cable/wire entrances are sealed.		
vii	U Locks provided on all Signal Units		

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vii	Separate 630mA fuses for all aspects		
viii	Fuse of Route LED of 100mA		
ix	Excess gap from post to signal unit, surface base to post packed with suitable material		
x	All Signals provided on LHS		
xi	Signals provided on RHS		
xii	Other Observations, if any		
c)	IPS & Power Supply Arrangement		
i.	Input Supply Arrangement (Availability of AT, Local, DG and Solar supply to be checked)		
ii	Availability of exhaust fan in IPS & Battery room		
iii	Load Sharing SMR provided in N+1 configuration		
iv	DC-DC converters for Relay Internal provided in N+2 configuration.		
v	N+1 configuration provided for other circuits in DC - DC converters		
vi	Auto transferring of load of signals from Inverter-1 to Inverter-2, Inverter-2 to CVT, CVT to Inverter-1 is functional.		
vii	Point machine supply fuse rating is 20Amp		
viii	Nearest wall to IPS cabinet distance of minimum 1 mtr from sides & rear and minimum 2 mtrs in front is available.		
ix	Cold Standby as per RDSO Specifications.		
x	Spares and T&P as per RDSO specifications		
xi	Spare wires available between Main supply distribution board to CT rack for Internal, External & Point supply duly terminated at both the end.		
xii	Spare cables between Change Over Panel to IPS SPD box duly terminated at both ends with changeover arrangement.		
xiii	Availability of Ring supply arrangements for: -		
a.	24V DC supply		
b.	60V DC supply (where applicable)		
c.	110V AC supply		
d.	Along with Zone wise/Line wise bifurcation of 24V/60V DC external supply.		
xiv	Separate 24V DC/110V AC in ring arrangement for LC gates located in station yard		

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xv	Separate cables with path/trench diversity for extension of 230V AC (or 110 V AC) to LC Gate located outside station section but within 2 km of station		
xvi	For Cut-in-Arrangement in Block section- Supply from two sources with changeover arrangement		
xvii	Availability of Supply arrangements in Relay Hut (for Distributed EI)		
a.	Input Supply Arrangement (Availability of AT, Local, DG and Solar supply to be checked)		
b.	AT Panel/CLS Panel to be outside		
c.	Each RH should have one power supply input from Centre and another from nearest AT		
d.	Cable for Power Supply arrangement as per RDSO TAN no. STS/E/TAN/3012 ver 3.0)		
xviii	7 potential free contacts provided in the IPS i. Inverter 1 fail, ii. Inverters 2 fail iii. FRBC output fail, iv. DC – DC converter fail, v. Mains fail, vi. Call S & T staff, vii. Battery low (50% deep discharge) wired (digital inputs) with Data logger. To be checked by generate faults		
xix	SMS generation of above faults as mentioned in para xvii through Data logger		
xx	SM Monitoring panel provided & proper function To be checked by introducing faults in IPS for all functions.		
xxi	Other Observations, if any		
d) IPS Battery: -			
I	Type (LMLA/VRLA), capacity and make of batteries.		
li	Physical condition of battery		
lii	Charging- No of cycles, Back up time etc.		
iv	Date of Installation Written on each battery		
v	Date of manufacturing (if more than 02 years old special note)		
e) Track Circuit			
i	Double bonding provided		
ii	Plug-in type Track Relay provided		
iii	Whether sufficient battery provided?		
iv	Whether choke provided?		

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v	Fixing of TLJB at rail level (Top surface of which shall not go beyond 1 feet above rail level)		
vi	Whether all type traction bonds i.e. structure, transverse, cross and continuity bonds are provided?		
vii	Whether GFN liners and rubber pads available?		
viii	Whether J-type pendrol clip provided on glued joints?		
ix	Batteries for TC provided in separate location boxes		
x	Date of manufacturing (if more than 02 years old specific note)		
xi	3 Batteries provided for each TC.		
	A. Charging,		
	B. Voltage		
	C. Date of Installation written on Cells		
	D. All battery connection done using Proper lugs		
xii	Track Feed Charger and Battery wired in V Connection to ensure both are not disconnected simultaneously		
xiii	+ve and -ve rail are wired as per TC Bonding plan		
xiv	Series wiring of point zone as per NR practice/guideline		
xv	Jumper cable is tied on wooden sleepers using iron clamps/hooks or on PSC sleeper's jumper cable tied by using clamps as per NR policy no. 2/16		
xvi	Provision of Dual detection to be checked in conjunction with SIP & as per HQ letter no.256-Sig/O/SG/ Pt.XIV dt. 01.02.2017 for:-		
1	Track Circuits, which are prone to failure during monsoon season		
2	Track Circuits, which are prone to failure on account of their location being on a curve and/or in iron or area or any other area, where the Track circuit fail due to shorting of the insulated glued joints or leakage of current through the sleepers to ballast.		
3	On bridges provided with steel channel sleepers.		
f)	Relay Room		
i	Proper wire for wiring of relays (16/0.20)		
ii	Metal to Carbon Relays of after Feb-2008 only to be provided in A, B & C route.		

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iii	For Metal to Carbon Relays, no of contacts in a circuit should be limited to 45.		
iv	Whether approved relay connectors provided?		
v	Relay based Flasher provided		
vi	Whether HR/ASR indication board provided in relay room?		
vii	Bunching, dressing & lacing of wiring completed		
viii	Insulation of relay rack		
ix	Diagnostic Panel provided		
x	Inter relay rack distance 1 meter and wall to rack distance 1.5 m available.		
xi	Parallel loading of contacts of all-important relays.		
xii	Whether contact resistance of all Relays is measured for all Relays before use Nos. of Relay discarded during such testing to be mentioned.		
xiii	Date of manufacturing		
xiv	If more than 02 years old, special note for Relays, preventative action taken		
xv	AFDAS provided		
a.	Type (Fire Detection and Alarm System/ Fire Detection and Alarm System alongwith Suppression System)		
b.	Wired with Data Logger for SMS generation		
xii	Fire Extinguisher provided outside Relay Room as per HQ guidelines		
xiii	All cable entry point from outside are sealed		
xiv	Door & windows are properly closed for dust proof environment		
xv	Cable duct in Relay Room/RH is properly filled up by sand alongwith RCC cover		
xvi	All opening in Relay room/RH to be plugged		
xvii	Availability of Air conditioner		
xviii	Availability of micro controlled for preventive continuous operation of AC		
g)	Fuses		
i	NDT, HRC fuse of app. Type		
ii	Fuse blow off indication		

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iii	Provision of PPTC fuse as per HQ letter no. 109-Sig/380 dt. 31.01.2017 for outdoor circuits of TPR, NKPR/RKPR etc as referred/specified in above mentioned instruction.		
iv	Fuse Automatic Changeover system		
v	Description of fuses is written		
vi	Test check done with main fuses		
h)	Control Panel		
i	Domino type panel		
ii	Button stuck up alarm provided		
iii	Working of Veeder Counters		
i)	Data Logger		
i	Whether Configuration/design/wiring is as per diagram approved by HQ?		
ii	Contacts of all Relays, IPS, ELD, Track feed battery charger & AFDAS taken in Data logger		
iii	To be checked all faults logic		
iv	To be checked simulation as per yard layout		
v	To be checked Output report relating maintenance, safety and operations		
iii	To be checked software for ELD monitoring for temporary faults.		
iv	Monitoring of Relay Room Opening		
v	Validation		
vi	Networking		
a	By 2MBPS		
b	By voice channel		
vii	Data Acquisition equipment inside relay room.		
viii	Maintenance Interface outside Relay room but secured		
ix	Availability of power supply for Data Logger from IPS separate module		
x	Availability of uninterrupted power supply for Data Logger PC & monitor and to be checked backup		
xi	Availability of Printer		
x	Connectivity with CMU		
xi	a) Time synchronize with EI.		
	b) Time synchronize with other than EI.		
j)	Cable as per NR policy circular no. 2/16		
I	20% spare conductor in each Main cable. Thereafter 10% spare conductor in tail cables.		

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ii	Duplicated Power cable arrangement for installations with more than 100 routes.		
iii	Signalling cable from Home to Home Signal laid in RCC duct.		
iv	Signalling cable in Automatic Signalling territory, between Advance Starter of one station and Home Signal of other station laid in RCC duct.		
v	Signalling cable during Track Crossing laid in DWC-HDPE pipe		
vi	Signalling cable during Road Crossing laid in GI pipe		
vii	Cable laying on Bridges/Culverts as per NR policy circular no. 2/16		
viii	Spare conductors shall be provided on the outermost layer.		
ix	Two numbers of minimum 12 Core dedicated spare cables from home signal to home signal laid and terminated in all locations for cable failures and cable testing.		
X	Provision of Cable huts, where ever too many locations boxes (> 10) are expected to come, in lieu of location boxes for security, proper protection and ease of maintenance.		
xi	Provision of line wise/function wise Signalling cable		
xii	All cable entry points in cabin, relay room, battery room, SM's room, location boxes, location huts, junction boxes, etc. must be closed with suitable masonry works, sand covering and plastering to prevent entry of rats etc.		
xiii	RCC slab provided on the cable pit of cabin and relay room/station.		
xiii	RCC slab provided on the cable pit of cabin and relay room/station.		
xiv	Cable Markers		
xv	Provision of ELD		
a.	At station		
b.	At Relay hut (for distributed hut)		

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k)	Block working		
i	Media redundancy OFC & Quad (one system on dark optical fiber or dedicated E1 channel (point to point) and the other system on 6 quad cable.)		
ii	Two set of independent cables shall be provided between locations to station for Individual systems for HASSDAC		
iii	Automatic Media changeover		
iv	Condition of Quad Cable (Insulation resistance, dB loss etc.)		
v	Power supply arrangement through battery charger suitable for Axle Counter working or through IPS		
vi	Provision of dual detection as per Railway Board's. Policy letter no. 2007/Sig/M/7/Genl. Dt. 28.08.2008, 2012/Sig/M/DAC/DD dt. 31.12.2013 & 256-Sig/O/SG/Pt.XIV dt. 01.02.2017.		
a	On Auto section, where train density is more than 70 trains each way.		
b	For Axle Counters used for IBS and BPS.		
1	For SSDAC/HASSDAC		
i	Separate cable for 24V DC supply for each unit of HASSDAC.		
ii	Separate set of IPS modules for each unit of HASSDAC.		
iii	Separate quad cable for each unit for local connection Relay room/RH		
l)	Testing and Measurements		
i	Cable Meggering and pairing		
ii	Wire count test		
iii	Bell test		
iv	Break test		
V	FAT certificate (In case of EI)		
vi	Selection table Test		
vii	Square sheet		
m)	Observation regarding work in yard area		
i	Location Boxes		
	-Earthing		
	-Painting inside and outside		
	-Numbering and labeling		

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	-Sand filling		
	-Proper fixing of relays, Terminals, wooden planks etc.		
	-Soldering of cable armors with catenary		
	-Earthwork around foundation		
	-Foundation as per HQ guidelines		
	-Other Observations		
ii	Point machines		
	-Cable entry in JB is not rubbing with JB edges or any other sharp edges		
	-oiling and greasing		
	-Ground connections are free from Obstructions		
	-JB is properly fixed and earthed. All Cable armors are earthed.		
	-Connection to Point Machine is laid in Pipe		
	-Wires are properly laid inside machine and terminated		
	-Ward plate as per CH is provided		
	In case of TWS: <ul style="list-style-type: none"> - MS flat tie bar with U clamp (bend) between sleeper 1 to 4 on opposite side of point machine. - MS Flat tie bar between sleeper 1 to 3 on point machine side - Metal liners provision 		
	Other Observations		
iii	Siding point		
	-Condition of Transmission		
	-Proper stroke is available at both ends		
	Other observations		
iv	L-xing gate (MLB/ELB)		
	-Condition of Rodding /Wire transmission in case of MLB		
	-Working of Road Signals		
	-Working of Hooter		

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	-Gate Signal- Approach locking, Warning available (wherever applicable)		
	- CH for emergency operation provided as per GWR		
	-All indications and operations provided as per SWR/GWR		
	-Emergency Sliding Boom outside lifting barrier		
	-Input Supply Arrangement (AT, Local, DG and Solar supply)		
	-Clearance between the road surface and the boom is 0.8 to 1 mtr.		
	-Time of operation less than 12 seconds at rated voltage.		
	-Positive boom locking is effective		
	-Boom painted alternately with 300mm bands of black and yellow colour and additionally provided with luminous Stripes.		
	-600mm Red disc provided at the center of boom, with red reflector buttons/luminous stripes facing road traffic. Disc marked with "STOP" sign of 50mm width in white luminous paint/stripes.		
	-LED type boom light provided at the center of the boom.		
	-Road signal with hooter for road users		
	-Location of LC Gate from adjacent Station		
a	If less than 02 KMs , supply from the station shall be extended through separate MCBs to LC Gate goomty.		
b	If more than 02 KMs A separate set of ATs and power supply control panel provided.		
c	Signals have battery backup for lighting		
	-Other Observations		
v	Crank handle		
	-KLCR fixed and wired properly		
	-Magneto Phone provided in CH location boxes		
	-CH with proper ward/key provided		
	-Padlock for SM provided		
	-Numbering/labeling of cable termination done		
	-Other observations		

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n)	DG Set		
i	Remote Operation		
ii	Change over switch between commercial supply / AT & DG sets provided?		
iii	Earthing		
o)	Electronic Interlocking		
1)	Power Supply arrangement:		
i	The 110 volt DC supply from IPS room to EI rack provided with duplicated cable of suitable gauge to ensure that voltage drop in cable is not more than 1.0 volt from IPS		
ii	The DC-DC converters provided for EI segregated for 'A' & 'B' systems along with segregation of cabling and termination for power supply up to DC-DC converters, for all the converters & shall be in N+1 configuration.		
iii	The DC-DC converter shall be installed near to EI rack or in the EI rack itself to avoid the line drop. The line drop shall not be more than 0.5volt.		
iv	For better reliability each OC, CIU have separate DC- DC converter preferably near the CIU, OC rack & shall be in N+1 configuration. The 110 V supply shall be taken from IPS battery bank to CIU, OC and PPM rack in redundant manner with separate core of wires.		
v	Where Panel Processor module is installed in SM room, the 110 volt DC power supply provided from EI or from IPS room with duplicated cable arrangement. The Panel Processor module have separate DC-DC converter in N+1 configuration.		
vi	24 V or 110 V DC supply for fan fed with separate external (IPS) supply, isolated from EI supply and provided with fuse.		

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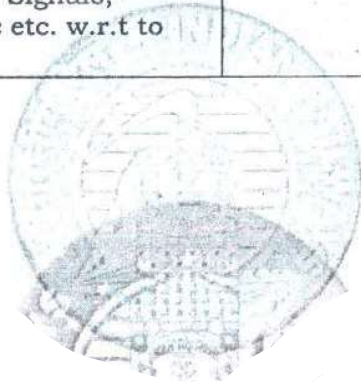
2)	Communication arrangement:		
i	The panel processor preferably housed inside CCIP and connected with EI on OFC cable in redundant manner in separate duct pipe to avoid failure due to cutting of OFC.		
ii	EI to VDU, CPU to CPU(in case of distributed system), CIU to Object Controller(in case of distributed system) & EI to Panel Processor Module connectivity planned with OFC cable to avoid damage due to surge and lightening. The optical modem is of industrial grade with operating temperature range of 0 to 70degC.		
iii	The communication line between the CPU's, CPU to PPM, CPU to OC and VDU provided in the ring system (Redundant manner) to avoid failure due to loss of communication. The OFC and other network provided with NMS.		
3)	Earthing arrangement: (For all EI's except Kyosan make K5BMC EI)		
i	Earthing provided as per RDSO's TAN, STS/E/TAN/3006Ver.1.0 dt 02.11.2012.		
ii	Class A protection provided on top of the building.		
iii	Copper tape (Bonding ring conductor) as per drawing mounted on insulated standoff is provided to cover the maximum area in the Relay room, Power room & Equipment room and the connection to equipment shall be made at the nearest point.		
iv	As far as possible, Railways shall make attempt to provide earthing in such a way that it can cover most part of the building. This is to ensure that earth resistance shall be less than 1ohm at the equipment.		
v	The interlinking of all Relay racks, as well as EI racks shall be ensured.		
vi	All the cable trough and ladder shall be earthed properly.		
4)	Synchronisation with Data Logger:		
i	Synchronization of the EI clock and data logger clock through CMU in network condition verified and certified at minimum Assistant Officers' level.		

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ii	The analog monitoring of output of DC-DC converter of EI wired into data logger for monitoring the healthiness of converter.		
5) Wiring Practice:			
i	The input, output, data and power supply cable shall be routed indifferent cable troughs separated with a gap of minimum 6 to 8 inches.		
ii	The input and output cables (RDSO approved) of EI twisted to minimize EMI & EMC effect.		
iii	The fuse terminals fixed with proper fuse rating marking, fuse number and should be of indicative type.		
iv	The lightening and surge protection devices installed as per concerned EI installation document.		
v	Wire ends properly crimped with correct size of lugs & there are no loose connections at the terminals end. Ensured and verified at site min. by Assistant Officers' level.		
6) Cyber Security aspects			
I	Any unauthorized software should strictly be prohibited in VDU PC, MT PC and Data logger PC		
ii	Wireless keyboard and mouse should not be used on VDU PCs, MT PC and Data logger PC.		
iii	Use only genuine operating system and other software products in the system		
iv	Unused ports should be disabled.		
V	Any other as per RDSO TAN no. EI/TAN/Security ver 1.0 dated 01.03.23.		
7) Miscellaneous:			
I	The Pre-commissioning checklist (as issued by RDSO for OEM) checked at site at minimum Assistant Officers' level jointly with the executing OEM or as per the guidelines on the matter.		
ii	OEM Certificate of installation available.		
iii	To be checked Power supply for VDU monitor provided through separate inverter at SM room with redundant arrangement.		
iv	The input and output details and logic scrutinised and verified at min. JAG level Officer before commissioning.		

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p)	General		
i	Approved Cable Route Plan updated/modified, as per actual cabling done, indicating distance of cable, cable crossing locations with respect to fixed Structures		
ii	Cable core plan- Certified by Executive Engineer as per site		
iii	Track jumper plan- Certified by Executive Engineer after testing-As built		
iv	HQ approved circuit diagrams, ST, PD, SIP, Application Logic, Interface drawing- duly certified by Executive Engineer after testing.		
v	Infringement of Signaling assets/equipments i.e. Signals, Location boxes, Pt m/c etc. w.r.t to BG SOD 2022		



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Table 04**Training of Modern Equipments**

S.No.	Description	Nos. of Supervisors trained	Nos. of Maintainer trained	PDC for remaining staff with details of staff
1	Electronic Interlocking			
a	Nos. of staff trained with OEM at OEM Premises			
b	Nos. of staff trained with OEM at On-Site training			
c	Nos. of staff trained with OEM for Trouble shooting.			
2	UFSBI			
a	Nos. of staff trained with OEM at OEM Premises			
b	Nos. of staff trained with OEM at On-Site training			
c	Nos. of staff trained with OEM for Trouble shooting.			
3	IPS			
a	Nos. of staff trained with OEM at OEM Premises			
b	Nos. of staff trained with OEM at On-Site training			
c	Nos. of staff trained with OEM for Trouble shooting.			
4	SSDAC/HASSDAC			
a	Nos. of staff trained with OEM at OEM Premises			
b	Nos. of staff trained with OEM at On-Site training			
c	Nos. of staff trained with OEM for Trouble shooting.			
5	UFSBI/SSBPAC			
a	Nos. of staff trained with OEM at OEM Premises			
b	Nos. of staff trained with OEM at On-Site training			
c	Nos. of staff trained with OEM for Trouble shooting.			
6	Availability of Manuals (EI,IPS,DAC,UFSBI/SSBPAC)	YES/NO		
7	Availability of Training monitor	YES/NO		
8	Availability of Trouble shooting guide/Chart/Board/Flow chart	YES/NO		

(Name, Designation and Signature of applying authority **OR** QA officer)

Table 5**Brief on deficiencies noted during Pre QA/QA inspection:**

Table No./ Para No.	Item	Status	PDC

Dy.CSTE/Sr.DSTE/ _____
QA officer

Dy.CSTE/Sr.DSTE/ _____
Executing agency



Copy to:

- 1) PCSTE/ECR for kind information please.
- 2) CSE-I/ECR for kind information please.
- 3) CSTE/Works & CSTE/Con/N & S/MHX for kind information please.