

# KARNATAKA POWER TRANSMISSION CORPORATION LIMITED

No. CE(E)/Trans/BZ/CYS- 35  
Encl: One Hand Book.

Office of the  
Chief Engineer, Electy.,  
Transmission, Bangalore Zone,  
KPTCL, A.R. Circle,  
Bangalore-09.  
Date: 22 - 11 -2005

## Circular

Sub: Hand Book of Maintenance Schedule for Stations  
and Transmission Lines.

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The mission of the Karnataka Power Transmission Corporation Limited is to ensure reliable quality Power. This objective can be achieved by ensuring high order Maintenance of Station equipments and Transmission Lines.

Proper Maintenance of Station equipments and Transmission Lines help to reduce scheduled outages and increase the stability and Reliability of Power systems. Systematic and regular maintenance works is a pre-Requisite for a healthy Power system.

With this in view, The Corporate Office has brought out detailed Maintenance schedules for Stations and Lines. However, these Maintenance schedules are not practiced in the field, resulting in unscheduled Power interruptions and there by decreasing the Power Availability / Reliability.

Therefore, the need of the hour is to carry out periodical Maintenance works in a systematic manner to achieve maximum Availability / Reliability.

To carryout the periodical Maintenance works on station Equipments and Transmission Lines, a "**Hand Book of Maintenance Schedules for Stations and Transmission Lines**" has been brought out and annexed to this circular for your reference.

Please note that the various schedules mentioned in this Hand Book are only indicative and not exhaustive.

The Executive Engineers, Elec., TL & SS Divisions are requested to get familiarised with the various schedules mentioned in the Hand Book and implement the same in their Divisions.

The following Guidelines are suggested to be practiced while taking up preventive Maintenance works as detailed in the Hand Book.

- ✓ Meticulously plan the maintenance works well in advance.
- ✓ Obtain the concurrence of the jurisdictional BESCOM O & M Executive Engineer, Elec., for taking up the Maintenance works planned on a notified Day.
- ✓ Ensure that the power shutdown Notification is notified in the Local news papers.
- ✓ Organize the men and materials required for the Maintenance works.
- ✓ Commence and complete the work with in the shutdown period notified.
- ✓ Create a safe working zone for the working personnel and cause supervision by authorised personnel.

The Superintending Engineers, Elec., (Transmission) (Maintenance), shall monitor the Maintenance works in their Circles and ensure that they are executed on the dates planned.

With the implementation of various Maintenance works as detailed in the Hand Book, ensure that the Power interruptions are totally eliminated and 100 % reliability is achieved.

Breakdown maintenances should became history of yester years.



Chief Engineer, Elec.,  
Transmission, Bangalore Zone, KPTCL,  
A.R.Circle, Bangalore-09

To,

- 1) All the Superintending Engineer, Elec., (Transmission) & (Maintenance) Circles, Bangalore Transmission Zone.
- 2) All the Executive Engineer, Elec., TL & SS Divisions, Bangalore Transmission Zone.
- 3) All the Asst. Executive Engineer, Elec., TL & SS Divisions, Bangalore Transmission Zone.
- 4) All the AE's/JE's (Ele), (Maintenance), TL & SS Divisions, Bangalore Transmission Zone.

**Copy to:** 5) Executive Engineer, Elec., (Office), KPTCL, Bangalore Transmission Zone.

6) Master File

**KARNATAKA POWER TRANSMISSION CORPORATION  
LIMITED**

**Bangalore Transmission Zone, Bangalore.**

**Hand Book of Maintenance  
Schedule for Stations and  
Transmission Lines.**

**Maintenance Schedule for Stations and Transmission Lines.**

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**DAILY Maintenance works:**

**ALL EQUIPMENTS**

- \* General cleaning of control and Relay panels, Battery chargers and other equipments in control room.
- \* Inspection of Battery charger.
- \* Visual inspection of Oil level in bushings, O.L.T.C, silica Gel in Breakers.
- \* Recording number of OLTC operations in a day and recording cumulative number of operations.
- \* Observing abnormal change in transformer humming sound.
- \* Cleaning of out door yard, Earth Electrode pits.
- \* Inspection of ODY for Arcing / Oil leakages. (Day & Night peak hours)
- \* Operation of DG sets & to run for 10 minutes.
- \* Review of Log Books / Reports of Shift Engineers.
- \* Check functioning of the cooling fans (Day & Night peak hours)

**Weekly Maintenance Works.**

**ALL EQUIPMENTS**

- \* Inspection of the level of Electrolyte in Batteries and topping up with distilled water, (if necessary.)
- \* Inspection of Oil level and condition of Oil in Air compressors.
- \* Draining of condensed water in Air receiver tanks of breakers.
- \* Checking of Auto Start / Stop of Compressors / Pumps of Breakers.
- \* Checking of Alarm and lock out for Air / Gas in Breakers.

**Monthly Maintenance works.**

**ALL EQUIPMENTS**

- \* Cleaning and applying petroleum Jelly for Battery terminals.

## Transformers

### Quarterly

- \* Cleaning of all bushings.
- \* Checking of Bushings and oil level.
- \* Tightening Earthing cap of Capacitor bushing.
- \* Checking of fans, pumps, Oil coolers for auto start / local / Remote start / stop.
- \* Checking of Oil leaks, (if any) and rectification.
- \* Checking OLTC and its drive mechanism for local / Remote operation and lubrication.
- \* Air release in main tanks/ Bucholtz Relays, bushings turret.
- \* Checking transformer Alarm / Trip Circuit.
- \* Tightening Transformer Neutral earth connections.
- \* Pressure checking of nitrogen injection fire protection system.

### Half Yearly

- \* Measurement of IR values and P I for condition monitoring.
- \* Testing of bottom oil of main tank for B.D.V (By R & D wing) and taking corrective action as suggested by R & D.

### Yearly

- \* Testing of main tank Oil for DGA / PPM etc.,
- \* Replacement of OLTC oil for every 5000 operations / once in a year, whichever in early.
- \* Check Transformer alarm, trip Circuits for Bucholtz Relay, PRV, OLTC, Diverter etc., after Switching of nitrogen injection fire protection system.
- \* Check oil level in OTI, WTI sensor pockets.
- \* TAN-Delta and capacitance Measurement.
- \* Check operation of Bucholtz Relay by Electrical air injection for Alarm trip.
- \* Check the contacts for OLTC, fan, Pump control.
- \* Tightening of terminals and vermin proof of marshaling box.
- \* Oil temperature reading comparison with external thermo meter in OTI Pocket.
- \* Checking arcing horn gaps of bushings.

## **BREAKERS**

### **Quarterly**

- \* Maintenance as per manufacturers manual.
- \* Checking of compressed Air and SF 6 gas pressures.
- \* Rectification of leakages, if any.
- \* Recording No of operation of counters.
- \* Lubrication of operating and linkage mechanisms as well a trip and close mechanism.
- \* Replacement of oil in MOCBS as per manufacturers recommendations.
- \* Tightening of clamps, pump connections, auxiliary switch connections.
- \* Checking closing and tripping of breakers through local / remote switch and relays.
- \* Check capacitor tripping device operation by removing D.C supply.
- \* Checking or pneumatic drive, hydraulic fluid and SCADA operation, wherever provided.
- \* Checking of Anti pumping relay.
- \* Check for smooth contact of all contactors and spray of rust lick for contacts mechanism.
- \* Check for vermin proofing.
- \* Check control wiring.

### **Half Yearly**

- \* Changing of compressor oil.
- \* Measure IR values.
- \* Tighten control circuit / terminals.

### **Annually - ( F O R E . H . V Breakers)**

- \* C.B timeing checkings (in association with RT / Research)
- \* Contact Resistance (in association with RT / Research)
- \* Pole Discrepancy Relay check.
- \* Operation of lockout check.
- \* Measurement of Tan-Delta & capacitance / by RT / Research.
- \* Checking of Earth connections.
- \* Detailed check up of breaker operating mechanism compressors / lubrication of drive mechanism / pneumatic drive.
- \* Over hauling of breaker mechanism / (as per manufacturers recommendation)
- \* Over hauling of breaker interrupter / (as per manufacturers recommendation)



**Current Transformers, Potential Transformers, C.V.T.S**

**Quarterly**

- \* Checking for oil leaks and oil level (CT, PT & C.V.T)
- \* Visual Inspection of HF point bushing for damages and earthing, if not used for P.L.C.C..
- \* Measurement of Voltages in marshalling box and control room.

**Cleaning**

- \* Checking & Tightening of secondary wiring and vermin proof of marshalling box.
- \* Check the earth connection / secondary circuit.
- \* Checking and tightening of jumps & clamps.

**Yearly**

- \* Check earth connections.
- \* Measure IR values.
- \* Checking of primary jumper clamps & primary connection of CTS.
- \* Vermin proof and secondary terminal box.
- \* Measurement of tan delta and capacitors for 220kv only.

**Isolators (EB or without EB)**

**Quarterly**

- \* Check linkages for simultaneous operation.
- \* Check earth switch Copper flexible.
- \* Check earth connections of earth blade.
- \* Clean Insulators and check for cracks.
- \* Check interlocks.
- \* Clean main contact, earth blade and spring assembly.
- \* Apply petroleum jelly to contacts, moving parts, bearings.
- \* Check working of auxiliary switches and control wiring.
- \* Check operation of Isolators and indication / remove / SCDA.

**Capacitor Bank - Quarterly**

- \* Checking blown out External fuses.
- \* Checking of leakage Oil / bulging of capacitors.
- \* Capacitance measurement and balancing.
- \* Check clamp, jump, earth connections.
- \* Recording Miliamps Meter reading, Intimate to R.T. Staff if it Exceeds 10 mA.

### **Lightning Arrestors - Annually**

- \* Cleaning of L.A STACKS.
- \* Observe cracks.
- \* Check earth connections.
- \* Determine IR values for comparison with previous values.
- \* Check for leakage current and surge counter (Note the initial readings of leakage current. If the current measured is Twice the initial reading, clean the L.A. If the measured current does not decrease, replace the L.A)

### **General**

#### **Quarterly**

- \* Check out door yard illumination & replace yard lighting (bulbs,) wherever necessary.
- \* Cleaning of control and relay panel, vermin proof for cable entry, earth connections.
- \* Cleaning of battery charger & checking of earth connections.
- \* Weighing of CO2 cylinders.
- \* Checking of fire hydrant extinguishers.

#### **Annually**

- \* Cleaning of auxiliary transformer, checking HV / LV connections, Neutral and earth connections.
- \* Checking of DC Emergency lamps in control Room.
- \* Tightening of cable, connections, breakers, checking LT - AC Breaker , operation, vermin proof for cable entry in AC and DC panels.
- \* Replenishing of fire extinguishers.
- \* Painting of name plates, phase indication, bay indication and earth electrodes.
- \* Earth resistance of all equipments.
- \* Inspection/Over hauling of OLTC in Transformers 25000 operational or 2 Years, whichever is earlier, with Oil replaced or as recommended by the Transformer supplier.

**Out door Yard**

**Annually / Half yearly**

- \* Gross grown to be cleaned.
- \* Check Tightness of PG / T clamps.
- \* Clean bus bar strung insulators.
- \* Check for Hotspots using thermo vision camera with the assistance of Hot Line staff.
- \* Check damages to ACSR conductor in jumps.
- \* Apply petroleum jelly and tightening of spacers in case of dabble conductor bus.
- \* Tightening of clamps of expansion joint in case of Rigid bus.

**11KV Switchgears**

**Quarterly**

- \* Check DC and control circuit wiring.
- \* Check closing and trip operation mechanism.
- \* Measure IR values.
- \* Apply petroleum Jelly for auxiliary switches.

**Half Yearly**

- \* Vermin proof for cable entry.
- \* Cleaning and lubricating of mechanism.
- \* Check the condition of contacts.
- \* Tightening cable connections and measure IR values of cables.
- \* Check earth connections of cables and DP Structure earth electrodes.
- \* Testing of SF6 gas pressure switches.

**Yearly**

- \* Check earthing of switchgear, potheads, CTS, PTS, Isolators, Cable & DP Structures.
- \* Clean bus bar and measure IR values.
- \* Calibration of relays and meters by RT wing.

Maintenance Schedule planner for the year - 2005 - 2006

Sl. No	Frequency	Date on which maintenance works are planned	Date of execution	Details of maintenance work carried out in Brief	Remarks
<b>I</b>	<b>Quarterly</b>				
<b>a</b>	<b>I quarter (Between Jan &amp; March)</b>				
<b>B</b>	<b>II Quarter (Between April &amp; Jun)</b>				
<b>C</b>	<b>III Quarter (Between July &amp; Sept)</b>				
<b>D</b>	<b>IV Quarter (Between Oct &amp; Dec)</b>				
<b>II</b>	<b>Half yearly</b>				
<b>A</b>	<b>Ist Half (Between Jan &amp; Jun)</b>				
<b>B</b>	<b>IInd Half (Between July &amp; Dec)</b>				
<b>C</b>	<b>Annually (Between Jan &amp; Dec)</b>				

Note:

- 1) Half Yearly maintenance works may be clubbed with quarterly maintenance works planned for IInd and IV quarter.
- 2) Annual maintenance works shall be clubbed with quarterly / half yearly maintenance works planed for IV quarter / IInd half yearly.
- 3) Simultaneous planning be made to carryout maintenance activities of down stream stations to reduce out ages as far as possible.

**Transmission Lines.**

**Maintenance Schedule**

**Vulnerable and Normal Sections**

Line sections may be classified as normal section and vulnerable section, based on the experience gained over years in carrying out the patrolling and maintenance.

**Vulnerable Sections**

- \* All lines emanating from Generating stations.
- \* All lines of 220KV and 400KV.
- \* Portion of lines passing through high / fast tree growth areas.
- \* Areas prone to theft / flux / soil erosion / hilly tracts /level crossing.

**Normal Line Section.**

Portion not prone to frequent defects and not covered under vulnerable section.

**Frequency for Patrolling**

Sl. No.	Section	Frequency
1	Normal	Quarterly
2	Vulnerable	Monthly

**Forms:**

Form 1	Patrolling programme
Form 2	Patrolling Report
Form 3	Log book of line patrolling and maintenance record

**Clearance of Trees, Shrubs etc.,**

- \* Check adequacy of clearance of Trees, Shrubs, Bushes, etc., from line conductor
- \* Cut all Trees, Bushes, Shrubs which infringe on clearance
- \* Small Bushes, Shrubs, Trees should be not be allowed beyond 3 meters
- \* Check grass growth on boundary wall of farms, which can grow to a height to infringe clearance

**Clearances as per I E Rules - 1956**

**Maintain vertical and horizontal, clearance as per the values given below as per IE Rules -1956**

Sl. No.	Description	33KV	66KV	110KV	220KV	400KV
1	Vertical Clarence	3.7M	4.0M	4.6M	5.5M	7.3M
2	Horizontal clearance (on the Basis of Maximum deflection due to wind pressure)	2.0M	2.3M	2.9M	3.8M	5.6M

**Ground Clarence**

1	33KV lines	5.2 Meters	Clarence across or along road any streets shall be 5.8 and 6.1 Meters respectively
2	66Kv lines	5.5 Meters	Clarence across or along any street shall be 6.1Metr
3	110 KV lines	6.1 Meters	
4	220KV lines	7.0 Meters	
5	400KV lines	8.8 Meters	

**Clearance of lowest conductor from Power lines to Telecommunication Lines**

1	From 33 KV lines	2.44 M
2	From 66 KV lines	2.44 M
3	From 110 KV lines	3.05 M
4	From 220 KV lines	4.58 M
5	From 400 KV lines	5.49 M

**Towers**

- \* Check the back filling of foundation of Tower.
- \* Check the concrete of chimney for cracks.
- \* For tower location, provided with revetment ensure that retaining wall is neither broken nor in danger of falling.
- \* Check Earthing of towers.
- \* Check all tower members are intact, in place and not damaged.
- \* Check galvanizing / painting of tower members are in proper condition.
- \* Check there is no corrosion of any part of tower / Hardware.
- \* Check anti climbing devices and barbed wiring are fixed and are in place.
- \* Check the number plate, danger board, phase plate and circuit plate.
- \* Clear all bird nest on tower / cross arms.



**Isolators and Hardware**

- \* Check flash over / chipped insulators.
- \* Test isolators by Hot line method once in a year for healthiness of insulators.
- \* Replace failed insulators.
- \* Check arcing horns for loose connections.
- \* Check vibration dampers.
- \* Check jumpers connections by thermo vision camera by hot line staff.
- \* Check armour rods of suspension clamps.
- \* Check jumper connections at tension point, suspension clamps.
- \* Check earth bond provided on suspension and tension hardware of earth wire.

**Conductor and Earth Wire**

- \* Check for visible damages like cut Strands, deposits, burn marks.
- \* Check midspan joint of conductor / ground wire for damage of conductor and ground wire strands.

# Maintenance Schedule For Transmission Lines

FORM No. - 1

Division.

T.L.M. Sub-Division.

## PATROLLING PROGRAMME

Programme No. : \_\_\_\_\_

01. Name of Office : \_\_\_\_\_

02. Name of the Line : \_\_\_\_\_

03. Name of Junior Engineer : \_\_\_\_\_

04. Month \_\_\_\_\_ Year \_\_\_\_\_

Sl. No.	Date		Section Assigned	Special Instructions
	From	To		

Signature  
Asst. Exec. Engineer, Ele.,  
T.L.M. Sub-Division

# Maintenance Schedule For Transmission Lines

**FORM No. - II**

Division.

T.L.M. Sub-Division.

## PATROLLING REPORT BY JUNIOR ENGINEER

Name of the Line : \_\_\_\_\_

Programme No. : \_\_\_\_\_

DATE OF PATROLLING/MAINTENANCE : \_\_\_\_\_

SECTION OF THE LINE PATROLLED : FROM \_\_\_\_\_ TO \_\_\_\_\_

Sl. No.	Description of Defects	Name of the Location and Tower No.
1.0	<b>FOUNDATION</b>	
1.1	Soil erosion/uneven settlement, earth cutting (Mention leg No.)	
1.2	Any crack or damage to foundation (Mention leg No.)	
1.3	Any crack or damage to retaining wall/revetment	
1.4	Earthing exposed	
1.5	Back-filling required	

**Karnataka Power Transmission Corporation Limited**

## Maintenance Schedule For Transmission Lines

Sl. No.	Description of Defects	Name of the Location and Tower No.					
2.0	<u>Tower</u>						
2.1	Damaged/Missing/Buckled members (Mention No. of missing pieces & Stage)						
2.2	Damaged/Missing/Rusted Bolts & Nuts (Mention Nos. & Stage)						
2.3	Danger Plate Missing						
2.4	No. Plate Missing						
2.5	Phase Plate Missing						
2.6	Step Bolts Missing (Mention Nos.)						
2.7	Anti Climbing Device Missing						
2.8	Protective coating disappeared Rusting of Legs/Members.						
2.9	Foreign Material on Tower						
3.0	<u>Hardware Fittings &amp; Insulators</u>						
3.1	Surface Pollution (Mention Phase & also Ckt. No in case of D/C Line)						
3.2	Unusual deflection of string (Mention Phase & also Ckt. No.)						
3.3	Flash over/Burning Mark on Arcing Horn/ Insulator /Fitting (Mention Phase & Ckt. No.)						
3.4	Any damage to fitting/missing of Arcing Horn (Mention Phase & Circuit No.)						

**Karnataka Power Transmission Corporation Limited**

## Maintenance Schedule For Transmission Lines

Sl. No.	Description of Defects	Name of the Location and Tower No.					
3.5	Number of disc damaged (Mention Phase, Ckt. No. and position from Tower)						
3.6	Check the condition of Suspension/Tension/ P.G. Clamps						
<b>4.0</b>	<b><u>Conductors &amp; Earthwires</u></b>						
4.1	Strands cut & opened of conductors/Jumpers (Mention Phase & Ckt.) and Compression ends.						
4.2	Dislocated/Missing/loose Vibration Damper of Conductor, mention Phase & Ckt.						
4.3	Dislocated/Missing/Loose VD of Earth Wire						
4.4	Earth Bonds Missing/dislocated						
4.5	Tower Foot Earthing						
<b>5.0</b>	<b><u>Electrical Clearances</u></b>						
5.1	Infringement in Horizontal, Vertical Clearance of Conductor with ref. to Trees, Buildings, Roads and other power and communication lines (Mention Phase & Circuit).						
5.2	Details of Trees Causing/may cause problems (Mention no. of Trees)						

**Karnataka Power Transmission Corporation Limited**

## Maintenance Schedule For Transmission Lines

Sl. No.	Description of Defects	Name of the Location and Tower No.				
5.3	Any new construction seen under the line corridor					
5.4	Check guy wires					

Patrolling done by (Name)

Signature of AEE (Ele.) with date

Counter Signature by Exe. Engineer, Ele

Counter Signature by Superintending. Engineer, Ele, T & S

INSTRUCTION IF ANY

Reviewed by  
AEE, T.L.M. Sub-Division,

Signature of Junior Engineer, Ele.,  
T.L.I.

**Karnataka Power Transmission Corporation Limited**

# Maintenance Schedule For Transmission Lines

**FORM No. - III**

Division. \_\_\_\_\_  
T.L.M. Sub-Division. \_\_\_\_\_

## LOG BOOK OF LINE PATROLLING & MAINTENANCE RECORDS.

Name of the Line : \_\_\_\_\_ Village: \_\_\_\_\_  
Location No. : \_\_\_\_\_ P.S. : \_\_\_\_\_  
Type of Tower : \_\_\_\_\_ Dist. : \_\_\_\_\_  
Type of Foundation : \_\_\_\_\_

SI. No.	Description of Defects	Location & Date of Patrolling / Maintenance
1.0	Foundation	
1.1	Soil erosion / uneven settlement/earth cutting (mention leg. No.)	
1.2	Any crack or damage to foundation (Mention leg. No.)	
1.3	Any crack or damage to retaining wall/revetment	
1.4	Earthing exposed	
1.5	Back filling required	

**Karnataka Power Transmission Corporation Limited**

## Maintenance Schedule For Transmission Lines

Sl. No.	Description of Defects	Location & date of Patrolling / Maintenance
<b>2.0</b>	<b><u>Tower</u></b>	
2.1	Damaged/Missing/Buckled members (Mention no. of missing pieces & Stage)	
2.2	Damaged/Missing/rusted Bolts & Nuts (Mention nos. & Stage)	
2.3	Danger Plate Missing	
2.4	No. Plate Missing	
2.5	Phase Plate Missing	
2.6	Step Bolts Missing	
2.7	Anti Climbing Device Missing	
2.8	Protective coating disappeared / Rusting of Legs/Members.	
2.9	Foreign Material on Tower	
<b>3.0</b>	<b>Hardware Fittings &amp; Insulators</b>	
3.1	Surface Pollution (Mention Phase & also Ckt. No in case of D/C Line)	
3.2	Unusual deflection of string (Mention Phase & also Ckt. No.)	
3.3	Flash over/Burning Mark on Arcing Horn/ Insulator /Fitting (Mention Phase & Ckt. No.)	
3.4	Any damage to fitting/missing of Arcing horn (Mention Phase & Circuit No.)	

**Karnataka Power Transmission Corporation Limited**



## Maintenance Schedule For Transmission Lines

Sl. No.	Description of Defects	Location & Date of Patrolling / Maintenance
3.5	Number of disc damaged (Mention Phase, Ckt. No. and position from Tower)	
3.6	Check the condition of Suspension/Tension/P.G. Clamps	
<b>4.0</b>	<b><u>Conductors &amp; Earthwires</u></b>	
4.1	Strands cut & opened of conductors/Jumpers (Mention Phase & Ckt.) and Compression ends.	
4.2	Dislocated/Missing/loose Vibration Damper of Conductor, mention Phase & Ckt.	
4.3	Dislocated/Missing/Loose VD of Earth Wire	
4.4	Earth Bonds Missing/dislocated	
4.5	Tower Foot Earthing	
<b>5.0</b>	<b><u>Electrical Clearances</u></b>	
5.1	Infringement in Horizontal, Vertical Clearance of Conductor with ref. to Trees, Buildings, Roads and other power and communication lines (Mention Phase & Ckt.)	
5.2	Details of Trees Causing/may cause problems (Mention no. of Trees)	

**Karnataka Power Transmission Corporation Limited**

# Maintenance Schedule For Transmission Lines

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Sl. No.	Description of Defects	Location & Date of Patrolling / Maintenance
5.3	Any new construction seen under the line corridor	
5.4	Check guy wires	

Patrolling done by (Name)

Signature of AEE (Ele.) with date

Counter Signature by Executive Engineer, (Ele.)

Counter Signature by Superintending. Engineer, (Ele) (T & S)

INSTRUCTION IF ANY

Reviewed by  
AEE, T.L.M. Sub-Division,

Signature of Junior Engineer, Ele.,  
T.L.I.

**Karnataka Power Transmission Corporation Limited**