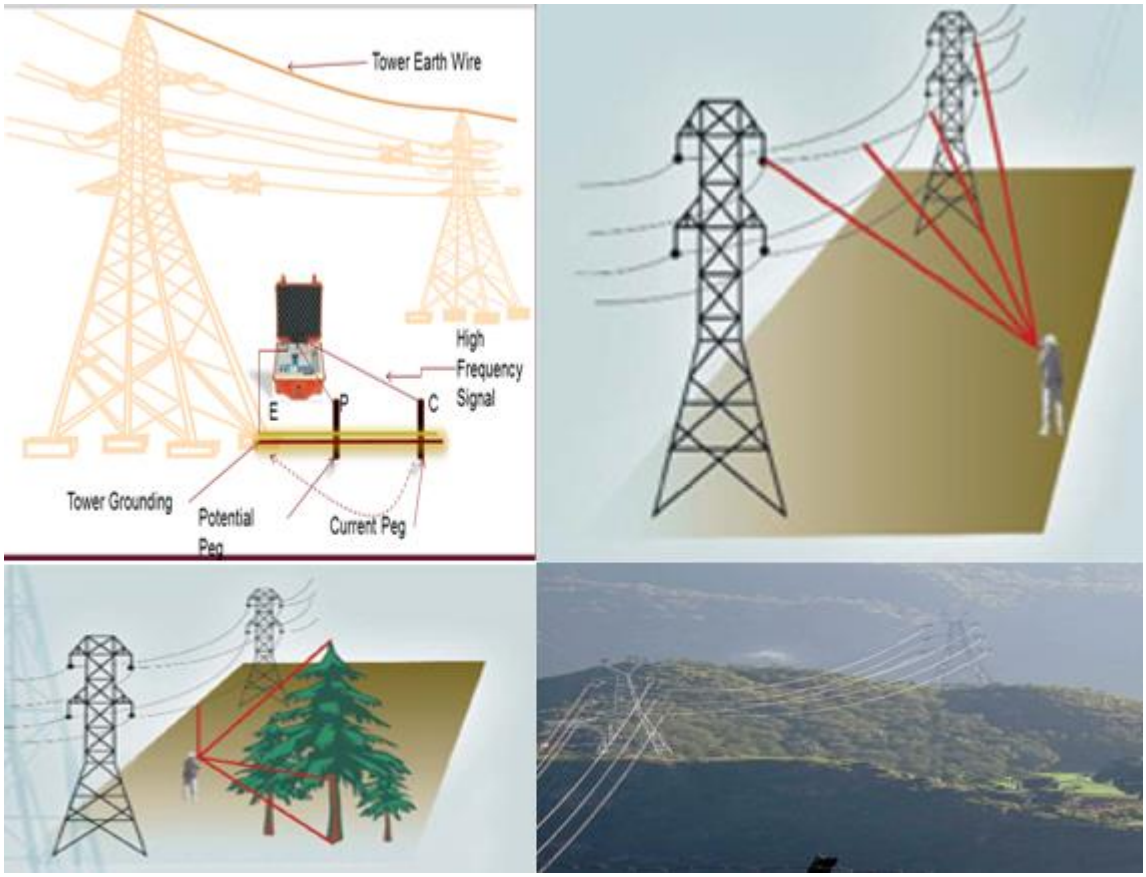
PRE-COMMISSIONING PROCEDURES FOR TRANSMISSION LINE



पावरग्रिड
POWERGRID

CORPORATE ASSET MANAGEMENT
POWER GRID CORPORATION OF INDIA LTD.

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PRE-COMMISSIONING PROCEDURES FOR TRANSMISSION LINES	Earlier Doc. No. D-2-01-70-01-02 Present Doc. No. D-2-01-70-01-03-Part-A				
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	00	CC(OS)	30/11/1995	Sd/-	Sd/-
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Sl. No.	Chapter	Revision	Action
1	All	01	Replace All
2	All	02	Replace All
3	All	03	Replace All

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ABBREVIATIONS

AC	Alternating Current
AM	Asset Management
CEA	Central electricity authority
CLR insulator	Composite Long Rod Insulator
CBIP	Central Board of Irrigation and Power
CERC	Central Electricity Regulatory Commission
CTUIL	Central Transmission Utility of India Limited
DC	Direct Current
D/C	Double Circuit
FS type Foundation	Fully submerged type foundation
GS	Ground Switch
IS	Indian standard
ICAO	International Civil aviation organization
MOEF	Ministry of Environment and Forest
M/C	Multi circuit
NTAMC	National Transmission Asset Management System
OPGW	Optical Fiber Ground wire
PTCC	Power and tele-communication coordination committee
ROW	Right of way
RTAMC	Regional Transmission Asset Management System
S/C	Single circuit

1.0 INTRODUCTION

This document includes overall procedure, safety rules, Statutory Requirements, dispatching procedure, switching sequences, inspection, testing & measurement, observations, acceptance criteria and documentation of test results for pre-commissioning procedures for transmission lines.

Different type of electrical clearances are tabulated as per CEA document (Measures relating to Safety and Electric Supply Regulations, 2010), CBIP manual for Transmission line in 2014, Forest conservation Act, 1980 & forest conservation Rules, 2003 & POWERGRID latest technical specifications for transmission lines. Different values indicated in this document is for reference purpose only; however, if there is any difference between the values indicated in this document & the values in the technical specifications/drawings; the values of technical specifications/drawings will prevail.

The detailed inspection and handing over documents are required to be checked for the entire length of transmission line before energization. Geo-tagged digital Photographs of all tower locations using high-resolution digital camera need to be handed over to taking over team and preserved as part of taking over record.

2.0 OVERALL PROCEDURE

First, it is to be ascertained that the transmission line to be energized is ready for operation and has been properly handed over (released) in writing. This will include all safety aspects, Electrical inspector clearance, PTCC clearance, statutory clearance, regulation/ system operator requirement and final inspection, if any.

Instructions for the work and supervision are given by the test leader (Line in charge). However, regular operators will execute all switching and operational activities.

Line charging instructions received from Engineering department & CTUIL should be clearly understood by the Line in charge and doubts, if any, are to be got clarified prior to the energization of the line.

Once, the line is handed over for charging, no work shall be permitted without a valid work permit.

Engineering department & CTUIL recommendations, system operator/ regulation requirements are to be followed before putting the system into continuous operation.

3.0 SAFETY PROCEDURES

Energization implies an abrupt and serious change of the working conditions in the line.

In order to avoid serious accidents, thorough information must be imparted to all personnel involved in the construction of transmission line. In-charge of the

Transmission line must ensure that due publicity has been made to the public in all the villages/ areas along the line route cautioning them against climbing the towers etc. and that the line is proposed to be charged on notified date. It is also to be confirmed that all the agencies involved in construction activities shall not carry out any job on the said line without a valid work permit.

It shall be ensured that before charging all men, material, Tools & plants and any temporary earthing on any part of the entire length of line are removed.

It must be ensured that any power supply/ low voltage charging used as "anti-theft measure" must be disconnected and isolated to avoid accidental connection.

All equipment tests and pre-commissioning tests must have been completed, reconnected (in case cables were isolated for testing purpose) and documented as per prescribed format.

The system must be formally declared ready for Energization and handed over for operation in writing.

4.0 STATUTORY REQUIREMENT

4.1 The concerned authorities shall be informed before commissioning the line and their approval shall be obtained in accordance with latest Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations.

4.2 Before charging of the line, PTCC approval from concerned authority shall be obtained.

5.0 INSPECTION

Before the line is scheduled to be handed over for the pre-commissioning/ Energization, the same shall be inspected by representatives of POWERGRID and Construction Agency. Such inspection shall include:

i) Right of way/ way leave/ electrical clearance

ii) Jumper drops

iii) Foundation and Revetments/ Protection Work

iv) Tower and Tower accessories

v) Earthing

vi) Hardware fittings

vii) Insulators

viii) Conductors and Earth wire/OPGW

ix) Accessories for conductor and Earth wires/OPGW

x) Aviation Warning Signals (Lights/globules/painting)

xi) Bird Diverter (if applicable)

5.1 RIGHT OF WAY / WAY LEAVE / ELECTRICAL CLEARANCE

5.1.1 Right of way/ Way leave clearance

Maximum width of Right of way of transmission line in forest area and minimum electrical clearances between Conductor & trees shall be as per guidelines/clarifications issued by MOEF & climate changes in 2019 under Forest conservation Act,1980 & forest conservation rules,2003 for laying of transmission lines through forest area.

(i) As per existing guidelines/clarifications issued by MOEF & climate changes in 2019 / POWERGRID specification, the maximum width of right of way for the transmission lines on forestland shall be as follows:

Transmission Voltage (KV)	Width of Right of Way (in meter)
66	18
132	27
220	35
+ /-320 HVDC	44
400 S/C	52
400 D/C	46
765 S/C (Delta)	64
765 S/C (Horizontal)	85
765 D/C	67
+/-500 HVDC	52
+/-800 HVDC	69
1200 S/C	89

(ii) Minimum electrical clearance between Conductor & Trees considering Maximum sag & swing of Conductor shall be as follows.

Voltage (KV)	Minimum clearance between conductors and trees (in meter)
66	3.4
132	4.0
220	4.6
400	5.5
765	9.0
+/-500 HVDC	7.4
+/-800 HVDC	10.7
1200	13

5.1.2 Electrical Clearance

All statutory electrical clearance of transmission lines w.r.t. ground, building, Structures, Power line crossings, River crossing, Railway & Road crossings etc. as stipulated under latest version of Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations & POWERGRID specification shall be ensured.

5.1.2.1 **Minimum Ground clearance** shall be as per clause 58.0 of Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2010 & POWERGRID specification under Sec-I & Sec-III of Vol-II.

The ground profile at the time of commissioning shall be checked with the profile approved at the time of check survey.

Sag in one of the span in each section shall be measured and it should be ensured that sag & tension of the section is in line with specification and sag & tension calculation chart approved by Engg.

Ground clearance of lowest conductors at critical points shall be checked in the field from any of the prevalent method and the values of ground clearance at these critical points including all power line, railway line and road crossings shall be recorded in the prescribed format.

In case of hilly Terrain and for building clearance, the side clearance from conductors and jumpers at critical points shall also be checked and recorded for all phases of conductor/ earth wire/ OPGW towards hill building side.

Transmission voltage (in kV)	**66**	**132**	**220**	**± 320 HVDC**	**400**	**765**	**± 500 HVDC**	**± 800 HVDC**	**1200**
Minimum Ground Clearance (in meter)	5.5	6.1	7.015	8.5	8.84	18	12.5	18	24

5.1.2.2 **Clearance of earth wire/OPGW with Top conductor at mid span to Top conductor**
Availability of required vertical clearances (as per design & POWERGRID Specification) between conductor and earth wire/OPGW shall be ensured through random checking. Minimum clearances between conductor and earth wire/OPGW at mid-span shall be as indicated below:

Voltage (kV)	66	132	220	+/- 320 HVDC	400	+/- 500 HVDC	765	+/- 800 HVDC	1200
Minimum mid span clearance (in meter)	3	6.1	8.5	8.5	9	9	9	12(pole) 6.1(DMR)	18

Record of such random checks shall be the part of pre-commissioning records.

5.1.2.3 **Clearance between line crossings each other**, the minimum clearances between the Power line crossing each other shall be as per clause no 69.0, part-III, Sec-4 of CEA's Regulations 2010 (Measures relating to Safety and Electric Supply) and POWERGRID specifications under sec-III, Vol-II

Where an overhead line crosses another overhead line, clearances shall be as under: -

(Minimum clearances in meters between AC lines crossing each other)

Sl. No.	Nominal System Voltage (kV)	11-66	110-132	220	400	765	1200
1.	**Low and Medium**	2.44	3.05	4.58	5.49	7.94	10.44
2.	**11-66**	2.44	3.05	4.58	5.49	7.94	10.44
3.	**110-132**	3.05	3.05	4.58	5.49	7.94	10.44
4.	**220**	4.58	4.58	4.58	5.49	7.94	10.44
5.	**400**	5.49	5.49	5.49	5.49	7.94	10.44
6.	**765**	7.94	7.94	7.94	7.94	7.94	10.44
7.	**1200**	10.44	10.44	10.44	10.44	10.44	10.44

Where an overhead direct current (DC) line crosses another overhead line, clearances shall be as under: -

Minimum clearances in meters between AC and DC lines crossing each other

Sl. No.	System Voltage (AC/DC)	100 kV DC	200 kV DC	300 kV DC	400 kV DC	500 kV DC	600 kV DC	800 kV DC
1	**Low and Medium AC**	3.05	4.71	5.32	6.04	6.79	7.54	9.04
2	**11-66 kV AC**	3.05	4.71	5.32	6.04	6.79	7.54	9.04
3	**110-132 kV AC**	3.05	4.71	5.32	6.04	6.79	7.54	9.04
4	**220 kV AC**	4.58	4.71	5.32	6.04	6.79	7.54	9.04
5	**200 kV DC**	4.71	4.71	5.32	6.04	6.79	7.54	9.04
6	**300 kV AC**	5.32	5.32	5.32	6.04	6.79	7.54	9.04
7	**400 kV AC**	5.49	5.49	5.49	6.04	6.79	7.54	9.04
8	**400 kV DC**	6.04	6.04	6.04	6.04	6.79	7.54	9.04
9	**500 kV DC**	6.79	6.79	6.79	6.79	6.79	7.54	9.04
10	**600 kV DC**	7.54	7.54	7.54	7.54	7.54	7.54	9.04
11	**765 kV AC**	7.94	7.94	7.94	7.94	7.94	7.94	9.04
12	**800 kV DC**	9.04	9.04	9.04	9.04	9.04	9.04	9.04
13	**1200 kV AC**	10.44	10.44	10.44	10.44	10.44	10.44	10.44

Provided that no guarding are required when line of voltage exceeding 33 kV crosses over another line of 250 V and above voltage or a road or a tram subject to the condition that adequate clearances are provided between the lowest conductor of the line of voltage exceeding 33 kV and the top most conductor of the overhead line crossing underneath the line of voltage exceeding 33 kV and the clearances as stipulated in regulation 58 from the topmost surface of the road maintained

5.1.2.4 **Electrical clearance from railway tracks** shall be as stipulated under Sec-III, Vol-II of Technical Specification of POWERGRID.

(i) Vertical clearance for OHE (other than high rise OHE):

Sl. No.	Transmission line voltage level	Minimum clearances from Rail Level
		New Power Line crossing or crossing planned for alteration
1	Above 66 kV & up to 132 kV	15.56 m
2	Above 132 kV & up to 220 kV	16.46 m
3	Above 220 kV & up to 400 kV	18.26 m
4	Above 400 kV & up to 500 kV	19.16 m
5	Above 500 kV & up to 800 kV	21.86 m

(ii) Vertical clearance for high-rise OHE*:

Sl. No.	Transmission line voltage level	Minimum clearances from Rail Level
		New Power Line crossing or crossing planned for alteration
1	Above 66 kV & up to 132 kV	17.56 m
2	Above 132 kV & up to 220 kV	18.46 m
3	Above 220 kV & up to 400 kV	20.26 m
4	Above 400 kV & up to 500 kV	21.16 m
5	Above 500 kV & up to 800 kV	23.86 m

(iii) Clearance between highest traction conductor & lowest crossing conductor

Sl. No.	Transmission line voltage level	Minimum clearances from Rail Level
		New Power Line crossing or crossing planned for alteration
1	Above 66 kV & up to 132 kV	3.05
2	Above 132 kV & up to 220 kV	4.58
3	Above 220 kV & up to 400 kV	5.49
4	Above 400 kV & up to 500 kV	7.94
5	Above 500 kV & up to 800 kV	7.94

***Applicable only for electrification of routes where double stack container having maximum height of 6809 mm is plying**

5.1.2.5 Clearances from buildings of Lines

Electrical clearances (Horizontal as well as vertical clearances) from building/structures shall be as per clause 61.0 of Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2010.

(1) An overhead line shall not cross over an existing building as far as possible and no building shall be constructed under an existing overhead line.

(2) Where an overhead line of voltage, exceeding 650 V passes above or adjacent to any building or part of a building, it shall have on the basis of maximum sag **a vertical clearance above the highest part of the building** immediately under such line, of not less than clearance mentioned as per below table for respective voltage level

Voltage (kV)	66	132	220	400	765	1200
Minimum clearance (mm)	4000	4600	5500	7300	10600	14500

(3) **The horizontal clearance** between the nearest conductor and any part of such building shall, on the basis of maximum deflection due to wind pressure, be not less than clearance mentioned as per below table for respective voltage level

Voltage (kV)	66	132	220	400	765	1200
Minimum clearance (mm)	2300	2900	3800	5600	8900	12800

Note: Clearance are calculated as per norms specified in clause no 61 of CEA safety regulation 2010

(4) For High Voltage Direct Current (HVDC) systems, vertical clearance and horizontal clearance, on the basis of maximum deflection due to wind pressure, from buildings shall be maintained as below:

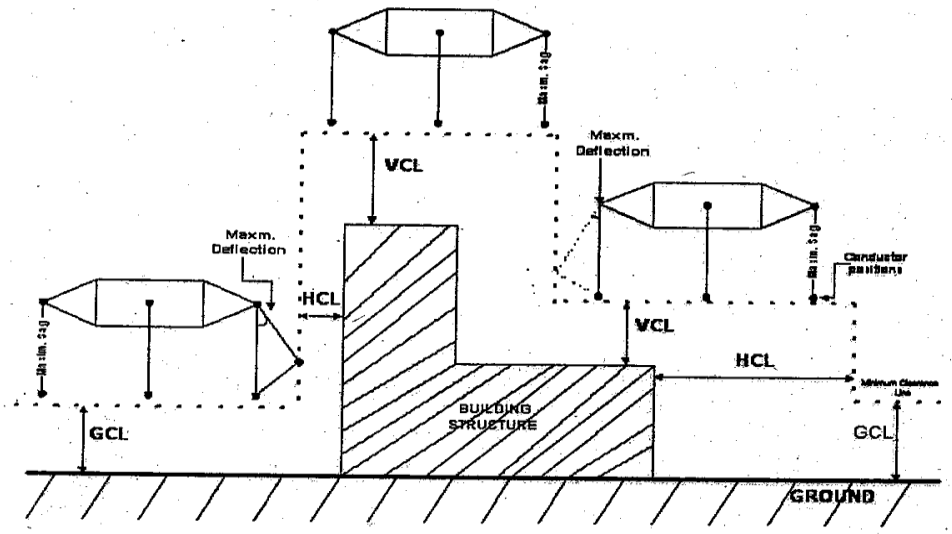
Sl. No	DC Voltage (kV)	Vertical Clearance (in mm)	Horizontal Clearance (in mm)
1.	100 kV	4600	2900
2.	200 kV	5800	4100
3.	300 kV	7000	5300
4.	400 kV	7900	6200
5.	500 kV	9100	7400
6.	600 kV	10300	8600
7.	800 kV	12400	10700

Vertical and horizontal clearances shall be as specified in schedule-X of **CEA safety regulation 2010**

Explanation: - For the purpose of this regulation the expression "building" shall be deemed to include any structure, whether permanent or temporary.

Schedule-X

Ground, Vertical and Horizontal clearances
[See sub-regulation (6) of regulation 58, sub-regulation (5) of regulation (60) and sub-regulation (5) of regulation 61]



GCL: Clearances as per Regulation 59
VCL: Clearances as per Regulation 60 & 61
HCL: Clearances as per Regulation 60 & 61

5.1.2.6 Minimum Clearance in air above ground and across road surface of Highways or roads for lowest conductor of an AC overhead lines, including service lines of nominal system voltage

As per sub regulation (1) of regulation (58) of CEA draft safety regulation 2021

Nominal system Voltage(in kV)	Clearance above ground			Clearance between conductor & road surface across high way(in meter)
	Across street (in meter)	Along street (in meter)	Elsewhere) (in meter)	
66	6.5	6.1	5.5	11.6 or U/G cable
132	6.5	6.1	6.1	11.6
220	7.02	7.02	7.02	12.52
400	8.84	8.84	8.84	14.0
765	18*	18*	18*	18.8
1200	24*	24*	24*	30

**Higher clearance predominantly induction effects and time varying electric field (ICNIRP limit:10 kV/m for occupational exposure) at voltage exceeding 400 kV*

5.1.2.7 Minimum Clearance in air above ground and across road surface of Highways or roads for lowest conductor of an DC overhead lines,

As per sub regulation (1) of regulation (58) of CEA draft safety regulation 2021

Nominal system Voltage (in kV)	Clearance above ground	Clearance between conductor & road surface across high way (in meter)
+/- 500 kV HVDC	12.5	17.25
+/- 800 kV HVDC	18	22.75

Highway clearance required 4.75 meter higher than ground clearances (considering the vehicle height 4.75 meter as mentioned in the Indian road congress documents, 1983)

5.1.2.8 Power line/cable crossing with waterway:

Minimum Clearance of Power Conductor over the Highest Flood Level in case of navigable/non navigable rivers (As per clause no 4.5.1 of CBIP manual on Transmission line, 2014)

a) **AC system**

AC Voltage Level in kV (Nominal voltage)	Minimum Clearance above H.F.L (mm)	
	Navigable River	Non-navigable river
66	19000	3650
110	19000	4300
132	19220	4300
220	20100	5100
400	21900	6400
765	25550	9400
1200	29900	11000

b) DC system

DC Voltage in kV	Minimum Clearance above H.F.L (mm)	
	Navigable River	Non-navigable river
+/- 500	24030	6750
+/- 800	27700	11000

FOUNDATION AND REVETMENTS/ PROTECTION WORK

5.2.1 FOUNDATION:

There shall not be any damage/ uneven settlement of foundations. For this, tolerances in levels of all four stubs should not exceed the criteria provided in the Annexure - C of IS -5613 (Part -3/Section 2) latest revision.

It is to be ensured that back filling of foundation is properly done. Soil shall be filled over all legs up to ground level.

Extra surface earth after foundation back filling shall be removed from legs of the tower.

Any crack or break in chimney, if found, shall be repaired/rectified with approval of site In-charge.

5.2.2 REVETMENTS / PROTECTION:

Cracks/ damages to revetments shall be repaired/ rectified with approval of site In-charge.

Wherever revetments are provided, weep holes shall have slope such as to flush out the deposited water away from tower platform.

In case of hilly terrain, the benching area should be leveled properly. The area around tower shall have proper slope for drainage of rainwater.

5.3 TOWER AND TOWER ACCESSORIES

5.3.1 Normal Tower

After completion of a transmission line, all the towers shall be thoroughly checked before charging the line. Special attention shall be given to the following points:

<u>Deformed/ Buckled/ Missing/ Rusted Members and Nuts and Bolts</u>

It is to be ensured that no members are bent, deformed or rusted in towers and if so, the same shall be replaced.

If any member is found missing, a new member shall be fixed as per structural drawing of the Tower.

Nuts shall be sufficiently tightened for the required Torque. Minimum 2/ 3 complete threads shall be projected outside the nut. All bolts shall have their nuts facing outside of the tower for Horizontal connection and downwards for Vertical connections.

Bolts shall be punched as per the specification and nuts shall be properly tack welded. It shall be ensured that the circular length of each welding shall be at least 10 mm. Proper zinc rich paint (90% zinc content) shall be applied on welded portion.

It shall be ensured that all tower members are fixed and tightened properly. All extra blank holes on tower members are filled with correct size of nuts & bolts. Geotagged Digital Photographs (from different angles) of such conformance of all towers are to be handed over to taking over team and preserved with taking over

records.

5.3.2 Special Towers

In addition to the above checks for towers, ladders and platforms provided in special towers shall be properly tightened and no foreign material shall be left out on such platforms.

5.3.3 Earthing of Towers

Ensure that proper earthing (Pipe type earthing in one of tower leg/ Counterpoise Earthing) of tower has been done and earthing strip is neither damaged nor broken and is properly fixed to the stub.

Ensure that Additional earthing is provided on every 7 to 8 kms distance at tension tower for direct earthing of both shield wires (Earth wire/ OPGW).

Ensure that Additional Rod type earthing is provided in one of foundation pit (Diagonally opposite to pipe type earthing) of all the transmission line towers in normal soil (i.e., Dry, Wet cultivated, Wet, PS, FS & Black cotton soil) in addition to pipe type earthing.

In case of counter poise earthing, it is to be ensured that earth wire is sufficiently buried in the ground to avoid digging out during cultivation. The length of counterpoise shall be as per technical specification. The same shall be laid uniformly and stacking/ coiling of counter poise wire is not allowed.

Before charging of the line, ensure that tower footing Impedance at each tower is below 10 ohms. If tower footing impedance of any tower (before stringing) has been recorded higher than 10 ohms, additional counterpoise type earthing/ Chemical earthing shall be provided to bring the tower footing impedance value below 10 ohms.

Earthing of special towers shall be verified as per approved drawings applicable for special towers/ special foundation.

5.3.4 Tower accessories

All danger plates, number plates, circuit plates and phase plates shall be in position as per the specification and properly tightened.

All phase plates shall be fixed in correct phase sequence. Special care may be taken at transposition towers for indicating the correct phase sequence.

It shall be ensured that the anti-climbing device (ACD) is provided at the suitable height of tower. In case of barbed wire type ACD, barbed wire shall be tightly fixed.

It shall be ensured that the step bolts (for normal towers) are provided up to the peak of the tower. Any missing step bolts shall be replaced.

Fixing of bird-guards shall be ensured at all towers to prevent birds perching on suspension insulator strings.

5.4 HARDWARE FITTINGS

Tightening of all bolts and nuts are to be checked up to specified torque. Check fixing of all security clips (W/R type clips).

Surface condition of corona control rings should be smooth. Distance/ alignment between tower side arcing horn (wherever applicable) and line side arcing horn/ corona control ring should be as per approved drawings.

Jumpers in the tension tower shall be properly bolted with the tension clamp and form a parabolic shape in order to achieve adequate clearance from steel super structure.

Provision of Suitable counter weight shall be ensured on Pilot string insulator (CLR type) as per approved drawings to restrain swing towards the tower.

Provision of Counter weight shall also be ensured on pilot insulator string (for both disc type/CLR pilot string) in case of transposition tower.

5.5 INSULATORS

All damaged/ broken porcelain/ glass insulator discs/ composite long rod/ porcelain long rod insulator units shall be replaced.

Unusual deflection in suspension strings, if observed, shall be rectified.

It is to be ensured before charging those insulators are clean. IR value of individual porcelain disc insulators shall be checked on random basis by 5/ 10 kV Insulation Tester and it shall not be less than 2000 Mega Ohm per disc.

5.6 CONDUCTORS & EARTH WIRES/OPGW

5.6.1 Conductor

Surface of the conductors shall be free from scratches/rubs.

Ensure that conductor strands are not cut and opened up. Wherever strands are found cut/ damaged/ scratched, they must be repaired with repair sleeves/ repair protective rods in case the no. of damaged strands are within specified limits (normally up to $1/6^{th}$ nos of strands in the outer layer) for lines up to 220 kV and maximum 2 strands in case of 400 kV and higher voltage level.

5.6.2 Earth wire/OPGW

Ensure that strands of earth wire/OPGW have no cuts.

5.7 ACCESSORIES FOR CONDUCTOR AND EARTHWIRES/OPGW

5.7.1 Joints

All joints on conductor/ earth wires shall be away from the tower at a distance of at least 30 meters or as provided in the technical specification (TS).

Ensure that not more than one joint in a sub-conductor is provided in one span.

Ensure that no mid span joint is provided in major crossings like SH/NH/ Expressway, railway crossing, 132 kV & above voltage level power lines and major

rivers etc. or as per the provision of technical specification.

Ensure that all mid span joints on conductors/ earth wire and repair sleeves of compression type are free from sharp edges, rust and dust. Wherever grease is specified the same shall be applied in the joints.

5.7.2 Clamping

Ensure that conductor is not over tightened in the suspension clamps.

5.7.3 Spacers, vibration dampers and copper bonds

Placement and number of spacers/ spacer-dampers on the bundle conductors on each phase shall be verified as per spacer/ spacer damper placement chart. Damaged/ missing spacers/ spacer-dampers shall be replaced and loose/ displaced spacers/ spacer-dampers shall be tightened/ relocated.

In case of tension towers, one additional spacer/ spacer damper shall be placed within 10 meters of dead-end clamp.

Spacing of Vibration dampers from the tower and spacing between damper to damper shall be verified as per the damper placement chart. All loose/ displaced VD shall be properly tightened/ relocated and missing VDs shall be provided.

It is to be ensured that no copper/ aluminum bond is loose/ missing.

5.7.4 Jumpers

Verify Jumper drop (i.e., distance between cross-arm and null point of jumper) as per drawing. All jumpers shall be checked for proper tightening and missing bolts. In case, jumpers (Conductor/ Earth wire) are found loose, it shall be tightened properly before line charging.

Geotagged Digital Photographs of such conformance for all jumper connections are to be handed over to taking over team and photographs are to be preserved by taking over team for record.

Jumper drop need to be measured for all tension tower locations and to be handed over to RHQ-AM. RHQ-AM will cross check 5% of measurement value on sample basis. If any abnormality is found in readings, additional 5% sample checking to be done. The sample checking process to be repeated till all abnormality related to jumper drop are resolved.

Transmission voltage kV)	**66**	**132**	**220**	**400**	**765**	**± 500 HVDC**	**± 800 HVDC**
Jumper Drop (In meter)	**1.3**	1.8	2.4	3.6	6.1	4	7.8(Pole) 2.6(DMR

5.7.5 Foreign material

Ensure that all foreign materials like ropes, dead bird, fallen tree branches; bird nests etc. on conductors, earth wires/OPGW, jumper, insulator string, cross arms are removed.

5.7.6 Others

It shall be ensured that all temporary/ local earthing, guys, T & P (Tools and Plants), foreign material, Pilot rope used in OPGW stringing and other loose material, which were used during stringing/ tower erection, have been removed.

If, there is any change in the ground profile before commissioning of line from the approved profile, the extra earth/ obstruction/ temporary sheds/ any other construction shall be removed.

5.8 AVIATION WARNING OBSTRUCTION SIGNALS (LIGHTS/ GLOBULES/ PAINTING)

It shall be ensured that following measures have been taken in the line/ Towers falling within obstruction zone of civil aviation and defense establishments as per IS-5613(latest revision), ICAO Guidelines and POWERGRID specification.

5.8.1 Day markers

5.8.1.1 **Structure marking**: The structure portion excluding cross arms above 45-meter height shall be painted in alternate bands of international orange and white color as per IS-5613(latest revision) & ICAO Guidelines.

5.8.1.2 Line markers may be provided as per the technical specification.

5.8.2 Night markers

It shall be ensured that proper aviation lights at the peak level/ at specified heights of towers have been provided along with Solar panels/ Battery banks/ Control cubicles and other accessories as per specification. The functioning of lights with simulation shall be checked/ verified.

5.9 BIRD DIVERTERS

Bird diverters shall be placed in identified stretches as per conditions stipulated by forest authority to avoid the chance of collision of birds with transmission line.

6.0 TESTING AND MEASUREMENT

6.1 Tower footing Impedance Measurement

Tower footing impedance measurement is to be carried out using tower footing impedance tester. The value of impedance should be below 10 ohms. If impedance value is higher than 10 ohms, additional counterpoise type earthing/ chemical earthing shall be provided to bring the tower footing impedance value below 10 ohms. These measurements may preferably be carried out during dry climate.

Tower footing impedance need to be measured for all tower location and the values need to be recorded for future reference and document will be handed over to RHQ-AM. RHQ-AM will carry out impedance measurement at 5% locations on sample basis. Corrective action will be taken if impedance values are higher than 10 ohms.

6.2 Before commissioning of the lines following tests may be carried out:

6.2.1 Conductor Continuity test:

6.2.1.1 Objective of this test is to verify that each conductor of the overhead line is properly connected.

A simple method of continuity test is illustrated below. Once the insulation test is completed and the results confirm no short circuit, carryout the following testing using 5kV/ 10 kV Insulation Tester

Sending End	Receiving End	Results (Ohms)
CLOSE R- Ph ground switch OPEN Y- Ph ground switch OPEN B- Ph ground switch	Test IR for R-Ph	Zero/ Low
	Test IR for Y-Ph	High
	Test IR for B-Ph	High
OPEN R- Ph ground switch CLOSE Y- Ph ground switch OPEN B- Ph ground switch	Test IR for R-Ph	High
	Test IR for Y-Ph	Zero/ Low
	Test IR for B-Ph	High
OPEN R- Ph ground switch OPEN Y- Ph ground switch CLOSE B- Ph ground switch	Test IR for R-Ph	High
	Test IR for Y-Ph	High
	Test IR for B-Ph	Zero/ Low

(All Ground Switch in open condition)

If the above test results are satisfactory, it confirms the continuity of the line.

6.2.1.2 The continuity Test of the line with proper phase indication or phase marking can be checked by continuity test as described below:

Sending End	Receiving End IR value in between	Results (Ohms)
Connect R & Y phase. B-phase & all GS open	R & Y Phase	Zero Or Low
	Y & B Phase	High
	B & R Phase	High
Connect R & B phase. Y-phase & all GS open	R & Y Phase	High
	Y & B Phase	High
	B & R Phase	Zero Or Low
Connect Y & B phase R-phase & all GS open	R & Y Phase	High
	Y & B Phase	Zero Or Low
	B & R Phase	High

If the test results are satisfactory, it confirms that marking of the phases are in order.

6.2.2 Insulation Resistance Test of Line

This test may be carried out using 5 kV or 10 kV Insulation Tester preferably power driven to ascertain the insulation condition of the line. If, 5 kV Insulation Tester is used for insulation resistance measurement, it shall be ensured that the induced voltage (CVT reading) is less than the instrument withstanding capacity to avoid the possibility of damage of instrument.

6.2.3 Transmission Line parameters (Z1, Z_0, Zn) measurement

The Transmission line parameters measurement to be done by Substation commissioning team and the measured line parameters need to be incorporated in the relay setting. This is to improve the accuracy of fault locators and the distance relays.

6.2.4 Offline Signature Analysis

Offline signature shall be taken before commissioning to ensure healthiness of transmission line before charging. If any abnormality is found in signature, same need to be analyzed and defects must be attended before line charging. This will be preserved for future reference if any.

6.2.5 Phase Sequence checking/validation (After energization)

Once, the line is charged from one end, without closing the Breaker at the other end, the Phase sequence is to be checked from the CVT output using Phase Sequence Meter. If other charged feeders are available, Phase sequence to be RECHECKED by the measurement of secondary voltage of both the Feeders (New line & available charged line).

Let the secondary Voltage of CVT is 110 volts (Phase to Phase) for both the Circuit. In case of correct Phase sequence the voltage reading shall be as follows:

New Circuit	Old Circuit	Voltage (in Volts)
R – Phase	R – Phase	0
R – Phase	Y – Phase	110
R – Phase	B – Phase	110
Y- Phase	R – Phase	110
Y- Phase	Y – Phase	0
Y- Phase	B – Phase	110
B- Phase	R – Phase	110
B- Phase	Y – Phase	110
B- Phase	B – Phase	0

In case the results are not matching the phase sequence is to be re-checked and reconfirmed before closing the breaker.

7.0 PROTECTIVE SYSTEM

Before energization, it must be ascertained that all protective systems for the line to be energized are operative.

This includes confirmation that the protections have been properly tested and tests have been documented as per Pre-Commissioning Procedure laid down by the utility for S/S Bay Equipment.

It also includes verification by inspection or otherwise, if necessary, by repetition of

trip test, that the protections are actually functionally enabled. This verification serves to prevent that energization takes place of a line where a protection has been disabled for test or other reason.

8.0 DISPATCH PROCEDURES

All operational activities (switching etc.) must be coordinated and communicated with the system dispatcher i.e. NTAMC/ RTAMC/ RLDC/ NLDC. In this respect, the general procedures already established by POWERGRID, Regulator and System Operator will be followed.

9.0 SWITCHING PROCEDURES

For each activity, the instructions to the operators and the communications to the dispatchers will be made in writing or by confirmed telephone messages. The switching procedures first to be properly documented step by step and understood by everybody involved in the switching operation prior to the energization. Any clarification required in the procedures must be resolved. The format established by the utility for switching orders and operational data logging shall be followed. Each and every activity must be listed and described, so that complete information is available for detailed investigation, if required in future.

10.0 HANDING OVER

The transmission line shall be inspected prior to Energization and a formal handing over document to be jointly signed by the representative of SUPPLIER (if available), ERECTION AGENCY and POWERGRID. However, all contractual taking over has to be resolved separately as per the terms and conditions of the contract. Handing over shall be limited to the completion of Erection and ready for Energization.

The relevant format No AM/COMM/LINE/1a & AM/COMM/LINE/1b which are in part-B of document for handing over is also a part of documentation

Any outstanding points or remaining activities are to be listed and signed jointly by the representatives of POWERGRID and ERECTION agency as per the Format No: AM/COMM/LINE/2 of part-B of this document. These documents are also to be retained at line office with a copy to regional office. The remaining activities outstanding points are classified in the following category.

Details of the SECTIONS:

A. List of outstanding activities remaining in any part of the line

B. A list of temporary arrangements introduced.

C. Check list of records properly documented, completed and signed as per Format No: AM/COMM/LINE/1 of part-B of this document

D. Original tracing of Profile, Route Alignment, Tower Design, Structural Drawings, Bill of Materials, Shop Drawings, stringing charts (initial and final as applicable) etc. of all towers/ line submitted to POWERGRID.

After resolving the above-mentioned outstanding activities or with only minor remaining points which do not influence on charging of line, handing over of the

transmission line shall be accepted by the pre-commissioning team. Handing over of transmission line for Energization with or without remaining activities shall be made by the line in-charge to the commissioning in charge in writing as per the Format No. AM/COMM/LINE/3 of part-B of this document

Shortcomings noticed during inspection, "List of outstanding activities" shall be recorded as per Format No: AM/COMM/LINE/2 of part-B of this document and a copy of the shortcomings noticed is to be given to the responsible parties like SUPPLIER(s) and ERECTION AGENCY etc. for corrective action to be taken on a time bound schedule.

11.0 ENERGIZATION

Execution of the energization is simply the last event in the switching sequence, switching of the close control button for the relevant circuit breaker.

12.0 OBSERVATIONS AND DURATION

Visual and audible inspection (look and listen) of the associated equipment and reading of permanent instruments will be made.

The system shall be kept charged for the duration prescribed as per CERC regulation. During this time, continuous monitoring and inspection will be maintained in control room, auxiliary systems areas and switchyards.

This will include frequent, scheduled inspection of all equipment and reading of all permanent instruments, recorders and surge arrester counters, especially system parameters as per standard procedures adopted by POWERGRID.

13 .0 DE-ENERGIZATION

Instructions about de-energization will be given only if, this is part of the test otherwise de-energization will be considered part of regular operation.

14.0 ACCEPTANCE CRITERIA

Neither insulation breakdown nor protective system actions must occur. No irregular equipment behavior noise, vibration, high temperature is permitted.

Corona discharges may not be “unreasonable”. Local discharges that may be attributable to sharp points, shall be carefully located and recorded. After termination of Energization, the equipment shall be closely inspected and the points rounded or covered.

No unscheduled changes of system or of equipment are permitted during the 8-hour energized condition.

15.0 DOCUMENTATION

Switching and operational activities will be recorded in regular manner in the operator’s log. Similarly, all readings of permanent instruments are also to be recorded. Copies of this log notes on special observations from inspections and other measurements will constitute the test records.

APPENDIX-III

Standard Manufacturing Quality Plan

STANDARD MANUFACTURING QUALITY PLAN
FOR
TRANSMISSION LINE TOWER STRUCTURES / PARTS

(Doc No: CC/QA&I/MQP/Standard/Tower parts/Rev 05)

(Valid From : 01-09-2019 to As per MQP Approval Letter)

INSTRUCTIONS FOR CODE ALLOCATION

Code 1	**Indicates place where testing is planned to be performed i.e. Inspection location**	Code 2	**Indicates who has to perform the tests i.e. Testing Agency**
A	At Equipment Manufacturer's works (Fabricator)	J	The Equipment Manufacturer
B	At Component Manufacturer's works (Re-roller)	K	The Component Manufacturer
C	At Authorized Distributor's place	L	The Third Party
D	At Independent Lab	M	The Turnkey Contractor
E	At Turn Key Contractor's location		
F	Not specified		
Code 3	**Indicates who shall witness the tests i.e. Witnessing Agency**	**Code 4**	**Review of Test Reports/Certificates**
P	Component Manufacturer itself	W	By Equipment manufacturer during raw material / bought out component inspection
Q	Component Manufacturer and Equipment Manufacturer	X	By Contractor during product/process inspection
R	Component Manufacturer, Equipment Manufacturer and Contractor	Y	By POWERGRID during product/process inspection
S	Equipment Manufacturer itself	Z	By Contractor and/or POWERGRID during product/process inspection
T	Equipment Manufacturer and Contractor		
U	Equipment Manufacturer, Contractor and POWERGRID		
V	Third Party itself		
Code 5	**Whether specific approval of sub-vendor / Component make is envisaged?**	**Code 6**	**Whether test records required to be submitted after final inspection for issuance of CIP/MICC**
E	Envisaged	Y	Yes
N	Not Envisaged	N	No

Sr. No.	Components/ Operation & Description of Test	Type of Check	Quantum of Check / Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
A. Raw Material Inspection (Indigenous)													
1.1	Structural Steel (Sections and Plates) - to be procured from POWERGRID approved Sources. If procured from re-rollers, specific vendor approval of POWERGRID needs to be ensured and CIP for every lot at re-roller's works.												
1.1.1	**Mechanical Properties**										E		
(a)		Test For Ultimate Tensile Strength	2 - Samples/cast/heat /Section for each vendor Or one sample per 20 MT / Section or Part Thereof for each vendor, subject to minimum of two samples, if cast/heat wise not maintained	IS: 2062:2011 Grade E250, POWERGRID Tech. Specn. IS: 2062:2011 Grade E350, POWERGRID Tech. Specn.	410 N/mm² (Min.) 490 N/mm² (Min)	Manufacturer's format of record (MFOR)	A	J	S	Z		N	The sampling Plan indicated is for material procured from POWERGRID approved source, where CIP is not required. Sampling plan for material which has been procured with CIP shall be as follows: 1 sample/section/lot for each vendor
(b)		Yield Stress		IS: 2062:2011 Grade E250, POWERGRID Tech. Specn. IS: 2062:2011 Grade E350, POWERGRID Tech. Specn.	i) <20mm thick: 250 N/mm² min ii) 20-40 mm thick: 240 N/mm² Min. iii) >40mm thick : 230 N/mm² min. i) <20mm thick : 350 N/mm² min ii) 20 - 40 mm thick : 330 N/mm² Min. iii) >40mm thick : 320 N/mm² min.	(MFOR)	A	J	S	Z		N	
(c)		Percentage Elongation at 5.65√Area		IS: 2062:2011 Grade E250, POWERGRID Tech. Specn. IS: 2062:2011 Grade E350, POWERGRID Tech. Specn.	23% Min. 22% Min.	(MFOR)	A	J	S	Z		N	
(d)		Bend Test	2 - Samples/cast/heat /Section for each vendor Or one sample per 20 MT / Section or Part Thereof for each vendor, subject to minimum of two samples, if cast/heat wise not maintained	IS: 2062:2011 Grade E250, POWERGRID Tech. Specn. IS: 2062:2011 Grade E350, POWERGRID Tech. Specn.	Piece at room temp. shall with stand bending through 180 degree to an internal dia i) not greater 2t for 25 mm, ii) 3t for > 25 mm, with both side parallel, without cracking. Piece at room temp. shall with stand bending through 180 degree to an internal dia i) not greater 2t	(MFOR)	A	J	S	Z		N	-do-

Sr. No.	Components/ Operation & Description of Test	Type of Check	Quantum of Check / Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						
							1	2	3	4	5	6	Remarks
(e)		Impact Test	1 - Sample per section per lot for each source	IS: 2062:2011 and IS 1757	IS: 2062:2011 and IS 1757	(MFOR)	A	J	S	Z		N	Applicable only if Material Grade E 250C /E 350 C/ E250 B0/E350 B0/E250Br/E350BR specified in Bill of Material /Drawing or TS
1.1.2	**Chemical Composition**	Chemical Analysis	1 - Sample per section per lot for each source	As per Chemistry enclosed at **Annexure-I** for each source	As per Chemistry enclosed at **Annexure-I** for each source	(MFOR)/TPL Reports	A/D	J /L	S/V	Z	-	N	
1.1.3	**Visual Inspection**	Visual	One sample for 50 MT / Section or Part Thereof	IS 2062:2011 POWERGRID Tech. Specn.	Material to be free from surface defects like laminations, rough/jagged and imperfect edges, cracks, rounded apex, deep roll marks, pipy and any harmful defects.	(MFOR)/TPL Reports	A	J	S	Z		N	
1.1.4	**Dimensional Inspection**	Measurement	One sample for 50 MT / Section or Part Thereof	IS 808/ IS 1730 / IS 1852 & POWERGRID Tech. Specn.		(MFOR)	A	J	S	Z		N	
(i)	**Angle section**												
a)	Tolerances For Leg Length of Angles Equal / Un Equal		One sample for 50 MT / Section or Part Thereof	IS 1852/ IS 808	Equal: (i) Up to 45 mm Leg Length : ± 1.5 mm (ii) > 45 to 100 mm Leg Length : ± 2.0 mm (iii) >100 mm Leg Length : ± 2.0 % of leg length Difference between Leg Length of Equal Angles shall be limited to 75 % of Total Tolerance (Plus & Minus) Unequal: tolerance as per IS	(MFOR)	A	J	S	Z		N	
b)	Out of Squareness	Measurement	One sample for 50 MT / Section or part thereof	IS 1852 POWERGRID Tech. Specn.	±1°	(MFOR)	A	J	S	Z		N	
c)	Camber	Measurement	One sample for 50 MT / Section or part thereof	IS 1851	(i) For Flange Less than 100 mm Reasonably Straight (ii) For Flange 100 mm & above Max 0.2% of length	(MFOR)	A	J	S	Z		N	

Sr. No.	Components/ Operation & Description of Test	Type of Check	Quantum of Check / Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
d)	Root radius	Measurement	-do-	IS 808	IS 808	Test Report	A	J	S	W	-	N	
e)	Weight Tolerance For Angle Sections	Unit Weight Test	One sample for 50 MT / Section or part thereof	IS 1852 /IS 808	i) Up to 3 mm thick: ±5%, ii) > 3 mm thick :+ 5%, - 3 % over weights specified in IS 808	(MFOR)	A	J	S	Z		N	
(ii)	**Plate**												
a)	Weight Tolerances	Unit Weight Test	One sample for 50 MT / Section or part thereof	IS 1852 / IS 1730	+5%, -2.5% over weights specified in IS 1730	(MFOR)	A	J	S	Z	-	N	
b)	Thickness Tolerance	Measurement	One sample for 50 MT / Section or part thereof	IS 2062:2006 / IS 1730 / IS 1852	< 8 mm thick : + 12.5 %, - 5 %, 8 mm - 12 mm : + 7.5 %, - 5 %, over 12 mm ± 5 %	(MFOR)	A	J	S	Z	-	N	
1.2	**Zinc- To be procured from POWERGRID approved sources or Imported LME registered source**												
	Chemical Composition	Chemical Analysis	Every Consignment	IS 209/IS 13229	IS 209/IS 13229	Zinc Manufacturer TC	B	K	P	W	E	N	
			One sample for 100MT or Part thereof	IS 209/IS 13229	IS 209/IS 13229	TPL Reports	D	L	V	W	E	N	
			One sample of molten zinc taken from bath per quarter	IS 209/IS 13229	Min Zinc purity 98.5%	TPL Reports	D	L	V	W	E	N	
B) In-Process Inspection													
2	Fabrication of Tower Parts			IS 802 Part II/ IS 7215/ POWERGRID approved Drwg., Shop Sketches									
(a)	Straightening	Visual	100%										
(b)	Cropping (Cutting)	Dimensional	Ist Piece and every 50th Piece		Length Tolerance : ± 2 mm, The cut surface to be clean, reasonable square & free from distortion.	MFOR	A	J	S	Z	-	N	
(c)	Stamping	Visual	Ist Piece and every 50th Piece		Letter size as per POWERGRID Tech. Specn. / TPL norms	-do-	A	J	S	Z	-	N	

Sr. No.	Components/ Operation & Description of Test	Type of Check	Quantum of Check / Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
(d)	Punching / Drilling	Dimensional	Ist Piece and every 50th Piece		Holes for bolts shall be drilled or punched with a jig but drilled holes shall be preferred. The punching may be adopted for thickness up to 12 mm. Tolerances regarding punch holes should be as follows: a)Holes must be perfectly circular and no tolerances in this respect are possible. b)The maximum allowable difference in diameter of the holes on the two sides of plates or angle is 0.8mm,i.e the allowable taper in a punched hole should not exceed 0.8mm on diameter. c)Holes must be square with the plates or angles and have their walls parallel.	-do-	A	J	S	Z	-	N	
(e)	Edge Security	Dimensional	Ist Piece and every 50th Piece	IS 802 Part II/ IS 7215/ POWERGRID approved Drwg., Shop Sketches		-do-	A	J	S	Z	-	N	
(i)	For 13.5 mm dia Hole				Sheared 20mm Min.								
					Rolled 16mm Min.								
(ii)	For 17.5 mm dia Hole				Sheared 23mm Min.								
					Rolled 20mm Min.								
(iii)	For 21.5 mm dia Hole				Sheared 28mm Min.								
					Rolled 25mm Min.								
(iv)	For 25 mm & 25.5 mm dia Hole				As per approved drawing								
(f)	Drilling & Punching Hole To Hole Distance		I[st] Piece and every 50th Piece		Tolerance cumulative and between consecutive hole shall be within ± 2 mm and ± 1mm respectively	-do-	A	J	S	Z	-	N	

Sr. No.	Components/ Operation & Description of Test	Type of Check	Quantum of Check / Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						
							1	2	3	4	5	6	Remarks
(g)	Notching Flange Cut Corner Cut Bevel Cut		I[st] Piece and every 50th Piece		+ 5mm on specified length of cut, operationally shearing up to 12 mm thick & by gas cutting for material above 12 mm thick	-do-	A	J	S	Z	-	N	
(h)	Heel Cutting	Dimensional	I[st] Piece and every 50th Piece	POWERGRID Approved Drwgs./ Shop Sketches	for members > 12mm thick - gas cutting may be adopted followed By grinding/Machine cutting; Tolerance on heel cutting length: +10mm	-do-	A	J	S	Z	-	N	
(i)	Bending		100% Pieces	IS 802(Part II)/ IS 7215/ POWERGRID Approved Drawing / Shop Sketches	(1) HT Sections / Plates - All Sections & all plates to be hot bent. (2) MS Section- i) Cold – Section upto 75X75X6 - Angle Upto 10° ii) Cold – Section upto 100X100X8 – Angle Upto 5° iii) Hot - Section above 75X75X6 – Angle Above 10° iv) Hot - Section above 100X100X8 – Angle Above 5° (3) M. S. Plates i) Cold Upto 12 mm thick - Angle Upto 15° ii) Hot - Others	-do-	A	J	S	Z	-	N	
(j)	Welding	(a) WPS Approval (Welding procedure specification) (b) PQR/WQR Approval (Procedure /Welder qualification record)		As per Power Grid Technical specn./approved Drg./POWERGRID approved Welding procedure & Welder`s qualification		-do-	A	J	U	Y	-	N	WPS approval by POWERGRID CIP at black stage for welded members
	Welding	(1) DP Test (2)Dimensional & visual for welded tower parts	Random Basis	-- do ---		-do-	A	J	U	Z	-	N	CIP

Sr. No.	Components/ Operation & Description of Test	Type of Check	Quantum of Check / Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
(k)	Final Inspection of Fabricated Parts		Random Basis	All parameters from (a) to (j) above are checked and record maintained before releasing the materials for galvanizing.		-do-	A	J	S	Z	-	N	
(l)	Foundation Bolts i) Cutting & Shearing ii) Chamfering iii) Threading	Physical	1st piece & every 50th piece	IS 802/POWERGRID technical spec./approved drawing		MFOR	A	J	S	Z		N	
3	**GLAVANIZING (Surface Preparation Procedure)**												
3.1	**Degreasing**	Chemical	One sample daily	IS 2629	Manufacturer's plant standard / IS	-do-	A	J	S	Z	-	N	
3.2	**Pickling**	Chemical	One sample daily	IS 2629	Manufacturer's plant standard/IS Iron contents 100 to 120 gram/litre. Max	-do-	A	J	S	Z	-	N	
3.3	**Rinsing**	Chemical	One sample daily	IS 2629	Manufacturer's plant standard / IS	-do-	A	J	S	Z	-	N	
3.4	**Pre Fluxing**	Chemical	One sample daily	IS 2629	IS 2629	-do-	A	J	S	Z	-	N	
3.5	**Pre-heating**	Measurement	One check daily	IS 2629	IS 2629	-do-	A	J	S	Z	-	N	
3.6	**Dipping** After drying is over the material is dipped in molten zinc. Following parameters are controlled					-do-	A	J	S	Z	-	N	
	a) Zinc bath temperature Recording is done by graphical manner OR sensors with digital display		Hourly check	IS 2629	450+/-10° C.	-do-	A	J	S	Z	-	N	

Sr. No.	Components/ Operation & Description of Test	Type of Check	Quantum of Check / Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						
							1	2	3	4	5	6	Remarks
	b) Immersion & Withdrawal time. Degree of immersion and withdrawal time is decided based on thickness and length of material.			IS 2629	IS 2629	-do-	A	J	S	Z	-	N	
3.7	**Quenching in Running Water:** After dipping the material is quenched in running water			IS 2629	IS 2629	-do-	A	J	S	Z	-	N	
3.8	**Dichromating :** After quenching, material is dipped in sodium dichromatic solution to avoid the white rust. (Proprietary Chemicals.)		One Sample	IS 2629	IS 2629	-do-	A	J	S	Z	-	N	
4	**Galvanizing Checking**												
(a)	Visual Checking	Visual	100%	IS 2629	Surface to be free from defects like bare / black spots, (except when small and suitable for patching) heavy ash & flux inclusions, lumps, pimples, runs etc.	-do-	A	J	S	Z	-	N	
(b)	Thickness of Zn Coating	Measurement	8 samples / shift	IS 4759	The minimum average zinc coating for all section shall be 87 microns for thickness $\geq$ 5 mm & 65 microns for thickness < 5mm and for plates	-do-	A	J	S	Z	-	N	*For marine mentioned in BPS, $\geq$5mm=127 micron, <5mm & plate=87 micron

Sr. No.	Components/ Operation & Description of Test	Type of Check	Quantum of Check / Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						
							1	2	3	4	5	6	Remarks
(c)	Weight of Zinc Coating	Measurement	3 samples / shift	IS 4759 / IS 6745	(a) For thickness below 5mm, but not less than 2 mm - Average Mass of Coating - 460gm/m² (b) For thickness 5mm & above – Average Mass of Coating - 610 gm/m²	-do-	A	J	S	Z	-	N	*For marine, ≥5mm=900gm/ m², <5mm & plate=610 gm/ m²
(d)	Uniformity of Zn Coating	Measurement	3 samples / shift	IS 2633	Material to withstand 4 dips of one minute each without showing signs of copper deposits	-do-	A	J	S	Z	-	N	
(e)	Adhesion Test of Zinc coating	Pivoted Hammer Test	3 samples / shift	IS 2629	No removal or lifting of coating in areas between hammer impressions	-do-	A	J	S	Z	-	N	
C. Final Inspection & Testing (Inspection Engineer to Check/ensure compliance to notes/General Requirements given on Notes of MQP.)													
(a)	VISUAL & DIMENSIONAL INSPECTION For Fabrication (as per approved dwg.) & Galvanizing	Visual & Measurement	One sample for Every 50 MT/ section/Lot or part thereof for each source/vendor	Please refer Sr. No 2(a) to 2(j) & Cl. No. 4.3 (a)	Please refer Sr. No 2(a) to 2(j) & Cl. No. 4.3 (a)	Test Report	A	J	U	Z		Y	CIP
(b)	MECHANICAL	(i) UTS Test (ii) Yield Stress Test (iii) % Elongation Test (iv) Bend Test (v) Impact Test, if applicable	One sample for Every 50 MT/ section/Lot or part thereof for each source/vendor	Please Refer (for test values) Sr. No. 1.1.1(a), (b) (c), (d) , (e)	Please Refer (for test values) Sr. No. 1.1.1(a), (b) (c), (d) , (e)	Test Report	A	J	U	Z	-	Y	CIP
(c)	Chemical Properties	Spectro Analysis	-do-	IS 2062:2012	Chemistry needs to be comparable with approved supplier TC	Test Report	A/ D	J/ L	U/V	Z		Y	CIP (Applicable for all except for black angle sections procured from POWERGRID approved Re-rollers with stage CIP. 10% samples shall be selected randomly for chemical testing from the Samples taken from material procured with CIP .)

Sr. No.	Components/ Operation & Description of Test	Type of Check	Quantum of Check / Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						
							1	2	3	4	5	6	Remarks
(d)	GALVANIZING TESTS	i) Thickness of Zinc Coating ii) Weight of Zinc Coating iii) Uniformity of Zinc Coating iv) Adhesion Test of Zinc Coating	One sample for Every 50 MT/ section/Lot or part thereof	IS 2629/IS 4759/IS 6745/IS 2633/	Please refer Cl. 4.0	Test Report	A	J	U	Z	-	Y	CIP
5	**For Foundation Bolt-**						A	J	U	Z	-	Y	CIP
	a) Dimensional test	Measurement	Sampling asper IS 1367/2500	POWERGRID Drawing	POWERGRID Drawing	Test Report							
	b) Mechanical Test UTS, Yield & Elongation	Mechanical	2 sample /heat/cast/lot of 100 MT	As per IS 2062/SAE 1018	As per IS 2062/SAE 1018								
	c) Chemical Test	Spectro Analysis	2 sample /heat/cast/lot or part thereof	As per IS 2062/SAE 1018	Chemistry needs to be comparable with raw material supplier TC	TPL Report							
6	Packing, Storing, Bundling and Handling	100%			IS802/POWERGRID specn./ Packing list to be submitted along with dispatch documents	Tower manufacturer's Log Book/Format No							Tower wise bundling shall be carried out. Pieces of light sections to be wire bundled and heavy sections to be supplied loose. Stacking to have proper ventilation and kept inclined. Damage to galvanization coating to be avoided while handling. to ensure sequential supplies and other details as per POWERGRID technical specification.

Sr. No.	Components/ Operation & Description of Test	Type of Check	Quantum of Check / Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						
							1	2	3	4	5	6	Remarks

NOTES / GENERAL REQUIREMENTS TO BE CHECKED/ENSURED

1 The manufacturer if purchasing the steel sections directly from the re-rollers, the POWERGRID approved re-roller MQP to be ensured.

2 Nuts/Bolts and Step Bolts / Nuts and other bought out items to be procured from POWERGRID approved sources and inspection at sub-vendor's works.

3 Welding procedure and Welder's performance qualification approval by POWERGRID is required in case welding is involved at any stage of fabrication of Tower parts.

4 All bent pieces shall be checked at the process of bending by a bend gauge made as per bend ratio/degree shown in the sketch of the item / mark no. On the stand, one piece is thoroughly checked with bend gauge and all other pieces are checked by comparison method and pieces are cleared for further process. If the holes are to be made near the bend line, the same shall be done after bending.

5 The sample pieces consumed in a testing shall be replenished by the manufacturer at the time of dispatch. If the offered material meets the quality requirements, CIP/MICC shall be issued for total quantity offered without deducting the weight of materials consumed in testing.

6 POWERGRID Specification means POWERGRID Technical Specification, Approved Drawing, Approved Technical data sheet and LOA provisions applicable for the specific contract.

7 **Grades of steel used and the standards to which the material conforms, shall be as approved by POWERGRID Engineering for the specific contract and same needs to be indicated in approved Drawings/ BOM & offer list.**

8 Steel plates below 6mm size used for packing plates/packing washers, produced as per IS: 1079 (Grade-0) are also acceptable. However, if below 6mm size plate are used as load bearing plates viz gusset plates , joint splices etc. the same shall conform to IS : 2062 or equivalent standard. Flats of equivalent grade meeting mechanical strength/ metallurgical properties may also be used in place of plates for packing plates/ packing washers.

9 The manufacturer shall maintain proper co-relation of test certificate with respect to the material from raw material stage to finished material stage (whether procured from POWERGRID approved sources on self- certification basis i.e. no stage CIP or POWERGRID approved re-rollers)

10 The manufacturer shall strip off galvanizing of rejected material before re-galvanizing in case rejection is due to galvanizing defects.

11 The manufacturer shall dispose off entire section rejected in physical testing by gas cutting or by machine cutting from any end of rejected mark number.

12 In case of any contradiction between Technical Specification / Approved Drawing and MQP, the details mentioned in the Technical Specification / Approved Drawing shall be final.

13 The manufacturer should progressively align their Quality System and sub-vendors Quality System to the requirements of ISO 9000 series Quality Standards and in due course of time should get their quality system certified to ISO 9001.

14 The manufacturer to ensure that all measuring & testing equipments is having valid calibration certificate issued by NABL accredited testing agency or other approved accreditation agency operating in line with ISO/IEC 17011 and having full membership & MRA of ILAC/APLAC only.

15 Inspection of angle sections at black stage for galvanised tower structures/parts, irrespective of specific contract can be followed as detailed hereunder:

a. The manufacturer may raise inspection call for angle section at black stage at re-roller's work against any one of the ongoing Contract.

b. The manufacturer may fabricate the raw material, cleared under CAT –A CIP for a particular contractor, for any of its POWERGRID projects under execution.

c. The manufacturer will maintain a separate register indicating splitting and swapping of material between different projects awarded to same contractor, which can be reviewed by POWERGRID inspection engineer. Separate register for each Contractor is to be maintained if the manufacturer is executing jobs for different contractor.

Sr. No.	Components/ Operation & Description of Test	Type of Check	Quantum of Check / Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						
							1	2	3	4	5	6	Remarks

d. The manufacturer as a contractor on whom POWERGRID has placed the contract, will only be allowed to split and swap material in black stage only, amongst its different ongoing contracts with POWERGRID, without any obligation to POWERGRID.

e. The final inspection after fabrication and galvanizing, however, will continue to be contract wise and CIPs will be issued for each contract only.

16 Pieces of light sections to be wire bundled & of heavy sections to be supplied loose. Stacking to have proper ventilation and kept inclined. Damage to galvanization coating to be avoided while handling. The fabricator to ensure sequential supplies and other details as per POWERGRID Technical Specification

17 Prior approval of POWERGRID is required to be taken for any activity or process that is out sourced.

18 In case tower part to be used at sub zero temperature, we may carry out Impact testing at -20° C during final inspection in line with IS/ POWERGRID TS.

19 All relevant IS standards shall be read along with the latest amendments.

20 Dispatch of the inspected towers shall be done with each tower / panel wise bundling in order to ensure availability of complete tower parts without missing of any member at site.

ANNEXURE-I

Agreed Chemical Composition of Billets / Blooms for POWERGRID Projects

	Rashtriya Ispat Nigam Ltd (RINL):			SAIL (IISCO)		SAIL (BSP)		SAIL (DSP)	
Grade	C18HMn-For HT (E350) with V	C18HMn-For HT (E350) with Ti	C20 MMn-For MS (E250)	SAIL Tower Grade VI For HT (E350)	C20 MMn-For MS (E250)	SAIL Tower Grade VI For HT (E350)	C20 MMn-For MS (E250)	SAIL Tower Grade VI For HT (E350)	C20 MMn-For MS (E250)
C	0.15-0.20	0.15-0.20	0.17-0.23	0.15-0.22	0.16-0.25	0.15-0.22	0.16-0.25	0.15-0.22	0.16-0.25
Mn	1.1-1.4	1.1-1.4	0.6-0.1	1.15-1.6	0.6-1.05	1.25-1.6 / 1.20-1.6*	0.6-1.05	1.25-1.6 / 1.20-1.6*	0.6-1.05
Si	0.1-0.35	0.1-0.35	0.1-0.35	0.10-0.35	0.15-0.30	0.15-0.30	0.1 (Max)	0.15-0.30	0.15-0.30
P (Max)	0.04	0.04	0.04	0.045	0.047	0.047	0.047	0.047	0.047
S (Max)	0.04	0.04	0.04	0.045	0.047	0.047	0.047	0.047	0.047
Cr (Max)	0.08	0.08	0.08	0.1	0.2	0.2	0.2	0.2	0.2
Ni (Max)	0.03	0.03	0.03	0.05	0.05	0.05	0.05	0.05	0.05
Cu (Max)	0.03	0.03	0.03	0.07	0.1	0.1	0.1	0.1	0.1
Mo (Max)	0.005	0.005	0.005	0.05	0.05	0.05	0.05	0.05	0.05
V (Min)	0.03			0.025	As per test certificate	0.025 / 0.03*	As per test certificate	0.025 / 0.03*	As per test certificate
V (Max)	0.08	0.01	0.01						
Nb (Min)				0.015		0.015		0.015	
Nb (Max)									
Ti (Min)		0.028							
Ti (Max)	0.01	0.05	0.01						
Al (min)	0.015 for SMS -1 Heats			0.015					
Al (max)	0.04 for SMS -2 Heats								
CE (Min)			0.28		0.28	0.36	0.28	0.36*/0.38	0.28
CE (Max)	0.45	0.45	0.42	0.45	0.42	0.45	0.42	0.45	0.42
S+P (Max)				0.09	0.09	0.09	0.09	0.09	0.09
N (Max)									
B (Max)	0.004	0.004	0.004	0.005	0.005	0.005	0.005	0.005	0.005
Sn (Max)									
Remarks	Variation in Min/Max Limit: C=0.02, Mn=0.03, P=0.005, S=0.005			Si - Traces - 0.35 for Al killed Steel, V=0.025 Min or Nb=0.015 (if added alone), V+Nb+Ti = 0.25 Max, Al=0.015 for Al Killed heats.		Mn 1.25 -1.60 for blooms size 350x150mm; V=0.025 Min for Billets and Blooms up to 150 mm and 0.03 for Blooms of 160 mm and above; Nb=0.015 (if added alone), Al=0.015 for Al Killed heats.		* 0.36 for 125x125 mm Billets Mn 1.25 -1.60 for blooms size 350x150mm; V=0.025 Min for Billets and Blooms up to 150 mm and 0.03 for Blooms of 160 mm and above; Nb=0.015 (if added alone), Al=0.015 for Al Killed heats.	

ANNEXURE-I

Agreed Chemical Composition of Billets / Blooms for POWERGRID Projects

	Tata Steel Ltd, Kalinganagar		Electrosteel Steels Ltd		Jindal Steel & Power Ltd (Raigarh & Angul)			JSW Steel Ltd		
Grade	C18 HMn-HT (E350)	C18 MMn-For MS (E250)	C18HMn-For HT (E350)	C20 MMn-For MS (E250)	C18 HMn-HT (E350)	C20 MMn-For MS (E250)	C18 MMn-For MS (E250)	C18 HMn-HT (E350)	C20 MMn-For MS (E250)	C18 MMn-For MS (E250)
C	0.12-0.18	0.12-0.18	0.15-0.22	0.17-0.25	0.15-0.20	0.17-0.23	0.15-0.21	0.15-0.21	0.17-0.23	0.15-0.21
Mn	1.05-1.45	0.6-0.95	1.20-1.50	0.6-1.00	1.20-1.50	0.60-1.00	060-1.00	1.20-1.50	0.60-1.00	0.60-1.00
Si	0.14-0.25	0.14-0.25	0.10-0.35	0.10-0.35	0.15-0.30	0.10-0.40	0.10-0.40	0.10-0.35	0.10-0.35	0.10-0.35
P (Max)	0.03	0.03	0.045	0.045	0.03	0.04	0.04	0.04	0.04	0.04
S (Max)	0.02	0.02	0.045	0.045	0.03	0.04	0.04	0.03	0.04	0.04
Cr (Max)	0.1	0.1	0.08	0.08	0.07	0.07	0.07	0.07	0.07	0.07
Ni (Max)	0.1	0.1	0.03	0.03	0.07	0.07	0.07	0.07	0.07	0.07
Cu (Max)	0.1	0.1	0.03	0.03	0.1	0.1	0.1	0.1	0.1	0.1
Mo (Max)	0.1	0.1	0.005	0.005	0.07	0.07	0.07	0.07	0.07	0.07
V (Min)			0.03		0.03			0.025		
V (Max)			0.06	0.005						
Nb (Min)					0.015			0.015*		
Nb (Max)	0.15	0.15								
Ti (Min)										
Ti (Max)	0.1	0.1								
Al (min)	0.02	0.02			0.015	0.01	0.01	0.015	0.01	0.01
Al (max)								0.06		
CE (Min)			0.36	0.28						
CE (Max)	0.45	0.42	0.45	0.42	0.45	0.42	0.42	0.45	0.42	0.42
S+P (Max)										
N (Max)	0.012	0.012								
B (Max)	0.0005	0.0005	0.004	0.004						
Sn (Max)										
Remarks	Total Microalloying (Ti+Nb+V) = 0.025 (Min) and 0.25 (Max)				Variation in Min Limit: C=0.02, Mn=0.03, P=0.005, S=0.005, Nb when added alone V+Nb+Ti<=0.25			Total Microalloying (Ti+Nb+V) <= 0.20 * Nb=0.015 (Min) if aded alone		

ANNEXURE-I

Agreed Chemical Composition of Billets / Blooms for POWERGRID Projects

	Jayaswal Neco Industries Ltd			Visa Steel Limited			Usha Martin Ltd			Monnet Ispat & Energy Ltd		
Grade	C18 /C20 HMn-HT (E350)	C18 MMn MS (E250)	C20 MMn- MS (E250)	C18 / C20 HMn-HT (E350)	C18MMn-For MS (E250)	C20 MMn-For MS (E250)	C18HMn-For HT (E350)	C20 MMn-For MS (E250)	C18 MMn for MS (E250)	C18HMn-For HT (E350)	C20 MMn-For MS (E250)	C18 MMn for MS (E250)
C	0.15-0.20	0.15-0.20	0.17-0.23	0.15/0.17*-0.20	0.15-0.20	0.17-0.21	0.15-0.20	0.17-0.23	0.15-0.21	0.17-0.21	0.18-0.22	0.16-0.20
Mn	1.2-1.50	0.6-1.00	0.6-1.00	1.2-1.5	0.6-1.0	0.6-1.0	1.20-1.50	06-1.00	0.6-1.00	1.20-1.35	0.60-0.80	0.60-0.80
Si	0.15-0.35	0.15-0.35	0.15-0.35	0.15-0.35	0.15-0.30	0.15-0.30	0.15-0.30	0.10-0.40	0.10-0.40	0.15-0.30	0.15-0.30	0.15-0.30
P (Max)	0.035	0.035	0.035	0.035	0.035	0.035	0.03	0.04	0.04	0.03	0.04	0.04
S (Max)	0.035	0.035	0.035	0.035	0.035	0.035	0.03	0.04	0.04	0.03	0.04	0.04
Cr (Max)	0.05	0.05	0.05	0.05	0.05	0.05	0.07	0.07	0.07	0.05	0.05	0.05
Ni (Max)	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.07	0.07	0.05	0.05	0.05
Cu (Max)	0.1	0.1	0.1	0.05	0.05	0.05	0.1	0.1	0.1	0.05	0.05	0.05
Mo (Max)	0.05	0.05	0.05	0.05	0.05	0.05	0.01	0.01	0.01	0.05	0.05	0.05
V (Min)	0.03			0.03			0.03			0.025		
V (Max)												
Nb (Min)												
Nb (Max)												
Ti (Min)												
Ti (Max)				0.01	0.01	0.01						
Al (min)	0.015	0.01	0.01	0.02			0.015	0.002	0.002			
Al (max)	0.035	0.035	0.035		0.025	0.025						
CE (Min)	0.38											
CE (Max)	0.42	0.41	0.41	0.44	0.39	0.39	0.45	0.42	0.42	0.45	0.42	0.42
S+P (Max)												
N (Max)												
B (Max)												
Sn (Max)	0.1	0.1	0.1									
Remarks	Variation in Min/Max Limit: C=0.02, Mn=0.05			* : For C20 HMn Material Variation in Min/Max Limit: C=0.02, Mn=0.03, P=0.005, S=0.005, Si=0.03, V+Nb+Ti = 0.15(Max)			V+Nb+Ti=0.25			Al=0.02 (Min) for Al Killed heats. Ti+Nb+V <= 0.15		

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ANNEXURE-I

Agreed Chemical Composition of Billets / Blooms for POWERGRID Projects

	Electrotherm India Pvt Ltd			Shreeyam Power Pvt Ltd	Bhushan Steel Ltd		Neelachal Ispat Nigam Ltd	Adhunik Metaliks	
Grade	C18 HMn-HT (E350)	C20 MMn-For MS (E250)	C18 MMn-For MS (E250)	C18 MMn-For MS (E250)	C18 HMn-HT (E350)	C20 MMn-For MS (E250)	C20 MMn-For MS (E250)	C18 HMn-HT (E350)	C20 MMn-For MS (E250)
C	0.15-0.21	0.17-0.23	0.15-0.21	0.15-0.21	0.15-0.21	0.17-0.23	0.15-0.23	0.15-0.20	0.17-0.23
Mn	1.20-1.50	0.60-1.00	0.60-1.00	0.60-1.00	1.20-1.60	0.60-1.00	0.6-1.0	1.2-1.5	0.6-1.0
Si	0.10-0.35	0.10-0.35	0.10-0.35	0.10-0.30	0.35	0.35	0.15-0.35	0.15-0.3	0.1-0.4
P (Max)	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
S (Max)	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Cr (Max)	0.1	0.1	0.1	0.07	0.12	0.12	0.01	0.06	0.06
Ni (Max)	0.07	0.07	0.07	0.07			0.05	0.08	0.08
Cu (Max)	0.1	0.07	0.07	0.07			0.01	0.07	0.07
Mo (Max)	0.07			0.07	0.07			0.03	0.03
V (Min)	0.025				0.03			0.03	
V (Max)	0.05						0.01		
Nb (Min)	0.015								
Nb (Max)									
Ti (Min)									
Ti (Max)								0.01	0.01
Al (min)	0.015	0.02	0.02	0.015	0.01	0.01	0.02*	0.02	
Al (max)									
CE (Min)									
CE (Max)	0.47	0.42	0.42	0.42	0.45	0.42	0.42	0.43	0.39
S+P (Max)									
N (Max)									
B (Max)									
Sn (Max)								0.015	0.015
Remarks	Nb = 0.015 Min if added alone Ti+Nb+V <= 0.20				Ti+Nb+V <= 0.20		(size 150x150 Sq.mm only) * In case Al killed steel only	Variation in Min/Max Limit: C=0.02, Mn=0.03, P=0.005, S=0.005, Si- 0.03	

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Appendix - IV

LIST OF MAJOR T&P USED IN TOWER ERECTION & STRINGING

APPENDIX-IV

List of Major T&P used in Tower Erection & Stringing

Sl No	Item Discription	Broad Technical Parameters & Standards
1	**Derrick Pole**	Made of seamless steel pipe: Material confirming to IS:1161, Grade Yst 240 **For 220kV & 132kV:** ID-116 mm, OD-127mm, Thickness 5.4mm, Length 6m/9m (6+3) **For 400kV & 765kV:** ID-155mm, OD-168.30 mm, Thickness 8mm, Length 6m/9m(6+3)/12m (6+6)
2	**Gin Pole**	Made of high-tensile aluminum and have swivel head & base. Length 12 to 24 m .Breaking strength 100/80/16kN with lifting capacity of 50/40/8kN.
3	**Motorised Power Winch**	As per IS 9507
4	**Hydraulic Power Winch**	Maximum pull capacity of 35kN with negative breaking system, independent mechanical stabilizer (front & rear) and emergency stop push button.
5	**Single sheave Pulley close & open type**	Conforming to IS:13156, Withstand load - 8 MT(min.)
6	**Double sheave Pulley**	Conforming to IS:13156, Withstand load - 5/10 MT(min.)
7	**"D" Shackle**	FORGED SHACKLES, IS/ISO 2415, Minimum Ultimate Strength - 5/8/10 T
8	**Steel Wire rope**	Steel wire rope DIA - 16/18/20 mm Conforming to IS 2266
9	**PP (Polypropylene) Rope**	Dia- 12 mm/16 mm/18 mm/20 mm/22mm/24 mm Conforming to IS 5175
10	**Turn Buckle**	Confirming to IS:3121,
11	**Trifor - (For tower erection with Gin pole)**	Confirming to IS 5604
12	**Motorised Joint Machine**	Light weight 100 T – for Zebra/ Moose Conductor & Earthwire and 120 T – Bersmis/ Lapwing Conductor
13	**Single sheave aerial rollers**	Dia. 300/450/660 mm Sheaves - Al alloy mounted on ball bearing Frames - Mild Steel
14	**Three sheave aerial rollers**	Side Rollers - Al alloy Centre Rollers - Al alloy or Mild Steel Frames - Mild Steel
15	**Five Sheave aerial Rollers**	
16	**Seven Sheave Rollers**	
17	**TSE - TWIN/QUAD/HEXA Bundle**	Capacity of TSE 8T for Twin Bundle, 16T for Quad Bundle & 24T for Hexa Bundle with negative hydraulic brakes for safety.
18	**Sagging Platform**	Superior Aluminium Alloy in trapezoidal structure with antifall barrier.
19	**EarthWire Roller**	Steel Sheave mounted on Double Ball Bearing.
20	**Head Board - OPGW**	Frames - Mild Steel, Front & Back Tail with Pin - High Tensile Steel
21	**Head Board - Twin/Quad/Hexa**	Made with heat treated alloy steel
22	**Pilot Wire**	Anti-Twisting Galvanized Braided Steel Rope 16 mm, 18mm for Twin Moose , 22mm for Quad Moose, 28 mm for Hexa Lapwing -800kV Stringing.
23	**Four sheave Pulley**	Material Conforming to IS:13156
24	**Turn Table**	Earth Wire-3 MT, Conductor-5MT
25	**Equilizer Pulley**	Material Conforming to IS:13156, Capacity - 10/15 MT
26	**Single End Socks Conductor**	High Tensile Galvanized Steel Wires
27	**Double End Socks Conductor**	High Tensile Galvanized Steel Wires
28	**Drum Lifting Jack**	Frame Material- M. S. Pipe, Class C
29	**Bull Dog Clamp - 18mm**	Conforming to IS:2361

Sl No	Item Discription	Broad Technical Parameters & Standards
30	**Spacer Cycle /Trolley**	Made of light Aluminium alloy material .
31	**Ratchet Lever Hoist**	IS:11340
32	**Swivel/Articulate Joint**	Made with High Tensile steel, 3/11/22/36 MT (BL)
33	**Bolted Come Along Clamp - E/W & Conductor**	Body - SG Iron Hook & Eye Bolt - HT steel Liners - Al Alloy

Note: Above technical parameters indicate the basic minimum requirements of T&Ps. All T&Ps shall confirm to Indian standards, wherever applicable. Other International standards, which ensure equal or better properties/performance shall also acceptable.

Annexure-I

1. Site Acceptance Tests

Prior to installation, every spooled fibre optic cable segment shall be tested for compliance with the Pre-shipment data previously received from the manufacturer. This requirement will preclude the installation of out of specification cable segments that may have been damaged during shipment.

SAT shall be carried out link by link from FODP to FODP. SAT may be performed in parts in case of long links.

Sag and tension of OPGW shall generally be as per approved sag-tension chart and during installation, sag and tension of OPGW shall be documented. Upon completion of a continuous cable path, all fibres within the cable path shall be demonstrated for acceptance of the cable path. Fibre Optic cable site testing minimum requirements are provided in Table 1(a) through 1 (c) below:

Table 1 (a)

Fibre Optic Cable Pre-Installation Testing

Item:	Description:
1.	Physical Inspection of the cable assembly for damage
2.	Optical fibre continuity and fibre attenuation with OTDR at 1550 nm
3.	Fibre Optic Cable length measurement using OTDR

Table 1 (b)

Fibre Optic Cable Splicing Testing

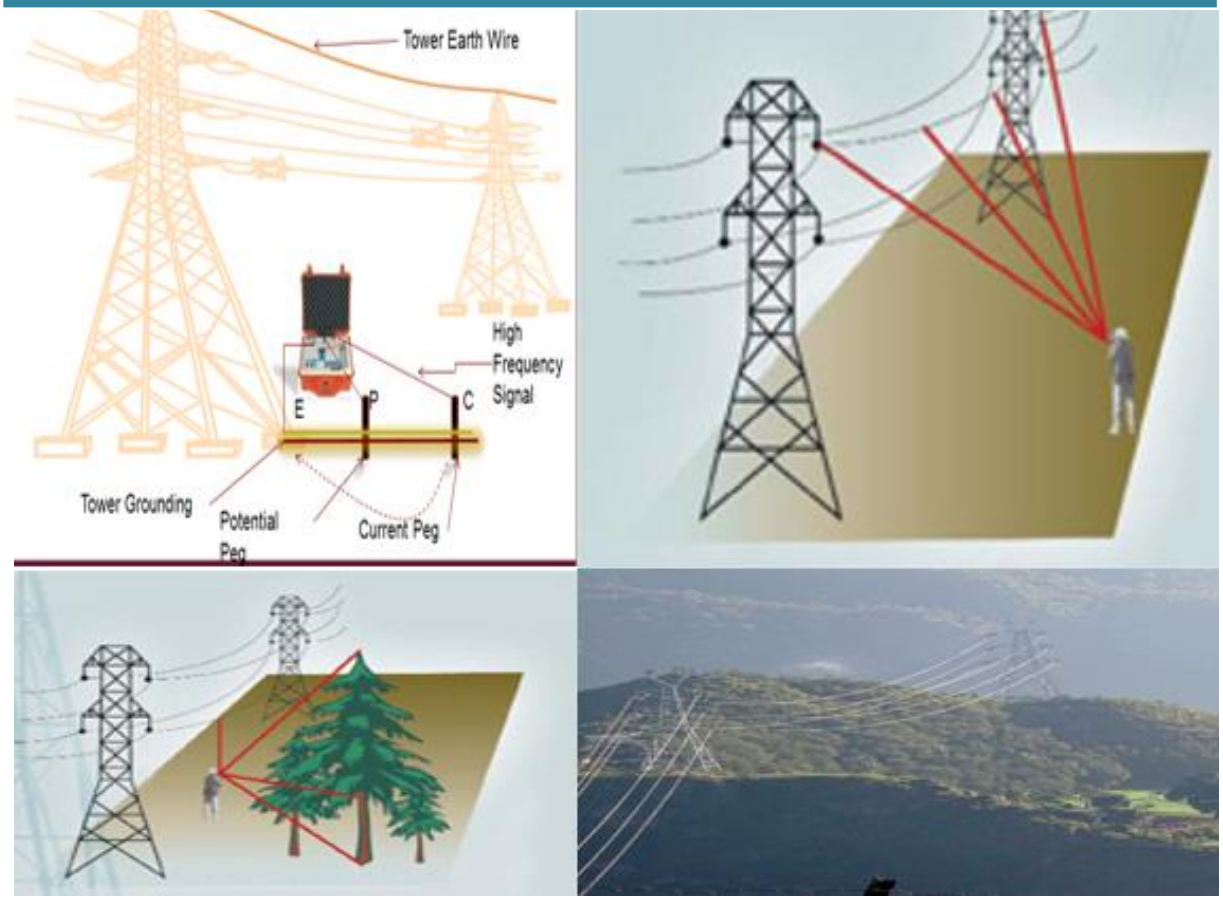
Item:	Description:
1.	Per splice bi-directional average attenuation with OTDR
2.	Physical inspection of splice box/enclosure for proper fibre / cable routing techniques
3.	Physical inspection of sealing techniques, weather proofing, etc.

Table 1 (c)

Fibre Optic Cable Commissioning Testing

Item:	Description:
1.	End to End (FODP to FODP) bi-directional average attenuation of each fibre at 1310 nm and 1550 nm by OTDR.
2.	End to End (FODP to FODP) bi-directional average attenuation of each fibre at 1310 nm and 1550 nm by Power meter.
3.	Bi-directional average splice loss by OTDR of each splice as well as for all splices in the link (including at FODP also).
4.	Proper termination and labelling of fibres & fibre optic cables at FODP as per approved labelling plan.
-End of Table-	

PRE-COMMISSIONING FORMATS FOR TRANSMISSION LINE



पावरग्रिड
POWERGRID

CORPORATE ASSET MANAGEMENT
POWER GRID CORPORATION OF INDIA LTD.

Sep ’2021

PRE COMMISSIONING FORMATS FOR TRANSMISSION LINES	Earlier Doc. No. D-2-01-70-01-02 Present Doc. No. D-2-01-70-01-03-part B				
	Rev.	Dept.	Date	Signature	Signature
	00	CC(OS)	30/11/1995	Sd/-	Sd/-
	01	CC(OS)	28/06/2004	Sd/-	Sd/-
	02	CC(AM)	15/12/2014	Sd/-	Sd/-
	03	CC(AM)	07/09/2021		

Proposed by	Reviewed by	Recommended by	Approved by
(Chhabila Kumar Sahoo) Engineer (AM)	(Manoj Kumar Singh) GM (AM)	(Adish Kumar Gupta) CGM (AM)	(A P Gangadharan) ED (AM)
Vivek Sundariyal CM (AM)			

Sl. No.	Chapter	Revision	Action
1	All	01	Replace All
2	All	02	Replace All
3	All	03	Replace All

Index

ABBREVIATIONS

AC	Alternating Current
AM	Asset Management
CC	Corporate Centre
CEA	Central electricity authority
CLR insulator	Composite Long Rod Insulator
CTUIL	Central Transmission Utility of India Limited
CVT	Capacitive Voltage Transformer
DC	Direct Current
D/C	Double circuit
FR type Foundation	Fissured rock type foundation
FS type Foundation	Fully submerged type foundation
GS	Ground Switch
HR type Foundation	Hard Rock type foundation
HVDC	High voltage Direct Current
ICT	Inter Connecting Transformer
IS	Indian standard
MOEF	Ministry of Environment and Forest
M/C	Multi circuit
NH	National Highway
NTAMC	National Transmission Asset Management System
OPGW	Optical Fiber Ground wire
PS type Foundation	Partially submerged type foundation
PTCC	Power and tele-communication coordination committee
PTW	Permit to work
ROW	Right of way
S/C	Single circuit
WBC type Foundation	Wet black cotton type foundation

Introduction:

The document consists of 4 formats.

Format 1: This format is divided into two parts. Part 1 covers the general information of Line, in part2 details inspection checklist need to be filled against each tower location.

Format 2: In this format list of pending works in the line, list of temporary arrangement used during line construction, removal of any antitheft measure used before energization of line will be filled and same will be verified in handing over format (**Format 3**)

Format 3: In this format handing over of the records related to statutory clearance documents, **Format -1** and **Format-2** will be done by construction team to the commissioning team and same will be recorded in this format with acceptance of energization of line by the commissioning in charge. The pending work (minor nature type) which will not potentially affect the charging of line will be listed in the format.

Format 4: Carrying out Electrical tests before energization of Line and recording of all electrical parameter such as voltage, current, active Power, reactive power, phase sequence etc. after energization of the line need to be done as per this format and record will be kept for future use.

Table for different type of clearances have given before each format for user reference purpose based on the present version of technical specification of POWERGRID.

FORMAT NO: AM/COMM/LINE/1a

Name of line	No of Circuit	Date of Energization

GERERAL DATA AND INFORMATION (for Line)

I	Region Name									
II	TL Office Name									
III	Type Of Conductor	Dog	Panther	Zebra	Moose	Snow Bird	AL 59	Bersimis	Lapwing	Others
IV	No of conductors in bundle	Single	Twin	Triple	Quad	Hexa	Octa	Others		
V	Voltage rating(kV)	66	132	220	+/-320	400	+/-500	+/- 800	765	1200
VI	Type of circuit	S/C	D/C	S/C on D/C Tower	M/C					
VII	Length of Line(in kms) **for the jurisdiction**									
VIII	Total Nos. of Towers **(in the jurisdiction)**									
a.	Total no of suspension towers									
b.	Total no of tension towers									

Note: Every row fields are independent and the verifying officer will tick the field as applicable for each location in other type of conductor HTLS or any other type to be mentioned

IX CROSSING DETAILS

a) River crossing

Span(Loc A-Loc B)	River(Name)	Whether River is navigable or not

b) Railway crossing

Span(Loc A-Loc B)	Name of Railway line

c) NH crossing

Span(Loc A-Loc B)	Name of NH

d) Power line crossing

Span (Loc A-Loc B)	Name of Power Line	Voltage rating of line (in kV)

FORMAT NO: AM/COMM/LINE/1b

GERERAL DATA AND INFORMATION (To be furnished against each Location)

Tower Location No:											
I	**Insulator Type**	Porcelain		CLR		Glass		Porcelain Long Rod		Mixed	
II	**Tower type details**										
	Tower type (For S/C)	A	B	B1	B2	C	C1	C2	D	D45	D60
	Tower type (For D/C)	DA	DB	DB1	DB2	DC	DC1	DC2	DD	DD45	DD60
	Angle of Deviation of Tower	0-2	2-15	2-7	7-15	15-30	15-22	22-30	30-60	30-45	45-60
	Tower type (For M/C) with angle of deviation	QA (0-2)	QB (2-15)			QC (15-30)			QD (30-60)		
III	**Normal Extn. (Meters)**	+3		+6		+9		+18		+25	+30
IV	**Other Leg/BodyExtn. (Meters)**	+1.5		+3.0		+4.5		+6.0		+7.5	+9.0
		-1.5		-3.0		-4.5		-6.0			
V	**Tower Foundation Type**	Dry	Sandy Dry	Wet	Wet cultivated	PS	FS	WBC FR	FR	HR	PILE
VI	**Is the location Vulnerable**	Yes					No				

Note: Every row fields are independent and the verifying officer will tick the field as applicable for each location

VII DETAILED CHECK LIST (To be furnished against locations)

Tower location No:

SL NO	DESCRIPTION	STATUS		REMARKS Record Deficiencies If Any
		YES	NO	
1	**Foundation**			
a	Check any damage/ uneven settlement of foundation			
b	Check back filling of foundation is properly filled up to the ground level of all legs			
c	Check surface earth/ concrete after foundation casting is removed from platform of the tower			
d	Check crack or damage to chimney			
e	Check crack or damage to retaining wall/ revetment and proper weep holes are provided for flushing water			
f	Check that all foundation chimneys are covered with soil and compacted specially in hilly terrain and river/ nalas banks up to ground level			
g	Check cliff-in foundation levels are within limit			
h	Check the back to back, diagonal and level of all four stubs (to be measured at stub top level). **Refer format-A for filling**.			
2	**Tower**			
a	Check for deformed/ rusted or damaged tower members			
b	Check for missing/hanging/bent tower members			
c	Check for missing bolts & nuts			
d	Check for tightening of all bolts & nuts			
e	Check for any missing joint plates			
f	Check for punching, tack welding (at least 10 mm circular length) and zinc coating of bolts & nuts			
g	Check filling of extra holes in tower members with bolts & nuts			
h	Check verticality of tower			

SL NO	DESCRIPTION	STATUS		REMARKS Record Deficiencies If Any
		YES	NO	
i	Check that no tower leg is suspected to be in sinking land or soil erosion field of river bank, if so, proper adequate protection has been provided			
J	Check fixing & visibility of all tower accessories namely danger/ number/ circuit/ phase plate/ step bolts and anti-climbing device (ACD)			
k	Check correct sequence of fixing of phase/ circuit plate at transposition towers			
l	Check that Fixing of bird-guards is done for all suspension towers to prevent birds perching			
m	Geotagged digital photographs (from different angles) of all towers to be taken and preserved.			
3	**Removal of T&P and foreign materials**			
a	Check temporary Earthing/ Guys used during stringing and jumpering are removed			
b	Check all foreign materials on tower e.g., discharge rod, wire/ropes, kite, bird nests and any other T&P etc. left over on tower/ cross arm are removed			
c	Check that all the insulator discs/ Long rod insulator units are free from any damage			
d	Check for unusual deflection in suspension strings and if found, should be rectified			
e	Check proper aviation warning signals on towers above 45 meter height			
f	Check that red & white paints have been applied on towers which fall in aviation route			
4	**Hardware fittings**			
a	Check that proper fixing of hardware fittings like corona control ring/ grading ring/ arcing horns/ etc. are provided as per the approved drawing/ specification			
b	Check the condition of cotter pins and ensure that proper size cotter pins have provided as per the approved drawing.			
c	Check that all insulators are thoroughly clean			

SL NO	DESCRIPTION	STATUS		REMARKS Record Deficiencies If Any
		YES	NO	
5	**Conductor and its accessories**			
a	Check that the conductors/ sub-conductors are free from scratches/ rubs			
b	Check that all joints on conductor/ earth wire/OPGW are away from the tower as per the specified distance (at least 30 meters) and joints are as per the approved drawings/ specification			
c	Check that not more than one joint in a sub conductor is provided in one span.			
d	Check that no mid span joints or repair sleeves are provided in major crossings for highway, Railway and major rivers.			
e	Check that all mid span joints on conductors/ Earth wire/OPGW and repair sleeves of compression type are free from sharp edges rust and dust			
f	Check that conductor is properly clipped in the suspension clamp			
g	Check that armor rods are provided on suspension towers			
h	Check that spacers/ spacer dampers are provided between sub conductors on each phase as per approved spacer placement chart/ specification			
i	Check that in case of tension towers, one additional spacer/ spacer damper is placed within 10 meter of dead end clamp.			
j	Check that all the spacers/ spacer-dampers are properly tightened and free from any external damage.			
k	Check that spacing of vibration dampers from the tower and spacing between damper to damper where two vibration dampers provided are properly fixed and tightened as per the damper placement chart/ specification			
l	Check that all the jumpers are properly fixed and torque tightened as per the approved drawing/ specification			

SL NO	DESCRIPTION	STATUS		REMARKS Record Deficiencies If Any
		YES	NO	
m	Check that on conductors/ earth wires/OPGW hardware fittings are free from all foreign material like dead bird/ fallen tree/ bird nests etc.			
n	Check that suitable counter weight is provided on Pilot string insulator (CLR type) as per approved drawings			
0	Check that Counter weight is provided for pilot insulator string in case of transposition tower (for both disc type/CLR type string)			
p	Geotagged digital Photographs indicating all jumper bolts are provided and properly tightened for at least 10% jumper connections are taken on random basis and preserved			
6	**Different type of Clearances**			
a	Check that right of way is not obstructed by any building/hut etc. The vertical clearance and horizontal clearance need to be maintained (if present/applicable) **(Refer Table-1 and 2)**			
b	Check that minimum clearance with trees is maintained if Trees are present in the corridor**(Refer Table-3)**			
c	Check that mid span clearance between top conductor and earth wire/ OPGW is adequate **(Refer Table-4)**			
d	Check that clearance between lowest conductor and ground is more than the required minimum ground clearance **(Refer Table-5)**			
e	Check that Jumper drop (i.e. distance between cross-arm and null point of jumper) as per design/drawing. All jumpers shall be checked for proper tightening. **(Refer Table-6)**			
f	Check that minimum clearance at Power line crossing is maintained. (if applicable) **(Refer Table-7)**			

SL NO	DESCRIPTION	STATUS		REMARKS Record Deficiencies If Any
		YES	NO	
g	Check that minimum clearance at railway track crossing is maintained (if applicable). **(Refer Table-8)**			
h	Check that minimum clearance at NH crossing is maintained. **(Refer Table-9)**			
i	Check that minimum clearance at River crossing is maintained (if applicable). **(Refer Table-10)**			
j	Measure the sag in one of the span in each section and check that sag and tension of the section is in line with specification and sag & tension calculation chart is approved by Engg. **Refer Format-B for measurement of Sag**			
7	**Tower footing impedance**			
a	Tower footing impedance needs to be measured at each location and it is to be ensured that impedance value is less than 10 ohms **Refer Format-C for measurement of Tower footing impedance**			
b	Physically check that earthing is at healthy condition (i.e. not damaged/not loose/not open)			
	10% checking			

Format-A for checking Back to Back measurement of stub

	As per drawing	Measured value	Deviation
Leg A-Leg B			
Leg B-Leg C			
Leg C-Leg D			
Leg D-Leg A			
Leg A-Leg C			
Leg B-Leg D			

Table-1: Clearance for right of way at different voltage level

Transmission voltage (kV)	66	132	220	± 320 HVDC	400 (S/C)	400 (D/C)	± 500 HVDC	± 800 HVDC	765(S/C) *(H/D type)	765 (D/C)	1200 (S/C)
ROW width (Meters)	18	27	35	44	52	46	52	69	85/ 64	67	89

* H-Horizontal configuration
D-Delta configuration
Formats for record

Location No	
ROW width (Meters)	

Table-2: Clearances from buildings of Lines

a) Vertical clearance

Voltage (kV)	66	132	220	400	765	1200
Minimum clearance (mm)	4000	4600	5500	7300	10600	14500

b) The horizontal clearance

Voltage (kV)	66	132	220	400	765	1200
Minimum clearance (mm)	2300	2900	3800	5600	8900	12800

Note: Clearance are calculated as per norms specified in clause no 61 of CEA safety regulation 2010

c) Clearance for DC line

Sl. No	DC Voltage (kV)	Vertical Clearance (in mm)	Horizontal Clearance (in mm)
1.	100 kV	4600	2900
2.	200 kV	5800	4100
3.	300 kV	7000	5300
4.	400 kV	7900	6200
5.	500 kV	9100	7400
6.	600 kV	10300	8600
7.	800 kV	12400	10700

Formats for record (if applicable)

Building /Structure	HCL	VCL
Clearance from building		

Table will be repeated for more than structure present

Table-3 : Minimum electrical clearance between Conductor & Trees

Voltage (KV)	Minimum clearance between conductors and trees (in meter)
66	3.4
132	4.0
220	4.6
400	5.5
765	9.0
+/-500 HVDC	7.4
+/-800 HVDC	10.7
1200	13

Formats for record (if applicable)

Tree	
Clearance from line	

Table repeated for more than one tree in corridor

Table-4: Minimum clearance for top conductor and Earth wire at mid-span

Voltage (kV)	66	132	220	± 320 HVDC	400	765	± 500 HVDC	± 800 HVDC	1200
Minimum mid span clearance (mm)	3000	6100	8500	9000	9000	9000	8500	12000(pole) 6100(DMR)	18000

Formats for record

Location	
Mid span Clearance value	

Table will be repeated if more than circuit is present in the line

Table-5: Minimum ground clearance for different voltage level

Transmission voltage kV)	**66**	**132**	**220**	**± 320 HVDC**	**400**	**765**	**± 500 HVDC**	**± 800 HVDC**	**1200**
Minimum Ground Clearance (mm)	5500	6100	7015	8500	8840	18000	12500	18000	24000

Formats for record

Location	
Minimum Ground Clearance (mm)	

Table will be repeated if more than circuit is present in the line

Table-6: Table for Jumper Drop

Transmission voltage kV)	**66**	**132**	**220**	**400**	**765**	**± 500 HVDC**	**± 800 HVDC**
Jumper Drop (in meter)	**1.3**	1.8	2.4	3.6	6.1	4	7.8(pole) 2.6(DMR)

***values to be confirmed with respective drawings**

Formats for record

Span (Tower location nos.)		**Jumper drop for Circuit-I**		
		R	**Y**	**B**

Table will be repeated for other circuit too in case of D/C or M/C

Table 7: Measurement of minimum clearance when line is crossing another Power line

Sl No	**Nominal System Voltage (in kV)**	**132**	**220**	**400**	**+/- 500 HVDC**	**765 kV**	**+/- 800 kV HVDC**	**1200**
1.	**132KV**	3050	4580	5490	6860	7940	9040	1044
2.	**220KV**	4580	4580	5490	6860	7940	9040	1044
3.	**400KV**	5490	5490	5490	6860	7940	9040	1044
4.	**+/- 500 kV HVDC**	6860	6860	6860	6860	7940	9040	1044
5.	**765 kV**	7940	7940	7940	7940	7940	9040	1044
6.	**+/- 800 kV HVDC**	9040	9040	9040	9040	9040	9040	1044

7.	**1200 kV**	1044	1044	1044	1044	1044	1044	1044

Formats for record (if applicable)

Span (Tower location nos.)		Crossing Power line details (Name & voltage)	Clearance (mm)

Table 8: Measurement of minimum clearance when line is crossing Railway track

(i) Vertical clearance for OHE (other than high rise OHE):

Sl. No.	Transmission line voltage level	Minimum clearances from Rail Level
		New Power Line crossing or crossing planned for alteration
1	Above 66 kV & up to 132 kV	15.56 m
2	Above 132 kV & up to 220 kV	16.46 m
3	Above 220 kV & up to 400 kV	18.26 m
4	Above 400 kV & up to 500 kV	19.16 m
5	Above 500 kV & up to 800 kV	21.86 m

(ii) Vertical clearance for high rise OHE*:

Sl. No.	Transmission line voltage level	Minimum clearances from Rail Level
		New Power Line crossing or crossing planned for alteration
1	Above 66 kV & up to 132 kV	17.56 m
2	Above 132 kV & up to 220 kV	18.46 m
3	Above 220 kV & up to 400 kV	20.26 m
4	Above 400 kV & up to 500 kV	21.16 m
5	Above 500 kV & up to 800 kV	23.86 m

* Applicable only for electrification of routes where double stack container having maximum height of 6809 mm is plying

(iii) Minimum Clearances between Highest Traction Conductor & Lowest Crossing conductors

Sl. No.	Transmission line voltage level	Minimum clearances from Rail Level
		New Power Line crossing or crossing planned for alteration
1	Above 66 kV & up to 132 kV	3.05
2	Above 132 kV & up to 220 kV	4.58
3	Above 220 kV & up to 400 kV	5.49
4	Above 400 kV & up to 500 kV	7.94

5	Above 500 kV & up to 800 kV	7.94

Notwithstanding the above ,Minimum clearance for railway crossings shall be as per Indian Railway Schedule of dimensions(BG) Revised 2004 as amended from time to time.

Formats for record (if applicable)

Span (Tower location nos.)	Railway track details (Name & voltage)	**Vertical clearance for OHE**	**Vertical clearance for high rise OHE**	**Minimum Clearances between Highest Traction Conductor & Lowest Crossing conductors**

Note: Minimum clearance when power line crossing railway track:

Table-9: Minimum Clearance in air above ground and across road surface of Highways or roads for lowest conductor of overhead lines

A) AC system

Nominal system Voltage(in kV)	**Clearance above ground**			**Clearance between conductor & road surface across high way(in meter)**
	Across street (in meter)	**Along street (in meter)**	**Elsewhere) (in meter)**	
66	6.5	6.1	5.5	11.6 or U/G cable
132	6.5	6.1	6.1	11.6
220	7.02	7.02	7.02	12.52
400	8.84	8.84	8.84	14.0
765	18*	18*	18*	18.8
1200	24*	24*	24*	30

B) DC system

Nominal system Voltage(in kV)	**Clearance above ground**	**Clearance between conductor & road surface across high way(in meter)**
+/- 500 kV HVDC	12.5	17.25
+/- 800 kV HVDC	18	22.75

Formats for record (if applicable)

Span (Tower location nos.)	Name of NH	Clearances	
		Clearance above Ground	Clearance between conductor & road surface across high way(in meter)

Table-10: Minimum Clearance of Power Conductor over the Highest Flood Level in case of navigable/non navigable rivers

AC system

AC Voltage Level in kV (Nominal voltage)	Minimum Clearance above H.F.L (mm)	
	Navigable River	Non-navigable river
66	19000	3650
110	19000	4300
132	19220	4300
220	20100	5100
400	21900	6400
765	25550	9400
1200	29900	11000

DC system

DC Voltage in kV	Minimum Clearance above H.F.L (mm)	
	Navigable River	Non-navigable river
+/- 500	24030	6750
+/- 800	27700	11000

Formats for record (if applicable)

Span (Tower location nos.)	Name of river (navigable/non-navigable)	Clearances	
		Clearance above Ground	Clearance between conductor & road surface across high way(in meter)

Format-B for measurement of sag in one of the span in each section (as applicable)

Section (Loc A To Loc B)	Span (Loc C To Loc D)	Measured sag(in meter)

Note: Measurement to be repeated for each phases and circuits

Format-C for measurement of Tower footing impedance

Location No.	Leg No	R(in Ω)	Rc (in Ω)	C (in nF)	L (in µH)	Z (in Ω)
	Leg-A					
	Leg-B					
	Leg-C					
	Leg-D					

(Note: The value should not be more than 10 ohms)

The above inspection and measurements are carried out in the location mentioned above and the remaining activities, temporary arrangements etc. are documented in format no: **AM/COMM/LINE/2**

	Erection Agency Representative	**Supplier Agency Representative**	**Project Execution (POWERGRID)**
Signature			
Date			
Name			
Organization			

Note:

- This format is to be filled for each tower location.
- This format is to be kept at group head quarter with a copy to regional head quarter
- This format to be signed not below the level of engineer and important locations like river crossing, railway crossing, National Highway, power line crossing etc. are to be countersigned by minimum Manager for POWERGRID and in-charge of the working agency

FORMAT NO: AM/COMM/LINE/2

NAME OF LINE	CIRCUIT	DATE OF ENERGISATION

INSPECTION RECORD PRIOR TO HANDING OVER FOR ENERGIZATION

LIST OF REMAINING ACTIVITIES

LIST OF TEMPORARY ARRANGEMENTS

Region:			Location		Observation		Completion		Inspection	
Section A/B/C	Sl. No.	Tower No.	From	To	Date	Sign	Date	Sign	Date	Sign
			Description of remaining activities/ Temporary arrangements							

	Erection Agency representative	Erection (POWERGRID)	Line In-charge (POWERGRID)
Signature			
Date			
Name			
Organization			

Details of sections is to be furnished in this format:

a. Outstanding activities remaining in any part of the line
b. A list of temporary arrangements introduced.
c. Checklist records properly completed and signed as per format **AM/COMM/ LINE/ 1**
d. Original tracing of Profile, Route alignment, Tower Design, Structural Drawings, Bill of material, Shop drawings, Stringing Charts indicating initial and final sag etc. of all towers submitted to POWERGRID.

Note: This document is to be retained at Group head S/S or TLM office with a copy RHQ

FORMAT NO: AM/COMM/LINE/3

NAME OF LINE	CIRCUIT	DATE OF ENERGISATION

HANDING OVER RECORD FOR ENERGIZATION

A. **GENERAL DATA AND INFORMATION**:

REGION		Office		TYPE OF TOWERS		S/C	D/C	M/C
VOLTAGE RATING			KV	Tower locations	From		To	
Total no. of towers				Total length			Kms.	

Details:

SL NO	DESCRIPTION	STATUS		REMARKS Record Deficiencies If Any
		YES	NO	
1	Check list of entire section of the line along with towers and accessories under this Division have carried out and documented in the format no: **AM/COMM/LINE/1**			
2	Inspection has been carried out in all towers and the outstanding issues along with temporary arrangements are documented in the format no: **AM/COMM/LINE/ 2**			
3	No. of remaining activities/ points are listed at **clause-B** in this format these are minor in nature and do not stop charging the line			
4	All Electrical and Ground clearances are as per the Approved drawings issued from CC/ Engg. Dept have been checked and no deviation has been noted.			
5	All man and material and temporary antitheft electrical connection, if any, have been removed from all the locations under this Division .			
6	All electrical clearance has been received from CEA electrical inspector for charging of the line vide order no: Dated: **(copy enclosed)**			

SL NO	DESCRIPTION	STATUS		REMARKS Record Deficiencies If Any
		YES	NO	
7	PTCC clearance has been received from CEA's PTCC Directorate for charging of the line vide order no: Dated: **(copy enclosed)**			
8	All statutory rules and regulations pertaining to line charging has been carried out and Nothing is pending			
9	All working agencies involved In construction/ erection of this Line are intimated regarding charging of this line and further work, if any, are to be carried out only after availing the Permit to Work (PTW) from the Concerned sub-station operating staff			

B. HANDING OVER CHECK POINTS(Minor nature)

SECTION	Points according to format no: AM/COMM/LINE/1 (Nos of remaining activities)	Points completed and confirmed		Points accepted	
		Date	Sign	Date	Sign
A					
SECTION	**Points according to format no:** AM/COMM/LINE/1 **(Nos of remaining activities)**	**Points completed and confirmed**		**Points accepted**	
		Date	**Sign**	**Date**	**Sign**
B					
C					
D					

The above line is handed over for Energization with/ without remaining activities

	Handed over by	Accepted for Energization
Signature		
Date		
Name		
Designation	**Line In-charge**	**Commissioning In-charge**

Note: For details of section, please refer pre commissioning doc no : D-2-01-70-01-02, format no **AM/COMM/LINE/ 2**

FORMAT NO: AM/COMM/LINE/4

NAME OF LINE	CIRCUIT	DATE OF ENERGISATION

COMMISSIONING FORMAT

A. GENERAL DATA AND INFORMATION:

REGION		Office		TYPE OF TOWERS		S/C	D/C	M/C
VOLTAGE RATING			KV	Tower locations	From		To	
Total no. of towers				Total length			Kms.	

Details:

SL NO	DESCRIPTION	STATUS		REMARKS Record Deficiencies If Any
		YES	NO	
1	The entire section of the line handed over for energization as per POWERGRID format no: AM/COMM/LINE/3 on Dated:			
2	No. of remaining activities/ points are listed as per format no: AM/COMM/LINE/2 on and these are minor in nature and do not stop charging the line			
3	All the equipments involved in charging of the line are tested and documented as per the pre-commissioning formats of bay equipment			
4	Pre - commissioning tests of bay/ feeder as per approved document has been completed and test results are documented			
5	In case, reactor provided in this line, all tests are carried out as per prescribed format and all test results are documented			
6	All electrical clearance has been received from CEA electrical inspector for charging of the line vide order no: dated: (copy to be enclosed)			

SL NO	DESCRIPTION	STATUS		REMARKS Record Deficiencies If Any
		YES	NO	
7	All man and material and temporary antitheft electrical connection, if any, removed from all the locations			
8	All electrical clearance has been received from CEA electrical inspector for charging of the line terminating feeder vide order no : dated:			
9	PTCC clearance has been received from CEA's PTCC Directorate for charging of the line vide order no: Dated:			
10	All statutory rules and regulations pertaining to line charging has been carried out and nothing is pending			
11	All working agencies involved in construction/ erection of this line and sub-station Equipments are intimated regarding charging of this line & bay and further work, if any, are to be carried out only after availing the permit to work (PTW) from the concerned sub-station operating staff			
12	All the protections are checked and put into service as per standard format no: and documented			

B. MEASUREMENT INSULATION RESISTANCE FOR LINE (using 5 kV/ 10 kV motorized Insulation Tester):

BETWEEN	MEASURED VALUE IN M - OHM	REMARK	CONDITION
R-PHASE & GROUND			All ground switches at other end are opened. Min. value should be approx. 150 Mega ohm (value may change with weather condition)
Y-PHASE & GROUND			
B-PHASE & GROUND			
R-PHASE & Y-PHASE			
Y-PHASE & B-PHASE			
B-PHASE & R-PHASE			

C. CONTINUITY TEST OF THE LINE

a. For phase marking confirmation

Sending end Conditions	Receiving end Insulation Resistance between	Measured value In ohms	Remarks
CLOSE R - Phase GS &	R – Phase & Ground		Low
OPEN Y - Phase GS &	Y – Phase & Ground		High
OPEN B - Phase GS	B – Phase & Ground		High
OPEN R - Phase GS	R – Phase & Ground		High
CLOSE Y - Phase GS	Y – Phase & Ground		Low
OPEN B - Phase GS:	B – Phase & Ground		High
OPEN R - Phase GS	R – Phase & Ground		High
OPEN Y - Phase GS	Y – Phase & Ground		High
CLOSE B - Phase GS	B – Phase & Ground		Low
CONNECT R & Y Phase E, all GS open	R & Y-phase		Low
	Y & B-phase		High
	B & R-phase		High
Connect R & B Phase, all GS open	R & Y-phase		High
	Y & B-phase		High
	B & R-phase		Low
Connect Y & B Phase, all GS open	R & Y-phase		High
	Y & B-phase		Low
	B & R-phase		High

Note:
1. If the test values are as per the remarks, phase marking at both ends are correct.
2. This test is to be done if the IR value do not show short circuit of the line with ground or between phases in IR measurement

D. Verification/validation of phase sequence

After closing the breaker from one end only the line can be charged.

a Check the phase sequence by the phase sequence meter by connecting at the secondary of the CVT

OK	Not OK

b Check the phase sequence by the help of multi-meter in case of a charged sub-station at the secondary of the CVT (old & new) in the control panel as per the

measurement indicated below:

Sl. No.	Voltage measurement between		Measured voltage (volts)	Remarks
	New circuit	Charged old circuit		
1	R-phase	R-phase		In case of correct phase sequence, the voltage measured between R & R phase, Y & Y phase, B & B phase of old charged line and newly charged circuit will be zero or very small and all other measurements will show full line CVT phase to phase secondary voltage
2	R-phase	Y-phase		
3	R-phase	B-phase		
4	Y-phase	R-phase		
5	Y-phase	Y-phase		
6	Y-phase	B-phase		
7	B-phase	R-phase		
8	B-phase	Y-phase		
9	B-phase	B-phase		

F **CHARGING INSTRUCTION**

Once the correct phase sequence is established, the charging instruction received from CC-Engg. & CTUIL to be followed and properly documented regarding status of various parameters with other lines and generators **(if any)**

Charging instruction no: Dated: (**Copy enclosed**)

i. Charging details:

Date: Time:

ii **Pre-charging conditions for sending end**

a. Voltage ☐ kV

b. **Generator Details:**

Unit No	Capacity	MW Generated	MVAR Generated	Remarks
1				
2				
3				

c. **Lines Connected**:

Sl. No.	Name of line	MW	MVAR	Line Reactor	
				In service	Capacity
1					
2					
3					

d. **No. and rating of ICTs connected**

Sl. No.	Rating		MW	Tertiary reactor MVAR
	Voltage	MVA		
1.				
2.				
3.				
4.				

e. **Status of Bus Reactor, if any**

Sl. No.	Rating	Status of charging/Healthiness

iii On charging condition

Details	Sending end	Receiving end
Voltage		N/A
MVAR		N/A
Open end voltage	N/A	

iv Post charging condition

Details	Sending end	Receiving end
Voltage		
MW		
MVAR		

The line has been/ not has been successfully test charged with or without following operational constraints:

1.
2.
3.

Signature					
Name					
Designation					
Organization				**POWERGRID**	**POWERGRID**
Agency	**Line Erection**	**S/S Erection**	**Line Supplier**	**Line In-Charge**	**S/S In-Charge**

Standard Manufacturing Quality Plan

For

Earthwire

(MQP no. CC/QA/SMQP/36 Rev 00)

Valid from 01-06-2021 to 31-05-2024

Instructions for Code Allocation

Code 1	Indicate place where testing is planned to be performed i.e. Inspection location	Code 2	Indicate who has to perform the tests i.e. Testing Agency
A	At Equipment Manufacturer's works	J	The Equipment Manufacturer
B	At Component Manufacturer's works	K	The Component Manufacturer
C	At Authorised Distributor's works	L	The Third Party
D	At Independent Lab	M	The Turnkey Contractor
E	At Turn Key Contractor's location		
F	Not specified		
Code 3	Indicate who shall witness the tests i.e. Witnessing Agency	Code 4	Review of Test Reports/Certificates
P	Component Manufacturer itself	W	By Equipment Manufacturer during raw material / bought out component inspection
Q	Conmponent Manufacturer and Equipment Manufacturer	X	By Contractor during product / process inspection
R	Component Manufacturer, Equipment Manufacturer and contractor	Y	By POWERGRID during product / process inspection
S	Equipment Manufacturer itself	Z	By Contractor and / or POWERGRID during product / process inspection
T	Equipment Manufacturer and Contractor		
U	Equipment Manufacturer and/or Contractor and POWERGRID		
V	Third Party itself		
Code 5	Whether specific approval of sub-vendor / component make is envisaged?	Code 6	Whether test records required to be submitted after final inspection for issuance of CIP/MICC
E	Envisaged	Y	Yes
N	Not Envisaged	N	No

Notes:

1	The MQP should be read in conjunction with the applicable technical specification against which the Earthwire is being manufactured.
2	In case of any contradiction between MQP and POWERGRID Technical specification/Approved Drawing, the Technical specifications/Approved Drawing of respective project shall have precedence over this MQP.
3	Proper co-relation of materials with test certificates from Raw Material stage to finished Earthwire shall be maintained.
4	The Equipment manufacturer shall carry out all the routine tests for correctness of stranding, no cuts, fins etc. on the strands, drums are as per specifications.
5	The equipment manufacturer will carry out the acceptance tests on steel strands on 10% of the drums offered for inspectionand will submit the records at the time of final inspection. POWERGRID's IE will select 10% sample of drums offered for rewinding & acceptance testing & shall be witnessed by POWERGRID at Equipment Manufacturer's works.
6	Equipment manufacturer shall obtain the following test certificates from POWERGRID approved sources for Steel Wire Rods/Zinc Ingots used for review by POWERGRID. a) Chemical test certificate of Steel Wire Rod Manufacturer b) Test Certificate of Zinc Manufacturer c) Test Certificates of the tests carried out by Steel Wire Rod Manufacturer

7	Adequate care shall be taken to avoid damages to galvanised coating during preforming and post forming operations. Special care should be taken to keep away dirt, grit, etc during stranding.
8	Valid calibration certificates of various testing and measuring instrument / equipments from Labs, acredited as per ISO/IEC -17025 which operates in accordance with the requirements of ISO/IEC 17011 having full membership & MRA of ILAC/APLAC, shall be maintained. Standard resistance for verification of Resistance bridges must be available at Earthwire manufacturer works. Earthwire manufacturer shall inform POWERGRID regional QA&I office regarding the date of calibration. POWERGRID representative shall witness the calibration of the testing equipments and after calibration, the testing equipments shall be sealed properly.
9	All relevant IS standards shall be read along with the latest amendments.
10	POWERGRID may review the effective implementation of the process during the product inspection/process inspection. In case of any violation in process or process parameters are observed, the reason along with corrective & preventive measure shall be conveyed to POWERGRID.
11	The manufacturer should progressively align their Quality system and sub-vendors Quality system to the requirements of ISO 9000 series Quality standards and in due course of time should get their quality system certified to ISO 9001.
12	The size of Earthwires & Test parameters shall be as per GTP/TS.
13	Finished Earth wire shall be checked for length verification and surface finish on separate rewinding machine at reduced speed (variable from 8 to 16 meters per minute). The rewinding facilities shall have appropriate clutch system and free of vibrations, jerks etc., with traverse laying facilities.
14	If Length is found less than declared length during rewinding, then two drums from the same lot shall be verified for declared length. In case, any of these drums is found having less length, the lot will be rejected otherwise lot shall be accepted with the actual length restricted to declare length. In case of defects in surface finish, additional two drums shall be taken for rewinding & if same problem is observed the entire lot shall be rejected.
15	Random length will be accepted provided no length is less than 70% of standard length and the total qty. of random lengths is not more than ten (10) percent of the total qty. in each shipment.
16	Top end of the Earthwire in each drum shall be sealed with tamper proof adhesive sticker duly signed by POWERGRID Inspection Engineer. The Earthwire ends are required to be sealed with heat shrinkable sleeves & POWERGRID lead seal. The end shall be proprely secured with the drum with help of "U" clamps (nail) on the side of the flange at three locations 75 mm apart to avoid loosening of Earthwire during transit and handling.
17	The Earth wire shall be supplied in non-returnable, strong, wooden drums and provided with lagging of adequate strength, constructed to protect the Earth wire against all damage and displacement during transit, storage and subsequent handling and stringing operations in the field. The Contractor shall be responsible for any loss or damage during transportation handling and storage due to improper packing. The drums shall generally conform to IS:1778-1980, except as otherwise specified in TS.
18	The drums shall be suitable for wheel mounting and for letting off the earth wire under a minimum controlled tension of the order of 5 kN
19	For Earth wire, two standard lengths shall be wound on each drum.
20	For Earth wire, each strand shall be individually welded to prevent parting of two lengths at a tension less than 15 kN. The two ends where the first length finishes and the second length starts, shall be clearly marked with adhesive tape and no weld should be present outside these marks. The length between the two marks shall be treated as scrap and will not be taken into account for measurement purposes.
21	As an alternative to non-returnable wooden drums, manufacturer may supply the earthwire in returnable steel drum. For steel drums, relevant painting specification as per the approved drum drawing shall be followed.
22	Solid Polypropylene sheet of minimum 5mm thickness shall be used for outer covering of earthwire in steel drum. Outside the covering, there shall be minimum two binders consisting of hoop iron/ galvanised steel wire. Two numbers of additional binders per drum shall also be supplied for rewrapping the polypropylene sheet with each lot of earthwire and 5 nos. crimping machines with the first lot of earthwire for crimping the binders at site. As an alternative, manufacturer may use wooden lagging of minimum 50 mm thickness for outer covering of earthwire.
23	The inner cheek of the flanges & drum barrel surface shall be painted with Bitumen based paint. Before reeling, cardboard or double corrugated or thick bituminous waterproof bamboo paper shall be secured to the drum barrel and inside of flanges of the drum by means of a suitable commercial adhesive material over which HDPE sheet to be provided. After reeling the earth wire, the exposed surface of the outer layer of earth wire shall be wrapped with self adhesive plastic sheet to preserve the earth wire from ingress of water dirt, grit and damage during storage transport and handling.
24	Rejection & retests shall be as per IS 398 part 5.
	In case of rejection of the offered lot of earthwire after testing as per MQP/Technical Specification/IS, the rejected material and the samples already tested shall be scrapped and strictly disposed off as follows:
	a) The rejected lot/tested samples shall be clearly identified and stored separately to avoid any mix up with any in-process/finished lot till the same is disposed off.
	b) The supplier shall arrange for cutting of the rejected earthwire lot in bits & pieces which shall be sold as scrap.
	c) In case supplier intends to dispose off rejected material through any other mode, the same shall be done with approval of Corporate QA&I Department.
	d) Necessary supporting documents in regard to (b) and (c) above, shall be submitted for verification of POWERGRID and record shall be maintained at manufacturer's works.

Sl No.	Components/Operations & Description of Test	Type of check	Quantum of check/ Sampling with basis	Reference document for testing	Acceptance norms	Form of record	Applicable Codes						Remarks	
							1	2	3	4	5	6		
1	**RAW MATERIAL**													
1.1	**High Carbon Steel Wire Rod**													
1.1.1	Steel wire rod Chemical composition	Chemical	1 Sample per heat per lot	IS 12776/ POWERGRID Spec.	POWERGRID Specification	Supplier TC	B	K	P	Z	E	N		
			4 Samples per Consignment (24 MT approx)			Plant Record	A	J	S	Z	E	N		
1.1.2	Diameter of Wire Rod and Ovality	Dimension	1 Sample per heat per lot	IS 7904	IS 7904	Supplier TC	B	K	P	Z	E	N		
			4 Samples per Consignment (24 MT approx)			Plant Record	A	J	S	Z	E	N		
1.1.3	Ultimate Tensile Test	Mechanical	1 Sample per heat per lot	IS 7904	IS 7904	Supplier TC	B	K	P	Z	E	N		
			4 Samples per Consignment (24 MT approx)			Plant Record	A	J	S	Z	E	N		
1.1.4	Percentage reduction of area	Mechanical	1 Sample per heat per lot	IS 7904	IS 7904	Supplier TC	B	K	P	Z	E	N		
			4 Samples per Consignment (24 MT approx)			Plant Record	A	J	S	Z	E	N		
1.1.5	Elongation	Mechanical	1 Sample per heat per lot	IS 7904	IS 7904	Supplier TC	B	K	P	Z	E	N		
			4 Samples per Consignment (24 MT approx)			Plant Record	A	J	S	Z	E	N		

Sl No.	Components/Operations & Description of Test	Type of check	Quantum of check/ Sampling with basis	Reference document for testing	Acceptance norms	Form of record	Applicable Codes						पावरग्रिड POWERGRID Remarks	
1.1.6	Cleanliness and Surface Smoothness (Visual Check)	Visual	100% on each coil	IS:7904	The wire rod shall be round & free from harmful defect like fins,splits,surface flaws,jagged surface & imperfect edges & other harmful defects	Plant Record	A	J	S	Z	E	N		
1.1.7	Microstructure										E			
1.1.7.1	Structure	Metallurgical	1 Sample per heat per lot	IS 7904	The Structure shall be fine perlite	Supplier TC	B	K	P	W	E	N		
						Plant Record	A	J	S	W	E	N		
1.1.7.2	Grain Size	Metallurgical	1 Sample per heat per lot	IS:4748 & As per ASTM E-112	ASTM Grain Size No. - Minimum 6 at with 100X Magnification	Supplier TC	B	K	P	W	E	N		
						Plant Record	A	J	S	W	E	N		
1.1.7.3	Inclusion Rating	Metallurgical	1 Sample per heat per lot	IS:7904 ASTM E -45	Max-2 in Thick Series	Supplier TC	B	K	P	W	E	N		
						Plant Record	A	J	S	W	E	N		
1.1.7.4	Surface Defects	Metallurgical	1 Sample per heat per lot	IS 7904	Maximum 1.0 % of Diameter of base wire	Supplier TC	B	K	P	W	E	N		
						Plant Record	A	J	S	W	E	N		
1.1.7.5	Decarburisation	Metallurgical	1 Sample per heat per lot	IS 7904	Maximum 1.0 % of Diameter of base wire	Supplier TC	B	K	P	W	E	N		
						Plant Record	A	J	S	W	E	N		
1.2	**Electrolytic Zinc**													
1.2.1	Purity of Zinc	Chemical	1Nos.Sample per heat/per lot	IS:209 Purity Zinc	Min.99.95%	Supplier TC	B	K	P	W	E	N		
2	**In-Process Testing**													
2.1	**Surface Preparation by Conventional Method (Using Hcl, Phosphate and Borax) or by Using Mechanical Descaling Method**													
2.1.1	Pickling in HCL solution, followed by Rinsing in Cold Water (If Applicable)	Chemical	2 Samples from Pickling Bath Daily	IS 2629	Plant Standard	Plant Record	A	J	S	W		N		
2.1.2	Surface Coating of Phosphate (If Applicable)	Chemical	2 Samples from Bath Daily	IS 2629	Plant Standard	Plant Record	A	J	S	W		N		
2.1.3	Hot Borax Solution	Chemical	1 sample from Borax	Plant Standard	Plant Standard	Plant Record	A	J	S	W		N		
2.1.4	Temperature of Borax Solution	Thermal	Once in 12 Hrs	Plant Standard	Plant Standard	Plant Record	A	J	S	W		N		

Sl No.	Components/Operations & Description of Test	Type of check	Quantum of check/ Sampling with basis	Reference document for testing	Acceptance norms	Form of record	Applicable Codes						पावरग्रिड POWERGRID Remarks	
2.2	**Steel Wire Drawing from Wire Rod**													
2.2.1	Surface Finish and Winding	Visual	100% on each coil	As per POWERGRID Specification	As per POWERGRID Specification	Plant Record	A	J	S	W		N		
2.2.2	Diameter	Dimension	20% coil drawn from each wire rod coil	Plant Standard	Plant Standard	Plant Record	A	J	S	W		N		
2.2.3	Breaking Load/ Tensile Test	Mechanical	20% coil drawn from each wire rod coil	Plant Standard	Plant Standard	Plant Record	A	J	S	W		N		
2.2.4	Torsion	Mechanical	20% coil drawn from each wire rod coil	Plant Standard	Plant Standard	Plant Record	A	J	S	W		N		
2.2.5	Wrapping	Mechanical	20% coil drawn from each wire rod coil	Plant Standard	Plant Standard	Plant Record	A	J	S	W		N		
2.2.6	Joints	Visual	100% on each coil	As per POWERGRID Specification	No Joints Allowed	Plant Record	A	J	S	W		N		
2.3	**Galvanizing**													
2.3.1	Degreasing Caustic Soda	Chemical and Measurement	1 sample from Bath Daily	Plant Standard	Conc Min 25 g/ltr Temp 40-70 Deg C	Plant Record	A	J	S	W		N		
2.3.2	Acid Cleaning	Chemical and Measurement	1 sample from Bath Daily	Plant Standard	HCL Conc 12-25% Iron Max.12%	Plant Record	A	J	S	W		N		
2.3.3	Rinsing	Chemical and Measurement	1 sample from Bath Daily	Plant Standard	Plant Standard	Plant Record	A	J	S	W		N		
2.3.4	Flux Coating Mixture of NH4Cl ZnCl2	Chemical & Measurement	1 Sample from bath daily	Plant Standard	Sp. Gravity 1.05-1.15 Temp.40-60° C	Plant Record	A	J	S	W		N		
2.3.5	Molten Zinc Bath Temperature	Measurement	After every 2 Hrs	IS 2629	Temperature 450± 10° C	Plant Record	A	J	S	W		N		
2.3.6	Chemical analysis of molten Zinc in Bath	Spectro Analysis	1 sample in 15 days	IS 209	Min 98.50%	Plant Record	A	J	S	W		N		
2.4	**Finished Galvanized Steel Wire**													
2.4.1	Surface Smoothness	Visual	100% on each coil	As per POWERGRID Specification	As per POWERGRID Specification	Plant Record	A	J	S	W		N		

Sl No.	Components/Operations & Description of Test	Type of check	Quantum of check/ Sampling with basis	Reference document for testing	Acceptance norms	Form of record	Applicable Codes						पावरग्रिड POWERGRID Remarks	
2.4.2	Diameter	Measurement	1 Sample from every 10 Coils	IS 12776/POWERGRID Specification	IS 12776/ POWERGRID Specification	Plant Record	A	J	S	W		N		
2.4.3	Breaking Load/ Tensile Test	Mechanical	1 Sample from every 10 Coils			Plant Record	A	J	S	W		N		
2.4.4	% Elongation	Mechanical	1 Sample from every 10 Coils			Plant Record	A	J	S	W		N		
2.4.5	Torsion	Mechanical	1 Sample from every 10 Coils			Plant Record	A	J	S	W		N		
2.4.6	Wrapping Test	Mechanical	1 Sample from every 10 Coils			Plant Record	A	J	S	W		N		
2.4.7	Preece Test	Chemical	1 Sample from every 10 Coils			Plant Record	A	J	S	W		N		
2.4.8	Mass of Zinc Coating	Chemical	1 Sample from every 10 Coils			Plant Record	A	J	S	W		N		
2.4.9	Adhesion Test	Physical	1 Sample from every 10 Coils	IS 4826/ POWERGRID Specification	IS 4826/ POWERGRID Specification	Plant Record	A	J	S	W		N		
2.4.10	DC Resistance Test	Electrical	100% on each coil	IS 12776/POWERGRID Specification	IS 12776 /POWERGRID Specification	Plant Record	A	J	S	W		N		
2.4.11	Check for Joints	Visual	1 Sample from every 10 Coils	As per POWERGRID Specification	No Joints are Allowed	Plant Record	A	J	S	W		N		
2.5	**Stranding**													
2.5.1	Lay Length/ Direction & Compactness	Measurement	Each Length of Strand	As per POWERGRID Specification	As per POWERGRID Specification	Plant Record	A	J	S	W		N		
2.5.2	Surface Cleanliness	Visual	100%	As per POWERGRID Specification	As per POWERGRID Specification	Plant Record	A	J	S	W		N		

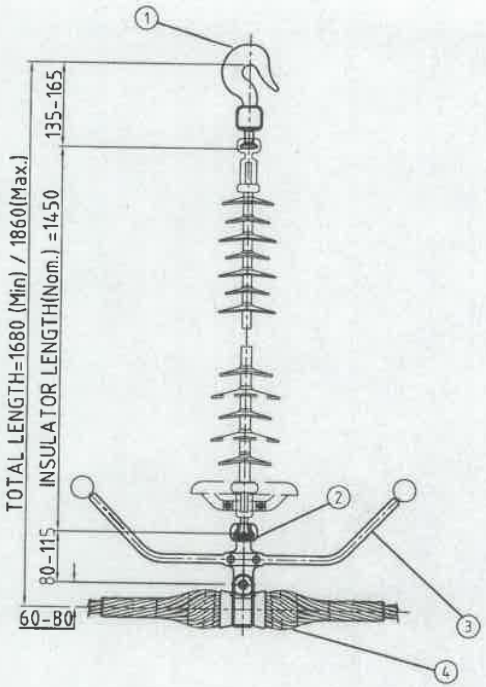
Sl No.	Components/Operations & Description of Test	Type of check	Quantum of check/ Sampling with basis	Reference document for testing	Acceptance norms	Form of record	Applicable Codes						पावरग्रिड POWERGRID Remarks	
2.5.3	Overall Dia	Measurement	1 sample from Each Drum	IS 12776/ POWERGRID Specification	IS 12776/ POWERGRID	Plant Record	A	J	S	W		N		
2.5.4	Pre forming and Post forming	Visual	100%	As per POWERGRID Specification	No spreading when cut	Plant Record	A	J	S	W		N		
2.5.5	Standard Length	Measurement	100%	IS 12776/ POWERGRID Specification	IS 12776/ POWERGRID Specification	Plant Record	A	J	S	W		N		
2.5.6	Joints	Visual	100%	As per POWERGRID Specification	No Joints are Allowed	Plant Record	A	J	S	W		N		
2.5.7	Check for Linseed Oil Application	Visual	100% on all drums	As per POWERGRID Specification	100% Oil Coating	Plant Record	A	J	S	W		N		
3	**Final Testing**													
3.1	**Routine Testing for Earthwire**													
3.1.1	Check for Correctness of Stranding	Visual	20% of the drums	As per POWERGRID Specification	As per POWERGRID Specification	Test Report	A	J	S	W,Z		N		
3.1.2	Check that there are no cuts, fins etc. on the strands	Visual	20% of the drums	As per POWERGRID Specification	As per POWERGRID Specification	Test Report	A	J	S	W,Z		N		
3.1.3	Check that the drums are as per specification	Visual	20% of the drums	As per POWERGRID Specification/Drum Drawing	As per POWERGRID Specification/Drum Drawing	Test Report	A	J	S	W,Z		N		
3.3	**Acceptance Test on Earthwire**													
	Tests on Complete Earthwire													
3.3.1	Check for Joints, Surface Smoothness, Cleanliness and Length Measurement by Rewinding	Visual & Measurement	1 Sample from every 10 Drums or part thereof	As per POWERGRID Specification	As per POWERGRID Specification	Test Report	A	J	U	Z		Y	CIP	
3.3.2	Lay Length/ Direction & Compactness	Measurement	1 Sample from every 10 Drums or part thereof	IS/12776/ POWERGRID Specification	As per GTP/POWERGRID Specification	Test Report	A	J	U	Z		Y	CIP	
3.3.3	Overall Dia	Measurement	1 Sample from every 10 Drums or part thereof	IS/12776/ POWERGRID Specification	As per GTP/POWERGRID Specification	Test Report	A	J	U	Z		Y	CIP	
3.3.4	DC Resistance Test	Measurement	1 Sample from every 10 Drums or part thereof	IS/12776/ POWERGRID Specification	As per GTP/POWERGRID Specification	Test Report	A	J	U	Z		Y	CIP	

Sl No.	Components/Operations & Description of Test	Type of check	Quantum of check/ Sampling with basis	Reference document for testing	Acceptance norms	Form of record	Applicable Codes						Remarks	
3.3.5	Pre forming and Post forming	Measurement	1 Sample from every 10 Drums or part thereof	As per POWERGRID Specification	No spreading when cut	Test Report	A	J	U	Z		Y	CIP	
	Tests on Individual Galvanized Wire of all Strands of the Sample(s)													
3.3.6	Diameter	Measurement	1 Sample from every 10 Drums or part thereof	IS 12776/POWERGRID Specification	As per GTP/POWERGRID Specification	Test Report	A	J	U	Z		Y	CIP	
3.3.7	Breaking Load/ Tensile Test	Mechanical	1 Sample from every 10 Drums or part thereof			Test Report	A	J	U	Z		Y	CIP	
3.3.8	% Elongation	Mechanical	1 Sample from every 10 Drums or part thereof			Test Report	A	J	U	Z		Y	CIP	
3.3.9	Torsion	Mechanical	1 Sample from every 10 Drums or part thereof			Test Report	A	J	U	Z		Y	CIP	
3.3.10	Wrapping Test	Mechanical	1 Sample from every 10 Drums or part thereof			Test Report	A	J	U	Z		Y	CIP	
3.3.11	Preece Test	Chemical	1 Sample from every 10 Drums or part thereof	IS 12776/IS 2633/POWERGRID Specification	As per GTP/ POWERGRID Specification	Test Report	A	J	U	Z		Y	CIP	
3.3.12	Mass of Zinc Coating	Chemical	1 Sample from every 10 Drums or part thereof	IS 12776/IS 6745/POWERGRID Specification	As per GTP/ POWERGRID Specification	Test Report	A	J	U	Z		Y	CIP	
3.3.13	Adhesion Test	Chemical	1 Sample from every 10 Drums or part thereof	IS 4826/POWERGRID Specification	IS 4826/POWERGRID Specification	Test Report	A	J	U	Z		Y	CIP	
3.3.14	DC Resistance Test	Electrical	1 Sample from every 10 Drums or part thereof	IS 12776/POWERGRID Specification	As per GTP/ POWERGRID Specification	Test Report	A	J	U	Z		Y	CIP	
3.3.15	Chemical Analysis	Chemical	1 sample per lot	As per POWERGRID Specification	As per POWERGRID Specification	Test Report	A	J	U	Z		Y	CIP	

Sl No.	Components/Operations & Description of Test	Type of check	Quantum of check/ Sampling with basis	Reference document for testing	Acceptance norms	Form of record	Applicable Codes						Remarks	
3.3.16	Microstructure													
3.3.16.1	Structure	Metallurgical	1 sample per lot	IS 7904	The Structure shall be fine perlite	Test Report	A	J	U	Z		Y	CIP	
3.3.16.2	Grain Size	Metallurgical	1 sample per lot	IS 4748	Min 6 @ 100X	Test Report	A	J	U	Z		Y	CIP	
3.3.16.3	Inclusion Rating	Metallurgical	1 sample per lot	IS 7904 & IS 4163	Max 2 Thick Series	Test Report	A	J	U	Z		Y	CIP	
3.3.16.4	Surface Defects	Metallurgical	1 sample per lot	IS 7904	Max 1% of Dia	Test Report	A	J	U	Z		Y	CIP	
3.3.16.5	Decarburisation	Metallurgical	1 sample per lot	IS 7904 & IS 6396	Max 1% of Dia	Test Report	A	J	U	Z		Y	CIP	
3.4	**Tests on Drums**													
3.4.1	Visual Check of Drums	Visual	100%	As per POWERGRID Specification	As per POWERGRID Specification	Test Report	A	J	U	Z		Y	CIP	
3.4.2	Dimension	Measurement	1 Sample from every 10 Drums or part thereof	As per POWERGRID Specification	As per POWERGRID Specification	Test Report	A	J	U	Z		Y	CIP	
3.4.3	Barrel Batten Test (For Wooden Drum)	Mechanical	1 Sample from every 10 Drums or part thereof	IS 1778	As per POWERGRID Specification	Test Report	A	J	U	Z		Y	CIP	
4	**Packing and Dispatch**													
4.1	**Earthwire**													
4.1.1	Packing of Drum	Visual	100%	As per POWERGRID Specification	As per POWERGRID Specification		A	J	S/U*	Z		N	This Information shall be stenciled on each drum in indelible ink. *100% verification by Earthwire Manufacturer and 10% by POWERGRID	
4.1.2	Contract/Award Letter No.	Visual	100%	As per POWERGRID Specification	As per POWERGRID Specification	Packing List	A	J	S/U*	Z		N		
4.1.3	Name and Address of Consignee	Visual	100%	As per POWERGRID Specification	As per POWERGRID Specification		A	J	S/U*	Z		N		
4.1.4	Manufacturer's name and Address	Visual	100%	As per POWERGRID Specification	As per POWERGRID Specification	Packing List	A	J	S/U*	Z		N		
4.1.5	Drum No.	Visual	100%	As per POWERGRID Specification	As per POWERGRID Specification	Packing List	A	J	S/U*	Z		N		

Sl No.	Components/Operations & Description of Test	Type of check	Quantum of check/ Sampling with basis	Reference document for testing	Acceptance norms	Form of record	Applicable Codes						Remarks	
4.1.6	Size of Earthwire	Visual	100%	As per POWERGRID Specification	As per POWERGRID Specification	Packing List	A	J	S/U*	Z		N	This Information shall be stenciled on each drum in indelible ink. *100% verification by Earthwire Manufacturer and 10% by POWERGRID	
4.1.7	Length of Earthwire in Meters	Visual	100%	As per POWERGRID Specification	As per POWERGRID Specification	Packing List	A	J	S/U*	Z		N		
4.1.8	Gross weight of Drum with Earthwire and Lagging	Visual	100%	As per POWERGRID Specification	As per POWERGRID Specification	Packing List	A	J	S/U*	Z		N		
4.1.9	Weight of Empty drum with lagging	Visual	100%	As per POWERGRID Specification	As per POWERGRID Specification	Packing List	A	J	S/U*	Z		N		
4.1.10	Arrow marking for unwinding	Visual	100%	As per POWERGRID Specification	As per POWERGRID Specification	Packing List	A	J	S/U*	Z		N		
4.1.11	Position of the Earth wire ends	Visual	100%	As per POWERGRID Specification	As per POWERGRID Specification	Packing List	A	J	S/U*	Z		N		
4.1.12	No. of turns in the outer most layer	Visual	100%	As per POWERGRID Specification	As per POWERGRID Specification	Packing List	A	J	S/U*	Z		N		
4.1.13	Barrel Diameter at three locations and an arrow marking at the location of measurement	Visual	100%	As per POWERGRID Specification	As per POWERGRID Specification	Packing List	A	J	S/U*	Z		N		
4.1.14	CIP/MICC no	Visual	100%	As per POWERGRID Specification	As per POWERGRID Specification	Packing List	A	J	S			N		
4.1.15	Sealing of Drums 100% by using	Visual	100%	As per POWERGRID Specification	As per POWERGRID Specification		A	J	U	Z		Y	CIP 100% verification by POWERGRID	
	a) Plain Heat shrinkable sleeve at both ends													
	b) Lead Sealing with plier at both ends													
	c) Adhesive Tamper Proof Sticker Duly Signed by POWERGRID IE (in case of Physical inspection) or by Contractor/Manufacturer's representative (in case of Virtual Inspection)													

Note: Earthwire Manufacturer has to ensure marking of CIP/MICC no. on all drums before dispatch and a copy of CIP/MICC along with the test reports should be sent to the site along with the dispatches.



Sr. No	DESCRIPTION	PART NO.	UTS	QTY.	REF DRG:CC:ENGG:TL/HW
4	SUSPENSION CLAMP (AGS)	AGS-PANTHER	70 kN	1	AGS-001
3	ARCINGBHORN (BALL)	AH-BL-01A	----	1	AHB-001
2	SOCKET EYE	SE-90-01	90 kN	1	SE-001
1	BALL HOOK	BH-70-01	70 kN	1	BH-001

TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCES : ±3%.
3) ALL FERROUS PARTS HOT DIP GALVANISED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) HARDWARE TOLERANCES ON LENGTH ±2%.

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

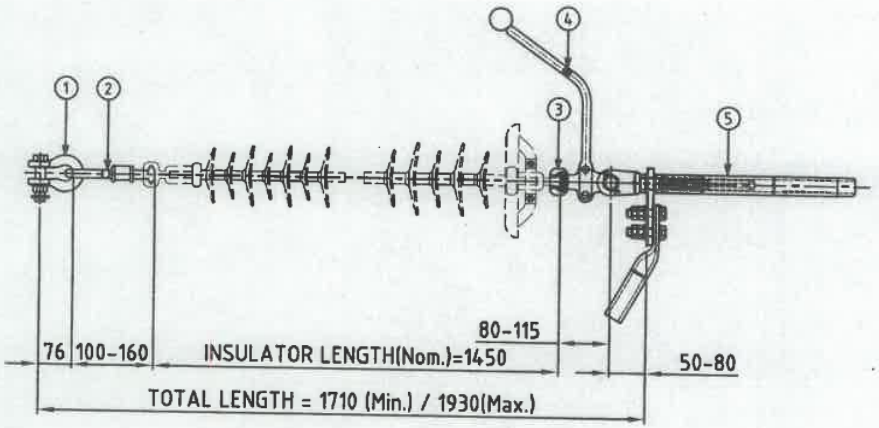
TITLE:- 132 KV SINGLE I SUSPENSION STRING SUITABLE FOR SINGLE ACSR PANTHER CONDUCTOR.

UTS-70 KN

CLEARED BY

SR. GM (ENGG–TL)	CGM (ENGG–TL)	ED (ENGG)
DATE: 14.11.19	MGR. (ENGG–TL)	CH. MGR. (ENGG–TL)	GM (ENGG–TL)

DRG. NO.:– CC:ENGG:TL/HW/132 KV/SP/SIS



Sr. No.	DESCRIPTION	PART NO.	UTS	QTY	REF DRG:CC:ENGG:TL/HW
5	COMP. DEAD END CLAMP	CDE-PANTHER	----	1	CDE-001
4	ARCING HORN (Ball)	AH-BL-03A	----	1	AHB-001
3	SOCKET EYE	SE-90-01	90 kN	1	SE-001
2	BALL LINK (HORN HOLDER)	BL-90-01	90 kN	1	BL-001
1	ANCHOR SHACKLE	AS-90-01	90 kN	1	AS-001

TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCES : ±3%.
3) ALL FERROUS PARTS HOT DIP GALVANISED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) HARDWARE TOLERANCES ON LENGTH ±2%.

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

TITLE:- 132 KV SINGLE TENSION STRING SUITABLE FOR SINGLE ACSR PANTHER CONDUCTOR.

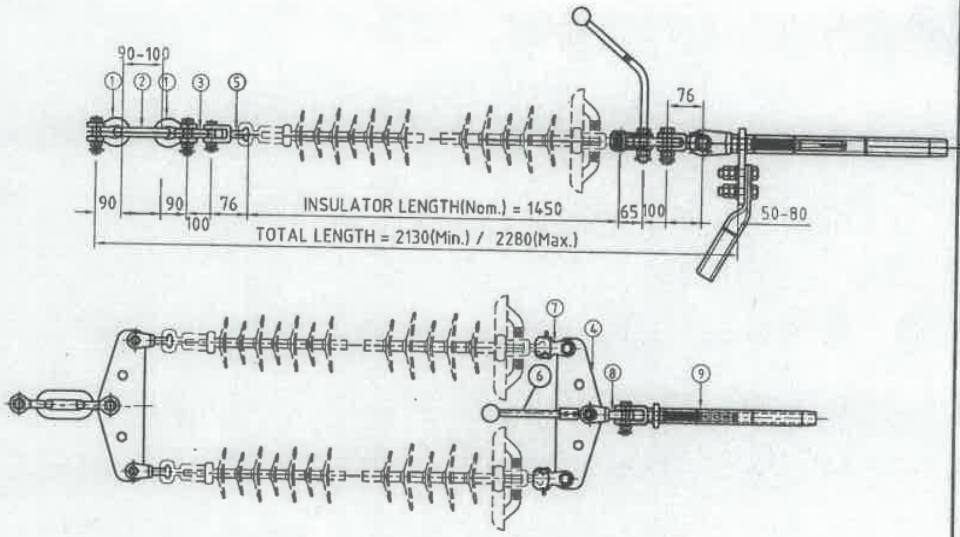
UTS-90 KN

CLEARED BY

SR. GM (ENGG–TL)	CGM (ENGG–TL)	ED (ENGG)

DATE	MGR. (ENGG–TL)	CH. MGR. (ENGG–TL)	GM (ENGG–TL)
14.11.19			

DRG. NO.:– CC:ENGG:TL/HW/132 KV/SP/ST



TECHNICAL D. AILS:

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCES : ±3%.
3) ALL FERROUS PARTS HOT DIP GALVANISED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) HARDWARE TOLERANCES ON LENGTH ±2%.

Sr. No	DESCRIPTION	PART NO.	UTS	QTY.	REF DRG:CC:ENGG:TL/HW
9	COMP. DEAD END CLAMP	CDE-PANTHER	-----	1	CDE-001
8	CLEVIS EYE	CE-90-01	90 kN	1	CE-001
7	SOCKET CLEVIS	SC-90-01	90 kN	2	SC-001
6	ARCING HORN (Ball)	AH-BL-02A	-----	1	AHB-001
5	BALL CLEVIS	BC-90-01	90 kN	2	BC-001
4	YOKE PLATE	YP-TR-180-02	180 kN	1	YP-TR-001
3	YOKE PLATE	YP-TR-180-01	180 kN	1	YP-TR-001
2	CHAIN LINK	CL-240-01	240 kN	1	CL-001
1	ANCHOR SHACKLE	AS-180-01	180 kN	2	AS-001

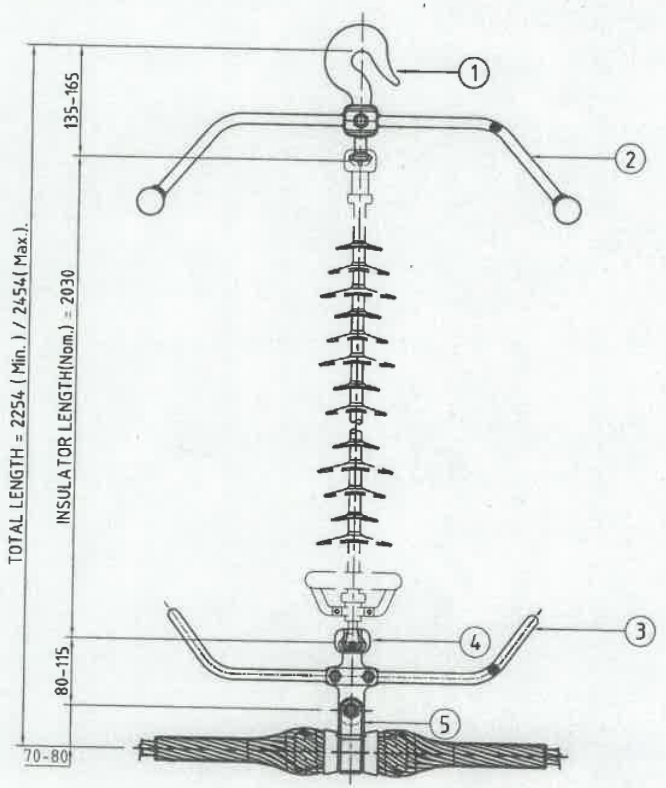
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

TITLE:- 132 KV DOUBLE TENSION STRING SUITABLE FOR SINGLE ACSR PANTHER CONDUCTOR.
UTS-180 KN

CLEARED BY

SR. GM (ENGG–TL)	CGM (ENGG–TL)	ED (ENGG)
DATE: 14.11.19	MGR. (ENGG–TL): 21.11.19	CH. MGR. (ENGG–TL)
		GM (ENGG–TL)

DRG. NO.:– CC:ENGG:TL/HW/132 KV/SP/DT



Sr. No	DESCRIPTION	PART NO.	UTS	QTY.	REF DRG:CC:ENGG:TL/HW
5	Suspension clamp (AGS)	AGS-ZEBRA	70 kN	1	AGS-001
4	Socket Eye	SE-90-01	90 KN	1	SE-001
3	Arcing Horn (Racket)	AH-RC-01	-----	1	AHR-001
2	Arcing Horn (Ball)	AH-BL-04	-----	1	AHB-001
1	BALL HOOK	BH-70-02	70 kN	1	BH-001

TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCES : ±3%.
3) ALL FERROUS PARTS HOT DIP GALVANISED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) HARDWARE TOLERANCES ON LENGTH ±2%.

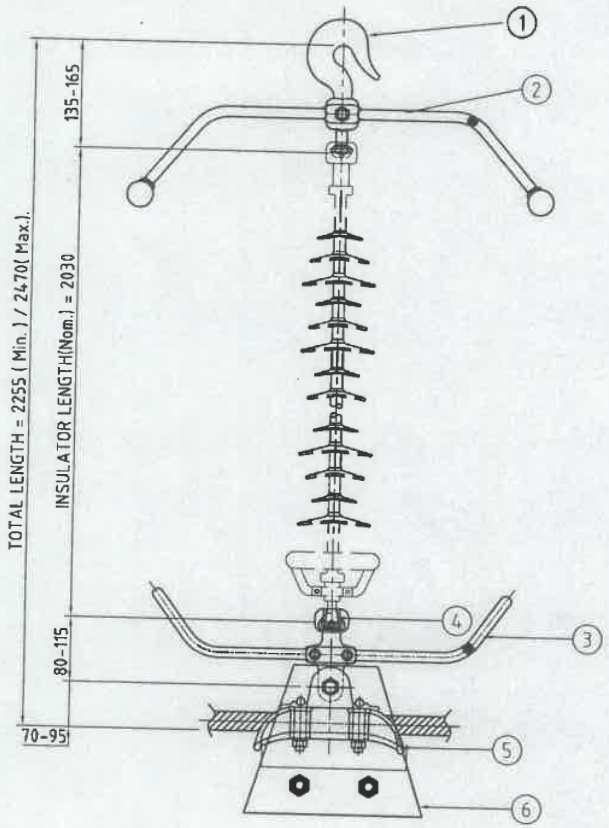
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

TITLE:- 220 KV SINGLE I SUSPENSION STRING SUITABLE FOR SINGLE ACSR ZEBRA CONDUCTOR.
UTS-70 KN

CLEARED BY

SR. GM (ENGG–TL)	CGM (ENGG–TL)	ED (ENGG)
DATE: 14.11.19	MGR. (ENGG–TL)	CH. MGR. (ENGG–TL) / GM (ENGG–TL)

DRG. NO.:– CC:ENGG:TL/HW/220 KV/SZ/SIS



Sr. No	DESCRIPTION	PART NO.	UTS	QTY.	REF DRG:CC:ENGG:TL/HW
6	Counter Weight Assembly	CW-02	-----	1	CW-001
5	Suspension clamp	ENV-ZEBRA	70 kN	1	ENV-001
4	Socket Eye	SE-90-01	90 KN	1	SE-001
3	Arcing Horn (Racket)	AH-RC-01	-----	1	AHR-001
2	Arcing Horn (Ball)	AH-BL-04	-----	1	AHB-001
1	BALL HOOK	BH-70-02	70 kN	1	BH-001

TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCES : ±3%.
3) ALL FERROUS PARTS HOT DIP GALVANISED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) HARDWARE TOLERANCES ON LENGTH ±2%.

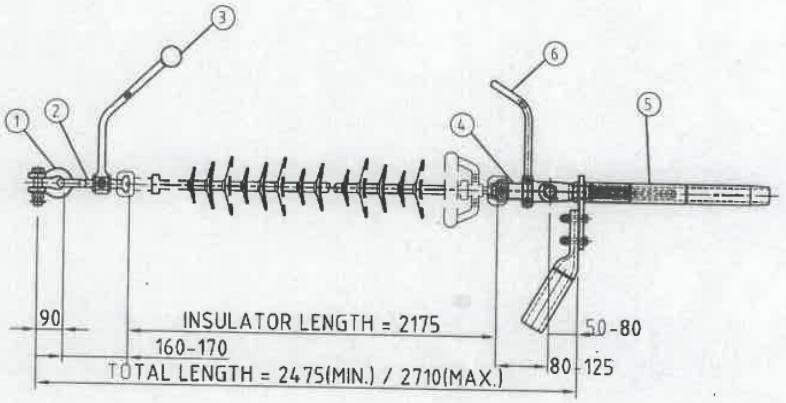
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

TITLE:- 220 KV SINGLE I SUSPENSION PILOT STRING SUITABLE FOR SINGLE ACSR ZEBRA CONDUCTOR.
UTS-70 KN

CLEARED BY

SR. GM (ENGG–TL)	CGM (ENGG–TL)	ED (ENGG)
DATE: 14.11.19	MGR. (ENGG–TL)	CH. MGR. (ENGG–TL)	GM (ENGG–TL)

DRG. NO.:– CC:ENGG:TL/HW/220 KV/SZ/SISP



Sr. No	DESCRIPTION	PART NO.	UTS	QTY.	REF DRG:CC:ENGG:TL/HW
6	ARCING HORN (Racket)	AH-RC-03	-----	1	AHR-001
5	COMP. DEAD END CLAMP	CDE-ZEBRA	-----	1	CDE-002
4	SOCKET EYE	SE-120-01	120 KN	1	SE-001
3	ARCING HORN (Ball)	AH-BL-03A	-----	1	AHB-001
2	BALL LINK (HORN HOLDER)	BL-120-01	120 KN	1	BL-001
1	ANCHOR SHACKLE	AS-120-01	120 KN	1	AS-001

TECHNICAL D. AILS:

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCES : ±3%.
3) ALL FERROUS PARTS HOT DIP GALVANISED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) HARDWARE TOLERANCES ON LENGTH ±2%.

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

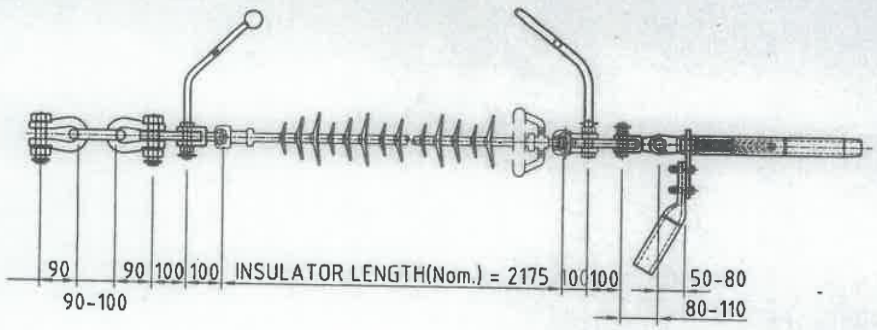
TITLE:- 220 KV SINGLE TENSION STRING SUITABLE FOR SINGLE ACSR ZEBRA CONDUCTOR.

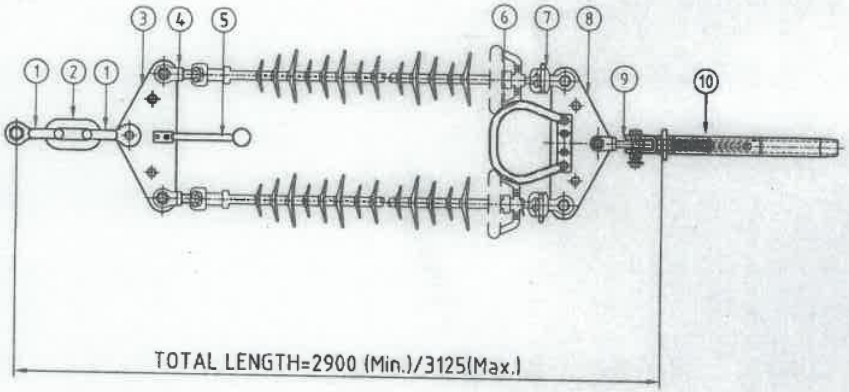
UTS-120 KN

CLEARED BY

SR. GM (ENGG–TL)	CGM (ENGG–TL)	ED (ENGG)
DATE: 14.11.19	MGR. (ENGG–TL)	CH. MGR. (ENGG–TL)	GM (ENGG–TL)

DRG. NO.:– CC:ENGG:TL/HW/220 KV/SZ/ST





Sr. No	DESCRIPTION	PART NO.	UTS	QTY.	REF DRG:CC:ENGG:TL/HW
10	COMP. DEAD END CLAMP	CDE-ZEBRA	-----	1	CDE-002
9	CLEVIS EYE	CE-160-01	160 KN	1	CE-001
8	YOKE PLATE	YP-TR-240-05	240 KN	1	YP-TR-001
7	SOCKET CLEVIS	SC-120-01	120 KN	2	SC-001
6	ARCING HORN (Racket)	AH-RC-02	-----	1	AHR-001
5	ARCING HORN (Ball)	AH-BL-02A	-----	1	AHB-001
4	BALL CLEVIS	BC-120-01	120 KN	2	BC-001
3	YOKE PLATE	YP-TR-240-02B	240 KN	1	YP-TR-001
2	CHAIN LINK	CL-240-01	240 KN	1	CL-001
1	ANCHOR SHACKLE	AS-240-01	240 KN	2	AS-001

TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCES : ±3%.
3) ALL FERROUS PARTS HOT DIP GALVANISED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) HARDWARE TOLERANCES ON LENGTH ±2%.
6) CLEVIS EYE NOT REQUIRED IF DEAD END ASSEMBLY INCLUDES ANCHOR SHACKLE

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

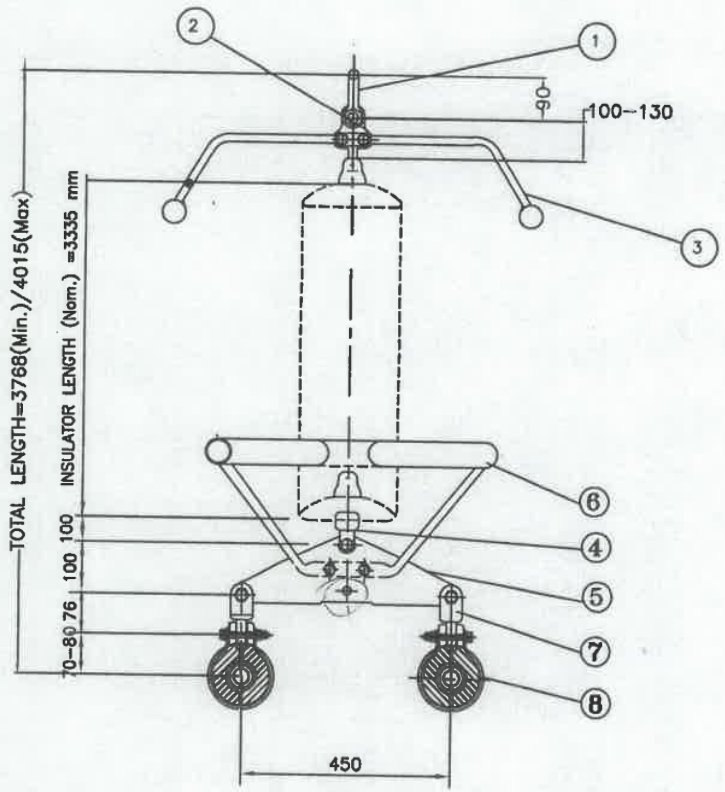
TITLE:- 220 KV DOUBLE TENSION STRING SUITABLE FOR SINGLE ACSR ZEBRA CONDUCTOR.

UTS-240 KN

CLEARED BY

SR. GM (ENGG–TL)	CGM (ENGG–TL)	ED (ENGG)
DATE: 19.11.19	MGR. (ENGG–TL)	CH. MGR. (ENGG–TL)	GM (ENGG–TL)

DRG. NO.:– CC:ENGG:TL/HW/220 KV/SZ/DT



TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCES : ±3%.
3) ALL FERROUS PARTS HOT DIP GALVANISED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) HARDWARE TOLERANCES ON LENGTH ±2%.

Sr. No.	DESCRIPTION	PART NO.	UTS	QTY.	REF DRG: CC:ENGG:TL/HW
8	SUSPENSION CLAMP (AGS)	AGS-MOOSE	70 KN	2	AGS-001
7	CLEVIS EYE	CE-90-01	90 KN	2	CE-001
6	CORONA RING	CR-400-01	----	1	CR-001
5	YOKE PLATE	YP-TR-120-04	120 KN	1	YP-TR-001
4	SOCKET CLEVIS	SC-120-01	120 KN	1	SC-001
3	ARCING HORN (BALL)	AH-BL-01B	----	1	AHB-001
2	BALL EYE (HORN HOLDER)	BE-120-01	120 KN	1	BE-001
1	ANCHOR SHACKLE	AS-120-01	120 KN	1	AS-001

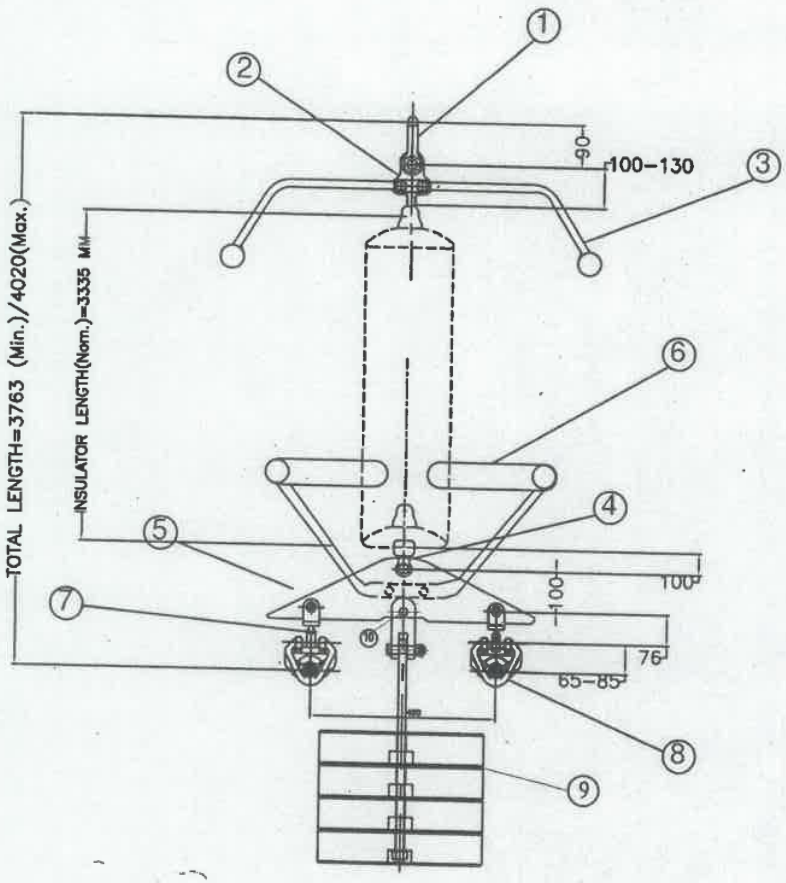
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

TITLE:- 400 KV SINGLE I SUSPENSION INSULATOR STRING FOR TWIN MOOSE ACSR CONDUCTOR.
UTS-120 KN

CLEARED BY

SR. GM (ENGG–TL)	CGM (ENGG–TL)	ED (ENGG)
DATE: 14.11.19	MGR. (ENGG–TL)	CH. MGR. (ENGG–TL) / GM (ENGG–TL)

DRG. NO.:– CC:ENGG:TL/HW/400 KV/TWIN/SIS



TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCES : ±3%.
3) ALL FERROUS PARTS HOT DIP GALVANISED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) HARDWARE TOLERANCES ON LENGTH ±2%.

Sr. No.	DESCRIPTION	PART NO.	UTS	QTY.	REF DRG: CC: ENGG: TL/HW
10	BOLT , NUT, PLAIN WASHER,SECURITY PIN (M16)	------	----	1	------
9	COUNTER WEIGHT ASSEMBLY	CW-03	----	1	CW-002
8	SUSPENSION CLAMP	ENV-MOOSE	70 KN	2	ENV-001
7	CLEVIS EYE	CE-90-01	90 KN	2	CE-001
6	CORONA RING	CR-400-01	----	1	CR-001
5	YOKE PLATE	YP-TR-120-04	120 KN	1	YP-TR-001
4	SOCKET CLEVIS	SC-120-01	120 KN	1	SC-001
3	ARCING HORN (BALL)	AH-BL-01B	----	1	AHB-001
2	BALL EYE (HORN HOLDER)	BE-120-01	120 KN	1	BE-001
1	ANCHOR SHACKLE	AS-120-01	120 KN	1	AS-001

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

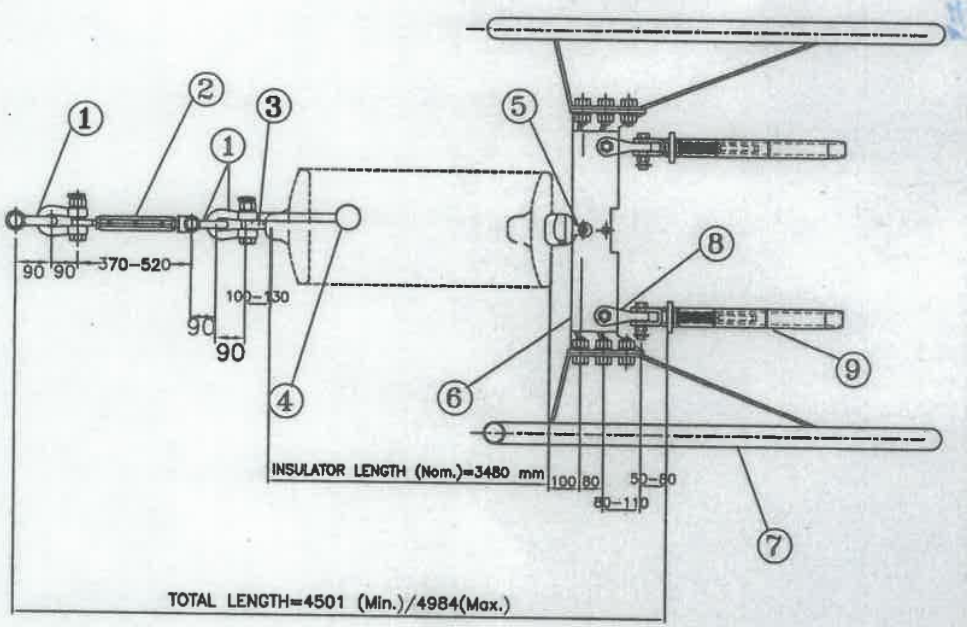
TITLE:- 400 KV SINGLE I SUSPENSION PILOT INSULATOR STRING FOR TWIN MOOSE ACSR CONDUCTOR.
UTS-120 KN

CLEARED BY

SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)

DATE	MGR. (ENGG-TL)	GH. MGR. (ENGG-TL)	GM (ENGG-TL)
14.11.19	21/11/19		

DRG. NO.:- CC:ENGG:TL/HW/400 KV/TWIN/SISP



TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCES : ±3%.
3) ALL FERROUS PARTS HOT DIP GALVANISED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) HARDWARE TOLERANCES ON LENGTH ±2%.
6) CLEVIS EYE NOT REQUIRED IF DEAD END ASSEMBLY INCLUDES ANCHOR SHACKLE

Sr. No.	DESCRIPTION	PART NO.	UTS	QTY.	REF DRG: CC: ENGG: TL/HW
9	COMPRESSION DEADEND	CDE-MOOSE	----	2	CDE-001
8	CLEVIS EYE	CE-160-01	160 KN	2	CE-001
7	CORONA RING	CR-400-03B	----	2	CR-002
6	YOKE PLATE	YP-RT-120-04	120 KN	1	YP-RT-001
5	SOCKET CLEVIS	SC-120-01	120 KN	1	SC-001
4	ARCING HORN (BALL)	AH-BL-03B	----	1	AHB-001
3	BALL EYE(HORN HOLDER)	BE-120-01	120 KN	1	BE-001
2	TURN BUCKLE	TB-120-01	120 KN	1	TB-001
1	ANCHOR SHACKLE	AS-120-01	120 KN	4	AS-001

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

TITLE:- 400 KV. SINGLE TENSION STRING SUITABLE FOR TWIN MOOSE ACSR CONDUCTOR.
UTS-120 KN

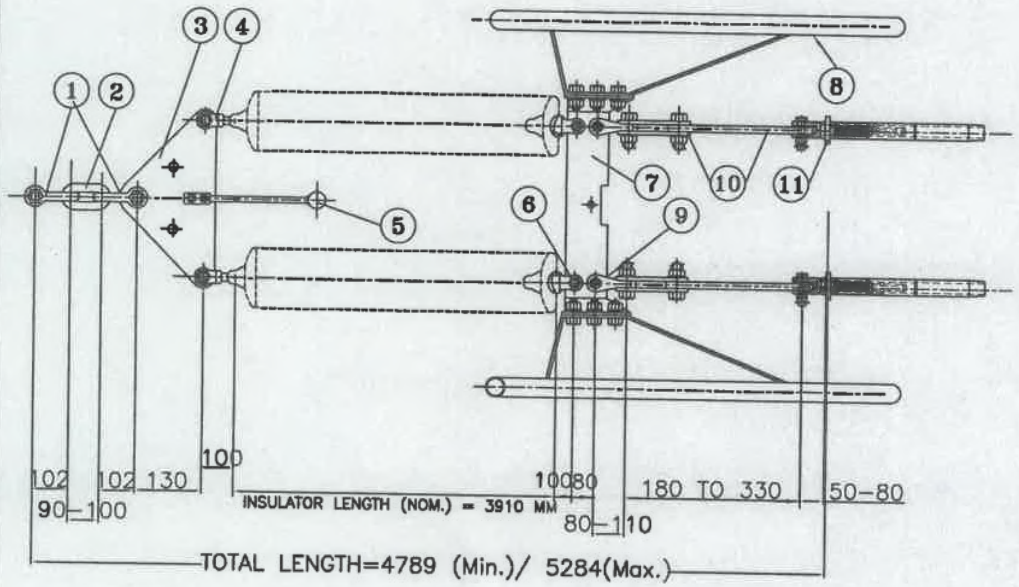
CLEARED BY

SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)
DATE: 14.11.19	MGR. (ENGG-TL)	CH. MGR. (ENGG-TL)	GM (ENGG-TL)

DRG. NO.:- CC:ENGG:TL/HW/400 KV/TWIN/ST

TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCES : ±3%.
3) ALL FERROUS PARTS HOT DIP GALVANISED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) HARDWARE TOLERANCES ON LENGTH ±2%.



Sr. No.	DESCRIPTION	PART NO.	UTS	QTY.	REF DRG: CC: ENGG: TL/HW
11	COMPRESSION DEADEND	CDE-MOOSE	----	2	CDE-002
10	SAG ADJUSTABLE PLATE	SAP-160-01	160 KN	2 SET	SAP-001
9	CLEVIS EYE	CE-160-01	160 KN	2	CE-001
8	CORONA RING	CR-400-03A	----	2	CR-001
7	YOKE PLATE	YP-RT-320-03	320 KN	1	YP-RT-001
6	SOCKET CLEVIS	SC-175-01	175 KN	2	SC-001
5	ARCING HORN (BALL)	AH-BL-02C	----	1	AHB-001
4	BALL CLEVIS	BC-175-01A/ BC-175-01B	175 KN	2	BC-001
3	YOKE PLATE	YP-TR-350-02	350 KN	1	YP-TR-001
2	CHAIN LINK	CL-320-01	320 KN	1	CL-001
1	ANCHOR SHACKLE	AS-350-02	350 KN	2	AS-001

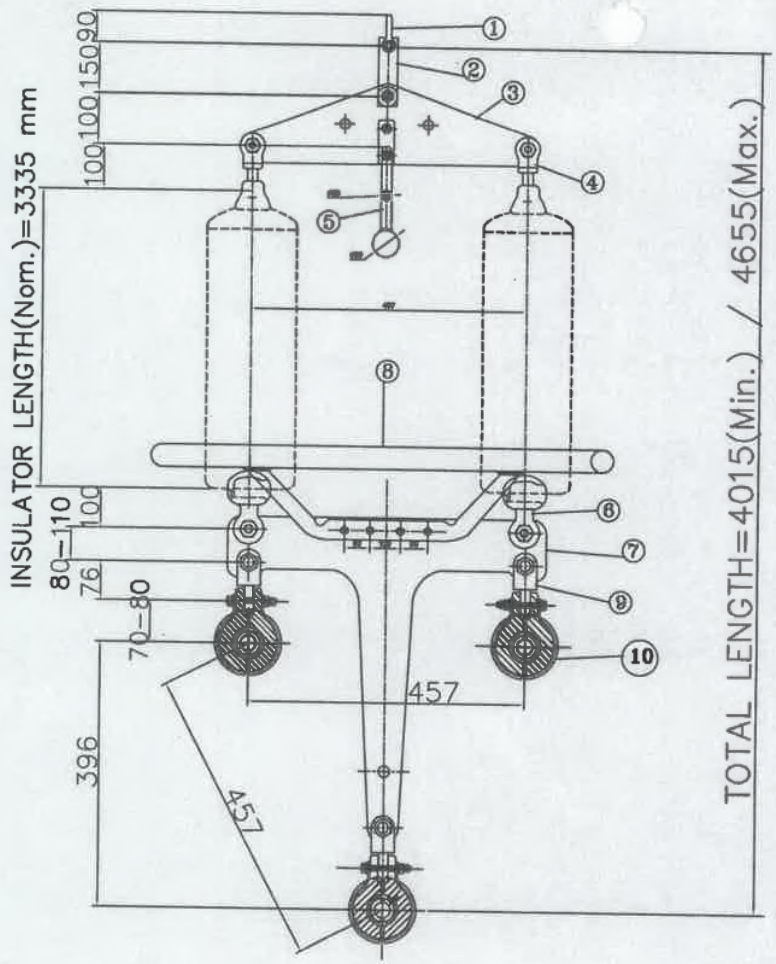
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

TITLE:- 400 KV DOUBLE TENSION INSULATOR STRING FOR TWIN MOOSE ACSR CONDUCTOR. UTS-320 KN

CLEARED BY

SR. GM (ENGG–TL)	CGM (ENGG–TL)	ED (ENGG)
DATE: 14.11.19	MGR. (ENGG–TL)	CH. MGR. (ENGG–TL)	GM (ENGG–TL)

DRG. NO.:– CC:ENGG:TL/HW/400 KV/TWIN/DT



Sr. No.	DESCRIPTION	PART NO.	UTS	QTY.	REF DRG: CC: ENGG: TL/HW
10	SUSPENSION CLAMP(A.G.S)	AGS-SNOWBIRD	70 KN	3	AGS-001
9	CLEVIS EYE	CE-90-01	90 KN	3	CE-001
8	CORONA RING	CR-400-02	----	1	CR-001
7	YOKE PLATE	YP-C-T-240-01	240 KN	1	YP-C-T-001
6	SOCKET CLEVIS	SC-120-01	120 KN	2	SC-001
5	ARCING HORN (BALL)	AH-BL-02B	----	2	AHB-001
4	BALL CLEVIS	BC-120-01	120 KN	2	BC-001
3	YOKE PLATE	YP-TR-240-02A	240 KN	1	YP-TR-001
2	Y-STRAP	YS-240-01	240 KN	1	YS-001
1	ANCHOR SHACKLE	AS-240-01	240 KN	1	AS-001

TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCES : ±3%.
3) ALL FERROUS PARTS HOT DIP GALVANISED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) HARDWARE TOLERANCES ON LENGTH ±2%.

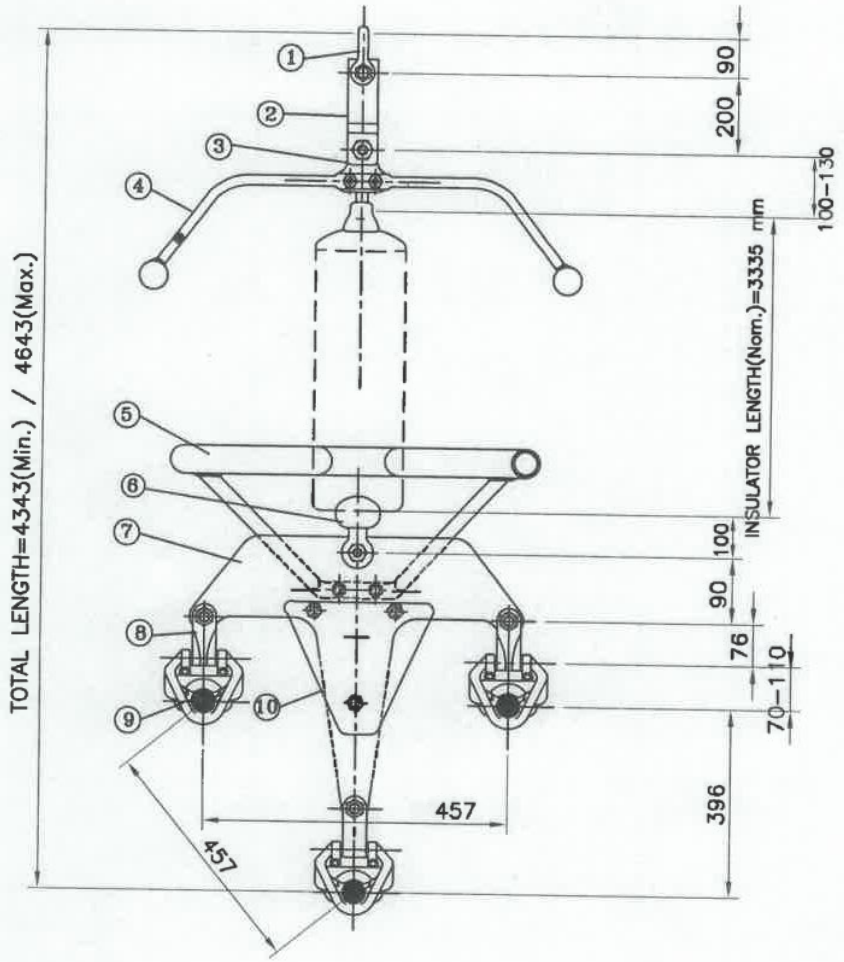
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

TITLE:- 400 KV DOUBLE "I" SUSPENSION INSULATOR STRING FOR TRIPLE ACSR "SNOWBIRD" CONDUCTOR.
UTS-240 KN

CLEARED BY

SR. GM (ENGG–TL)	CGM (ENGG–TL)	ED (ENGG)
DATE: 14.11.19	MGR. (ENGG–TL)	CH. MGR. (ENGG–TL)	GM (ENGG–TL)

DRG. NO.:– CC:ENGG:TL/HW/400 KV/TRIPLE/DIS



TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCES : ±3%.
3) ALL FERROUS PARTS HOT DIP GALVANISED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) HARDWARE TOLERANCES ON LENGTH ±2%.

Sr. No.	DESCRIPTION	PART NO.	UTS	QTY.	REF DRG:CC:ENGG:TL/HW
10	COUNTER WEIGHT	CW-01	----	1 SET	CW-001
9	SUSPENSION CLAMP	ENV-SNOWBIRD	70 KN	3	ENV-001
8	CLEVIS EYE	CE-90-01	90 KN	3	CE-001
7	YOKE PLATE	YP-C-T-120-02	120 KN	1	YP-C-T-001
6	SOCKET CLEVIS	SC-120-01	120 KN	1	SC-001
5	CORONA RING	CR-400-01	----	1	CR-001
4	ARCING HORN (BALL)	AH-BL-01B	----	1	AHB-001
3	BALL EYE (HORN HOLDER)	BE-120-01	120 KN	1	BE-001
2	Y-STRAP	YS-120-01	120 KN	1	YS-001
1	ANCHOR SHACKLE	AS-120-01	120 KN	1	AS-001

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

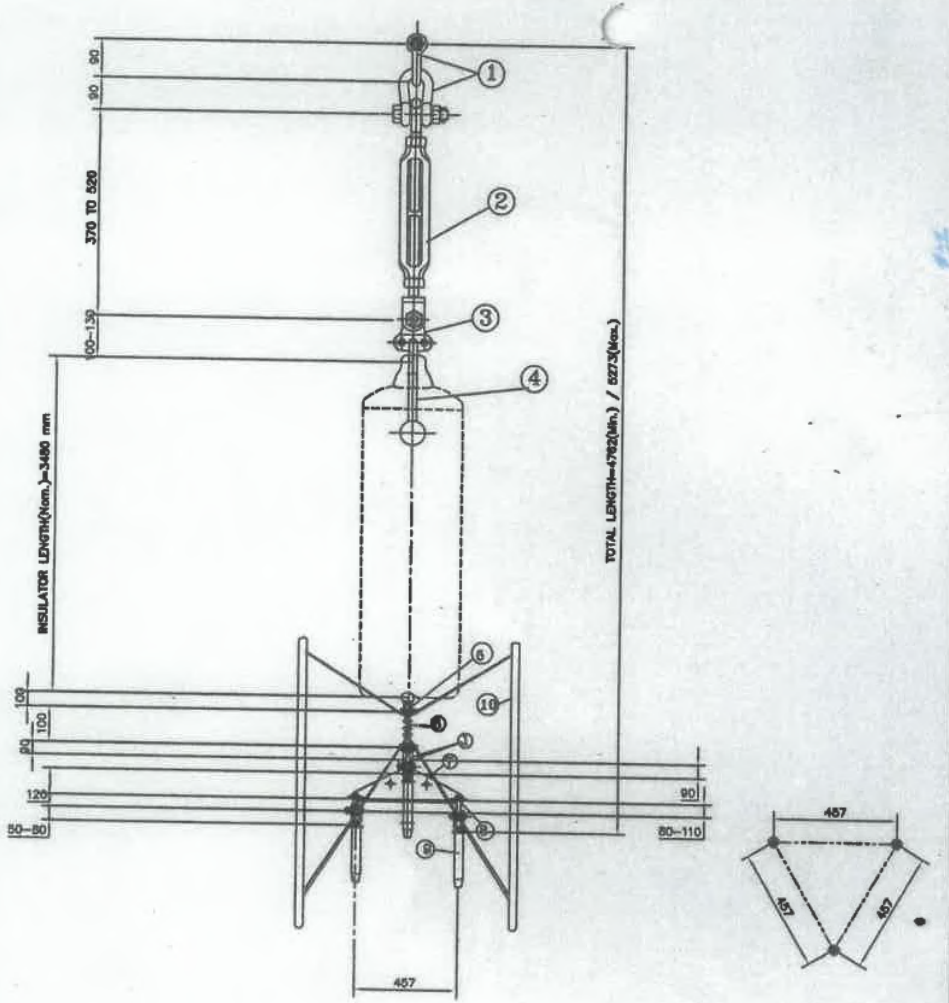
TITLE:- 400 KV SINGLE I SUSPENSION PILOT INSULATOR STRING FOR TRIPLE ACSR "SNOWBIRD" CONDUCTOR WITH COUNTER WEIGHT. UTS-120 KN

CLEARED BY

SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)

DATE	MGR. (ENGG-TL)	CH. MGR. (ENGG-TL)	GM (ENGG-TL)
14.11.19	21/11/19		

DRG. NO.:- CC:ENGG:TL/HW/400 KV/TRIPLE/SISP



Sr. No.	DESCRIPTION	PART NO.	UTS	QTY.	REF DRG: CC: ENGG: TL/HW
10	CORONA RING	CR-400-03D	----	2	CR-002
9	COMPRESSION DEADEND	CDE-SNOWBIRD	112.2 KN(Min)	3	CDE-001
8	CLEVIS EYE	CE-160-01	160 KN	3	CE-001
7	YOKE PLATE	YP-TR-80-01	80 KN	1	YP-TR-001
6	YOKE PLATE	YP-TR-120-08	120 KN	1	YP-TR-001
5	SOCKET CLEVIS	SC-120-01	120 KN	1	SC-001
4	ARCING HORN (BALL)	AH-BL-03B	----	1	AHB-001
3	BALL EYE (HORN HOLDER)	BE-120-01	120 KN	1	BE-001
2	TURN BUCKLE	TB-120-01	120 KN	1	TB-001
1	ANCHOR SHACKLE	AS-120-01	120 KN	6	AS-001

TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCES : ±3%.
3) ALL FERROUS PARTS HOT DIP GALVANISED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) HARDWARE TOLERANCES ON LENGTH ±2%.
6) CLEVIS EYE NOT REQUIRED IF DEAD END ASSEMBLY INCLUDES ANCHOR SHACKLE

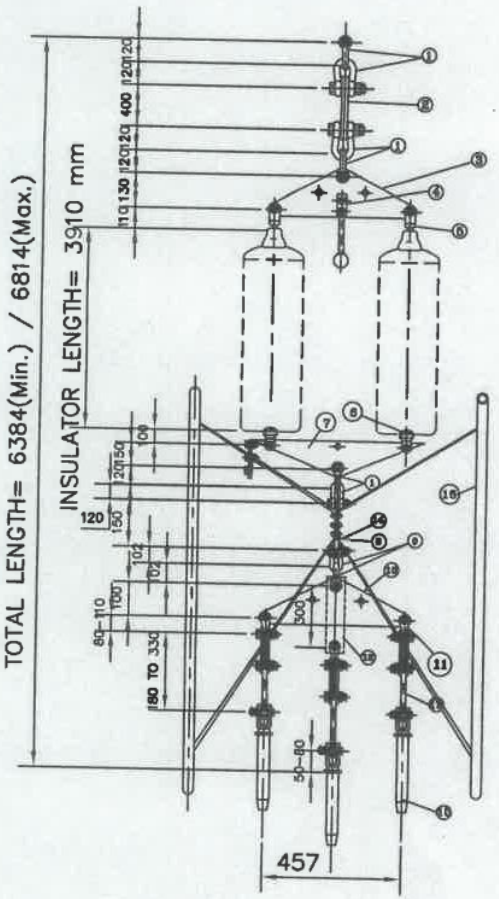
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

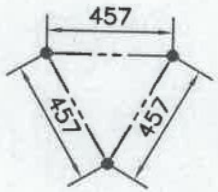
TITLE:- 400 KV SINGLE TENSION INSULATOR STRING FOR TRIPLE ACSR "SNOWBIRD" CONDUCTOR. UTS-120 KN

CLEARED BY

SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)
DATE: 14.11.19	MGR. (ENGG-TL)	CH. MGR. (ENGG-TL) / GM (ENGG-TL)

DRG. NO.:- CC:ENGG:TL/HW/400 KV/TRIPLE/ST





Sr. No.	DESCRIPTION	PART NO.	UTS	QTY.	REF DRG: CC: ENGG: TL/HW
16	CORONA RING	CR-400-04B	----	2	CR-002
15	COMPRN. DEADEND	CDE-SNOWBIRD	112.2 KN(Min.)	3	CDE-001
14	ANCHOR SHACKLE	AS-180-01	180 KN	2	AS-001
13	SAG ADJUSTABLE PLATE	SAP-160-01	160 KN	3	SAP-001
12	EXTENSION LINK	EL-160-01	160 KN	1	EL-001
11	CLEVIS EYE	CE-160-01	160 KN.	3	CE-001
10	YOKE PLATE	YP-TR-280-01	280 KN	1	YP-TR-001
9	ANCHOR SHACKLE	AS-350-02	350 KN	2	AS-001
8	YOKE PLATE	YP-TR-470-07	470 KN	1	YP-TR-001
7	YOKE PLATE	YP-TR-420-01	420 KN	1	YP-TR-001
6	SOCKET CLEVIS	SC-235-01	235 KN	2	SC-001
5	BALL CLEVIS	BC-235-01A	235 KN	2	BC-001
4	ARCING HORN (BALL)	AH-BL-02C	----	2	AHB-001
3	YOKE PLATE	YP-TR-470-02	470 KN	1	YP-TR-001
2	EXTENSION LINK	EL-420-01	420 KN	1	EL-001
1	ANCHOR SHACKLE	AS-470-01	470 KN	6	AS-001

TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCES : ±3%.
3) ALL FERROUS PARTS HOT DIP GALVANISED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) HARDWARE TOLERANCES ON LENGTH ±2%.

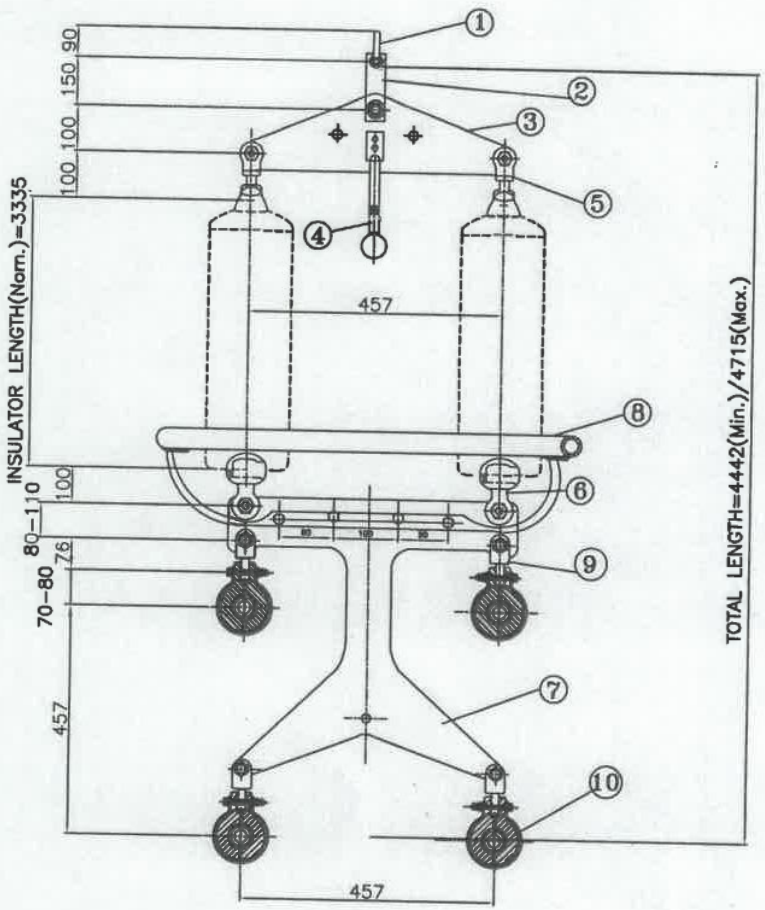
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

TITLE:- 400 KV. DOUBLE TENSION INSULATOR STRING FOR TRIPLE ACSR "SNOWBIRD" CONDUCTOR. UTS-420 KN

CLEARED BY

SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)
DATE: 14.11.19	MGR. (ENGG-TL)	CH. MGR. (ENGG-TL)	GM (ENGG-TL)

DRG. NO.:- CC:ENGG:TL/HW/400 KV/TRIPLE/DT



Sr. No.	DESCRIPTION	PART NO.	UTS	QTY.	REF DRG:CC:ENGG:TL/HW
10	SUSPENSION CLAMP(A.G.S)	AGS-MOOSE	70 KN	4	AGS-001
9	CLEVIS EYE	CE-90-01	90 KN	4	CE-001
8	CORONA RING	CR-400-02	----	1	CR-001
7	YOKE PLATE	YP-C-Q-240-01	240 KN	1	YP-C-Q-001
6	SOCKET CLEVIS	SC-120-01	120 KN	2	SC-001
5	BALL CLEVIS	BC-120-01	120 KN	2	BC-001
4	ARCING HORN (BALL)	AH-BL-02B	----	2	AHB-001
3	YOKE PLATE	YP-TR-240-02A	240 KN	1	YP-TR-001
2	Y-STRAP	YS-240-01	240 KN	1	YS-001
1	ANCHOR SHACKLE	AS-240-01	240 KN	1	AS-001

TECHNICAL D AILS:

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCES : ±3%.
3) ALL FERROUS PARTS HOT DIP GALVANISED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) HARDWARE TOLERANCES ON LENGTH ±2%.

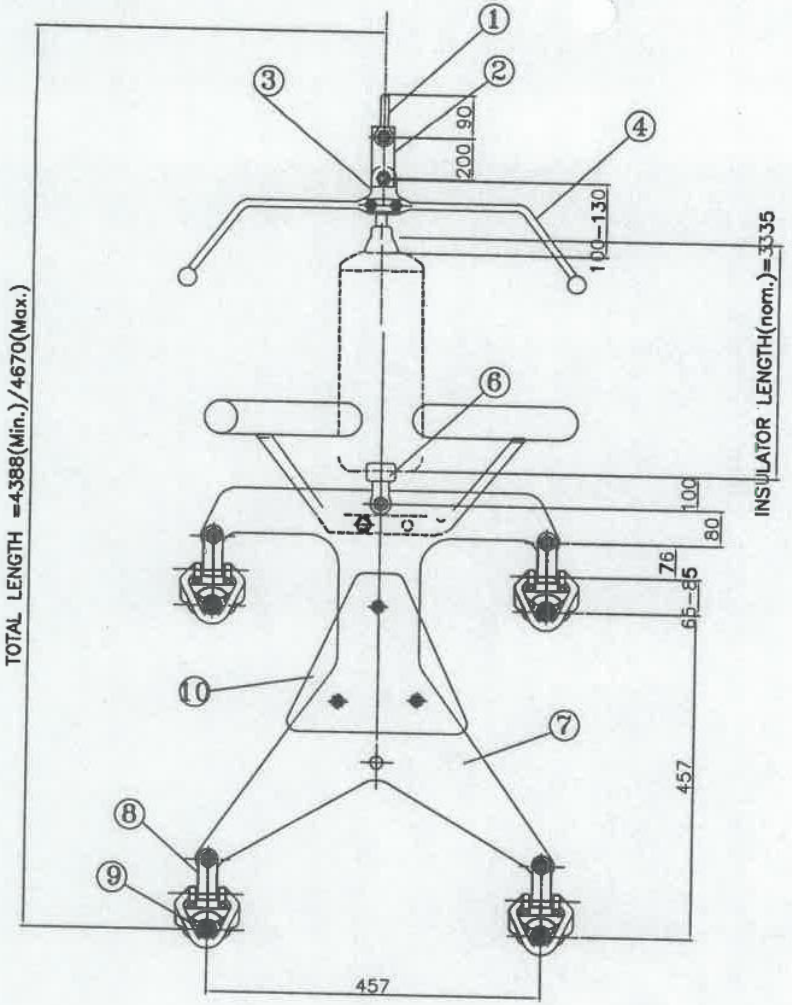
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

TITLE:- 400 KV DOUBLE I SUSPENSION STRING FOR QUADRUPLE ACSR MOOSE CONDUCTOR. UTS-240 KN

CLEARED BY

SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)
DATE: 14.1.19	MGR. (ENGG-TL)	CH. MGR. (ENGG-TL)	GM (ENGG-TL)

DRG. NO.:- CC:ENGG:TL/HW/400 KV/QUAD/DIS



Sr. No.	DESCRIPTION	PART NO.	UTS	QTY.	REF DRG:CC:ENGG:TL/HW
10	COUNTER WEIGHT ASSEMBLY	CW-01	----	1 SET	CW-001
9	SUSPENSION CLAMP	ENV-MOOSE	70 KN	4	ENV-001
8	CLEVIS EYE	CE-90-01	90 KN	4	CE-001
7	YOKE PLATE	YP-C-Q-120-02	120 KN	1	YP-C-Q-001
6	SOCKET CLEVIS	SC-120-01	120 KN	1	SC-001
5	CORONA RING	CR-400-01	----	1	CR-001
4	ARCING HORN (BALL)	AH-BL-01B	----	1	AHB-001
3	BALL EYE (HORN HOLDER)	BE-120-01	120 KN	1	BE-001
2	Y-STRAP	YS-120-01	120 KN	1	YS-001
1	ANCHOR SHACKLE	AS-120-01	120 KN	1	AS-001

TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCES : ±3%.
3) ALL FERROUS PARTS HOT DIP GALVANISED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) HARDWARE TOLERANCES ON LENGTH ±2%.

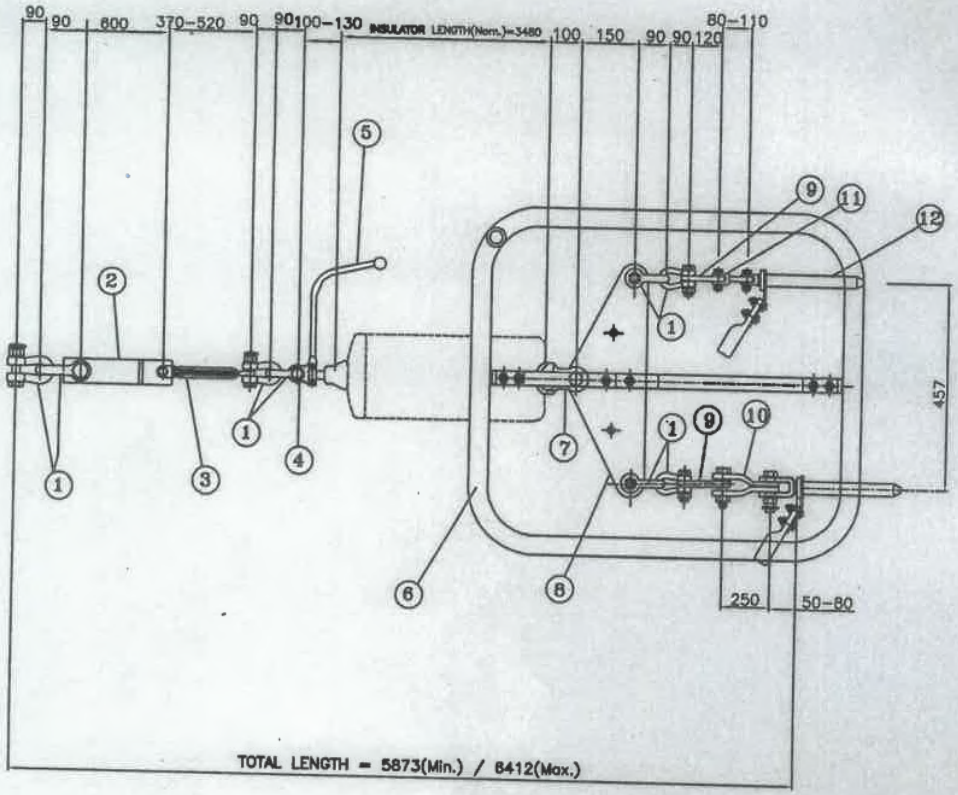
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

TITLE:- 400 KV SINGLE I SUSPENSION PILOT STRING SUITABLE FOR QUADRUPLE ACSR MOOSE CONDUCTOR.
UTS-120 KN

CLEARED BY

SR. GM (ENGG–TL)	CGM (ENGG–TL)	ED (ENGG)
DATE: 14.11.19	MGR. (ENGG–TL)	CH. MGR. (ENGG–TL)	GM (ENGG–TL)

DRG. NO.:– CC:ENGG:TL/HW/400 KV/QUAD/SISP



Sr. No.	DESCRIPTION	PART NO.	UTS	QTY.	REF DRG:CC:ENGG:TL/HW
13	SPACER (250 mm)	RS-250-MOOSE	----	1	RS-001
12	COMPRESSION DEADEND	CDE-MOOSE	----	4	CDE-002
11	CLEVIS EYE	CE-160-01	160 KN.	2	CE-001
10	Y-STRAP	YS-160-02	160 KN.	2	YS-001
9	YOKE PLATE	YP-TR-80-01	80 KN.	2	YP-TR-001
8	YOKE PLATE	YP-TR-120-06	120 KN	1	YP-TR-001
7	SOCKET CLEVIS	SC-120-01	120 KN	1	SC-001
6	CORONA RING	CR-400-03C	----	2 SETS	CR-002
5	ARCING HORN (BALL)	AH-BL-03B	----	1	AHB-001
4	BALL EYE (HORN HOLDER)	BE-120-01	120 KN	1	BE-001
3	TURN BUCKLE	TB-120-01	120 KN	1	TB-001
2	Y-STRAP	YS-120-02	120 KN	1	YS-001
1	ANCHOR SHACKLE	AS-120-01	120 KN	8	AS-001

TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCES : ±3%.
3) ALL FERROUS PARTS HOT DIP GALVANISED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) HARDWARE TOLERANCES ON LENGTH ±2%.
6) CLEVIS EYE NOT REQUIRED IF DEAD END ASSEMBLY INCLUDES ANCHOR SHACKLE

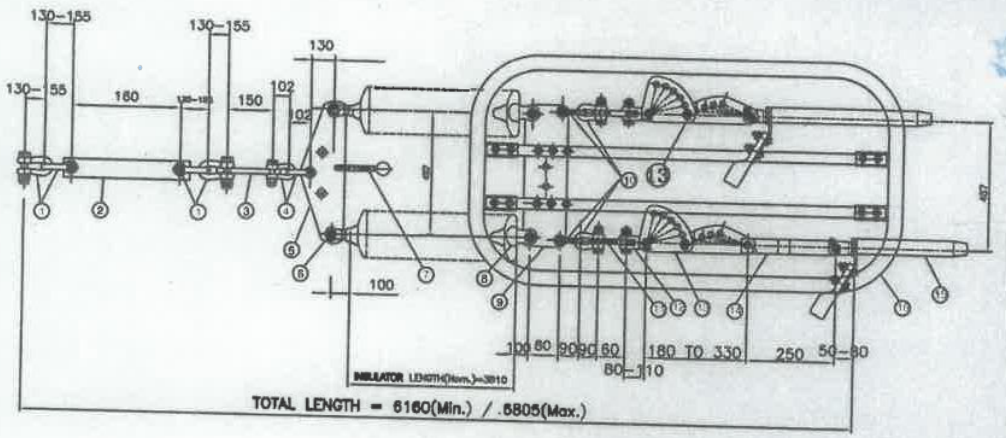
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

TITLE:- 400 KV. SINGLE TENSION STRING SUITABLE FOR QUADRUPLE ACSR MOOSE CONDUCTOR. UTS-120 KN

CLEARED BY

SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)
DATE: 14.11.19	MGR. (ENGG-TL)	CH. MGR. (ENGG-TL)	GM (ENGG-TL)

DRG. NO.:- CC:ENGG:TL/HW/400 KV/QUAD/ST



TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCES : ±3%.
3) ALL FERROUS PARTS HOT DIP GALVANISED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) HARDWARE TOLERANCES ON LENGTH ±2%.

Sr. No.	DESCRIPTION	PART NO.	UTS	QTY.	REF DRG:CC:ENGG:TL/HW
17	RIGID SPACER (250 mm)	RS-Twin-Moose	----	1	TWIN-RS-001
16	CORONA RING	CR-400-04A	----	2,SET	CR-002
15	COMPRESSION DEADEND	CDE-MOOSE	----	4	CDE-001
14	Y-STRAP	YS-160-02	160 KN	2	YS-001
13	SAG ADJUSTING PLATE	SAP-160-01	160 KN	4	SAP-001
12	CLEVIS EYE	CE-160-01	160 KN	4	CE-001
11	YOKE PLATE	YP-RT-350-01	350 KN	2	YP-RT-001
10	ANCHOR SHACKLE	AS-180-01	180 KN.	8	AS-001
9	YOKE PLATE	YP-RT-320-02	320 KN	2	YP-RT-001
8	SOCKET CLEVIS	SC-175-01	175 KN	4	SC-001
7	ARCING HORN (BALL)	AH-BL-02C	----	2	AHB-001
6	BALL CLEVIS	BC-175-01A / BC-175-01B	175 KN	4	BC-001
5	YOKE PLATE	YP-TR-350-02	350 KN	2	YP-TR-001
4	ANCHOR SHACKLE	AS-350-02	350 KN	4	AS-001
3	YOKE PLATE	YP-TR-640-01	640 KN	1	YP-TR-001
2	EXTENSION LINK	EL-640-01	640 KN	1	EL-001
1	ANCHOR SHACKLE	AS-640-01	640 KN	4	AS-001

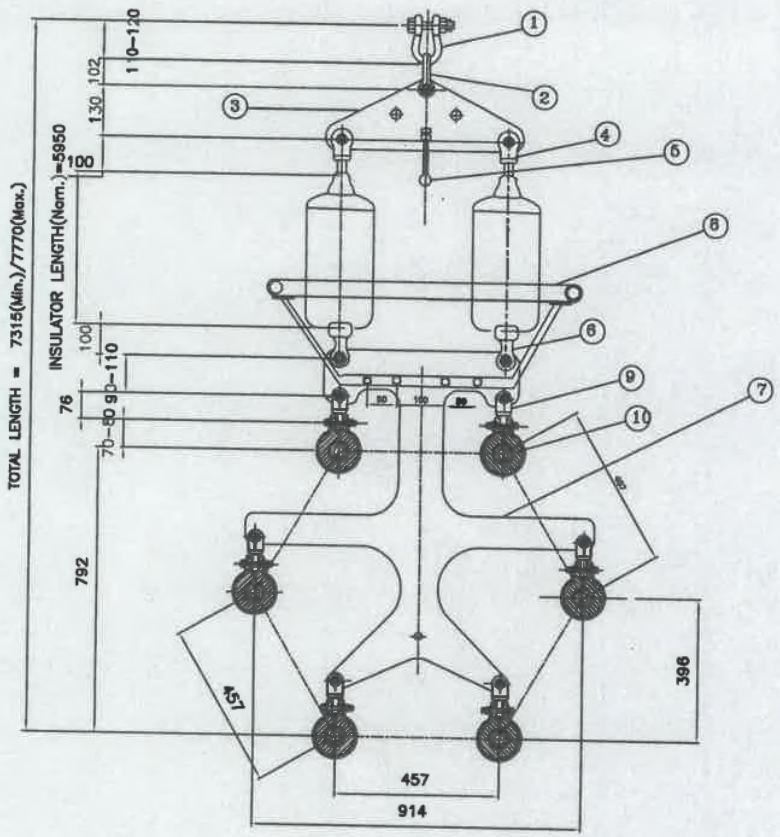
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

TITLE:- 400 KV D/C QUAD TENSION STRING SUITABLE FOR QUADRUPLE ACSR MOOSE CONDUCTOR.
UTS-640 KN

CLEARED BY

SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)
DATE 14/11/19	MGR. (ENGG-TL)	CH. MGR. (ENGG-TL)	GM (ENGG-TL)

DRG. NO.:- CC:ENGG:TL/HW/400 KV/QUAD/QT



TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCES : ±3%.
3) ALL FERROUS PARTS HOT DIP GALVANISED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) HARDWARE TOLERANCES ON LENGTH ±2%.

Sr. No.	DESCRIPTION	PART NO.	UTS	QTY.	REF DRG:CC:ENGG:TL/HW
10	SUSPENSION CLAMP(AGS)	AGS-ZEBRA	70 KN	6	AGS-001
9	CLEVIS EYE	CE-90-01 / CE-70-01	90/70 KN	6	CE-001
8	CORONA RING	CR-765-02	----	1	CR-001
7	YOKE PLATE	YP-C-H-350-01	350 KN	1	YP-C-H-001
6	SOCKET CLEVIS	SC-175-01	175 KN	2	SC-001
5	ARCING HORN	AH-BL-02C	----	2	AHB-001
4	BALL CLEVIS	BC-175-01A / BC-175-01B	175 KN	2	BC-001
3	YOKE PLATE	YP-TR-350-02	350 KN	1	YP-TR-001
2	ANCHOR SHACKLE	AS-350-02	350 KN	1	AS-001
1	ANCHOR SHACKLE	AS-350-01	350 KN	1	AS-001

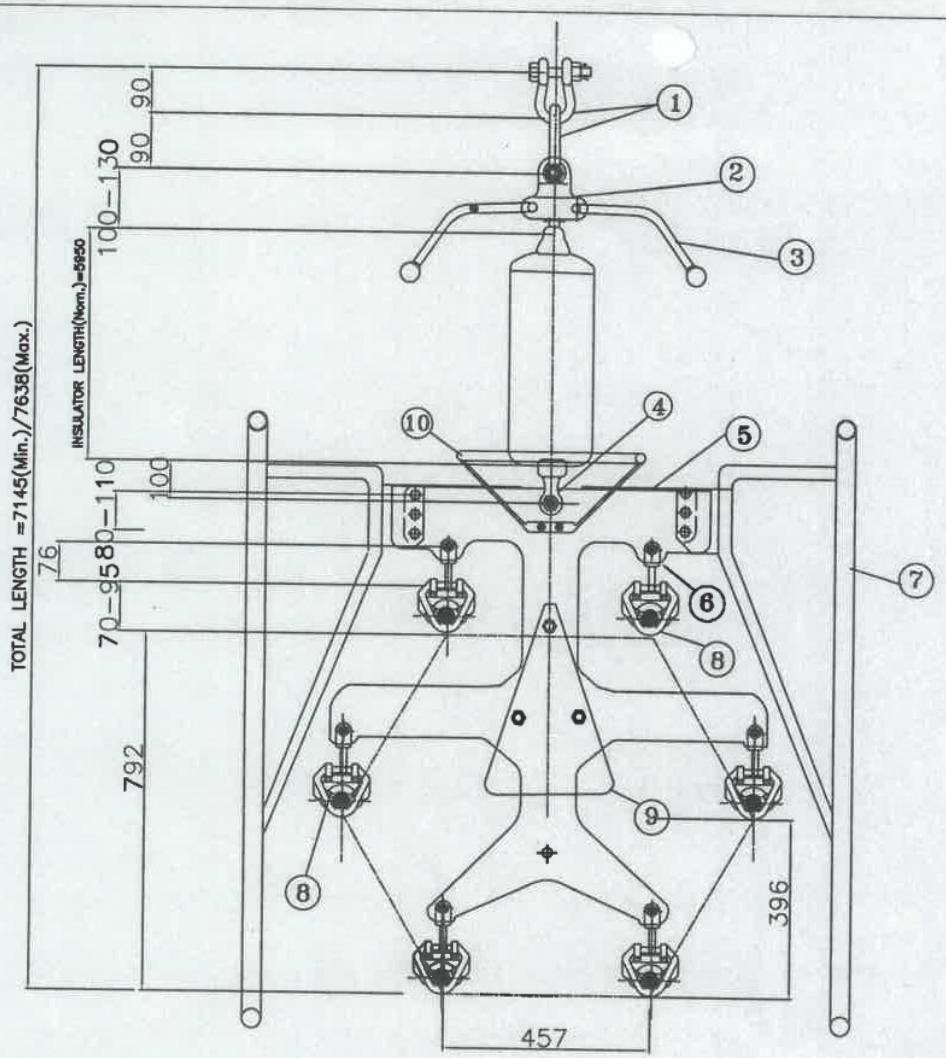
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

TITLE:- 765 KV D/C (HEXA ZEBRA) DOUBLE "I" SUSPENSION STRING FOR SIX BUNDLE "ZEBRA" ACSR CONDUCTOR
UTS-350 KN

CLEARED BY

SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)
DATE: 14.11.19	MGR. (ENGG-TL)	CH. MGR. (ENGG-TL)	GM (ENGG-TL)

DRG. NO.:- CC:ENGG:TL/HW/765 KV/HEXA/DIS



Sr. No.	DESCRIPTION	PART NO.	UTS	QTY.	REF DRG:CC:ENGG:TL/HW
10	CORONA RING	CR-765-01	----	1	CR-001
9	COUNTER WEIGHT ASSEMBLY	CW-01	----	1	CW-001
8	SUSPENSION CLAMP(ENV.)	ENV-ZEBRA	70 KN	6	ENV-001
7	CORONA RING	CR-765-03A	----	2	CR-002
6	CLEVIS EYE	CE-90-01 / CE-70-01	90/70 KN	6	CE-001
5	YOKE PLATE	YP-C-H-160-02	160 KN	1	YP-C-H-001
4	SOCKET CLEVIS	SC-175-01	175 KN	1	SC-001
3	ARCING HORN (BALL)	AH-BL-01B	----	1	AHB-001
2	BALL EYE (HORN HOLDER)	BE-160-01	160 KN	1	BE-001
1	ANCHOR SHACKLE	AS-180-01	180 KN	2	AS-001

TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCES : ±3%.
3) ALL FERROUS PARTS HOT DIP GALVANISED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) HARDWARE TOLERANCES ON LENGTH ±2%.

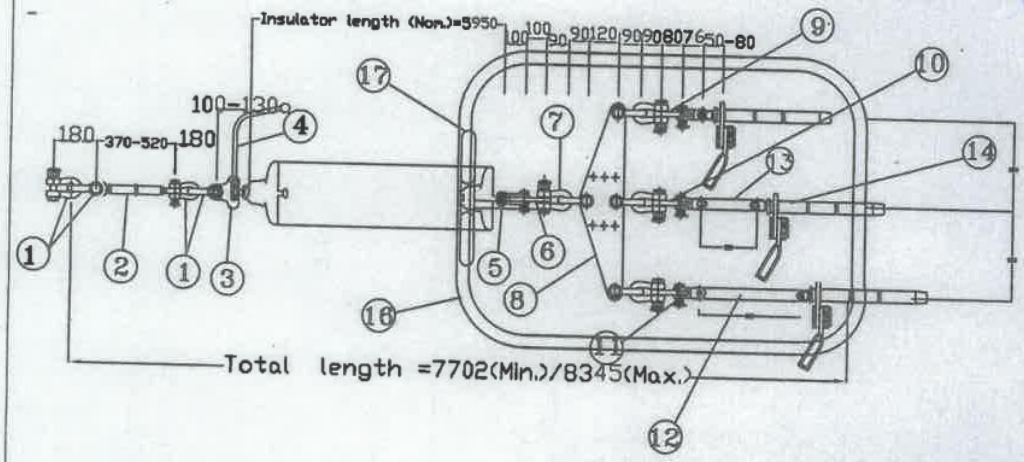
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

TITLE:- 765 KV SINGLE "I" SUSPENSION PILOT STRING FOR SIX BUNDLE "ZEBRA" ACSR CONDUCTOR WITH COUNTER WEIGHT. UTS-160 KN

CLEARED BY

SR. GM (ENGG–TL)	CGM (ENGG–TL)	ED (ENGG)
DATE 14.11.19	MGR. (ENGG–TL)	CH. MGR. (ENGG–TL)	GM (ENGG–TL)

DRG. NO.:– CC:ENGG:TL/HW/765 KV/HEXA/SISP



TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCES : ±3%.
3) ALL FERROUS PARTS HOT DIP GALVANISED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) HARDWARE TOLERANCES ON LENGTH ±2%.
6) 2 Nos. CLEVIS EYE (USED ON TOP TWO SUBCONDUCTORS) NOT REQUIRED IF DEAD END ASSEMBLY INCLUDES ANCHOR SHACKLE

Sr. No.	DESCRIPTION	PART NO.	UTS	QTY.	REF DRG:CC:ENGG:TL/HW
17	CORONA RING.	CR-765-01	----	1	CR-001
16	CORONA RING	CR-765-04A	----	2	CR-002
15	SPACER (250 mm)	RS-TWIN-ZEBRA	----	1	TWIN-RS-001
14	COMPRESSION DEADEND	CDE-ZEBRA	----	6	CDE-001
13	Y-STRAP	YS-160-02	160 KN	2	YS-001
12	Y-STRAP	YS-160-01	160 KN	2	YS-001
11	CLEVIS EYE	CE-160-01	160 KN	6	CE-001
10	YOKE PLATE	YP-TP-80-02	80 KN	1	YP-TR-001
9	YOKE PLATE	YP-RT-80-01	80 KN	2	YP-TR-001
8	YOKE PLATE	YP-TR-80-03	80 KN	2	YP-TR-001
7	ANCHOR SHACKLE	AS-120-01	120 KN	16	AS-001
6	YOKE PLATE	YP-TR-160-04	160 KN	1	YP-TR-001
5	SOCKET CLEVIS	SC-175-01	175 KN	1	SC-001
4	ARCING HORN (BALL)	AH-BL-03B	----	1	AHB-001
3	BALL EYE(HORN HOLDER)	BE-160-01	160 KN	1	BE-001
2	TURN BUCKLE	TB-160-01	160 KN	1	TB-001
1	ANCHOR SHACKLE	AS-180-01	180 KN	4	AS-001

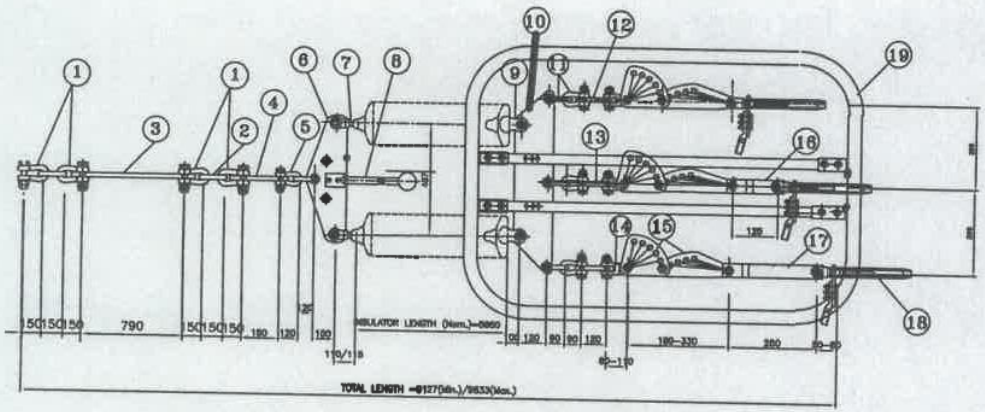
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

TITLE:- 765 KV D/C SINGLE TENSION STRING FOR SIX BUNDLE "ZEBRA" ACSR CONDUCTOR . UTS-160 KN

CLEARED BY

SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)
DATE: 14.11.19	MGR. (ENGG-TL)	CH. MGR. (ENGG-TL)	GM (ENGG-TL)

DRG. NO.:- CC:ENGG:TL/HW/765 KV/HEXA/ST



TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCES : ±3%.
3) ALL FERROUS PARTS HOT DIP GALVANISED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) HARDWARE TOLERANCES ON LENGTH ±2%.

Sr. No.	DESCRIPTION	PART NO.	UTS	QTY.	REF DRG:CC:ENGG:TL/HW
20	RIGID SPACER (250 mm)	RS-TWIN-ZEBRA	----	1	TWIN-RS-001
19	CORONA RING	CR-765-04A	----	2,SET	CR-002
18	COMPRESSION DEADEND	CDE-ZEBRA	----	6	CDE-002
17	Y-STRAP	YS-160-02	160 KN	2	YS-001
16	Y-STRAP	YS-160-01	160 KN	2	YS-001
15	SAG ADJUSTABLE PLATE	SAP-160-01	160 KN	6	SAP-001
14	CLEVIS EYE	CE-160-01	160 KN	6	CE-001
13	YOKE PLATE	YP-TP-350-02	350 KN.	1	YP-TP-001
12	YOKE PLATE	YP-RT-350-01	350 KN.	2	YP-RT-001
11	ANCHOR SHACKLE	AS-180-01	180 KN.	12	AS-001
10	YOKE PLATE	YP-TP-470-01	470 KN	2	YP-TP-001
9	SOCKET CLEVIS	SC-235-01	235 KN	4	SC-001
8	ARCING HORN	AH-BL-02C	----	2	AHB-001
7	BALL CLEVIS	BC-235-01A/BC-235-01B	235 KN	4	BC-001
6	YOKE PLATE	YP-TR-470-02	470 KN	2	YP-TR-001
5	ANCHOR SHACKLE	AS-470-01	470 KN	4	AS-001
4	YOKE PLATE	YP-TR-920-01	920 KN	1	YP-TR-001
3	EXTENSION LINK	EL-920-01	920 KN	1	EL-001
2	CHAIN LINK	CL-920-01	920 KN	2	CL-001
1	ANCHOR SHACKLE	AS-920-01A / AS-920-01B	920 KN	4	AS-001

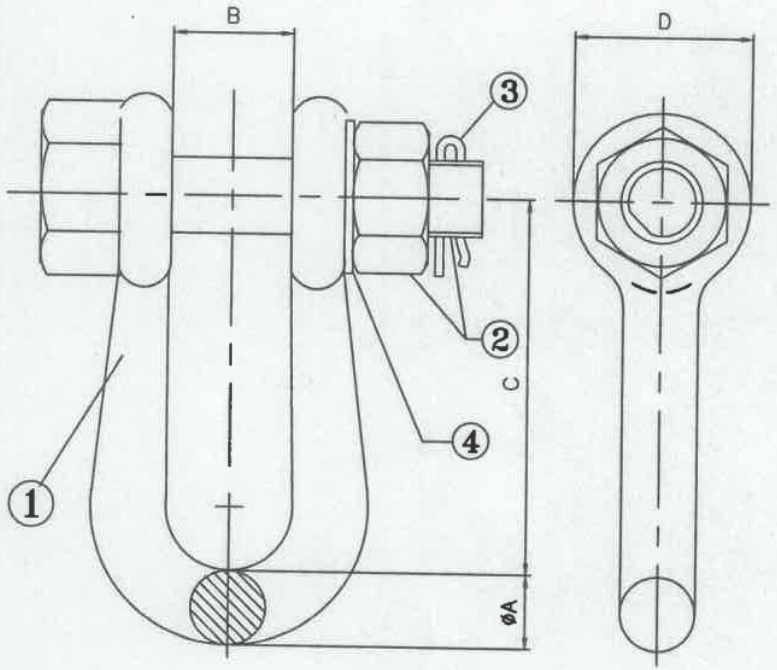
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

TITLE:- 765 KV D/C QUADRUPLE TENSION STRING FOR SIX BUNDLE "ZEBRA" ACSR CONDUCTOR UTS-920 KN

CLEARED BY

SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)
DATE 14.11.19	MGR. (ENGG-TL)	CH. MGR. (ENGG-TL) / GM (ENGG-TL)

DRG. NO.:- CC:ENGG:TL/HW/765 KV/HEXA/QT



TECHNICAL DETAILS:-

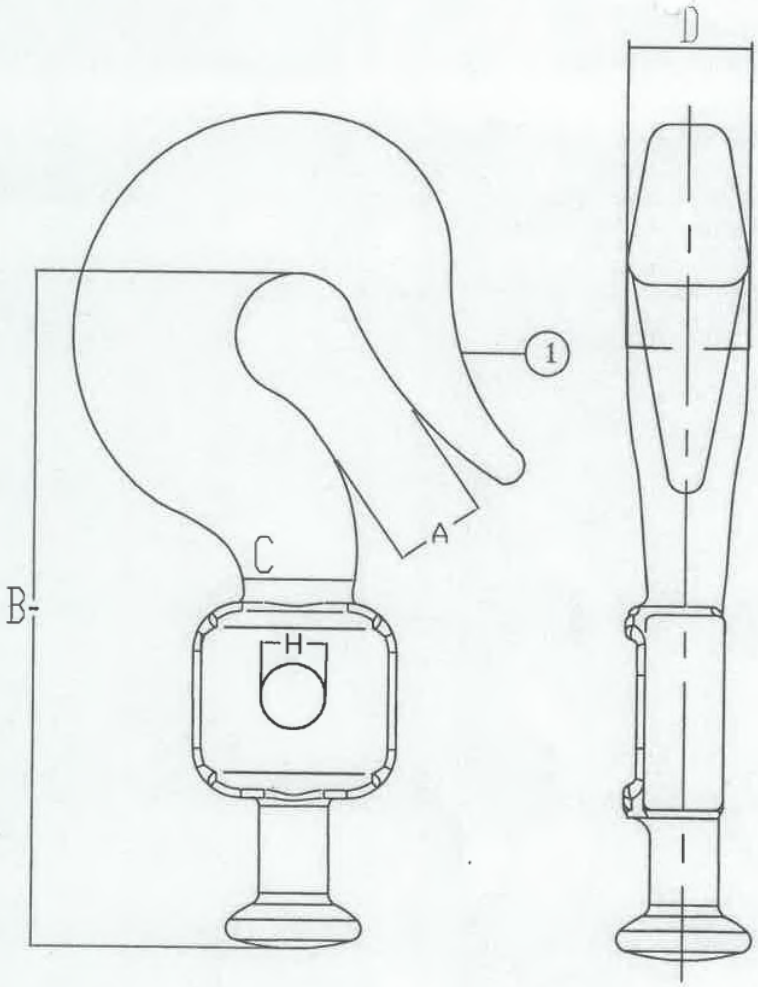
1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.

PART No.	UTS(KN)	A	B	C	D	BOLT SIZE &GRADE
AS-920-01A	920	40-45	47-50	150	90-92	39 (8.8)
AS-920-01B	920	47	47-50	150	85-92	39 (8.8)
AS-640-01	640	38-40	42-45	130-155	74-90	36 (8.8)
AS-470-01	470	32	35	120	70-72	30 (8.8)
AS-350-01	350	25-28	36-40	110-120	58-62	27 (8.8)
AS-350-02	350	25-27	30	102	58-60	27 (8.8)
AS-240-01	240	22-24	26-28	90	50-60	22 (8.8)
AS-180-01	180	20-22	24-28	90	50-52	22 (5.6)
AS-120-01	120	20-22	24-28	90	48-52	20 (5.6)
AS-90-01	90	16-20	22-24	76	40-45	16(5.6)

No.	DESCRIPTION	MATERIAL	QTY.
4	PLAIN WASHER	MILD STEEL Fe-410,IS:2062	1
3	SPLIT PIN	STAINLESS STEEL, AISI-304	1
2	NUT & BOLT	MILD STEEL IS:6639, 1363 PART-III & 1367 PART-XIII	1,1
1	ANCHOR SHACKLE	FORGED STEEL CL-IV,IS:2004	1

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

CLEARED BY			
SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)	TITLE:- ANCHOR SHACKLE
14.12.19	21.12.19		DRG .NO. :- CC:ENGG:TL/HW:AS-001
DATE	MGR. (ENGG-TL)	CH. MGR. (ENGG-TL)	GM (ENGG-TL)



TECHNICAL DETAILS:-

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWER GRID SPECIFICATION
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) BALL DESIGNATION 16 mm AS PER IS:2486 (PART–II)

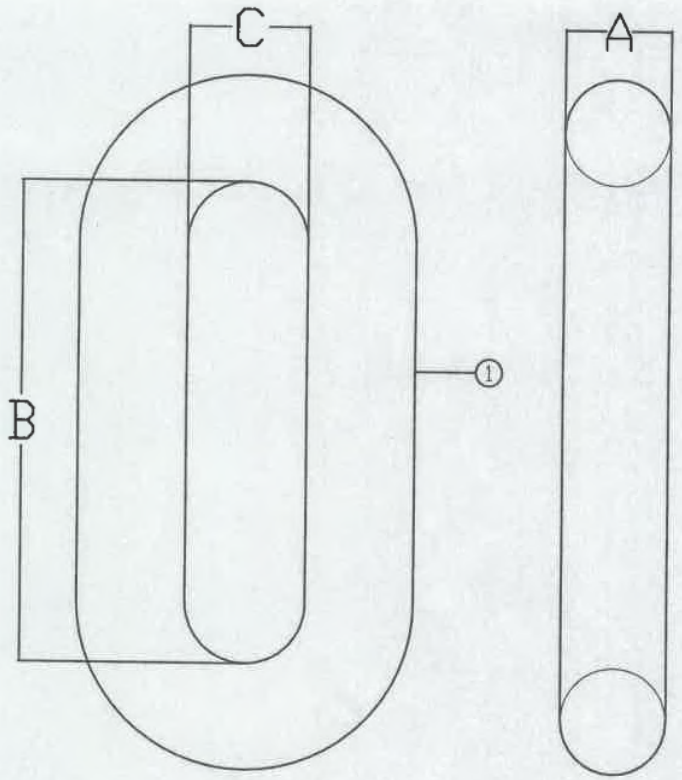
PART No.	UTS(KN)	A	B	C	D	H
BH-70-01	70	22	135-165	17-20	20-22	NA
BH-70-02	70	22	135-165	17-20	20-22	14

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

CLEARED BY			
SR. GM (ENGG–TL)	CGM (ENGG–TL)	ED (ENGG)	TITLE:- BALL HOOK
14.11.19	21/11/19		
DATE	MGR. (ENGG–TL)	CH. MGR. (ENGG–TL)	GM (ENGG–TL)

DRG .NO. :- CC:ENGG:TL/HW:BH-001

No.	DESCRIPTION	MATERIAL	QTY.
1	BALL HOOK	FORGED STEEL CL–IV,IS:2004	1



TECHNICAL DETAILS:-

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWER GRID SPECIFICATION
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.

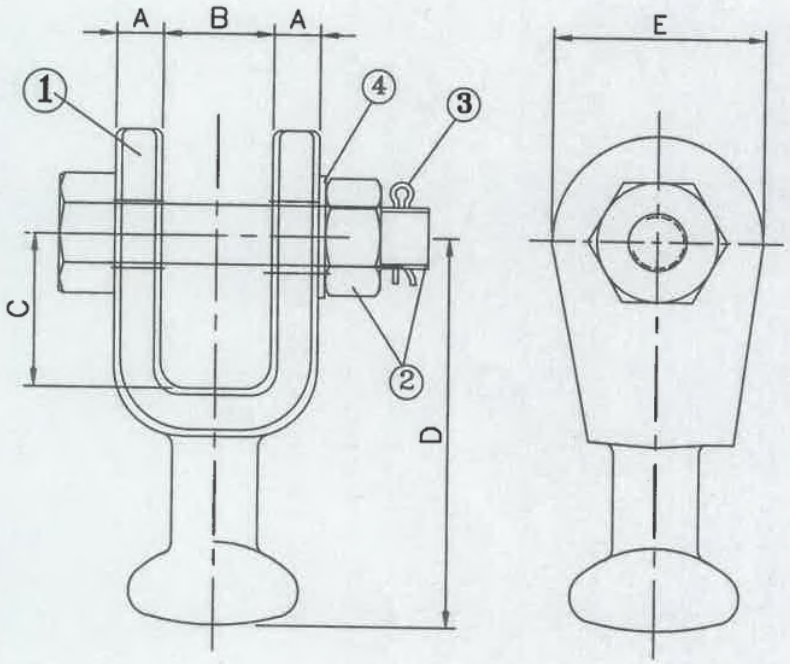
PART No.	UTS(KN)	THICKNESS	B	C
CL-920-01	920	40-45	150	50-55
CL-320-01	320	25-27	90-100	29-35
CL-240-01	240	20-22	90-100	25-32

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

No.	DESCRIPTION	MATERIAL	QTY.
1	CHAIN LINK	FORGED STEEL CL-IV,IS:2004	1

CLEARED BY			
SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)	TITLE:- CHAIN LINK
DATE: 14.11.19	MGR. (ENGG-TL): 21.11.19	CH. MGR. (ENGG-TL)	GM (ENGG-TL): 25.11.19

DRG .NO. :- CC:ENGG:TL/HW:CL-001



TECHNICAL DETAILS:-

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWER GRID SPECIFICATION
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.

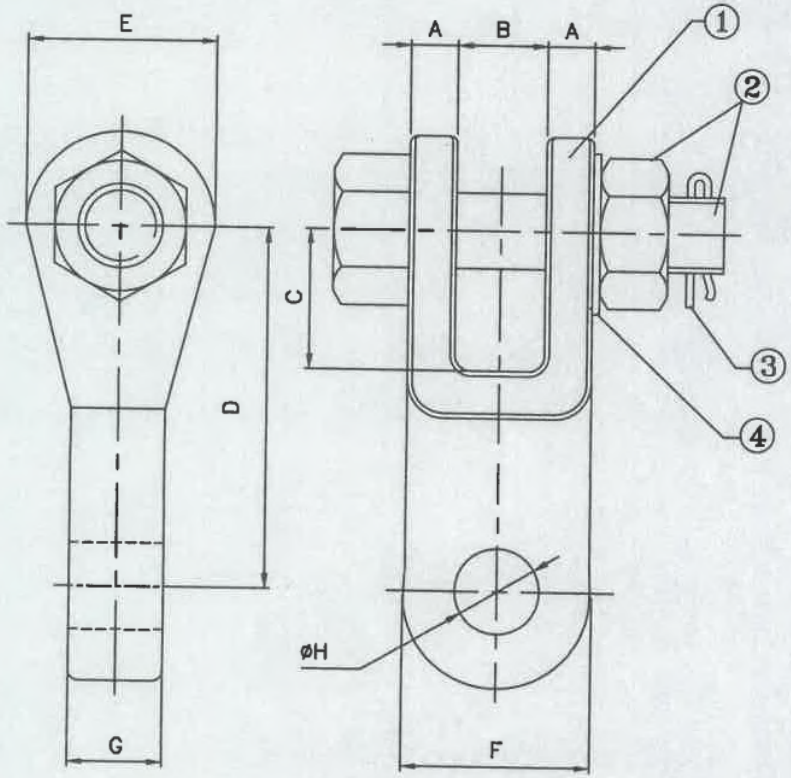
PART No.	UTS(KN)	A	B	C	D	E	DESIGNATION	BOLT SIZE &GRADE
BC-235-01A	235	14-15	28-29	42-50	110	56-60	24MM	22 (5.6)
BC-235-01B	235	14	29	50	115	60	24MM	22 (5.6)
BC-175-01A	175	12-14	22-25	38-45	100	50-52	20MM	22 (5.6)
BC-175-01B	175	13	22-25	42	100	45	20MM	22 (5.6)
BC-120-01	120	12-14	22-24	38-45	100	45-52	20MM	20 (5.6)
BC-90-01	90	10-13	22-25	36-40	76	38-45	16MM	16 (5.6)

No.	DESCRIPTION	MATERIAL	QTY.
4	PLAIN WASHER	MILD STEEL Fe-410,IS:2062	1
3	SPLIT PIN	STAINLESS STEEL, AISI-304	1
2	NUT & BOLT	MILD STEEL IS:6639, 1363 PART-III & 1367 PART-XIII	1,1
1	BALL CLEVIS	FORGED STEEL CL-IV,IS:2004	1

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

CLEARED BY			
SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)	TITLE:- BALL CLEVIS
DATE: 14.11.19	MGR. (ENGG-TL)	CH. MGR. (ENGG-TL)	GM (ENGG-TL)

DRG .NO. :- CC:ENGG:TL/HW:BC-001



TECHNICAL DETAILS:-

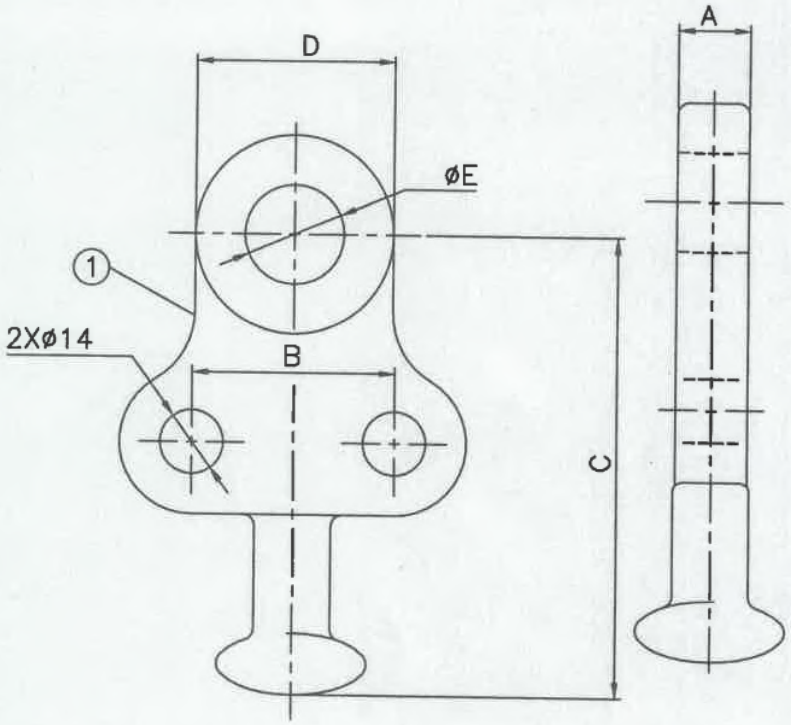
1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWER GRID SPECIFICATION
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.

PART No.	UTS(KN)	A	B	C	D	E	F	G	H	BOLT SIZE &GRADE
CE-160-01	160	12-14	23-24	40-50	80-110	50-54	50-54	20	24	22 (5.6)
CE-90-01	90	10-12	22-24	32-41	76	38-50	38-50	20	18	16 (5.6)
CE-70-02	70	10	22	50	100	40	40	30	18	16 (5.6)

No.	DESCRIPTION	MATERIAL	QTY.
4	PLAIN WASHER	MILD STEEL Fe-410,IS:2062	1
3	SPLIT PIN	STAINLESS STEEL, AISI-304	1
2	NUT & BOLT	MILD STEEL IS:8638, 1363 PART-III & 1367 PART-VIII	1,1
1	CLEVIS EYE	FORGED STEEL CL-IV,IS:2004	1

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

CLEARED BY			
SR. DM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)	TITLE:- CLEVIS EYE
14.11.19	21.3.20		DRG .NO. :- CC:ENGG:TL/HW:CE-001
DATE	MGR. (ENGG-TL)	CH. MGR. (ENGG-TL)	GM (ENGG-TL)



TECHNICAL DETAILS:-

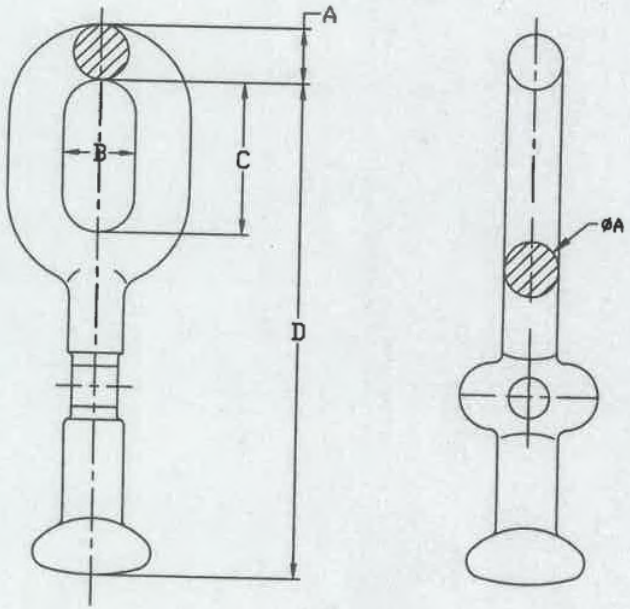
1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.

PART No.	UTS(KN)	A	B	C	D	DESIGNATION	E
BE-160-01	160	20	50	100-130	44-50	20MM	24
BE-120-01	120	20	50	100-130	44-50	20MM	22

No.	DESCRIPTION	MATERIAL	QTY.
1	H.H. BALL EYE	FORGED STEEL CL-IV,IS:2004	1

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

CLEARED BY			
SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)	TITLE:- BALL EYE(HORN HOLDER)
14.11.19	21.11		DRG .NO. :- CC:ENGG:TL/HW:BE-001
DATE	MGR. (ENGG-TL)	CH. MGR. (ENGG-TL)	GM (ENGG-TL)



TECHNICAL DETAILS:-

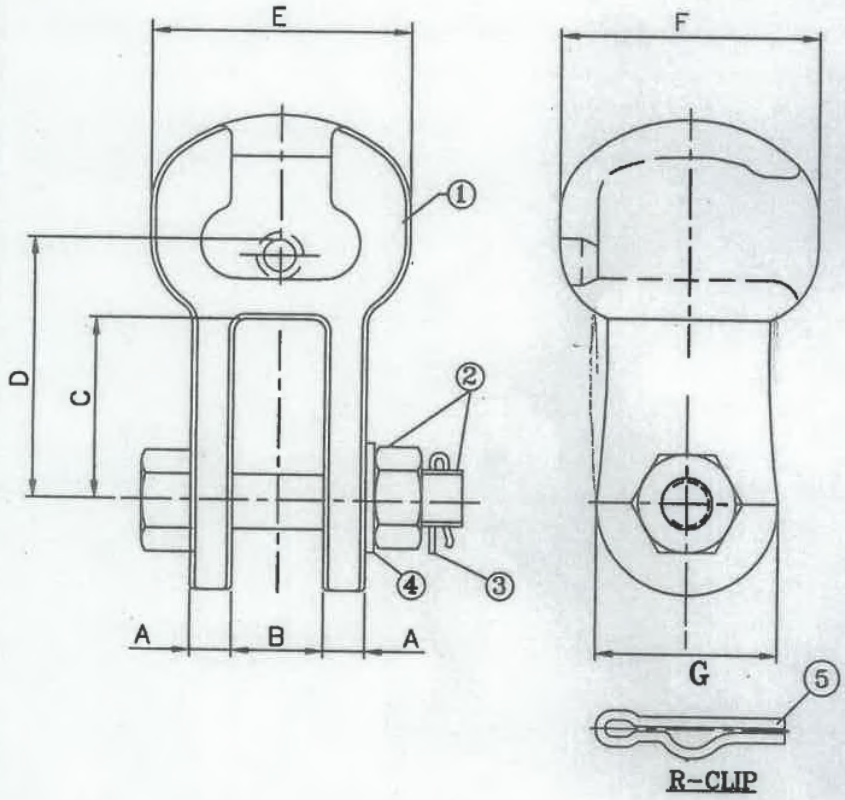
1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVANISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.

PART No.	UTS(KN)	A	B	C	D	DESIGNATION	HOLE SIZE
BL-120-01	120	20	25-30	55-60	160-170	20MM	14
BL-90-01	90	16	25	50-60	100-160	16MM	NA

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

CLEARED BY			
SR. GM (ENGG–TL)	CGM (ENGG–TL)	ED (ENGG)	TITLE:- BALL LINK(HORN HOLDER)
14.11.19	21/11		DRG .NO. :- CC:ENGG:TL/HW:BL-001
DATE	MGR. (ENGG–TL)	CH. MGR. (ENGG–TL)	GM (ENGG–TL)

No.	DESCRIPTION	MATERIAL	QTY.
1	H.H. BALL LINK	FORGED STEEL CL–IV,IS:2004	1



No.	DESCRIPTION	MATERIAL	QTY.
5	R-CLIP	STAINLESS STEEL, AISI-304	1
4	PLAIN WASHER	MILD STEEL Fe-410,IS:2062	1
3	SPLIT PIN	STAINLESS STEEL, AISI-304	1
2	NUT & BOLT	MILD STEEL IS:5640, 1363 PART-III & 1367 PART-XIII	1,1
1	SOCKET CLEVIS	FORGED STEEL CL-IV,IS:2004	1

TECHNICAL DETAILS:-

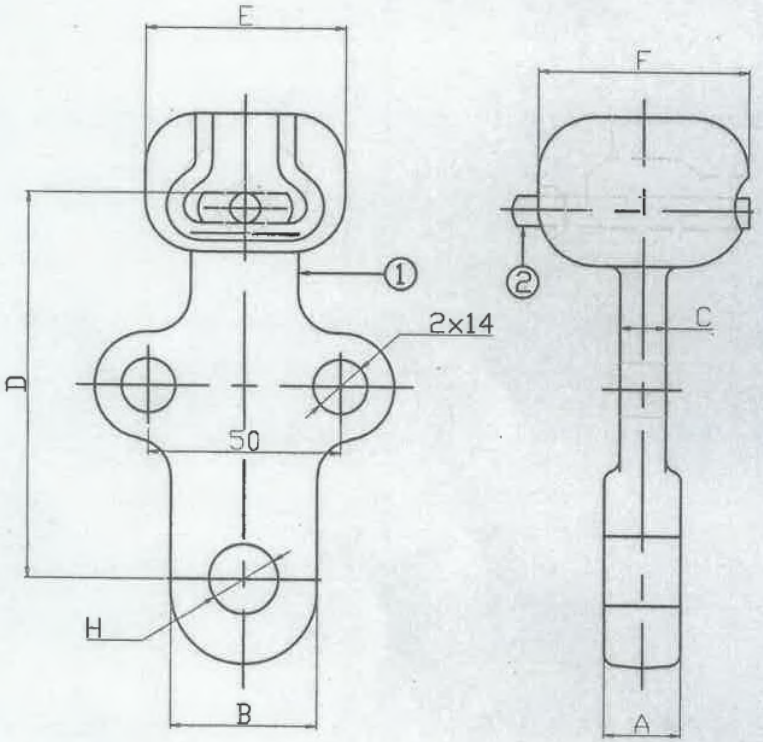
1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.

PART No.	UTS(KN)	A	B	C	D	E	F	G	DESIGNATION	BOLT SIZE &GRADE
SC-235-01	235	14-15	24-26	73-76	100	80-85	75-80	56-60	24MM	22 (5.6)
SC-175-01	175	12-14	23-24	75-80	100	65-71	65-71	50-51	20MM	22 (5.6)
SC-120-01	120	12-14	23-24	75-80	100	65-71	65-71	45-52	20MM	20 (5.6)
SC-90-01	90	10-12	22-25	50(MIN)	70	52-60	51-60	35-40	16(B)MM	16 (5.6)

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

CLEARED BY			
SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)	TITLE:- SOCKET CLEVIS
DATE: 14.11.19	MGR. (ENGG-TL): 21-Jul	CH. MGR. (ENGG-TL)	GM (ENGG-TL)

DRG .NO. :- CC:ENGG:TL/HW:SC-001



TECHNICAL DETAILS:-

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWER GRID SPECIFICATION
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) SOCKET DESIGNATION 16 mm(B) FOR 90kN & 20 mm FOR 120kN AS PER IS:2486 (PART–II)

PART No.	UTS(KN)	A	B	C	D	E	F	H
SE-120-01	120	20	45-50	11-14	80-125	60-65	60-65	24
SE-90-01	90	18-20	36-40	10-13	80-115	52-60	51-60	18

No.	DESCRIPTION	MATERIAL	QTY.
2	R–CLIP	STAINLESS STEEL AISI–304	1
1	SOCKET EYE	FORGED STEEL CL–IV,IS:2004	1

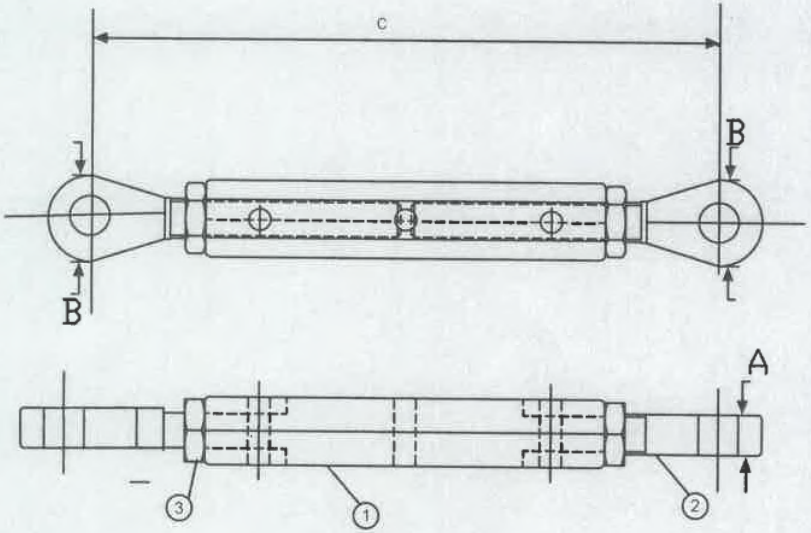
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

CLEARED BY

	SR. GM (ENGG–TL)	CGM (ENGG–TL)	ED (ENGG)
DATE	14.1.19	21.3.19	
	MGR. (ENGG–TL)	CH. MGR. (ENGG–TL)	GM (ENGG–TL)

TITLE:- SOCKET EYE

DRG .NO. :- CC:ENGG:TL/HW:SE-001



No.	DESCRIPTION	MATERIAL	QTY.
3	CHECK NUT	MILD STEEL FE-410 IS-2062	2
2	EYE BOLT	FORGED STEEL CL-IV, IS-2004	2
1	BODY	FORGED STEEL CL-IV, IS-2004	1

TECHNICAL DETAI :-

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.

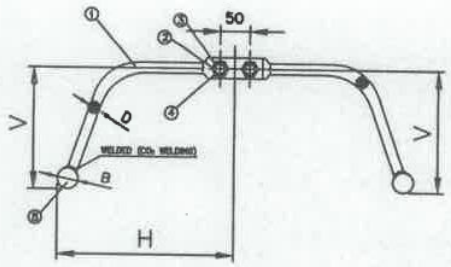
PART No.	UTS(KN)	A	B	C	HOLE SIZE
TB-160-01	160	20	48-60	370-520	24
TB-120-01	120	20	48-60	370-520	22

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

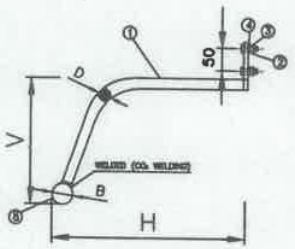
CLEARED BY			
SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)	
14.11.19	21.11.19		
DATE	MGR. (ENGG-TL)	CH. MGR. (ENGG-TL)	GM (ENGG-TL)

TITLE:- TURN BUCKLE

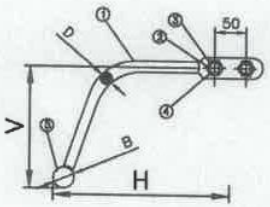
DRG .NO. :- CC:ENGG:TL/HW:TB-001



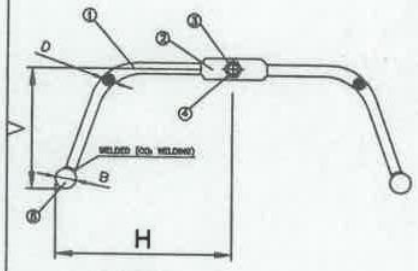
TYPE-1



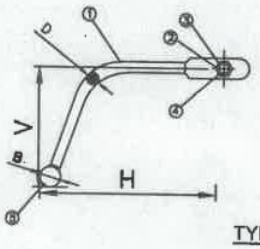
TYPE-2



TYPE-3



TYPE-4



TYPE-5

No.	DESCRIPTION	MATERIAL	QTY.
5	BALL	FORGED STEEL CL-II, IS:2004	1
4	PLAIN WASHER (M12)	MILD STEEL Fe-410, IS:2062	2 for Type 1,3 &3 1 for Type 4 & 5
3	SPRING WASHER (M12)	SPRING STEEL IS:4072 & 3063	2 for Type 1,2 &3 1 for Type 4 & 5
2	BOLT & NUT (M12)	MILD STEEL	2.2 for Type 1,2 &3 1.1 for Type 4 & 5
1	ARCING HORN	MILD STEEL Fe-410,IS:2062	1

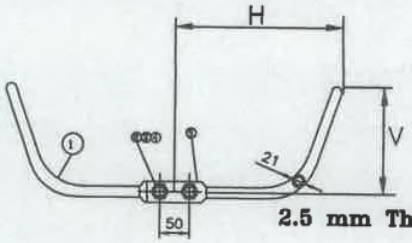
TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) NO DEFORMATION LOAD IS 1.5 KN.
3) GENERAL TOLERANCES : ±3%.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) ALL FERROUS PARTS HOT DIP GALVANISED AS PER POWER GRID SPECIFICATION.
6) SPRING WASHER ELECTRO GALVANISED.

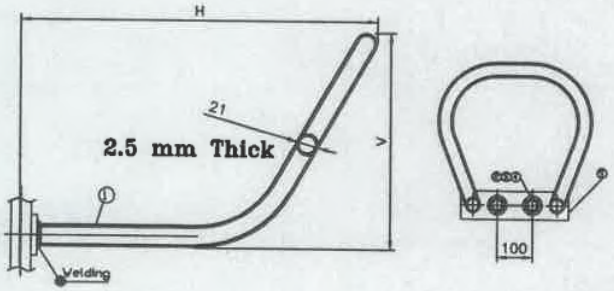
PART No.	TYPE	V	H	D	B
AH-BL-01A	1	115	350	16	40
AH-BL-01B	1	190	400	20	50
AH-BL-02A	2	115	350	16	40
AH-BL-02B	2	190	400	20	50
AH-BL-02C	2	400	410	20	50
AH-BL-03A	3	115	350	16	40
AH-BL-03B	3	190	400	20	50
AH-BL-04	4	115	350	16	40
AH-BL-05	5	190	350	16	40

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

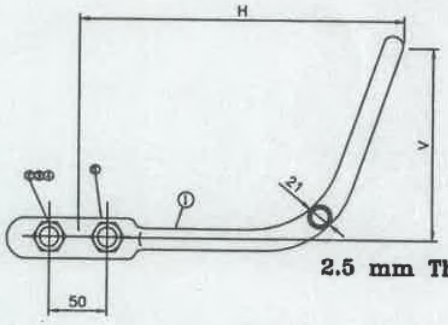
CLEARED BY			
SR. GM (ENGG–TL)	CGM (ENGG–TL)	ED (ENGG)	TITLE:- ARCING HORN(BALL)
14.11.19	21.11.19		DRG .NO. :- CC:ENGG:TL/HW:AHB-001
DATE	MGR. (ENGG–TL)	CH. MGR. (ENGG–TL)	GM (ENGG–TL)



TYPE-1



TYPE-2



TYPE-3

No.	DESCRIPTION	MATERIAL	QTY.
5	FLAT	MILD STEEL Fe-410 IS:2062	1
4	PLAIN WASHER (M12)	MILD STEEL Fe-410, IS:2062	2
3	SPRING WASHER (M12)	SPRING STEEL IS:4072 & 3063	2
2	BOLT & NUT (M12)	MILD STEEL	2,2
1	ARCING HORN	MILD STEEL Fe-410,IS:2062	1

TECHNICAL DETAILS:

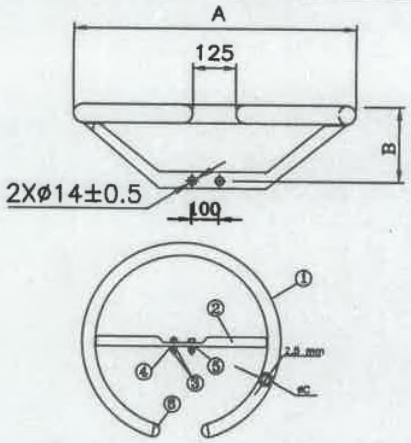
1) ALL DIMENSIONS ARE IN mm.
2) NO DEFORMATION LOAD IS 1.5 KN.
3) GENERAL TOLERANCES : ±3%.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) ALL FERROUS PARTS HOT DIP GALVANISED AS PER POWER GRID SPECIFICATION.
6) SPRING WASHER ARE ELECTRO GALVINISED.

PART No.	TYPE	V	H
AH-RC-01	1	115	445
AH-RC-02	2	250	350
AH-RC-03	3	150	445

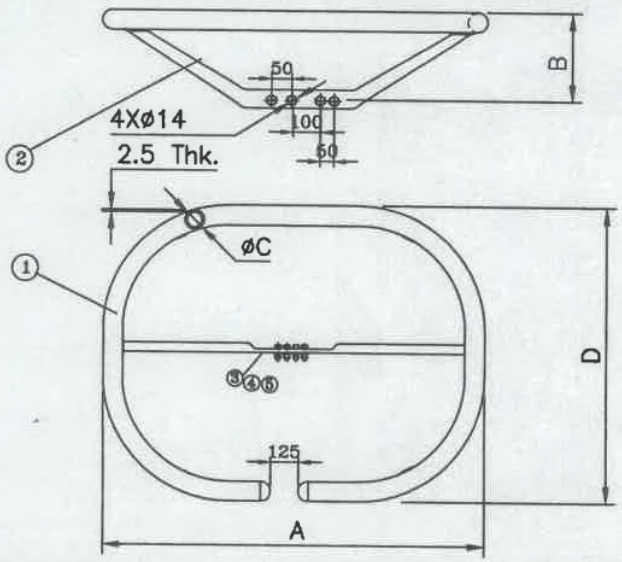
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

CLEARED BY			
SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)	TITLE:- ARCING HORN(RACKET)
DATE: 19.11.19	MGR. (ENGG-TL)	CH. MGR. (ENGG-TL)	GM (ENGG-TL)

DRG .NO. :- CC:ENGG:TL/HW:AHR-001



TYPE- 1



TYPE- 2

TECHNICAL DETAILS:-

1) ALL DIMENSIONS ARE IN mm.
2) NO DEFORMATION LOAD 1.5 kN
3) GENERAL TOLERANC%%SE ±3%
4) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWER GRID SPECIFICATION
5) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
6) SPRING WASHERS ARE ELECTRO GALVANISED.

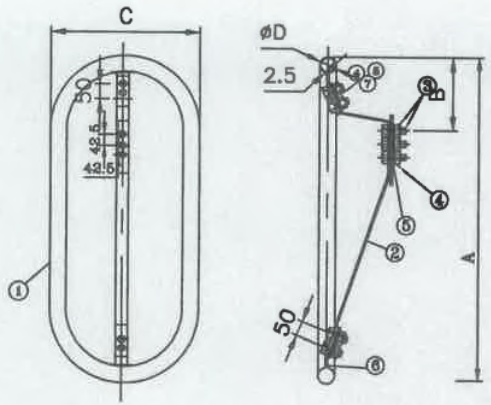
Comp No.	TYPE	A	B	C	D
CR-765-01	1	700	370	75	NA
CR-765-02	2	1200	370	75	900
CR-400-01	1	600	270	60	NA
CR-400-02	2	1200	250	60	600

No.	DESCRIPTION	MATERIAL	QTY.
6	ALUMUNIUM CAP	ALUMUNIUM ALLOY A-6 IS-617	2
5	SPRING WASHER	SPRING STEEL IS:4072 & IS:3063	2 FOR TYPE-1 4 FOR TYPE-2
4	PLAIN WASHER (2.5 mm THK.)	MILD STEEL Fe-410,IS:2062	2 FOR TYPE-1 4 FOR TYPE-2
3	BOLT & NUT (M12)	GALVANISED STEEL GR 5.6	2.2 FOR TYPE-1 4.4 FOR TYPE-2
2	BRACKET	ALUMUNIUM ALLOY	1
1	CORONA RING	ALUMUNIUM ALLOY	1

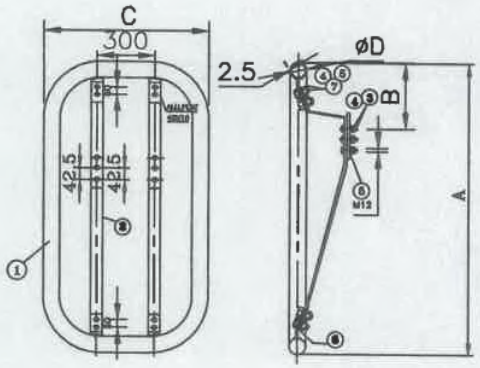
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

CLEARED BY			
SR. GM (ENGG–TL)	CGM (ENGG–TL)	ED (ENGG)	TITLE:- CORONA RING
DATE: 14.11.19	MGR. (ENGG–TL)	CH. MGR. (ENGG–TL)	GM (ENGG–TL)

DRG .NO. :- CC:ENGG:TL/HW:CR-001



TYPE- 3



TYPE- 4

TECHNICAL DETAILS:-

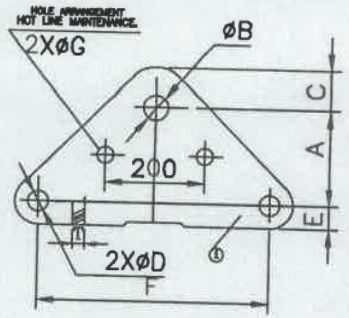
1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWER GRID SPECIFICATION
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) SPRING WASHERS ARE ELECTRO GALVANISED.
6) NO DEFORMATION LOAD IS 1.5 KN.

Comp No.	TYPE	A	B	C	D
CR-765-03A	3	1510	350	600	75
CR-765-04A	4	1800	350	1200	75
CR-400-03A	3	1100	250	500	60
CR-400-03B	3	600	250	500	60
CR-400-03C	3	1200	250	800	60
CR-400-03D	3	1150	350	850	60
CR-400-04A	4	1550	250	900	60
CR-400-04B	4	1700	650	900	60

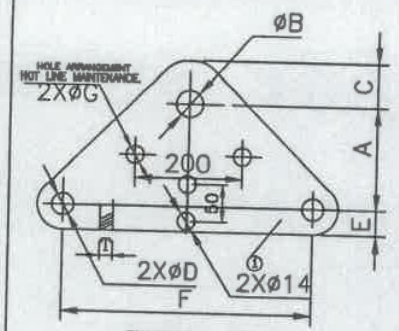
No.	DESCRIPTION	MATERIAL	QTY.
7	BOLT & NUT (M12)	GALVANISED STEEL GR 5.6	4,4 FOR TYPE-3 6,6 FOR TYPE-4
6	ALUMUNIUM FLAT FOR CC RING	ALUMUNIUM ALLOY A-6 IS-617	1 FOR TYPE-3 2 FOR TYPE-4
5	SPRING WASHER	SPRING STEEL IS:4072 & IS:3063	7 FOR TYPE-3 14 FOR TYPE-4
4	PLAIN WASHER (2.5 mm THK.)	MILD STEEL Fe-410,IS:2062	7 FOR TYPE-3 14 FOR TYPE-4
3	BOLT & NUT (M12)	GALVANISED STEEL GR 5.6	5,5 FOR TYPE-3 6,6 FOR TYPE-4
2	BRACKET	MILD STEEL Fe-410, IS 2062	1 FOR TYPE-3 2 FOR TYPE-4
1	CORONA RING	ALUMUNIUM ALLOY 63400/6063 IS:733	1

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

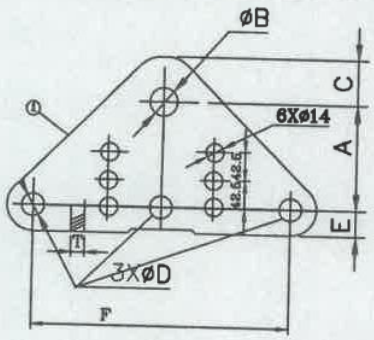
CLEARED BY			
SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)	TITLE:- CORONA RING
19.11.19	21.11.19		DRG .NO. :- CC:ENGG:TL/HW:CR-002
DATE	MGR. (ENGG-TL)	CH. MGR. (ENGG-TL)	GM (ENGG-TL)



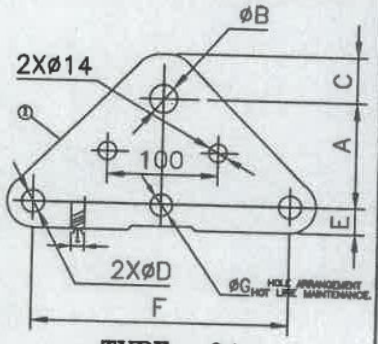
TYPE –01



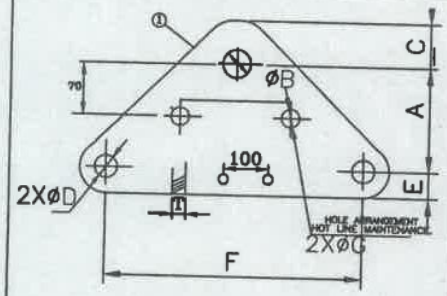
TYPE –02



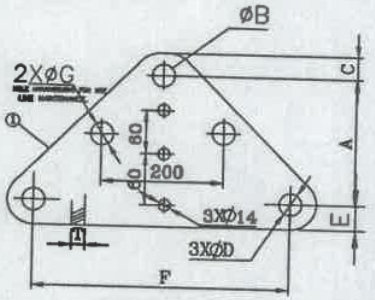
TYPE –03



TYPE –04



TYPE –05



TYPE –06

TECHNICAL DETAILS:-

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWER GRID SPECIFICATION
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.

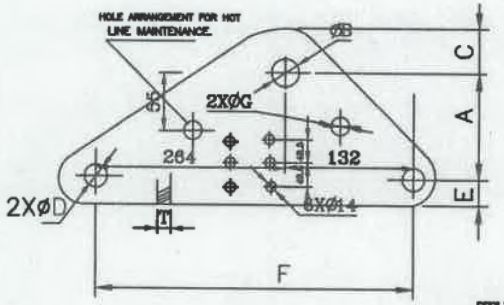
PART No.	UTS(KN)	TYPE	T	A	B	C	D	E	F	G
YP-TR-920-01	920	1	32	150	42	90	33	50	457	29
YP-TR-640-01	640	1	28	150	38	75	29	45	457	24
YP-TR-470-02	470	2	25	130	33	56	24	36	457	24
YP-TR-420-01	420	1	22	150	33	56	24	36	457	24
YP-TR-350-02	350	2	20	130	29	53	24	36	457	22
YP-TR-280-01	280	1	20	100	29	53	24	36	457	22
YP-TR-240-02A	240	2	20	100	24	38	22	33	457	22
YP-TR-240-02B	240	2	20	100	24	38	22	33	457	22
YP-TR-240-05	240	5	20	100	24	38	22	33	330	22
YP-TR-180-01	180	1	20	100	24	38	22	33	330	22
YP-TR-180-02	180	2	20	100	24	38	18	27	330	22
YP-TR-160-04	160	4	20	100	24	38	18	27	330	22
YP-TR-120-04	120	4	16	100	24	42	22	33	457	22
YP-TR-120-05	120	5	16	100	22	33	18	27	450	22
YP-TR-120-06	120	6	16	150	22	33	18	27	450	22
YP-TR-80-01	80	1	16	120	22	33	22	33	457	22
YP-TR-80-03	80	3	16	120	22	39	24	36	457	22

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

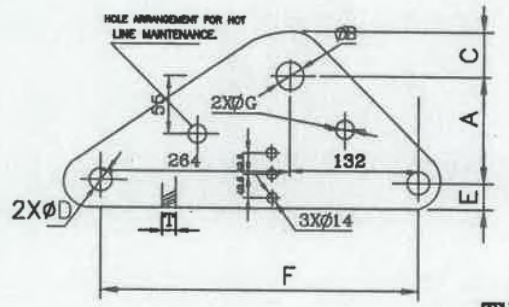
No.	DESCRIPTION	MATERIAL	QTY.
1	YOKE PLATE	MILD STEEL Fe-410,IS:2062	1

CLEARED BY			
SR. GM (ENGG–TL)	CGM (ENGG–TL)	ED (ENGG)	TITLE:- YOKE PLATE-TRIANGULAR
DATE: 14.11.19	MGR. (ENGG–TL): 21.11.19	CH. MGR. (ENGG–TL)	GM (ENGG–TL): 21/11/19

DRG .NO. :- CC:ENGG:TL/HW:YP-TR-001



TYPE –07



TYPE –08

TECHNICAL DETAILS:-

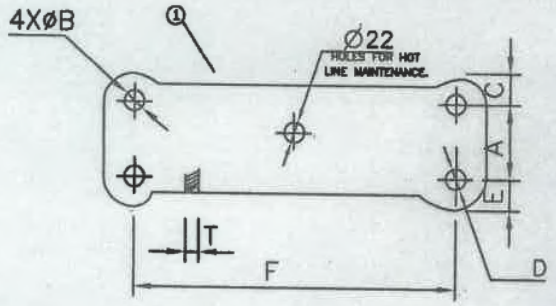
1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.

PART No.	UTS(KN)	TYPE	T	A	B	C	D	E	F	G
YP-TR-470-07	470	7	22	120	33	56	24/29	44	396	24
YP-TR-120-08	120	8	16	100	22	33	22/24	36	396	22

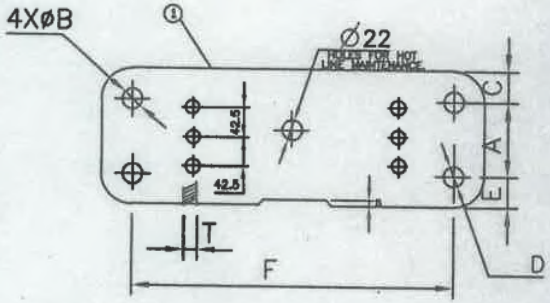
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

CLEARED BY			
SR. GM (ENGG–TL)	CGM (ENGG–TL)	ED (ENGG)	TITLE:- YOKE PLATE-TRIANGULAR
14.11.19	21.11.19		DRG .NO. :- CC:ENGG:TL/HW:YP-TR-002
DATE	MGR. (ENGG–TL)	CH. MGR. (ENGG–TL)	GM (ENGG–TL)

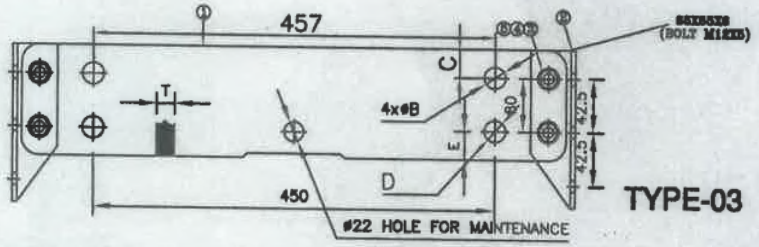
No.	DESCRIPTION	MATERIAL	QTY.
1	YOKE PLATE	MILD STEEL Fe–410,IS:2062	1



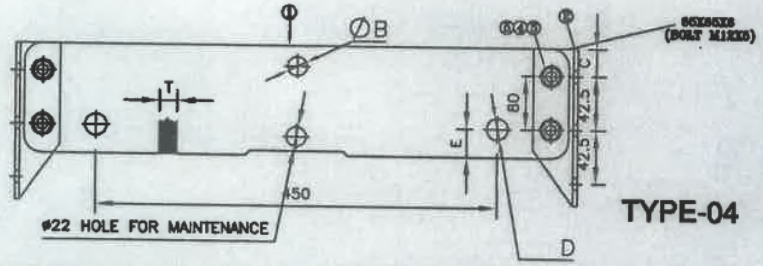
TYPE-01



TYPE-02



TYPE-03



TYPE-04

TECHNICAL DETAILS:-

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.

PART No.	UTS(KN)	T	A	B	C	D	E	F
YP-RT-350-01	350	20	80	24	36	24	36	457
YP-RT-320-02	320	20	80	24	36	24	36	457
YP-RT-320-03	320	20	80	24	36	24	36	NA
YP-RT-120-04	120	16	80	22	33	24	36	450
YP-RT-80-01	80	16	80	22	33	24	36	457

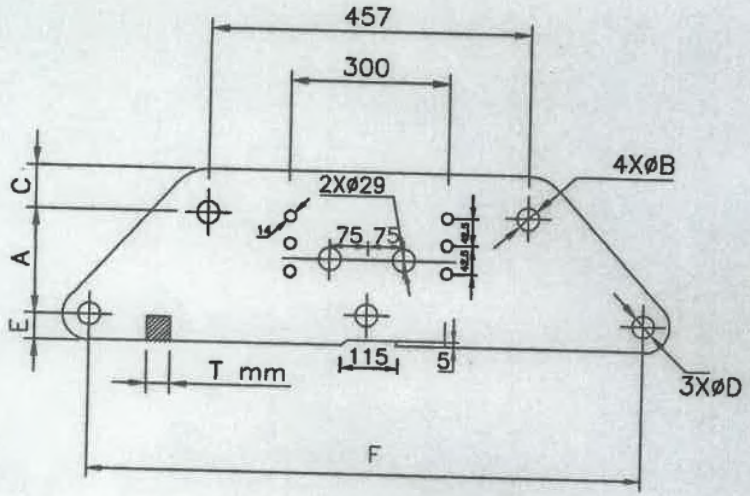
No.	DESCRIPTION	MATERIAL	QTY.
1	YOKE PLATE	MILD STEEL Fe-410,IS:2062	1

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

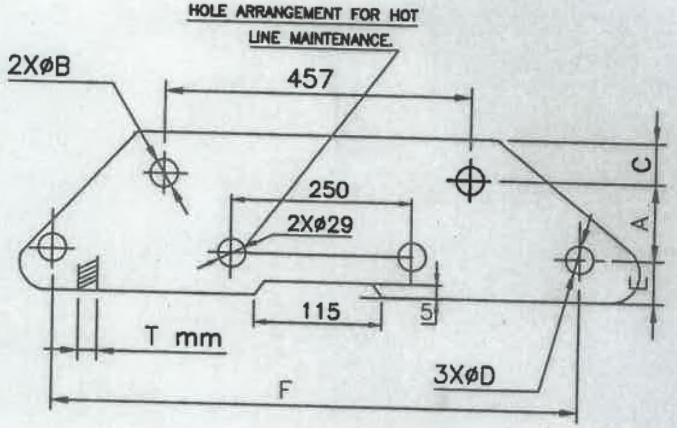
CLEARED BY			
SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)	
14.1.19	21.1.19		
DATE	MGR. (ENGG-TL)	CH. MGR. (ENGG-TL)	GM (ENGG-TL)

TITLE:- RECTANGULAR YOKE PLATE

DRG .NO. :- CC:ENGG:TL/HW:YP-RT-001



TYPE–01



TYPE–02

TECHNICAL DETAILS:-

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.

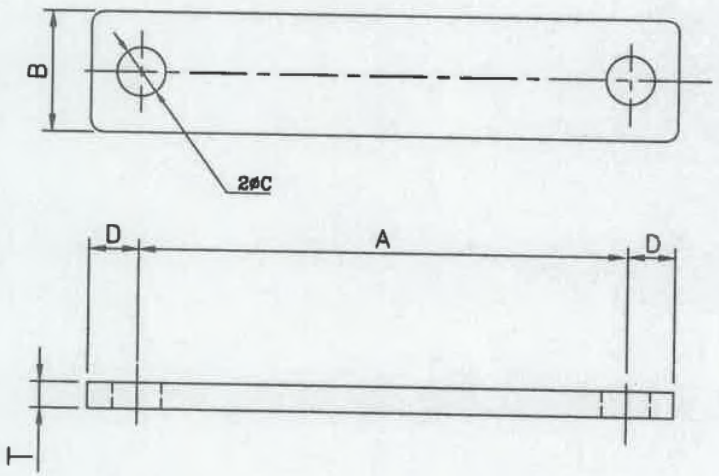
PART No.	UTS(KN)	T	A	B	C	D	E	F
YP-TP-470-01	470	22	120	24	38	24	38	792
YP-TP-350-02	350	20	120	24	36	24	36	914
YP-TP-80-02	180	16	80	22	33	24	36	914

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

No.	DESCRIPTION	MATERIAL	QTY.
1	YOKE PLATE	MILD STEEL Fe-410,IS:2062	1

CLEARED BY			
SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)	TITLE:- TRAPEZOIDAL YOKE PLATE
DATE 14.11.19	MGR. (ENGG-TL) 21.11.19	CH. MGR. (ENGG-TL)	GM (ENGG-TL) 21.11.19

DRG .NO. :- CC:ENGG:TL/HW:YP-TP-001



TECHNICAL DETAILS:-

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWER GRID SPECIFICATION
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.

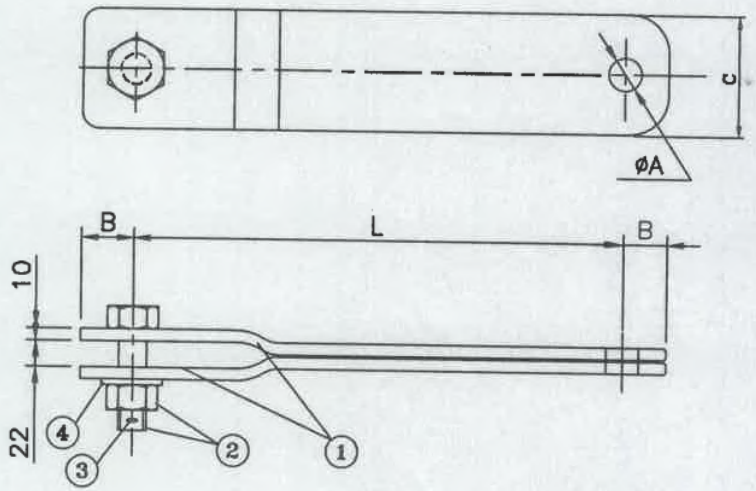
Part No.	UTS	T	A	B	C	D
EL-920-01	920	32	790	125	42	90
EL-640-01	640	30	160	125	39	70
EL-420-01	420	25	400	80	33	55
EL-160-01	160	16	300	60	24	36
EL-80-01	80	16	360	50	22	40

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

No.	DESCRIPTION	MATERIAL	QTY.
1	EXTENSION LINK	MS PLATE	1

CLEARED BY			
SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)	TITLE:- EXTENSION LINK
DATE: 14.11.19	MGR. (ENGG-TL): 21.11.19	CH. MGR. (ENGG-TL)	GM (ENGG-TL): 25.11.19

DRG .NO. :- CC:ENGG:TL/HW:EL-001



TECHNICAL DETAILS:-

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWER GRID SPECIFICATION
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.

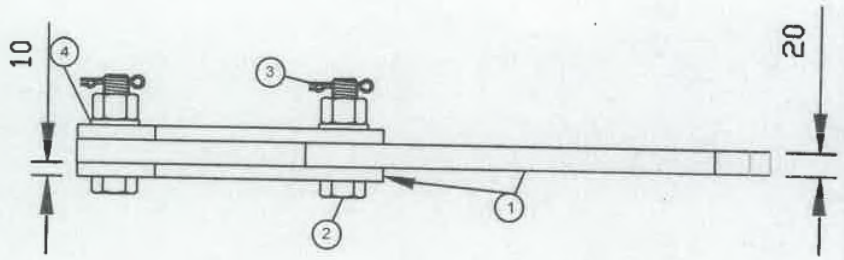
PART No.	UTS	A	B	C	L	Bolt Size & Grade
YS-240-01	240	24	36	65	150	M22(8.8)
YS-160-01	160	24	36	50	125	M22(5.6)
YS-160-02	160	24	36	50	250	M22(5.6)
YS-120-01	120	22	33	50	200	M20(5.6)
YS-120-02	120	22	33	50	600	M20(5.6)

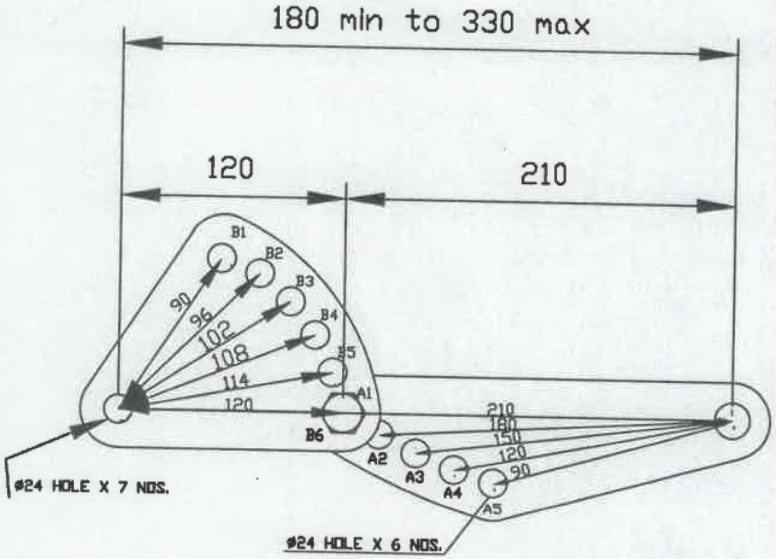
No.	DESCRIPTION	MATERIAL	QTY.
4	PLAIN WASHER	MILD STEEL Fe-410,IS:2062	1
3	SPLIT PIN	STAINLESS STEEL, AISI-304	1
2	BOLT & NUT	MILD STEEL	1,1
1	Y-STRAP	MILD STEEL Fe-410,IS:2062	1 SET

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

CLEARED BY			
SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)	TITLE:- Y-STRAP
DATE: 14.11.19	MGR. (ENGG-TL): 21.62	CH. MGR. (ENGG-TL)	GM (ENGG-TL)

DRG .NO. :- CC:ENGG:TL/HW:YS-001





TECHNICAL DETAILS:-

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWER GRID SPECIFICATION
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) ADJUSTMENT RANGE:-

	A5	A4	A3	A2	A1
B1	180	210	240	270	300
B2	186	216	246	276	306
B3	192	222	252	282	312
B4	198	228	258	288	318
B5	204	234	264	294	324
B6	210	240	270	300	330

PART No.	SAP-160-01

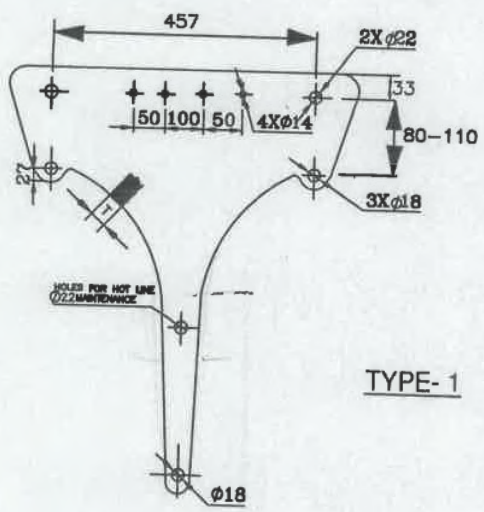
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

No.	DESCRIPTION	MATERIAL	QTY.
4	PLAIN WASHER	MILD STEEL Fe-410,IS:2062	2
3	SPLIT PIN	STAINLESS STEEL, AISI-304	2
2	NUT & BOLT (M22)	MILD STEEL IS:6639, 1363 PART-III & 1367 PART-XIII GRADE 4.6/4.8	2,2
1	SAG ADJUSTABLE PLATE	MILD STEEL Fe-410,IS:2062	1SET

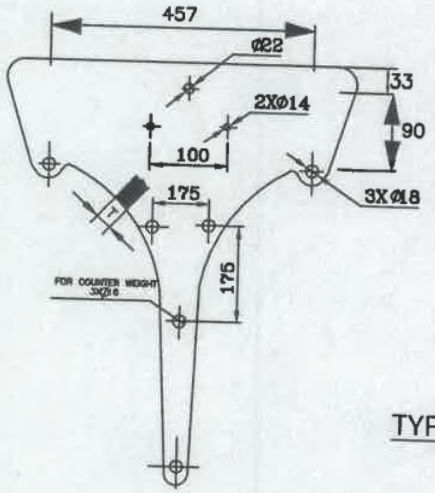
	SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)
CLEARED BY		31/10/19	
DATE	14.11.19	21.11.19	
	MGR. (ENGG-TL)	CH. MGR. (ENGG-TL)	GM (ENGG-TL)

TITLE:- SAG ADJUSTMENT PLATE

DRG .NO. :- CC:ENGG:TL/HW:SAP-001



TYPE- 1



TYPE- 2

TECHNICAL DETAILS:-

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWER GRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.

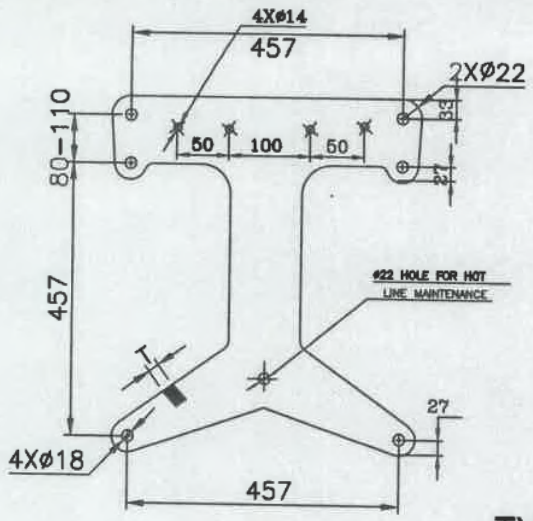
PART No.	UTS(KN)	TYPE	T
YP-C-T-240-01	240	1	16
YP-C-T-120-02	120	2	16

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

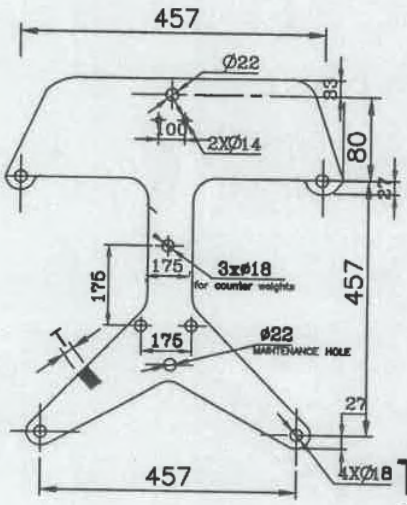
CLEARED BY			
SR. GM (ENGG–TL)	CGM (ENGG–TL)	ED (ENGG)	TITLE:- CONDUCTOR YOKE PLATE
14.11.19	21.11.19		
DATE	MGR. (ENGG–TL)	CH. MGR. (ENGG–TL)	GM (ENGG–TL)

DRG .NO. :- CC:ENGG:TL/HW:YP-C-T-001

No.	DESCRIPTION	MATERIAL	QTY.
1	YOKE PLATE	MILD STEEL Fe-410,IS:2062	1



TYPE-01



TYPE-02

TECHNICAL DETAILS:-

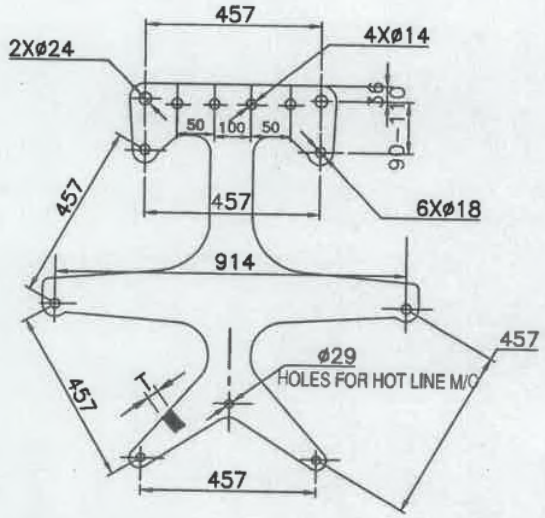
1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWER GRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.

PART No.	UTS(KN)	TYPE	T
YP-C-Q-240-01	240	1	16
YP-C-Q-120-02	120	2	16

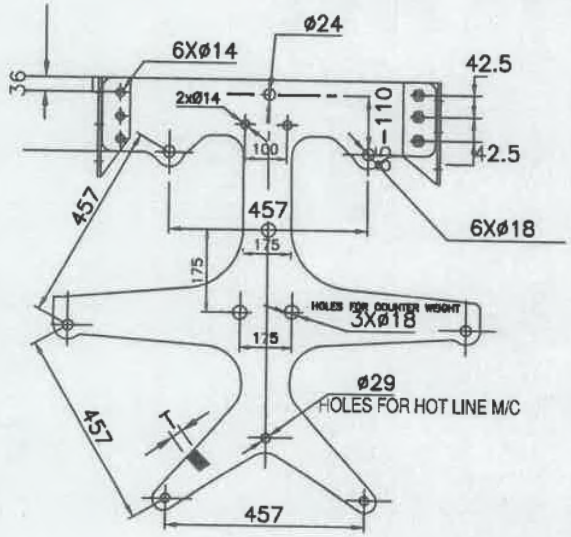
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

No.	DESCRIPTION	MATERIAL	QTY.
1	YOKE PLATE	MILD STEEL Fe-410,IS:2062	1

CLEARED BY			
SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)	TITLE:- CONDUCTOR YOKE PLATE
14.11.19	21.11.19		DRG .NO. :- CC:ENGG:TL/HW:YP-C-Q-001
DATE	MGR. (ENGG-TL)	CH. MGR. (ENGG-TL)	GM (ENGG-TL)



TYPE 01



TYPE 02

TECHNICAL DETAILS:-

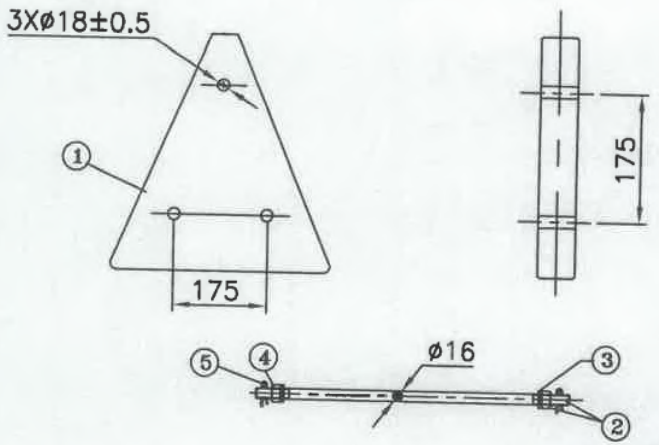
1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWER GRID SPECIFICATION
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.

PART No.	UTS(KN)	TYPE	T
YP-C-H-350-01	350	1	20
YP-C-H-160-02	160	2	16

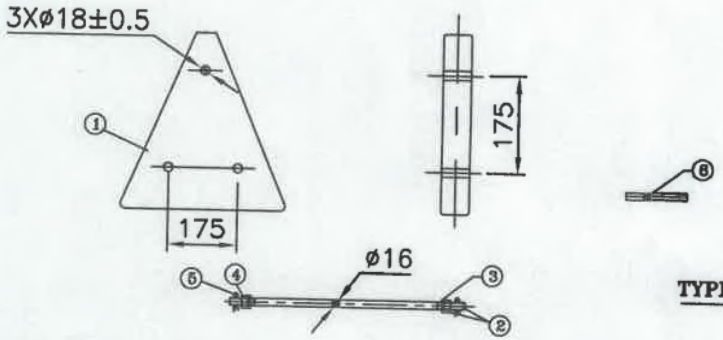
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

CLEARED BY			
SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)	TITLE:- CONDUCTOR-YOKE PLATE
14.1.19	21.02		DRG .NO. :- CC:ENGG:TL/HW:YP-C-H-001
DATE	MGR. (ENGG-TL)	CH. MGR. (ENGG-TL)	GM (ENGG-TL)

No.	DESCRIPTION	MATERIAL	QTY.
1	YOKE PLATE	MILD STEEL Fe-410,IS:2062	1



TYPE–1



TYPE–2

No.	DESCRIPTION	MATERIAL	QTY.
6	SPACING TUBE	MILD STEEL TUBE IS –1161	3, Only for Type 2
5	SPLIT PIN	STAINLESS STEEL, AISI–304	6
4	SPRING WASHER (M16)	SPRING STEEL IS : 3063 & 4072	6
3	PLAIN WASHER (M16)	MILD STEEL Fe–410, IS:2062	6
2	STUD & NUT (M16)	MILD STEEL Fe–410, IS:2062	3,6
1	COUNTER WEIGHT (25 KG)	CAST IRON IS : 210 / MILD STEEL Fe–410, IS:2062	TYPE 1: 8 NOS. TYPE 2: 4 NOS.

TECHNICAL DETAILS:

1) ALL DIMENSION ARE IN mm
2) GENERAL TOLERANCES ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVANISED AS PER POWER GRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) MIN. NO. OF DIPS IN STANDARD PREECE TEST (ONE MINUTE DURATION)
   (i) SPRING WASHERS : 3 DIPS.
   (ii) FASTERNERS : 4 DIPS.
   (iii) ALL OTHER FERROUR PARTS : 6 DIPS.

PART No.	TYPE	TOTAL WEIGHT (Kg)
CW-01	1	200 (25X8)
CW-02	2	100 (25X4)

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

CLEARED BY			
SR. GM (ENGG–TL)	CGM (ENGG–TL)	ED (ENGG)	TITLE:- COUNTER WEIGHT
DATE: 14.11.19	MGR. (ENGG–TL): 21-03	CH. MGR. (ENGG–TL)	GM (ENGG–TL)

DRG .NO. :– CC:ENGG:TL/HW:CW–001

TECHNICAL DETAILS:-

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWER GRID SPECIFICATION
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.

PART No.	TYPE	TOTAL WEIGHT (Kg)
CW-03	3	200(25X8)

No.	DESCRIPTION	MATERIAL	QTY.
6	SPLIT PIN	STAINLESS STEEL, AISI-304	2
5	PLAIN WASHER (M16)	MILD STEEL Fe-410, IS:2062	2
4	HEXAGON NUT(M16)	MILD STEEL Fe-410, IS:2062	2
3	COUNTER WEIGHT	CAST IRON IS : 210 / MILD STEEL Fe-410, IS:2062	1
2	'U' BOLT ø16	MILD STEEL Fe-410, IS:2062	1
1	UNIVERSAL JOINT WITH BOLT & NUT /TWISTED ANCHOR SHACKLE	FORGED STEEL CLASS IV, IS 2004	1

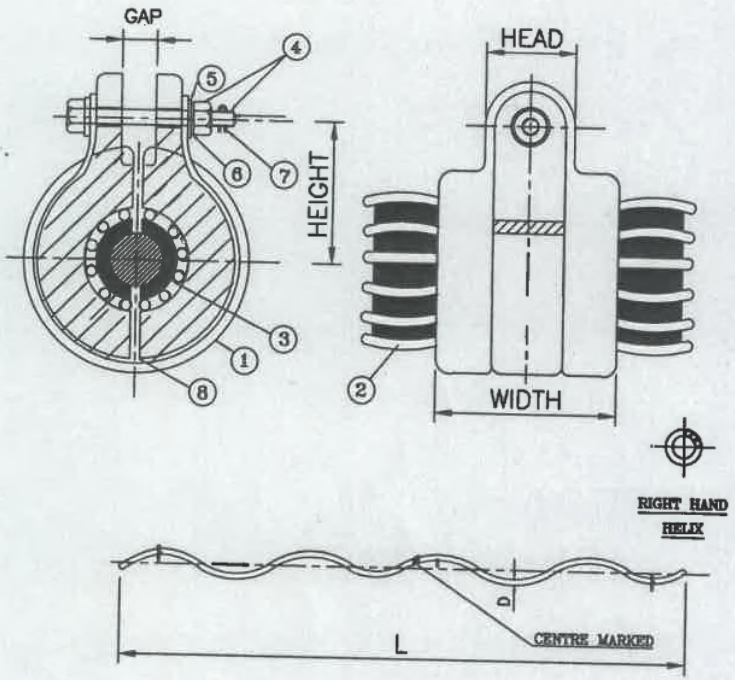
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

CLEARED BY

SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)
DATE 14.11.19	MGR. (ENGG-TL)	CH. MGR. (ENGG-TL)	GM (ENGG-TL)

TITLE:- COUNTER WEIGHT

DRG .NO. :- CC:ENGG:TL/HW:CW-002



TECHNICAL DETAILS:-

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWER GRID SPECIFICATION
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
4) UTS OF CLAMP 70 kN.

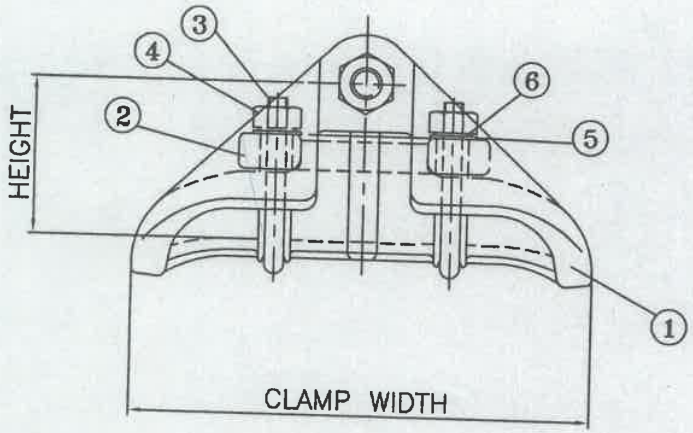
PART No.	WIDTH	HEAD	GAP	BOLT	HEIGHT	L	D	Rod/Set
AGS-PANTHER	100-110	45-55	23-26	16 (5.6)	60-80	1760	6.35	11
AGS-ZEBRA	110-140	48-60	24-32	16 (5.6)	70-80	2080	7.87	12
AGS-MOOSE	130-150	50-60	24-32	16 (5.6)	70-80	2235	9.27	12
AGS-SNOWBIRD	110-140	48-60	24-32	16 (5.6)	70-80	2080	7.87	13

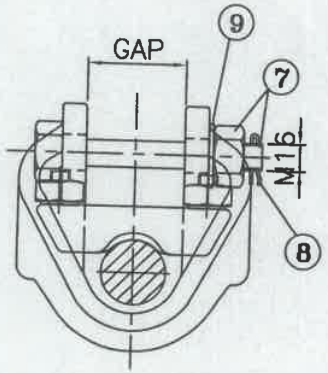
No.	DESCRIPTION	MATERIAL	QTY.
8	STRAP	HIGH STRENGTH ALU ALLOY 65032/6061,IS:733	1
7	SPLIT PIN	STAINLESS STEEL AISI-304	1
6	SPRING WASHER	SPRING STEEL IS:4072 & IS:3063	1
5	PLAIN WASHER	MILD STEEL Fe-410, IS:2062	2
4	NUT & BOLT	GALVD.STEEL [illegible]	1,1
3	BODY (CUSHIONED)	NEOPRENE	2
2	ARMOUR ROD	H.T.ALUMINIUM ROD 65032/6061, IS:733, IS:2121	1,SET
1	CLAMP BODY	ALUMINIUM ALLOY A-6,IS:617	2

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

CLEARED BY			
SR. GM (ENGG-TL)	CGM (ENGG-TL)	ED (ENGG)	TITLE:- SUSPENSION CLAMP (AGS TYPE)
14.11.19	21/11/19		
DATE	MGR. (ENGG-TL)	CH. MGR. (ENGG-TL)	GM (ENGG-TL)

DRG .NO. :- CC:ENGG:TL/HW:AGS -001





TECHNICAL DETAILS:-

1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED & SPRING WASHER ELECTRO GALVANISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.

PART No.	clamp width	GAP	BOLT	HEIGHT
ENV-ZEBRA	220-230	36-50	16 (5.6)	70-95
ENV-MOOSE	190-250	35-50	16 (5.6)	65-85
ENV-SNOWBIRD	220-275	35-42	16(5.6)	70-110

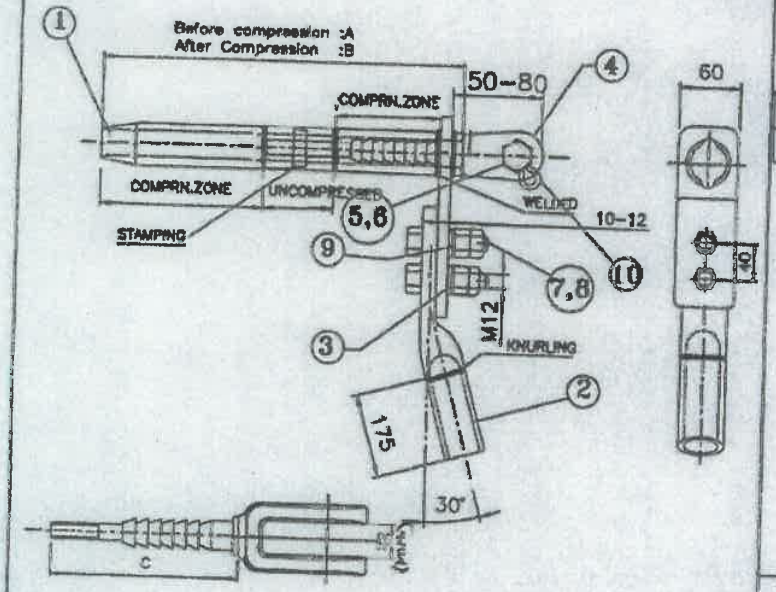
No.	DESCRIPTION	MATERIAL	QTY.
9	PLAIN WASHER (M16, 3.15mm THK.)	MILD STEEL Fe-410,IS:2062	1
8	SPLIT PIN	STAINLESS STEEL AISI-304	1
7	BOLT WITH NUT (M16)	GALVD.STEEL GR:5.6/5.0, IS:6639, 1969 PART-III & 1967 PART-XIII	1,1
6	SPRING WASHER (M12)	SPRING WASHER IS:4072, IS: 3063	4
5	PLAIN WASHER (M12, 2.5mm THK.)	STAINLESS STEEL AISI-304	4
4	NUT (M12)	STAINLESS STEEL AISI-304	4
3	U-BOLT (M12)	STAINLESS STEEL AISI-304	2
2	KEEPER PIECE	ALUMINIUM ALLOY A-6 IS:617	1
1	CLAMP BODY	ALUMINIUM ALLOY A-6 IS:617	1

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

CLEARED BY

SR. GM (ENGG–TL)	CGM (ENGG–TL)	ED (ENGG)	TITLE:- SUSPENSION CLAMP (ENVELOPE TYPE)
DATE 14.11.19	MGR. (ENGG–TL) 21.11.19	CH. MGR. (ENGG–TL)	GM (ENGG–TL) 21.11.19

DRG .NO. :- CC:ENGG:TL/HW:ENV-001



TECHNICAL DETAILS:-

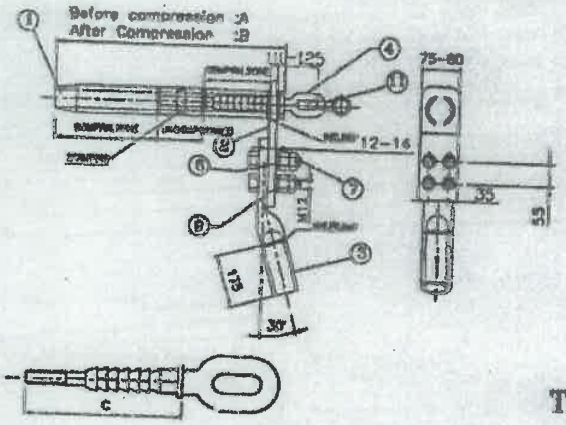
1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) CAPACITY OF HYDRAULIC COMPRESSOR: 100 TON
6) SPRING WASHERS ARE ELECTROGALVANISED

PART No.
CDE-PANTHER

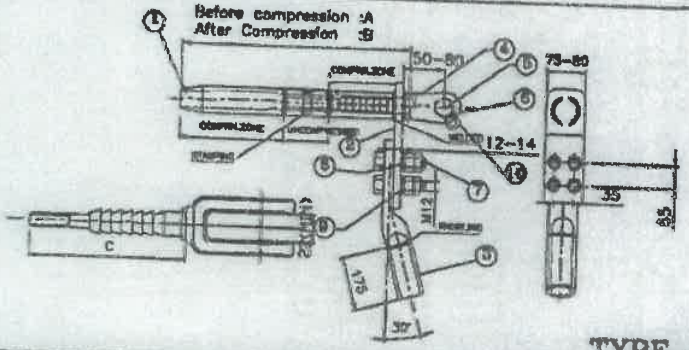
No.	DESCRIPTION	MATERIAL	QTY.
10	SPLIT PIN	S.S(AISI-304)	1
9	SPRING WASHER (M12)	SPRING STEEL, IS:3085, 407S	2
8	PLAIN WASHER (M12, 3.15mm THK)	MILD STEEL, E410, IS:2062	2
7	BOLT & NUT (M12 X 60)	MILD STEEL, GR.A, IS:6639/1363/1987	(2.4)
6	PLAIN WASHER (3.15mm THK)	MILD STEEL, E410, IS:2062	1
5	BOLT & NUT (M16)	MILD STEEL, GR.8, IS:6639/1363/1987	1
4	STEEL CLAMP	FORGED STEEL, CL-2, IS-3064	1
3	JUMPER TERMINAL	ALUMINIUM ALLOY 19500/1650, IS:733	1
2	TERMINAL PAD	ALUMINIUM ALLOY 19600/1360, IS:733	1
1	COMPRESSION TUBE	ALUMINIUM ALLOY 19600/1360, IS:733	1

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

CLEARED BY			
DY. GM (ENGG-TL)	CDM (ENGG-TL)	GM (ENGG)	TITLE:-COMPRESSION DEAD END
14.11.19			
DATE	MGR. (ENGG-TL)	SR. MGR (ENGG-TL)	DRG.NO. :- CC.ENGG.TL/HW:CDE-001



TYPE-01



TYPE-02

TECHNICAL DETAILS:-

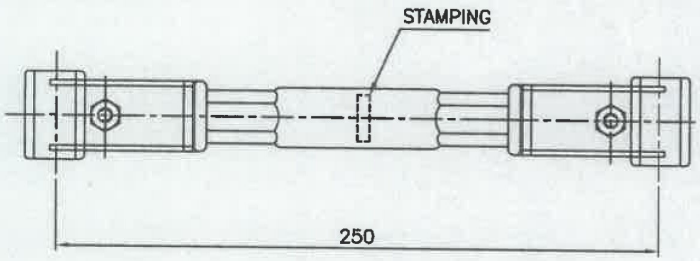
1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWER GRID SPECIFICATION
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.
5) CAPACITY OF HYDRAULIC COMPRESSOR: 100 TON
6) SPRING WASHERS ARE ELECTROGALVANISED

PART No.
CDE-ZEBRA
CDE-SNOWBIRD
CDE-MOOSE

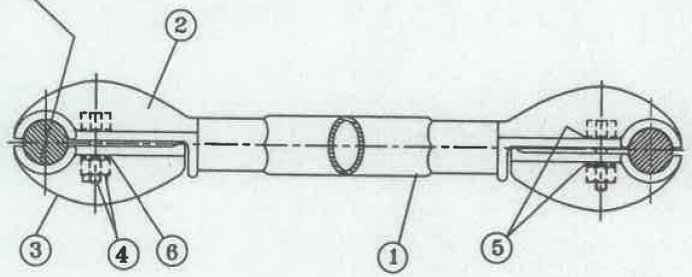
No.	DESCRIPTION	MATERIAL	QTY.
11	ANCHOR BRACKLE (AB-180-01) AS PER DRW. DRG AB-001		1
10	SPLIT PIN	S.S(ASTM-304)	1
9	SPRING WASHER (M12)	SPRING STEEL, IS:3443, 4677	4
8	PLAIN WASHER (M12, 3.15mm THK)	MILD STEEL, IS:513, IS:2062	4
7	BOLT & NUT (M12 X 40)	MILD STEEL, GR1.6, IS:6639/1363/1367	4,8
6	PLAIN WASHER (3.15mm THK)	MILD STEEL, IS:513, IS:2062	1
5	BOLT & NUT (M16)	MILD STEEL, GR1.6, IS:6639/1363/1367	1
4	STEEL CLAMP	FORGED STEEL, GR-E, IS:3624	1
3	JUMPER TERMINAL	ALUMINIUM ALLOY 19500/1050, IS:733	1
2	TERMINAL PAD	ALUMINIUM ALLOY 19500/1050, IS:733	1
1	COMPRESSION TUBE	ALUMINIUM ALLOY 19500/1050, IS:733	1

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

CLEARED BY			
SR. CM. (ENGG-TL)	DGM (ENGG-TL)	ED (ENGG)	TITLE:-COMPRESSION DEAD END
DATE	MGR. (ENGG-TL)	SR. CM. MGR. (ENGG-TL)	DRG.NO. - CC:ENGG:TL/HW:CDE-002
14.05.19			



øD Diameter of used conductor



No.	DESCRIPTION	MATERIAL	QTY.
6	SPRING WASHER (M12)	SPRING STEEL IS:3063,IS:4072	2
5	PLAIN WASHER (M12)	MILD STEEL Fe-410, IS:2062	4
4	BOLT & NUT (M12X50)	MILD STEEL CR.5.6/5.0, IS:6639, 1363 PART-III & 1367 PART-XIII	2,2
3	PACKING PIECE	ALUMINIUM ALLOY A-6,IS:617	2
2	CLAMP	ALUMINIUM ALLOY A-6,IS:617	2
1	SPACING TUBE	ALUMINIUM ALLOY 65032/6061,IS:739	1

TECHNICAL DETAILS:-

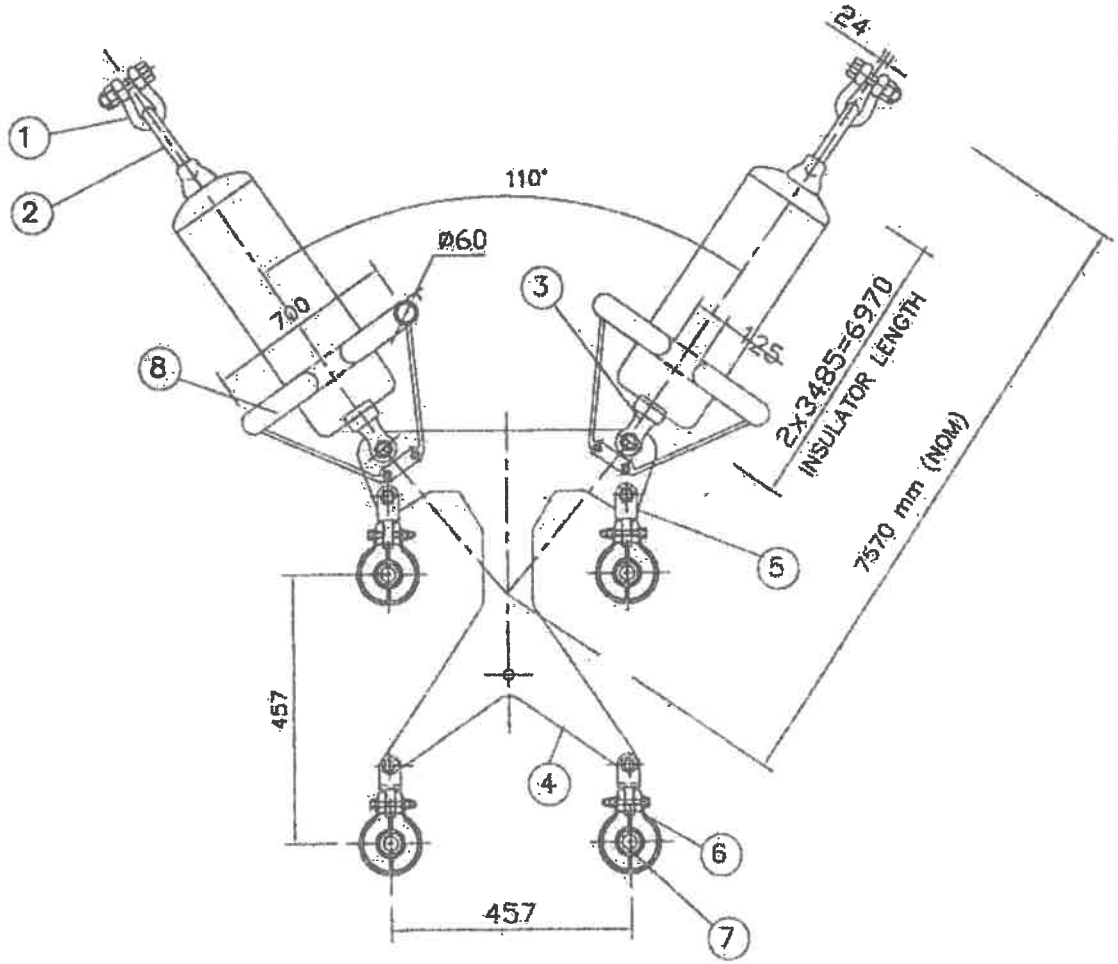
1) ALL DIMENSIONS ARE IN mm.
2) GENERAL TOLERANCSE ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVINISED AS PER POWERGRID SPECIFICATION.
4) ALL DIMENSIONS ARE AFTER GALVANISATION EXCEPT DRILLED HOLES.

PART NO.	D	DESCRIPTION
RS-TWIN-MOOSE	31.77	SUITABLE FOR MOOSE CONDUCTOR
RS-TWIN-ZEBRA	28.62	SUITABLE FOR ZEBRA CONDUCTOR

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

CLEARED BY			
SR. GM (ENGG–TL)	CGM (ENGG–TL)	ED (ENGG)	TITLE:- TWIN RIGID SPACER
DATE: 14.11.19	MGR. (ENGG–TL): 21.11.19	CH. MGR. (ENGG–TL)	GM (ENGG–TL)

DRG .NO. :- CC:ENGG:TL/HW:TWIN-RS-001



TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) SPRING WASHER ELECTRO GALVD.AS PER POWER GRID SPECIFICATION
3) BALL & SOCKET SIZE 24 mm. AS PER IEC-120.
4) ALL FERROUS PARTS HOT DIP GALVD.AS PER POWER GRID SPECIFICATION
5) TOLERANCES ON NOMINAL LENGTH OF STRING IS ±60mm
6) TOLERANCES ON LENGTH OF HARDWARE ITEM IS ±3mm.
7) TYPE OF VARIOUS FITTINGS & MODE OF ATTACHMENT AS SHOWN ARE INDICATIVE AND NOT MANDATORY.

SR NO	DESCRIPTION	MATERIAL	UTS	SURFACE TREATMENT	QTY
8	GRADING RING	ALUMINIUM ALLOY 63400 /6063 IS:733	1.5 KN	----	2
7	ARMOUR ROD	HIGH TENSILE ALU.ROD 65032/6061 IS:739	---	----	4
6	SUSPENSION CLAMP	ALUMINIUM ALLOY 4600/ IS:617	65 KN	----	4
5	CLEVIS EYE	FORGED STEEL CL-IV, IS:2004	65 KN	H.D.G	4
4	YOKE PLATE	MILD STEEL Fe-410, IS:2062	263 KN	H.D.G	1
3	SOCKET CLEVIS	FORGED STEEL CL-IV, IS:2004	230 KN	H.D.G	2
2	BALL LINK	FORGED STEEL CL-IV, IS:2004	230 KN	H.D.G	2
1	ANCHOR SHACKLE	FORGED STEEL CL-IV, IS:2004	230 KN	H.D.G	2

FOR BID PURPOSE ONLY

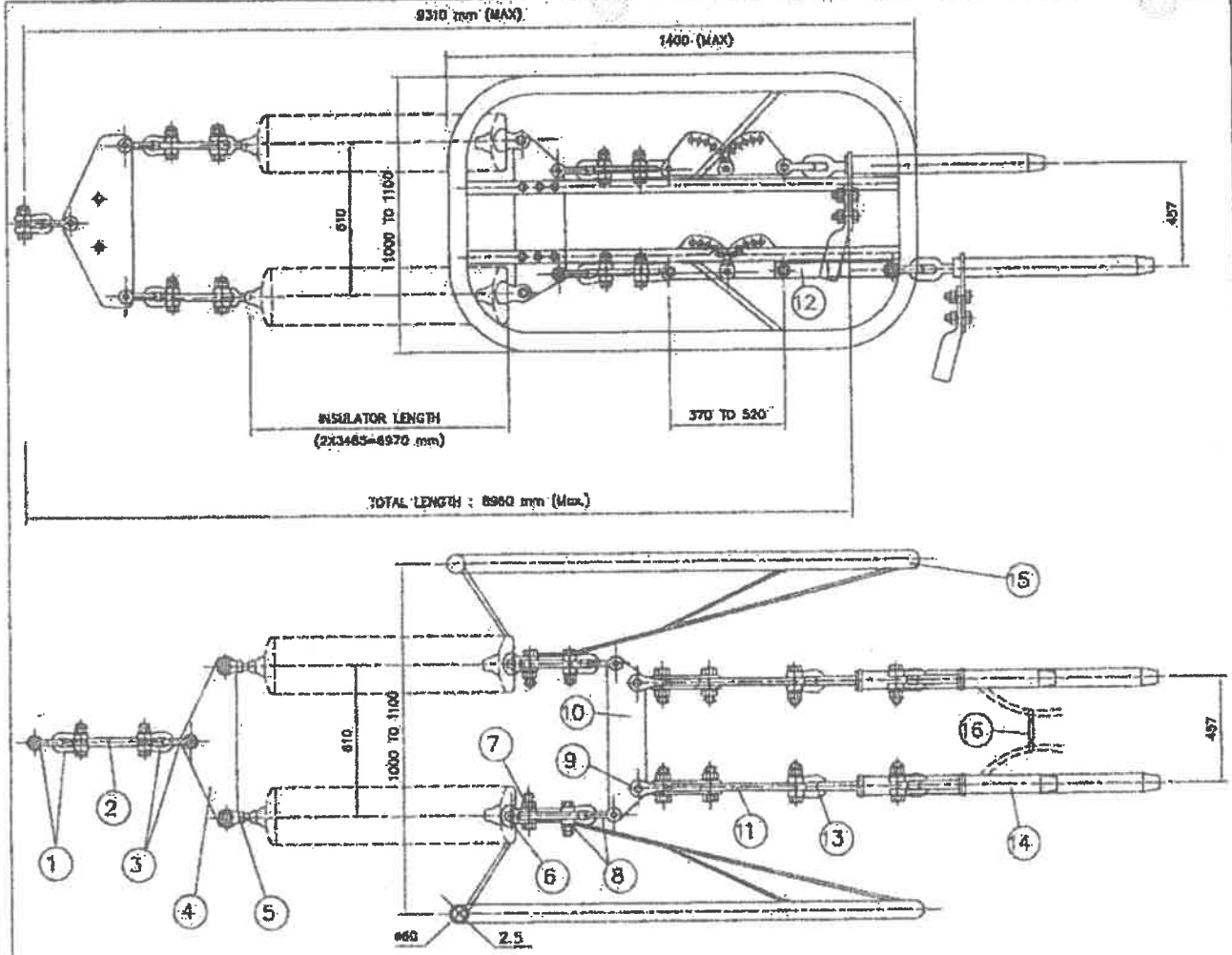
POWER GRID CORP. OF INDIA LTD.

PROJECT
500 KV HVDC TRANSMISSION SYSTEM

TITLE: TYPICAL 500 KV SINGLE 'V' SUSPENSION TYPE STRING FOR QUADRUPLE 'LAPWING' ACSR/BERSIMIS
UTS :- 263 KN.

DRG. NO. TU/500KV/SSV/COMPOSITE/012

REV. 0



Sr.No.	DESCRIPTION	MATERIAL	U.T.S.	QTY.
16	SPACER	ALUMINIUM ALLOY 4600,IS:617	———	1
15	CORONA CONTROL RING	ALUMINIUM ALLOY 63400/ 6063,IS:733	2 KN	2
14	COMPRN. DEADEND	ALUMINIUM ALLOY 64401/6201,IS:733	178.6 KN	4
13	ANCHOR SHACKLE	FORGED STEEL CL-IV,IS:2004	460 KN	4
12	EXTENSION LINK	MILD STEEL Fe-410, IS:2062	460 KN	2
11	SAG ADJUSTING PLATE	MILD STEEL Fe-410, IS:2062	460 KN	4
10	YOKE PLATE	MILD STEEL Fe-410, IS:2062	460 KN.	2
9	CLEVIS EYE	FORGED STEEL CL-IV,IS:2004	230 KN	4
8	ANCHOR SHACKLE	FORGED STEEL CL-IV,IS:2004	230 KN	8
7	YOKE PLATE	MILD STEEL Fe-410, IS:2062	460 KN.	2
6	SOCKET CLEVIS	FORGED STEEL CL-IV,IS:2004	230 KN	4
5	BALL CLEVIS	FORGED STEEL CL-IV,IS:2004	230 KN	4
4	YOKE PLATE	MILD STEEL Fe-410, IS:2062	460 KN.	2
3	ANCHOR SHACKLE	FORGED STEEL CL-IV,IS:2004	460 KN.	4
2	YOKE PLATE	MILD STEEL Fe-410, IS:2062	920 KN.	1
1	ANCHOR SHACKLE	FORGED STEEL CL-IV,IS:2004	920 KN.	2

TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) SPRING WASHER ELECTRO GALVD. AS PER POWER GRID SPECIFICATION.
3) BALL & SOCKET SIZE 24 mm. AS PER IEC-120
4) ALL FERROUS PARTS HOT DIP GALVD. AS PER POWER GRID SPECIFICATION.
5) TOLERANCES ON NOMINAL LENGTH OF SRTING IS ±80 mm.
6) TOLERANCES ON LENGTH OF HARADWARE ITEM IS ±3 mm.
7) TYPE OF VARIOUS FITTINGS & MODE OF ATTACHMENT AS SHOWN ARE INDICATIVE AND NOT MANDATORY

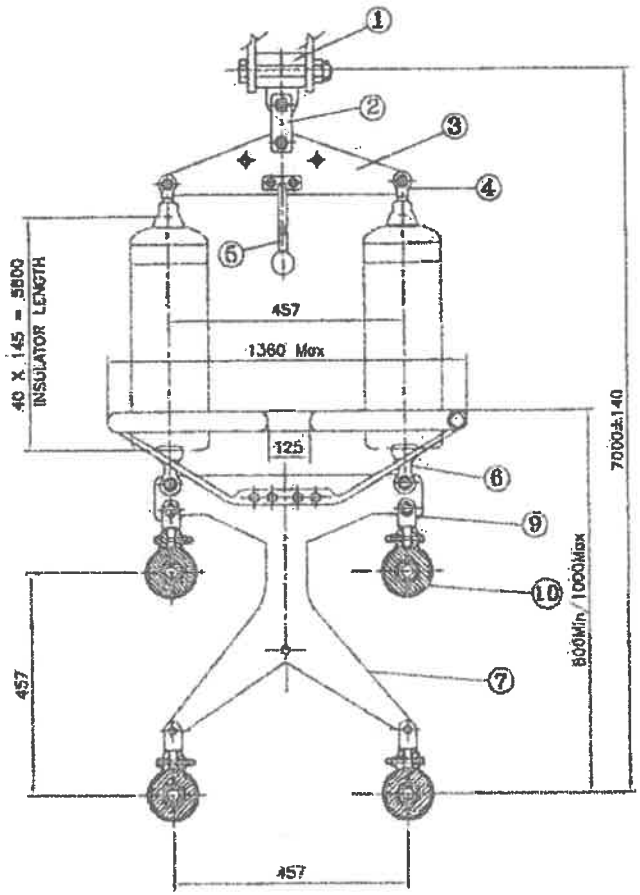
FOR BID PURPOSE ONLY

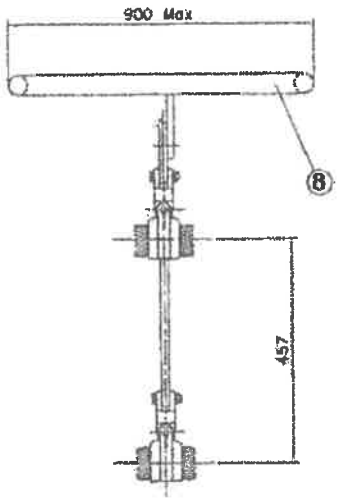
POWER GRID CORP. OF INDIA LTD.

PROJECT: 500 KV HVDC TRANSMISSION SYSTEM

TITLE: TYPICAL 500 KV QUADRUPLE TENSION TYPE STRING FOR QUADRUPLE 'LAPWING' ACSR. UTS :- 920 KN.

DRG. NO. TL/500KV/QT/COMPOSITE/013 | REV. 0





Sr.No.	DESCRIPTION	U.T.S.
11	ARMOUR ROD	35 kg/mm2
10	SUSPENSION CLAMP	70 KN
9	CLEVIS EYE	70 KN
8	GRADING RING	1.5 KN
7	YOKE PLATE (LINE SIDE)	270 KN
6	SOCKET CLEVIS	135 KN
5	ARCING HORN (TOWER SIDE)	1.5 KN
4	BALL CLEVIS	135 KN
3	YOKE PLATE (TOWER SIDE)	270 KN
2	STRAP	270 KN
1	TOWER HINGE	270 KN

INDICATIVE DRAWING ONLY

TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) SPRING WASHER ELECTRO GALVANIZED.
3) SLIPPING STRENGTH OF CLAMP BETWEEN 20 TO 29 KN.
4) BALL & SOCKET SIZE 20 mm. IS:2486. (PART-II).
5) ALL FERROUS PARTS HOT DIP GALVANIZED AS PER IS : 2629.
6) MIN.CORONA EXTINCTION VOLTAGE (DRY) 510 KV (RMS).
7) RIV AT 510 KV (DRY) BELOW 1000 MICROVOLTS.
8) HARDWARE TOLERANCES ON LENGTH ±2%.
9) INSULATOR DISC TOLERANCES : ±4 mm.PER DISC.
10) GENERAL TOLERANCE ±3% APPLICABLE FOR INDIVIDUAL COMPONENTS.

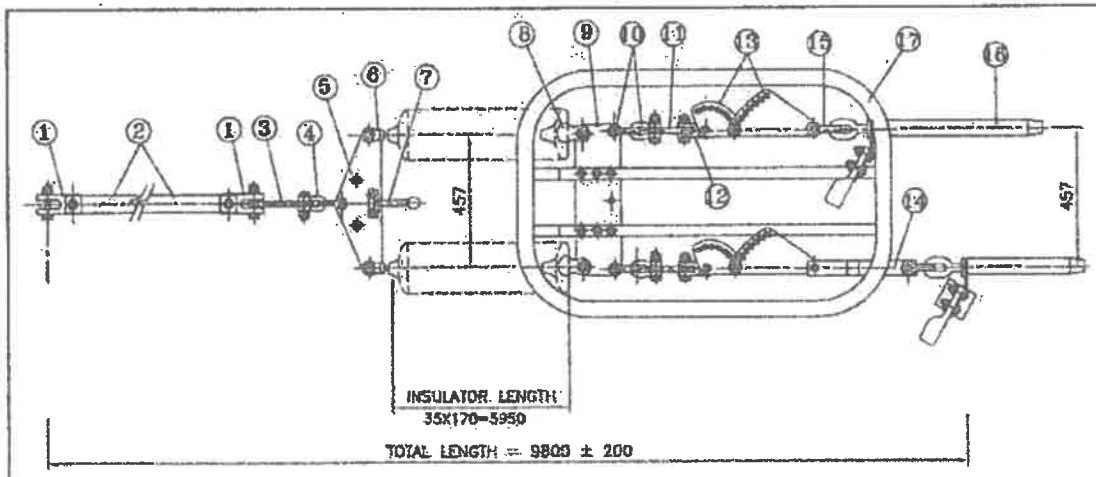
TENDER PURPOSE ONLY

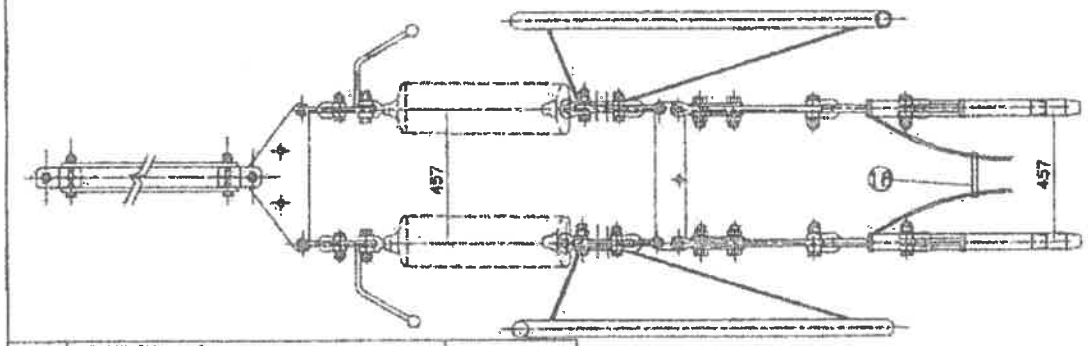
POWERGRID CORPORATION OF INDIA LTD.

TITLE:

765 KV DOUBLE"I"SUSPENSION INSULATOR STRING FOR QUADRUPLE ACSR"BERSIMIS" CONDUCTOR for TT 'A' UTS : 270 KN.

Drg No. TL/765/DIS/A/270	Rev : 0





Sr.No.	DESCRIPTION	U.T.S.
18	SPACER (250 mm)	------
17	CORONA CONTROL RING	1.5 KN
16	COMPRN. DEADEND	146.3 KN(min)
15	ANCHOR SHACKLE	230 KN
14	Y-TYPE EXTENSION LINK	230 KN.
13	SAG ADJUSTING PLATE	230 KN
12	CLEVIS EYE	230 KN
11	YOKE PLATE	460 KN.
10	ANCHOR SHACKLE	230 KN.
9	YOKE PLATE	460 KN.
8	SOCKET CLEVIS	230 KN
7	ARCING HORN (TOWER SIDE)	1.5 KN
6	BALL CLEVIS	230 KN
5	YOKE PLATE	460 KN.
4	ANCHOR SHACKLE	460 KN.
3	YOKE PLATE	920 KN.
2	EXTENSION LINK	920 KN.
1	CLEVIS EYE	920 KN.

INDICATIVE DRAWING ONLY

TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) SPRING WASHER ELECTRO GALVANIZED.
3) SLIPPING STRENGTH OF CLAMP : 146.3 KN (min)
4) BALL & SOCKET SIZE 24 mm. IS:2486 (PART-II).
5) ALL FERROUS PARTS HOT DIP GALVANIZED. AS PER IS : 2629.
6) MIN.CORONA EXTINCTION VOLTAGE (DRY) 510 KV (RMS).
7) RIV AT 510 KV (DRY) BELOW 1000 MICROVOLTS.
8) HARDWARE TOLERANCES ON LENGTH ±2%.
9) INSULATOR DISC TOLERANCES : ±5 mm PER DISC.
10) GENERAL TOLERANCE ±3% APPLICABLE FOR INDIVIDUAL COMPONENTS.
11) CORONA SHIELD FITTED ON TWO OUTER DEADEND CLAMPS.

TENDER PURPOSE ONLY

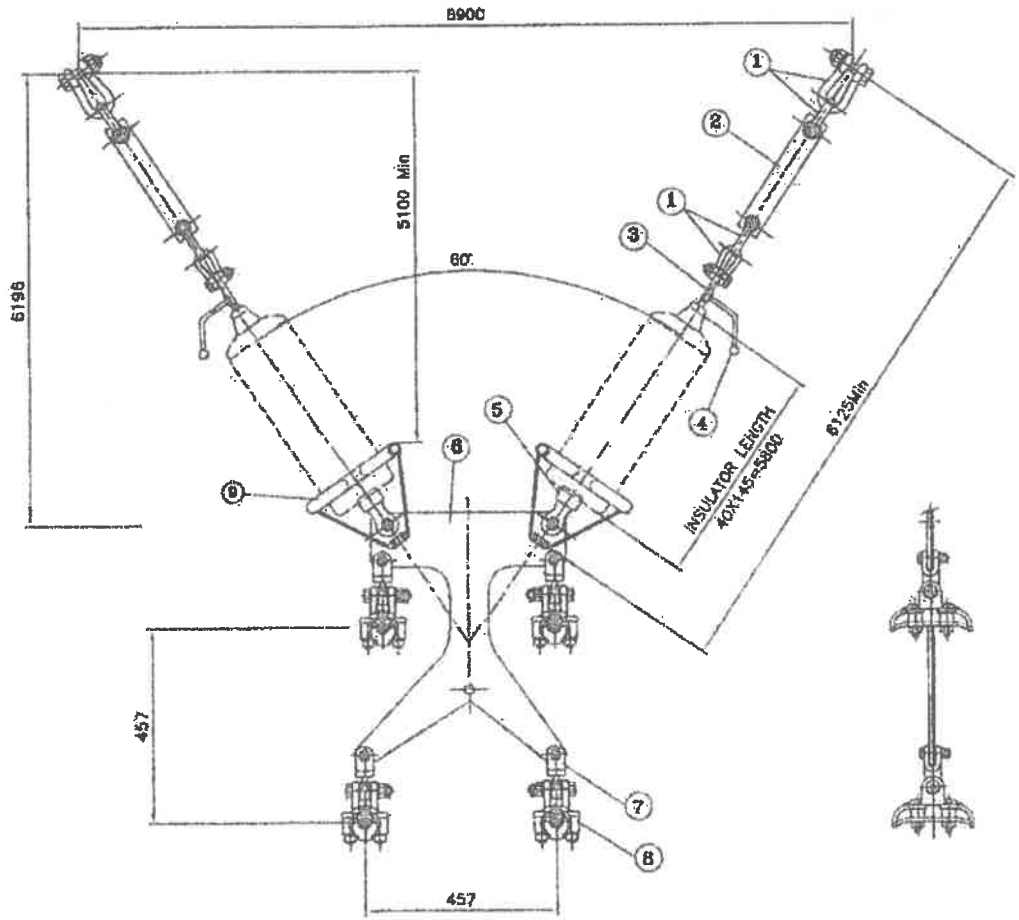
POWERGRID CORPORATION OF INDIA LTD.

TITLE:

765 KV. QUADRUPLE TENSION INSULATOR STRING FOR QUADRUPLE ACSR"BERSIMIS" CONDUCTOR for TT 'C' & 'D'

UTS : 920 KN.

DRG No. TL/765/QT/CD/920 | Rev: 0



Sr.No.	DESCRIPTION	U.T.S.
9	GRADING RING	1.5 KN
8	SUSPENSION CLAMP (Corona Free)	35 KN
7	CLEVIS EYE	35 KN
6	YOKE PLATE	120 KN.
5	SOCKET CLEVIS	120 KN
4	ARCING HORN (TOWER SIDE)	1.5 KN
3	HORN HOLDER BALL EYE	120 KN.
2	EXTENSION LINK	120 KN.
1	ANCHOR SHACKLE	120 KN.

INDICATIVE DRAWING ONLY

TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) SPRING WASHER ELECTRO GALVANIZED.
3) SLIPPING STRENGTH OF CLAMP BETWEEN 20 TO 29 KN.
4) BALL & SOCKET SIZE 20 mm. IS:2486, (PART–II).
5) ALL FERROUS PARTS HOT DIP GALVANIZED AS PER IS : 2629.
6) MIN.CORONA EXTINCTION VOLTAGE (DRY) 510 KV (RMS).
7) RIV AT 510 KV (DRY) BELOW 1000 MICROVOLTS.
8) HARDWARE TOLERANCES ON LENGTH ±2%
9) INSULATOR DISC TOLERANCES ; ±4 mm.PER DISC.
10) GENERAL TOLERANCE ±3% APPLICABLE FOR INDIVIDUAL COMPONENTS.

TENDER PURPOSE ONLY

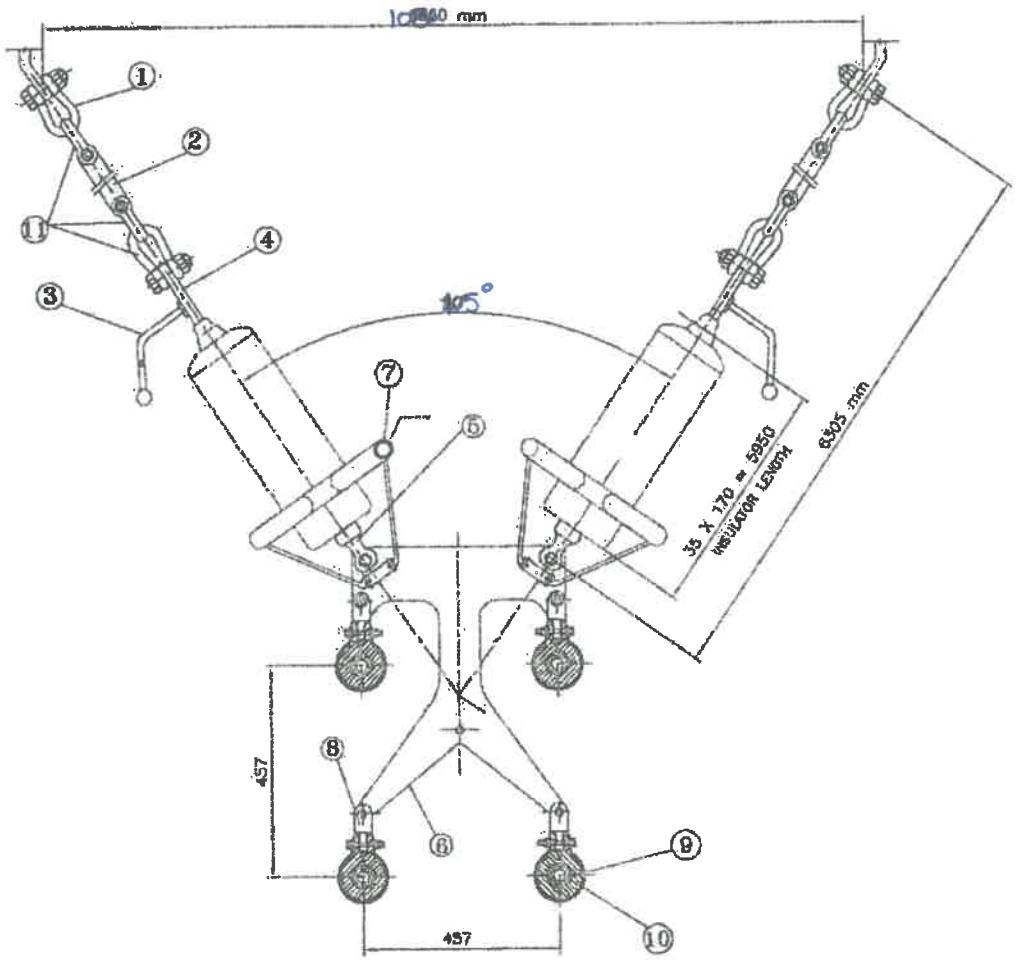
POWERGRID CORPORATION OF INDIA LTD.

TITLE:

765 KV SINGLE"V"SUSPENSION PILOT INSULATOR STRING FOR QUADRUPLE ACSR "BERSIMIS"CONDUCTOR FOR TT 'C' & 'D'

UTS : 120 KN.

DRG No.TL/765/SVSP/CD/120 | Rev: 0



Sr.No.	DESCRIPTION	U.T.S.
11	ANCHOR SHACKLE	230 KN
10	ARMOUR ROD	35 Kg/mm2
9	SUSPENSION CLAMP	70 KN
8	CLEVIS EYE	70 KN
7	GRADING RING	1.5 KN
6	YOKE PLATE (LINE SIDE)	286 KN
5	SOCKET CLEVIS	230 KN
4	HORN HOLDER, BALL EYE,	230 KN
3	ARCING HORN (TOWER SIDE)	1.5 KN
2	EXTENSION LINK	230 KN
1	ANCHOR SHACKLE	230 KN

INDICATIVE DRAWING ONLY

TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) SPRING WASHER ELECTRO GALVANIZED.
3) SLIPPING STRENGTH OF CLAMP BETWEEN 20 TO 29 KN.
4) BALL & SOCKET SIZE 24 mm. IS:2486. (PART–II).
5) ALL FERROUS PARTS HOT DIP GALVANIZED AS PER IS : 2629.
6) MIN.CORONA EXTINCTION VOLTAGE (DRY) 510 kV (RMS).
7) RIV AT 510 KV (DRY) BELOW 1000 MICROVOLTS.
8) HARDWARE TOLERANCES ON LENGTH ±2%.
9) INSULATOR DISC TOLERANCES : ±5 mm.PER DISC.
10) GENERAL TOLERANCE ±3% APPLICABLE FOR INDIVIDUAL COMPONENTS.

TENDER PURPOSE ONLY

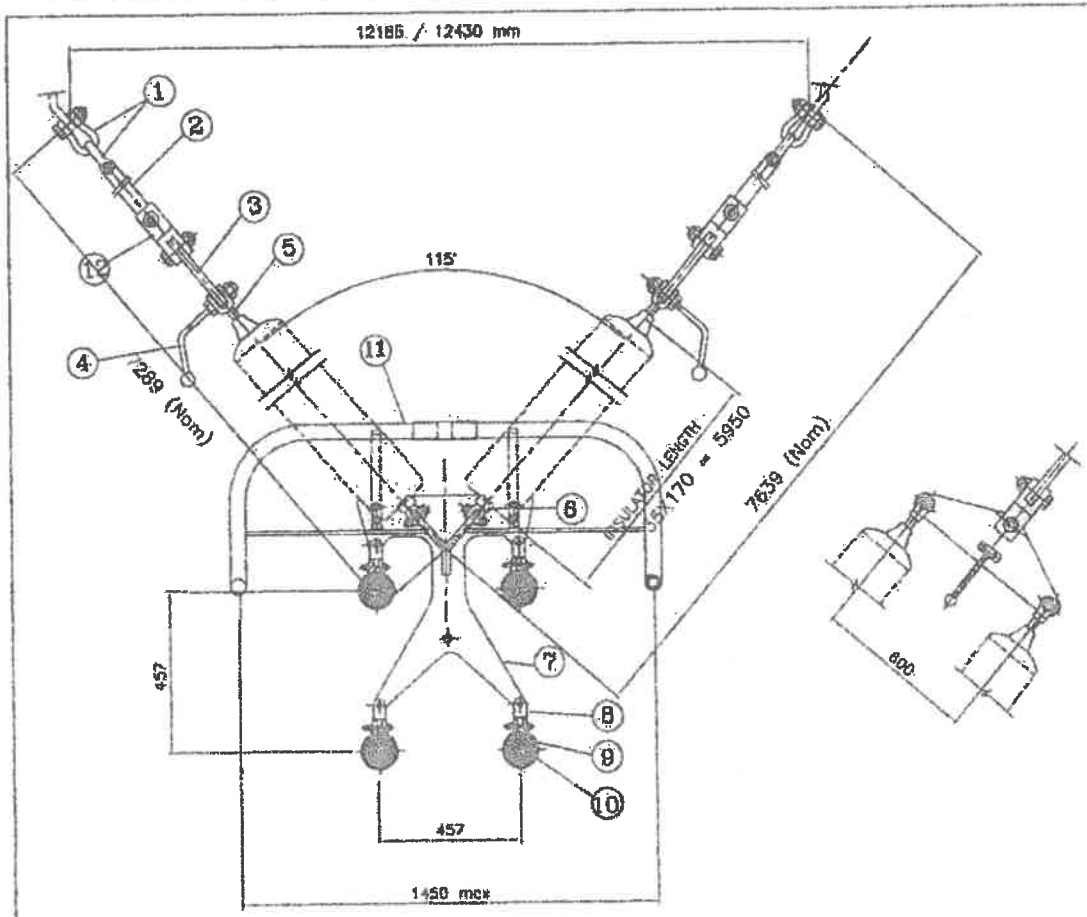
POWERGRID CORPORATION OF INDIA LTD.

TITLE:

765 KV SINGLE"V"SUSPENSION INSULATOR STRING FOR QUADRUPLE ACSR 'BERSIMIS' CONDUCTOR FOR TT 'A'. UTS : 230 KN.

(HORIZONTAL)

DRG No.TL/765/SVS/A/230 | Rev: 0



Sr.No.	DESCRIPTION	U.T.S.
12	CLEVIS CLEVIS	460 KN
11	CORONA CONTROL RING	1.5 KN
10	ARMOUR ROD	35 Kg/mm2
9	SUSPENSION CLAMP (SCAG)	120 KN
8	CLEVIS EYE	120 KN
7	YOKE PLATE (LINE SIDE)	495 KN
6	SOCKET CLEVIS	238 KN
5	BALL CLEVIS	238 KN
4	ARCING HORN	1.5 KN
3	YOKE PLATE (TOWER SIDE)	460 KN
2	EXTENTION LINK	460 KN
1	ANCHOR SHACKLE	420 KN

INDICATIVE DRAWING ONLY

TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) SPRING WASHER ELECTRO GALVANIZED.
3) SLIP STRENGTH OF SUSPENSION CLAMP BETWEEN 20 TO 29 KN.
4) BALL & SOCKET SIZE 24 mm. IS:2486. (PART–II).
5) ALL FERROUS PARTS HOT DIP GALVANIZED AS PER IS: 2629.
6) MIN.CORONA EXTINCTION VOLTAGE (DRY) 510 KV (RMS).
7) RIV AT 510 KV (DRY) BELOW 1000 MICROVOLTS.
8) HARDWARE TOLERANCES ON LENGTH ±2%.
9) INSULATOR DISC TOLERANCES : ±5 mm.PER DISC.
10) GENERAL TOLERANCE ±3% APPLICABLE FOR INDIVIDUAL COMPONENTS.

TENDER PURPOSE ONLY

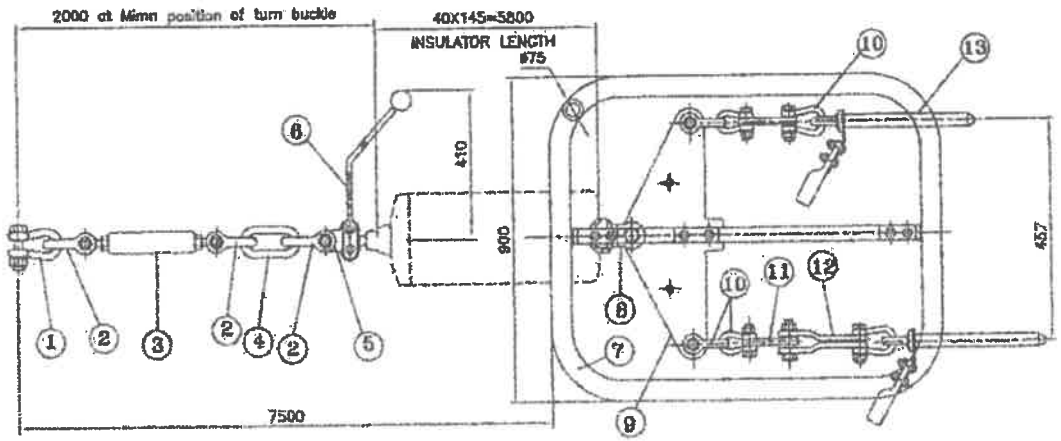
POWERGRID CORPORATION OF INDIA LTD.

TITLE:

765 KV DOUBLE"V"SUSPENSION INSULATOR STRING FOR QUADRUPLE ACSR"BERSIMIS" CONDUCTOR for TT 'B'

UTS : 460 KN.

DRG No. TL/765/DVS/B/460 | Rev: 0



INDICATIVE DRAWING ONLY

Sr.No.	DESCRIPTION	U.T.S.	QTY.
14	SPACER (250 mm)	------	1
13	COMPRESSION DEADEND	146.3 KN(min)	4
12	STRAP	85 KN.	2
11	YOKE PLATE	85 KN	2
10	ANCHOR SHACKLE	85 KN	8
9	YOKE PLATE	120 KN	1
8	SOCKET CLEVIS	120 KN	1
7	CORONA CONTROL RING	1.5 KN	2 SETS
6	ARCING HORN	1.5 KN	1
5	HORN HOLDER BALL EYE	120 KN	1
4	CHAIN LINK	120 KN	1
3	TURN BUCKLE	120 KN	1
2	ANCHOR SHACKLE	120 KN	6
1	ANCHOR SHACKLE	120 KN	1

TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN mm.
2) SPRING WASHER ELECTRO GALVD.
3) SLIPPING STRENGTH OF CLAMP : 146.3 KN (min)
4) BALL & SOCKET SIZE 20 mm AS PER IS:2486, (PART-II).
5) ALL FERROUS PARTS HOT DIP GALVD. AS PER IS:2629.
6) MIN.CORONA EXTINCTION VOLTAGE (DRY) 510 KV (RMS).
7) RIV AT 510 KV (DRY) BELOW 1000 MICROVOLTS.
8) HARDWARE TOLERANCES ON LENGTH ±2%
9) INSULATOR DISC TOLERANCES : ±4 mm PER DISC.
10) GENERAL TOLERANCE ±3% APPLICABLE FOR INDIVIDUAL COMPONENTS.

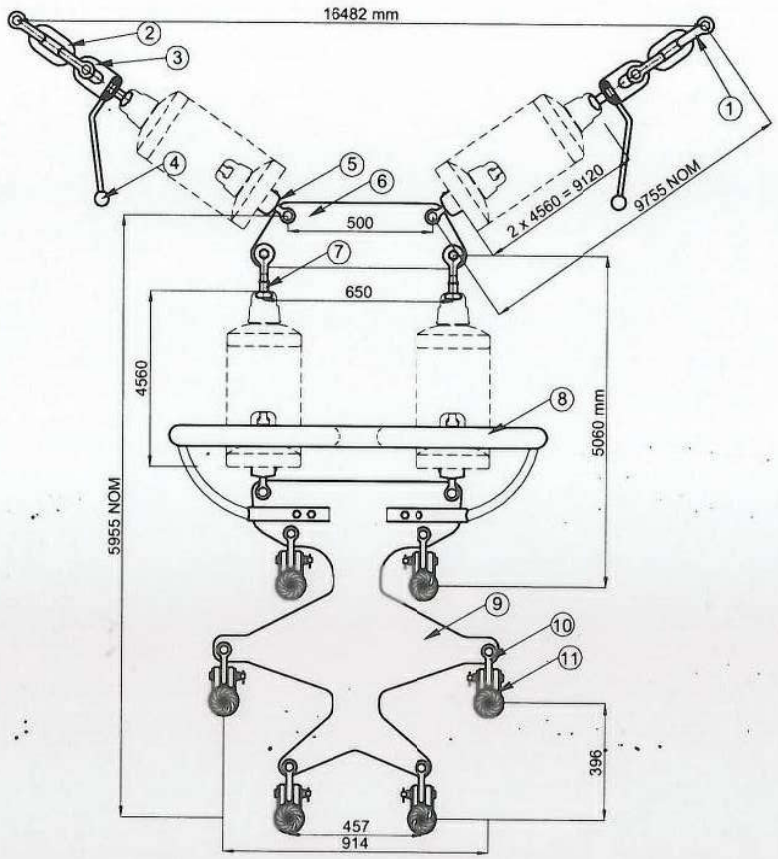
TENDER PURPOSE ONLY

POWERGRID CORPORATION OF INDIA LTD.

TITLE:

765 KV, SINGLE TENSION INSULATOR STRING FOR QUADRUPLE ACSR "BERSIMIS" UTS :120KN.

DRG. NO:TL/765/ST/TRANS/130 REV 0



TECHNICAL DATA

1. ASSEMBLY MINIMUM ULTIMATE TENSILE STRENGTH - 505 KN.
2. BALL& SOCKET DESIGNATION 28 MM AS PER IS:2486 PART-II.
3. BALL& SOCKET LOCKING BY R-CLIP MADE OF STAINLESS STEEL.
4. FERROUS PARTS HOT DIP GALVANIZED AND SPRING WASHER ELECTROGALVANIZED AS PER POWERGRID SPECIFICATION.
5. GENERAL TOLERANCE SHALL NOT EXCEED ± 3%.
6. TOLERANCE ON LENGTH OF HARDWARE IS ± 2%.
7. WEIGHT IS INDICATIVE ONLY.
8. ALL DIMENSIONS ARE IN MM..

FOR BID PURPOSE ONLY

S.NO.	DESCRIPTION	QTY. (NOS.)	UTS (KN)
11	A.G.SUSPENSION CLAMP	6	130
10	CLEVIS EYE	6	130
9	MAIN YOKE PLATE	1	505
8	GRADING RINGS	1	-
7	BALL CLEVIS	2	440
6	TAPERZOIDAL YOKE PLATE	1	440
5	SOCKET CLEVIS	4	440
4	BALL ARCING HORN	2	-
3	H.H BALL LINK	2	440
2	CHAIN LINK	2	440
1	D - SHACKLE	4	440

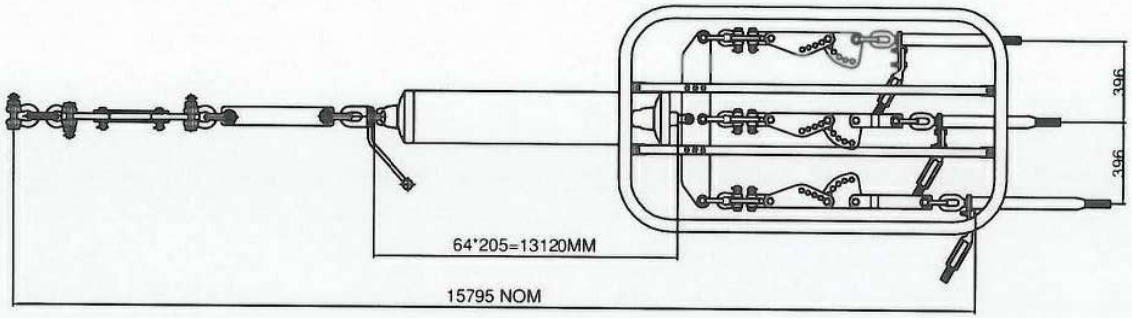
POWER GRID CORPORATION OF INDIA LTD.

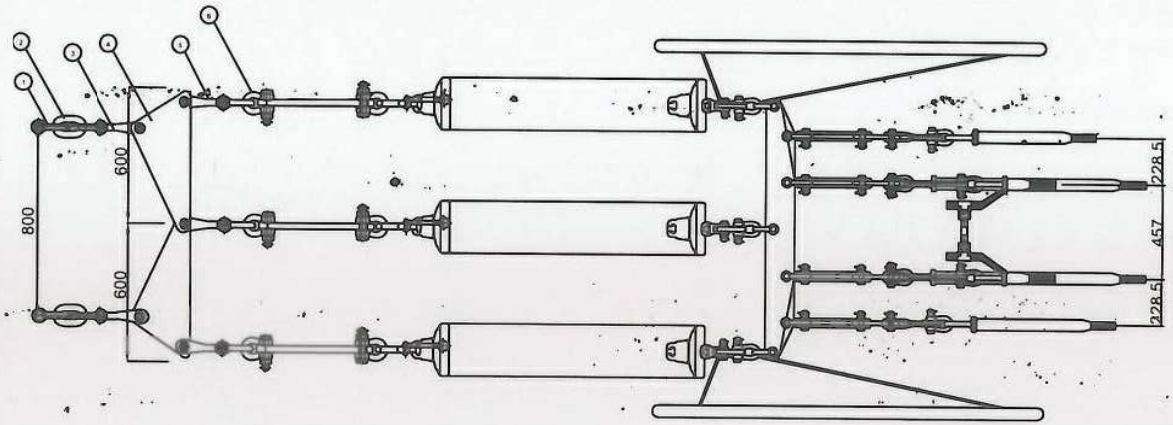
PROJECT : 800 KV HVDC TRANSMISSION LINE

TITLE : OUTLINE DRAWING OF SINGLE 'Y' SUSPENSION INSULATOR STRING WITH 2 X 3, 420 KN, DC COMPOSITE LONG ROD INSULATORS SUITABLE FOR HEXA BUNDLE ACSR LAPWING CONDUCTOR

DRAWING NO.: TL/HVDC/800KV/SYS/02

REV 0





TECHNICAL DETAILS:

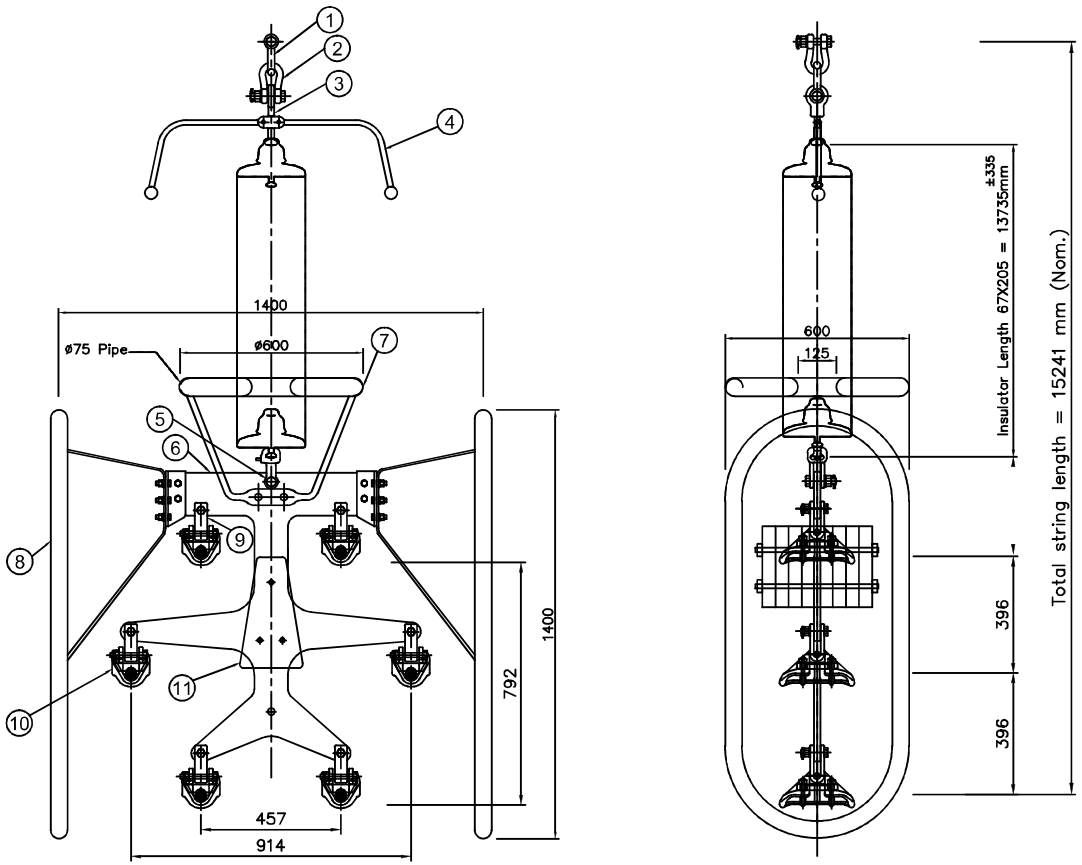
1) ALL DIMENSIONS ARE IN mm.
2) SPRING WASHER ELECTRO GALVANIZED.
3) SLIPPING STRENGTH OF CLAMP BETWEEN 16 TO 24 KN.
4) BALL & SOCKET SIZE 20 mm. IS:2486. (PART-II).
5) ALL FERROUS PARTS HOT DIP GALVANIZED AS PER IS : 2629.
6) MIN.CORONA EXTINCTION VOLTAGE (DRY) 510 KV (RMS).
7) RIV AT 510 KV (DRY) BELOW 1000 MICROVOLTS.
8) HARDWARE TOLERANCES ON LENGTH ±2%.
9) INSULATOR DISC TOLERANCES : ±5 mm.PER DISC.
10) GENERAL TOLERANCE ±3% APPLICABLE FOR INDIVIDUAL COMPONENTS.

BID PURPOSE ONLY

Sr.No.	DESCRIPTION	U.T.S.	QTY.
6	ANCHOR SHACKLE	440 KN	6
5	EXTENSION LINK	440 KN	3
4	YOKE PLATE	660 KN	2
3	EXTENSION LINK	660 KN	2
2	CHAIN LINK	660 KN	2
1	ANCHOR SHACKLE	660 KN	4

Title :
+/- 800 KV. TRIPLE TENSION INSULATOR STRING FOR HEXAGONAL ACSR "LAPWING" CONDUCTOR.
UTS : 1320 KN.

DRAWING NO. - PL/800 kV/HVDC/03



INDICATIVE DRAWING ONLY

Notes :

1. General Tolerance ±3% unless otherwise specified.
2. Tolerance on length of hardware fitting ±2%
3. Ferrous Parts are hot dip galvanised as per IS: 2629
4. Ball & socket designation 28mm as per IS: 2486 Part II/IEC–120
5. Ultimate Tensile Strength of assembly 160 kN
6. Ultimate Tensile Strength of Suspension Clamp 70 kN
7. Slip strength of clamp 20 to 29 kN
8. Clamp is suitable for ACSR Lapwing (dia. 38.22 mm)
9. Spring washer are electro galvanised as per PGCIL Spec.
10. Flat washer are hot dip galvanised as per PGCIL Spec.
11. Min corona extinction voltage (Dry) 880 kV
12. RIV at 22 kV/cm (+ve) below 1000 microvolts.

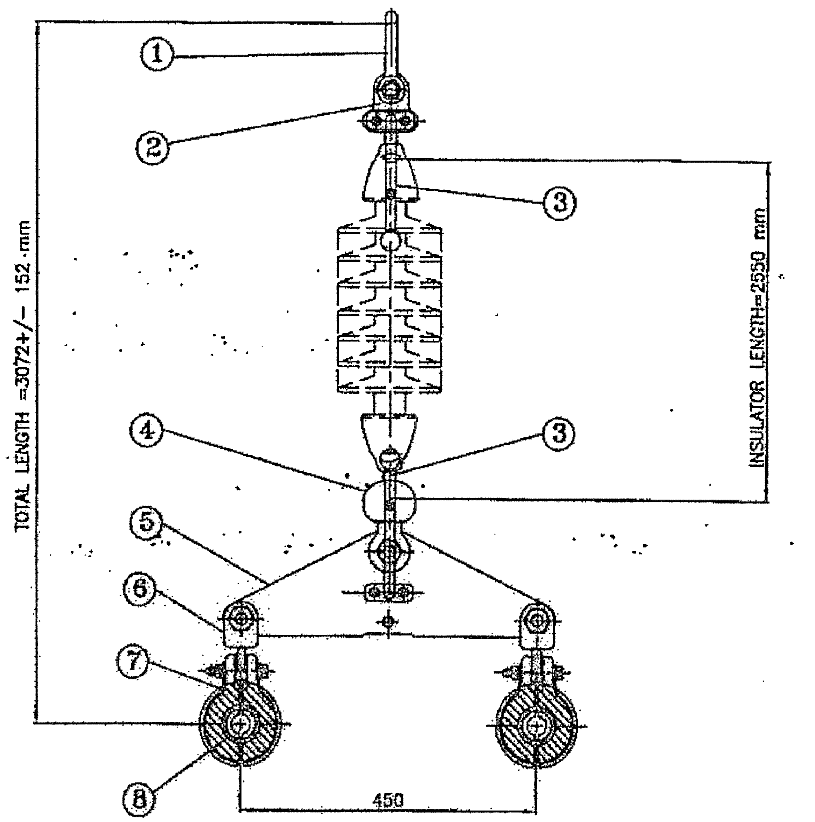
TENDER PURPOSE ONLY

Sl.	Description	Qty.	UTS(kN)
11	Counter Weight Assem.(200 Kgs)	1 set	–
10	Suspension Clamp	6	70
9	Clevis Connector	6	70
8	Corona/Grading Ring & Brackets	1 set	–
7	Corona/Grading Ring & Brackets	1	–
6	Yoke Plate	1	160
5	Socket Clevis	1	160
4	Arcing Horn	1	1.5
3	Ball Eye (Horn Holder)	1	160
2	Anchor Shackle	1	160
1	Anchor Shackle	1	160

Title:
800KV SINGLE 'I' SUSPENSION PILOT HARDWARE FITTINGS SUITABLE FOR ACSR LAPWING
UTS :160 kN

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

DRAWING NO.: -DL/800kV/HVDC/04



Sr No.	DESCRIPTION	MATERIAL	U T S.	QTY
8	ARMOUR ROD	HIGH TENSILE ALUMINIUM ROD 65032/6061 IS:733		
7	SUSPENSION CLAMP (AGS)	ALUMINIUM ALLOY A-6, IS:617	70 KN	2
6	CLEVIS EYE	FORGED STEEL CL-IV, IS:2004	70 KN	2
5	YOKE PLATE	MILD STEEL Fe-410 IS:2062	160 KN	1
4	SOCKET CLEVIS	FORGED STEEL CL-IV, IS:2004	160 KN	1
3	ARCING HORN	MILD STEEL Fe 410 IS:2062	15 KN	2
2	HORN HOLDER BALL EYE	FORGED STEEL CL-IV, IS:2004	160 KN	
1	ANCHOR SHACKLE	FORGED STEEL CL-IV, IS:2004	160 KN	

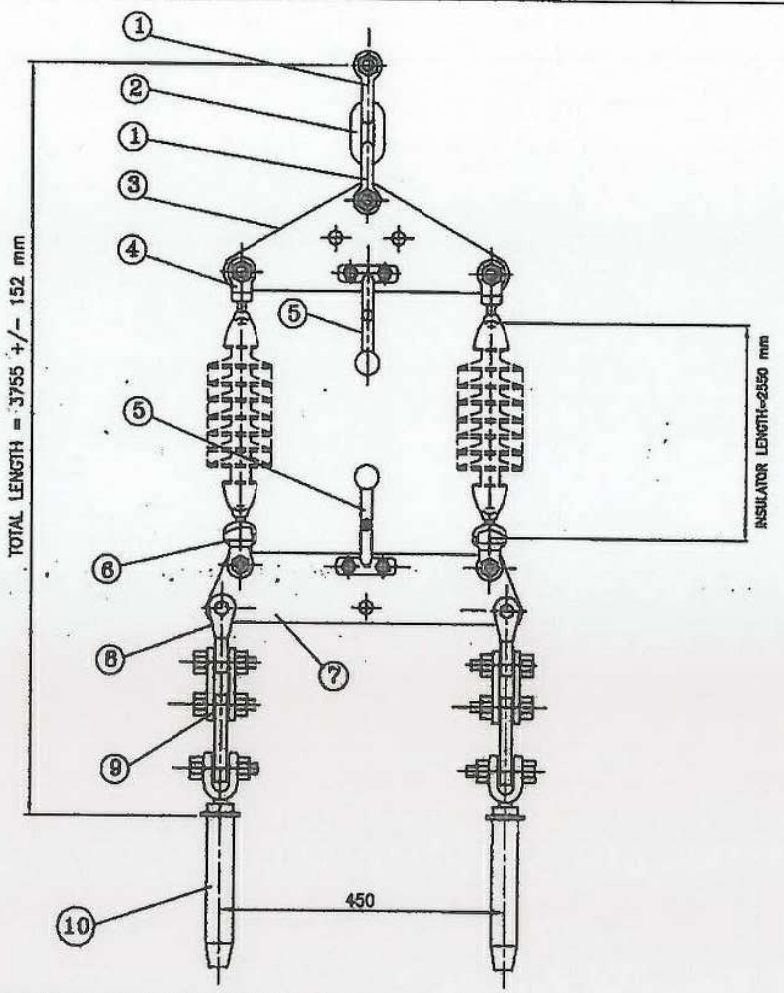
TECHNICAL DATA :-

1) ALL DIMENSIONS ARE IN mm.
2) ALL FERROUS PARTS HOT DIP GALVANIZED AS PER POWERGRID SPECIFICATION.
3) SPRING WASHERS ARE ELECTRO GALVANIZED.
4) BALL & SOCKET SIZE 20 mm B AS PER IS:2486 (PART-II)
5) TOLERANCE ON TOTAL LENGTH OF HARDWARE FITTING. ±2%.
6) MAGNETIC POWER LOSS AT 500 AMP.CONDUCTOR CURRENT LESS THAN 0.5 WATT PER CLAMP ASSEMBLY.
7) TOTAL WEIGHT : 150.0 KG(APPROX)

FOR TENDER PURPOSE ONLY

Title:-
[redacted] SINGLE 'I' SUSPENSION INSULATOR STRING FOR "TWIN LAPWING"ACSR COND. WITH ARMOUR GRIP TYPE CLAMP
UTS 160KN

Drg No. 800HVDC/MR/SIS



SR.NO	DESCRIPTION	MATERIAL	U.T.S.	QTY.
10	COMPRESSION DEADEND CLAMP	ALUMINIUM ALLOY & STEEL 63400/6063 IS:733		2
9	SAG ADJUSTABLE PLATE	MILD STEEL Fe-410, IS:2062	210 KN	2 SET
8	CLEVIS EYE	FORGED STEEL CL-N, IS:2004	210 KN	2
7	YOKE PLATE	MILD STEEL Fe-410, IS:2062	420 KN	1
6	SOCKET CLEVIS	FORGED STEEL CL-N, IS:2004	210 KN	2
5	ARCING HORN	MILD STEEL Fe-410, IS:2062	1.5 KN	2
4	BALL CLEVIS	FORGED STEEL CL-N, IS:2004	210 KN	2
3	YOKE PLATE	MILD STEEL Fe-410, IS:2062	420 KN	1
2	CHAIN LINK	FORGED STEEL CL-N, IS:2004	420 KN	1
1	ANCHOR SHACKLE	FORGED STEEL CL-N, IS:2004	420 KN	2

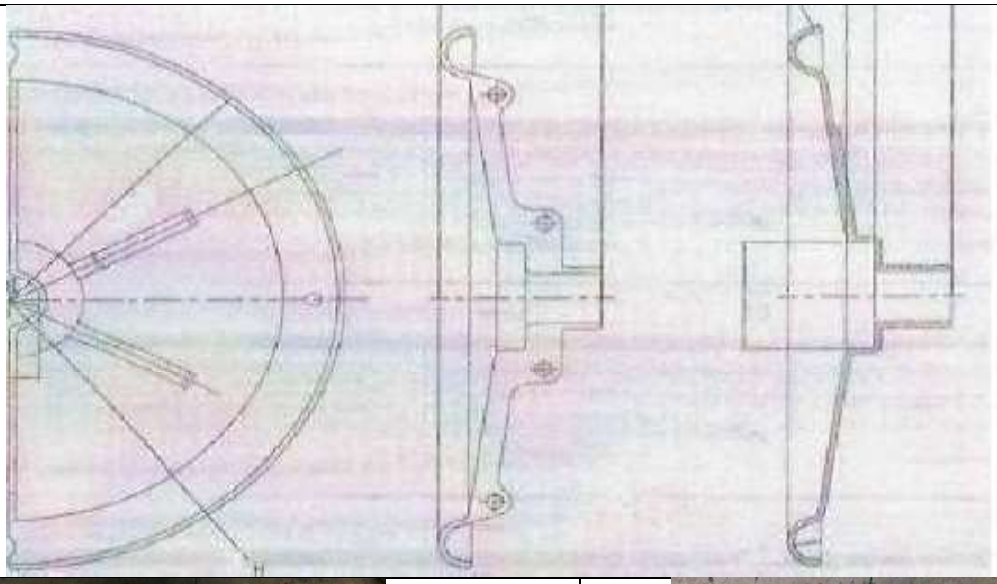
TECHNICAL DATA:

1) ALL DIMENSIONS ARE IN mm.
2) TOLERANCE ON TOTAL LENGTH OF HARDWARE FITTING, ±2%.
3) BALL & SOCKET SIZE 24mm AS PER IS:2486 (PART-II)
4) ALL FERROUS PARTS HOT DIP GALVANIZED AS PER POWERGRID SPECIFICATION.
5) SPRING WASHER ARE ELECTRO GALVANIZED.
6) TOTAL WEIGHT : 325 KG (APPROX)

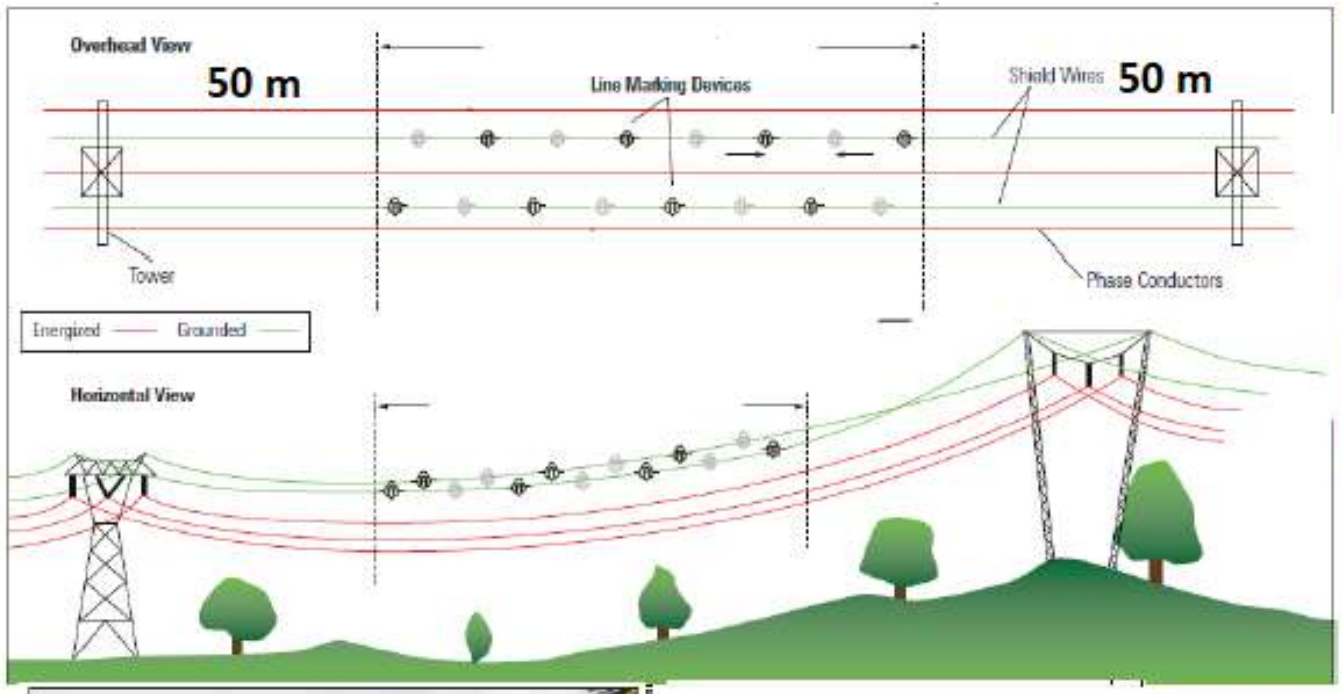
FOR TENDER PURPOSE ONLY

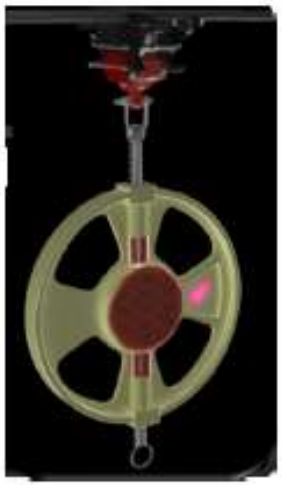
Title:-
[redacted] DOUBLE TENSION INSULATOR STRING FOR "TWIN LAPWING ACSR' COND. UTS 420 KN

Drg no. 800HVDC/MR/ DT



Indicative drawing/ photographs of covered type grading ring (to be used on suspension strings at tower/ cold end)





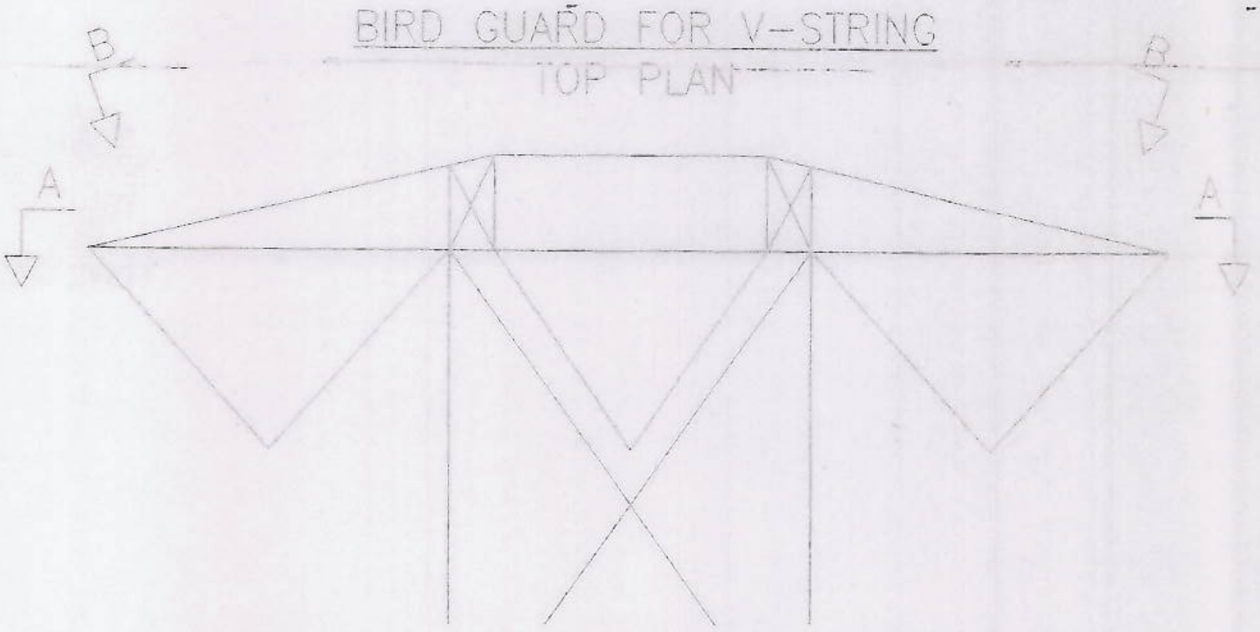
METHODE OF INSTALLATION OF BIRD FLIGHT DIVERTERS

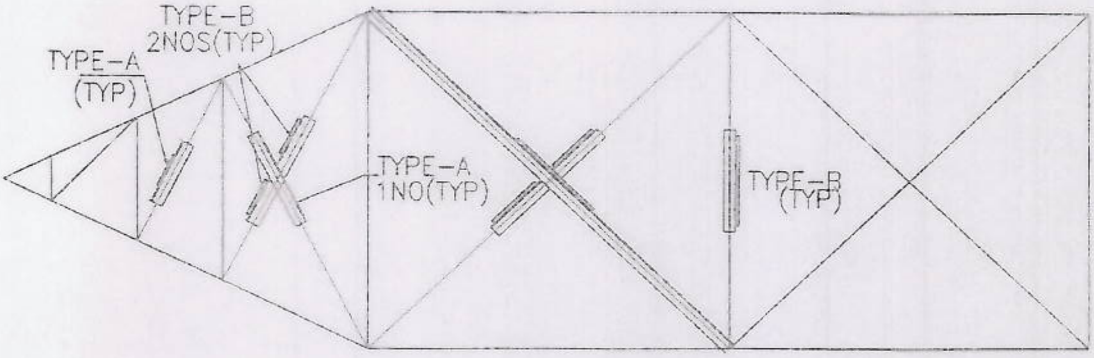
FOR TENDER PURPOSE ONLY

PICTURE SHOWN IN THE DRAWING IS INDICATIVE ONLY

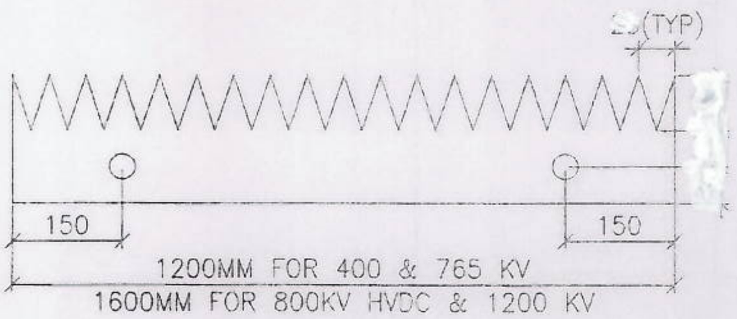
	POWER GRID CORPORATION OF INDIA LIMITED
TITLE:	DETAILS OF BIRD FLIGHT DIVERTERS
DRAWING No.	CC:ENGG:TWR:ACC:BFD SH 1 OF 1

BIRD GUARD FOR V-STRING
TOP PLAN



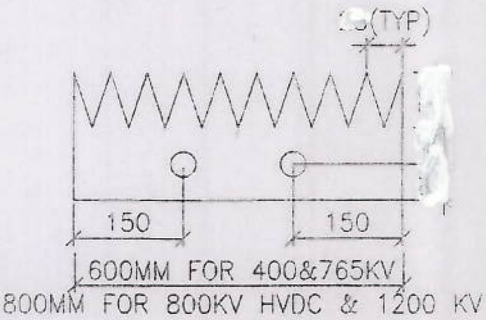


VIEW AA & BB



FLAT 3mm

TYPE-A



FLAT 3mm

TYPE-B

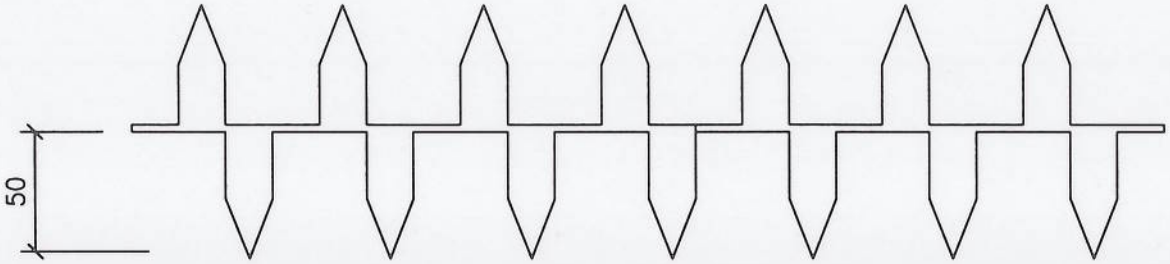
NOTES:-

1. ALL DIMENSIONS ARE IN MM.
2. EACH BIRD GUARD SHALL BE FITTED WITH 2 NOS. M16X35 BOLTS.
3. A SET OF BIRD GUARD SHALL INCLUDE ALL PLATES REQUIRED FOR TOP & BOTTOM PLAN.
4. ALL STEEL MEMBERS,BOLTS AND NUTS ARE TO BE HOT DIP GALVANISED.
5. FOR DETAIL OF BIRD GUARD, REFER DRG. CC: ENGG: TL BIRD GUARD.

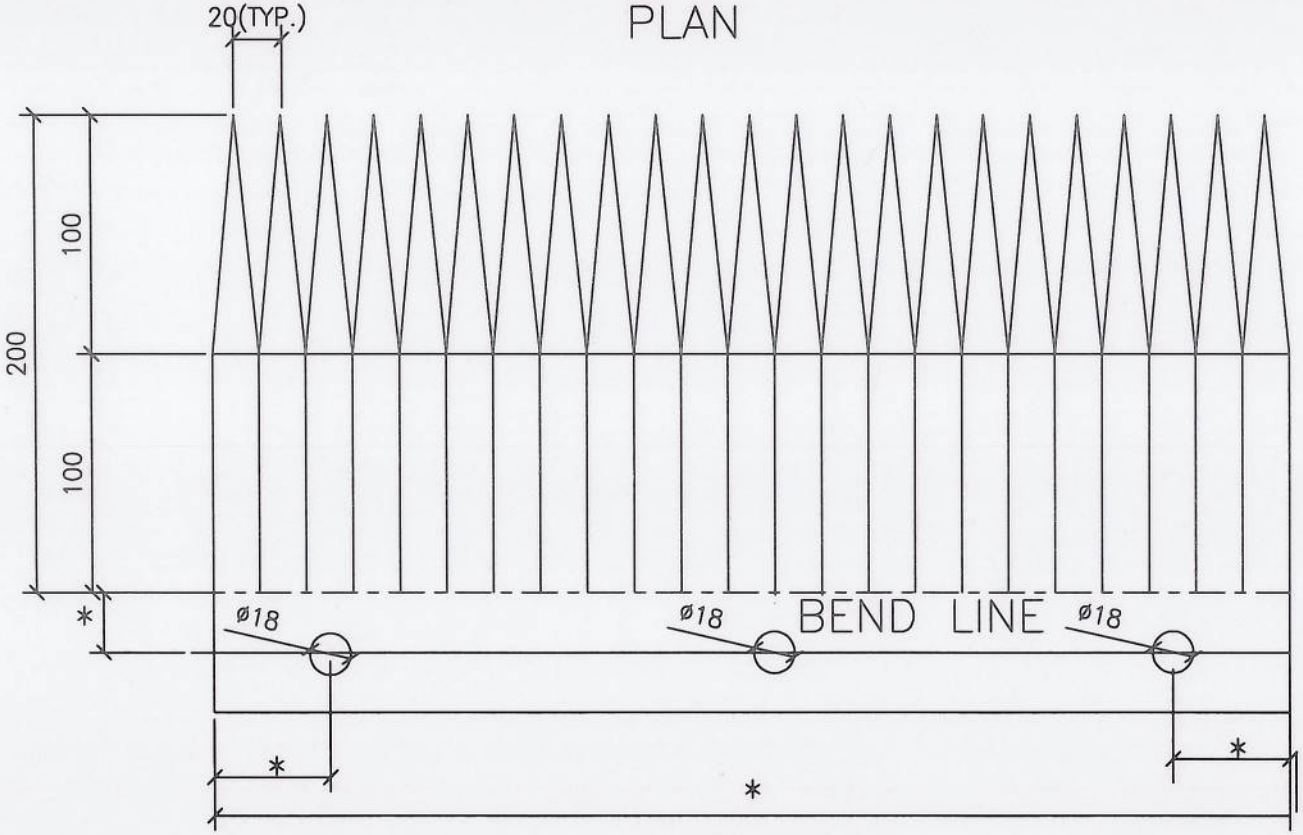
POWER GRID CORPORATION OF INDIA LTD	
DESCRIPTION	BIRD GUARD FOR V STRING

REV	DESCRIPTION	CHKD	REVD	DATE	DESIGN	CHECKED	REVIEWED	REVIEWED	SCALE	DRG. NO
									NTS	

→ SRI M.Z. KHAN., D.G.M. (BNGO TL)

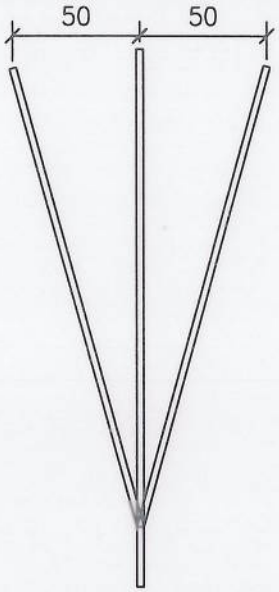


PLAN



BG 3 MM PLATE

ELEVATION



SIDE VIEW

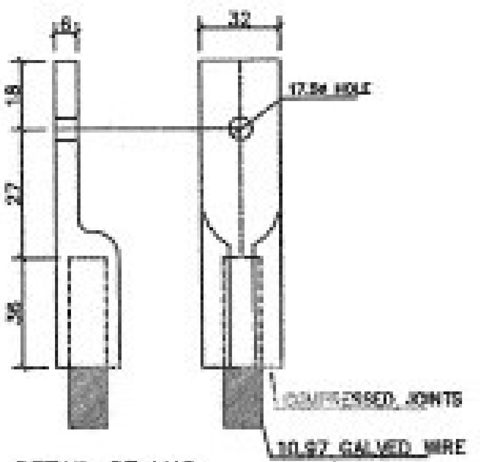
* –MAY VARY AS PER TOWER DETAILS

NO. OF HOLE SHALL BE AS PER TOWER DETAILS

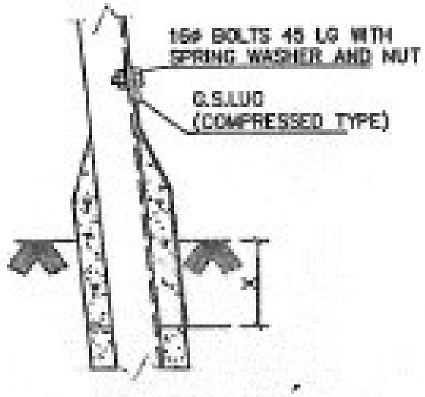
POWER GRID CORPORATION OF INDIA LIMITED

(A GOVERNMENT OF INDIA ENTERPRISE)

REVISION				CLEARED BY					TITLE: Details of BIRD GUARD		
REV. No	DESCRIPTION	ISSUED BY	CLEARED BY	DATE	DESIGN	CHKD.	REVIEWED	APPROVED	SCALE N.T.S.	DRAWING NO:CC:ENGG:TL: Bird Guard	REV. 0

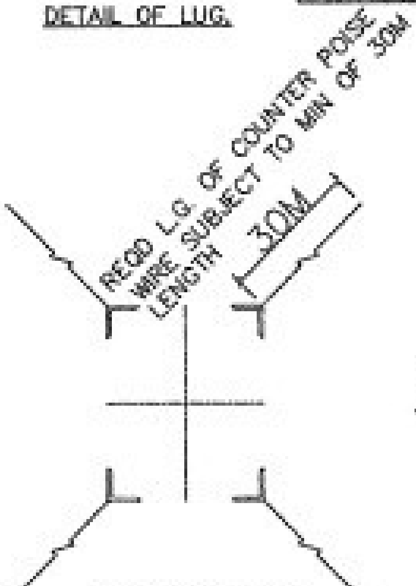


DETAIL OF LUG.

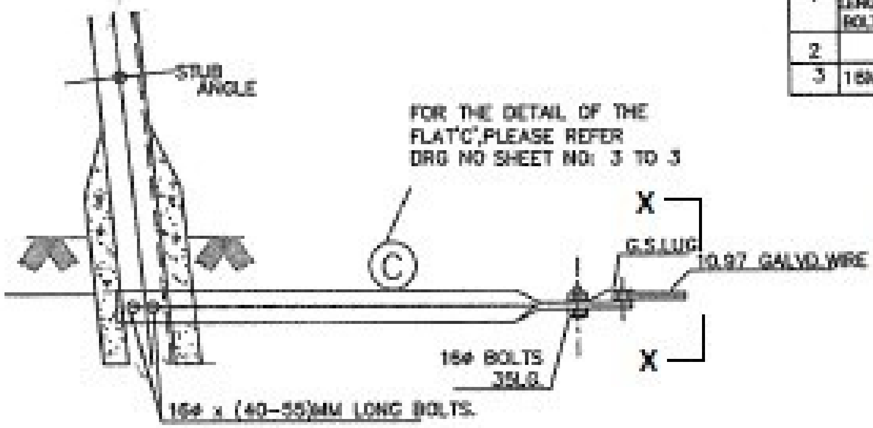


X – NOT LESS THAN 1000MM

LUG FITTING FOR THREE LEGS (TYPICAL)



BASE OF TOWER



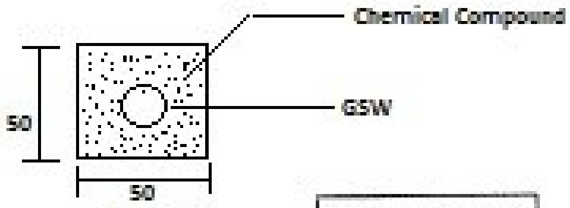
LUG FITTING ON FOUTRH LEG

NOTES:–

1. ALL DIMENSIONS ARE IN MM.
2. 10.97MM GALVANISED WIRE WITH G.S. LUG FORGED AT ONE END AND FREE FOR A REQURIED LENGTH OF COUNTER POISE WIRE.
3. FOUR G.S LUG WILL BE REQUIRED PER TOWER THREE LUGS WILL BE CONNECTED ON THREE LEGS AND FOURTH LUGS WILL BE CONNECTED WITH FLAT TYPE 'C' PROVIDED FOR PIPE TYPE EARTHING.
4. 10.97MM WIRE SHALL BE OUTSIDE COPPING.
5. ONE SET COMPRISING OF 4NOS OF REQUIRED LENGTH OF COUNTER POISE WIRE.
6. FOR SOIL RESISTIVITY LESS THAN 1500 OHMS–METER, 4 LENGTHS OF 30M WIRE SHALL BE PROVIDED, AND FOR SOIL RESISTIVITY GREATHER THAN 1500 OHMS–METER, 4 LENGTH OF 70M WIRE SHALL BE PROVIDED.

LIST OF BOLTS & NUTS / TOWER.

S.NO	SIZE					QTY
1	STUB THICK.(mm)	7–11	13–16	17–21	22–26	5
	LENGTH OF M16 BOLT (mm)	40	45	50	55	
2	M–16 x 35LG					1
3	16MM DIA 3.5MM THK.SP.WASHER					6

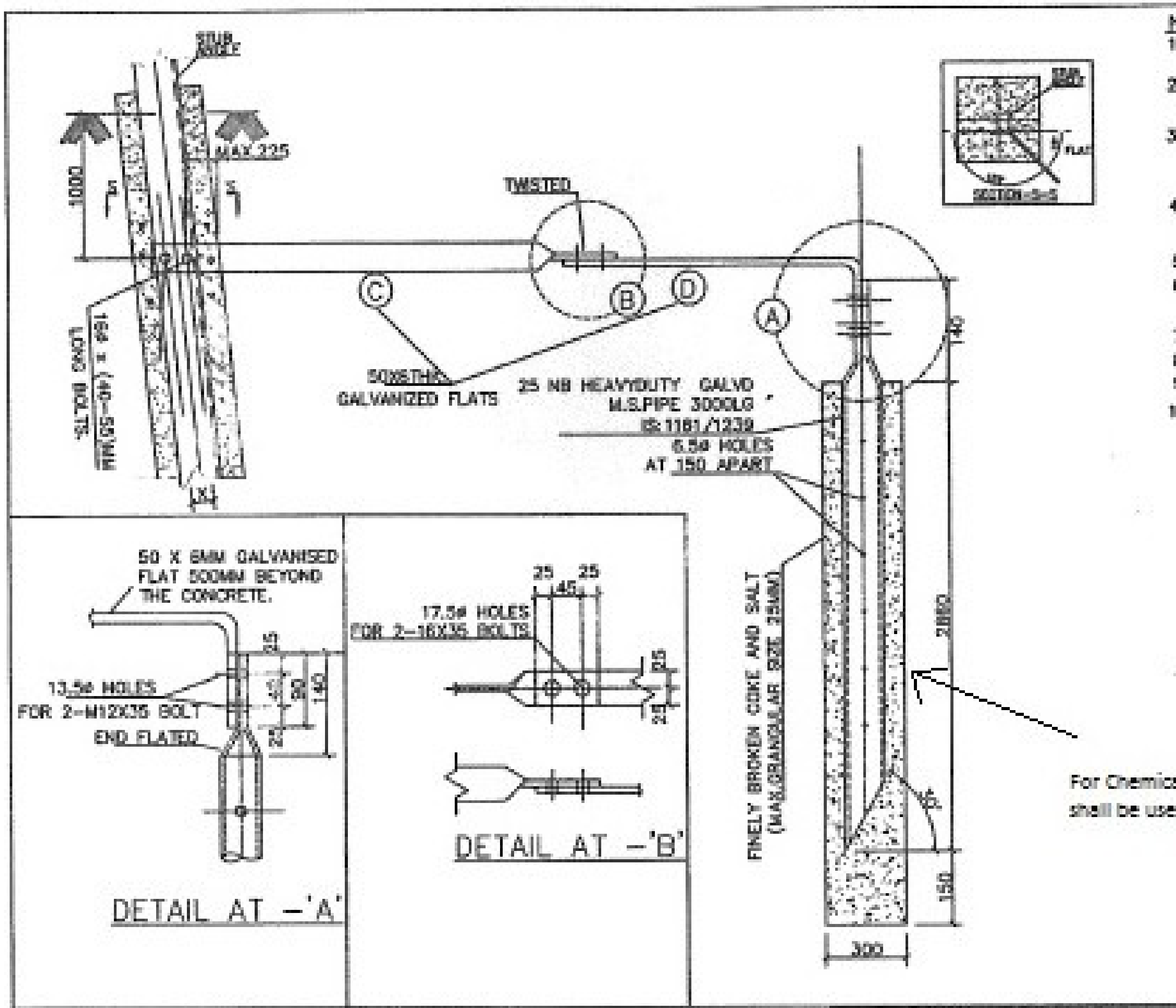


View X-X
For Chemical earthing

STANDARD DRAWING

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

REVISION					CLEARED BY			PROJECT: 765/400 KV TRANSMISSION SYSTEM
REV. No	DESCRIPTION	CHKD	REVD	APPD	CHECKED	REVIEWED	APPROVED	TITLE: COUNTERPOISE EARTHING
								SCALE N.T.S. — DRAWING No: [illegible] sheet 3/3 — REV. 0



For Chemical earthing Chemical Compound shall be used in place of coke & salt

NOTE :–

1. "C"STRIP IS TO BE PROVIDED ON ONE LEG OF EACH TOWER, WHICH WILL BE SUPPLIED WITH STUB .
2. "D"STRIP WITH PIPE EARTHING ARRANGEMENT IS TO BE PROVIDED ON ONLY ONE LEG.
3. 17.5ø HOLES SUITABLE FOR 16MM ø BOLT CONFIRMING TO IS:12427–2001, CLASS 5.6 & IS:14394–1996, Gr. 5 FOR HEX NUT UNLESS OTHERWISE SPECIFIED.
4. FOR COUNTERPOISE EARTHING STRIP 'C' SHALL BE CONNECTED WITH COUNTERPOISE WIRE THROUGH 'A' LUG.
5. ALL DIMENSIONS ARE IN MM.
6. 12 & 16MM DIA SPIRNG WASHER SHALL CONFIRM TO IS:3063–1994 TYPE B AND ELECTRO GALVANIZED AS PER IS:1573–1986.
7. HDG BOLT/NUTS TO BE GALVANIZED AS PER IS:1367(P–13)–1983.
8. C & D FLATS TO BE HOT DIP GALVANIZED AS PER IS:2629–1985.
9. MATERIAL FOR C & D FLAT AS PER IS:2062 GRADE "A".
10. X TO BE COMPATIBLE WITH STUB

LIST OF BOLTS & NUTS / TOWER.

S.NO	SIZE					QTY
1	STUB THICK.(mm)	[illegible]–11	12–16	17–21	22–28	2
	LENGTH OF M16 BOLT (mm)	40	45	50	55	
2	M–16 x 35LG					2
3	M–12 x 35LG					2
4	16MM DIA 3.5MM THK.SP.WASHER					4
5	12MM DIA 2.5MM THK.SP.WASHER					2

STANDARD DRAWING

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

REV. No.	DESCRIPTION	CHKD	REVD	APPD
REVISION				

CLEARED BY

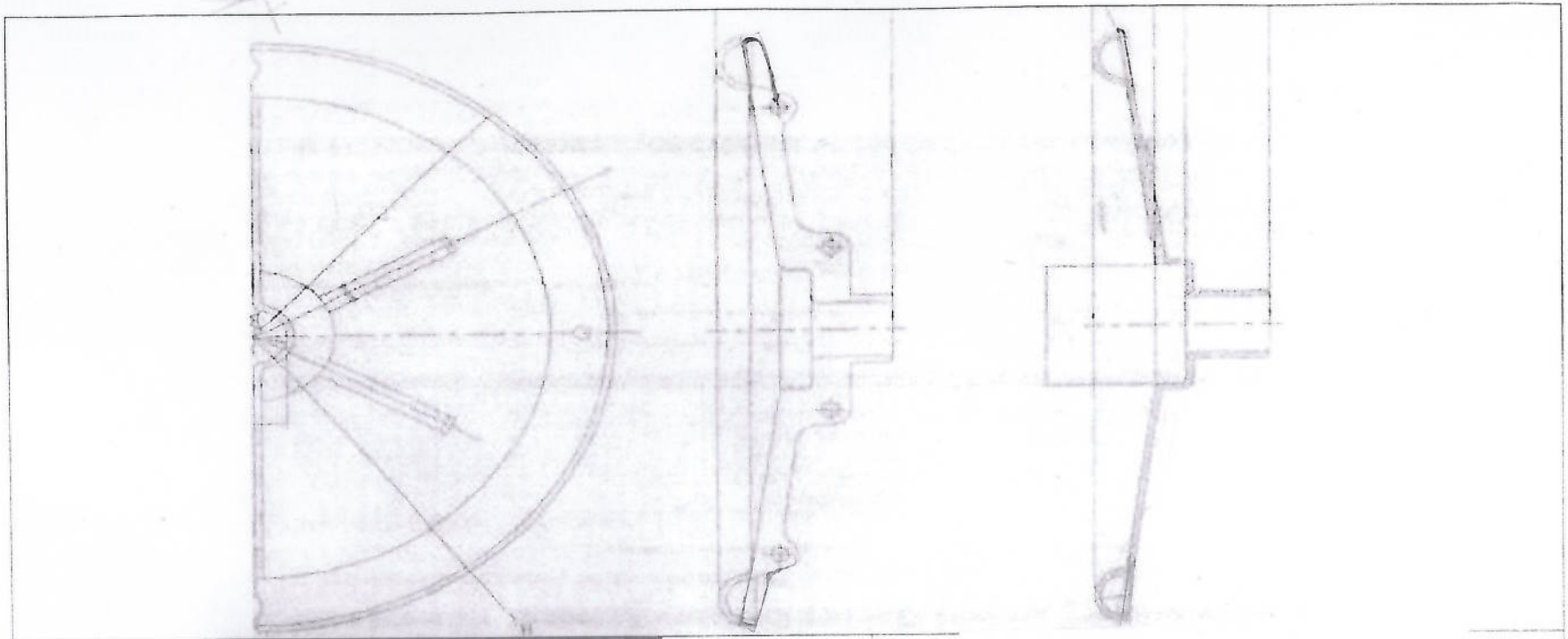
CHECKED | REVIEWED | APPROVED

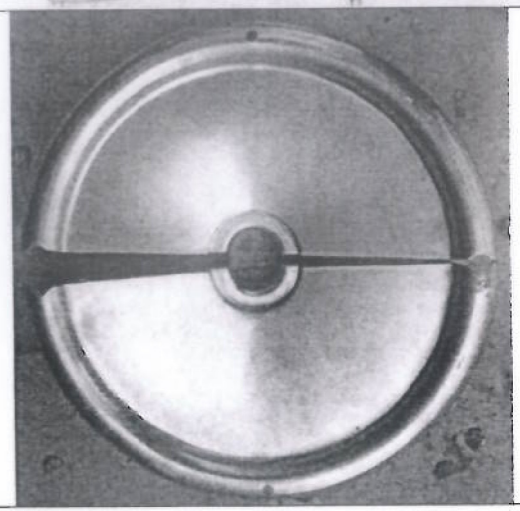
PROJECT: 765/400 KV TRANSMISSION SYSTEM

TITLE: PIPE TYPE EARTHING

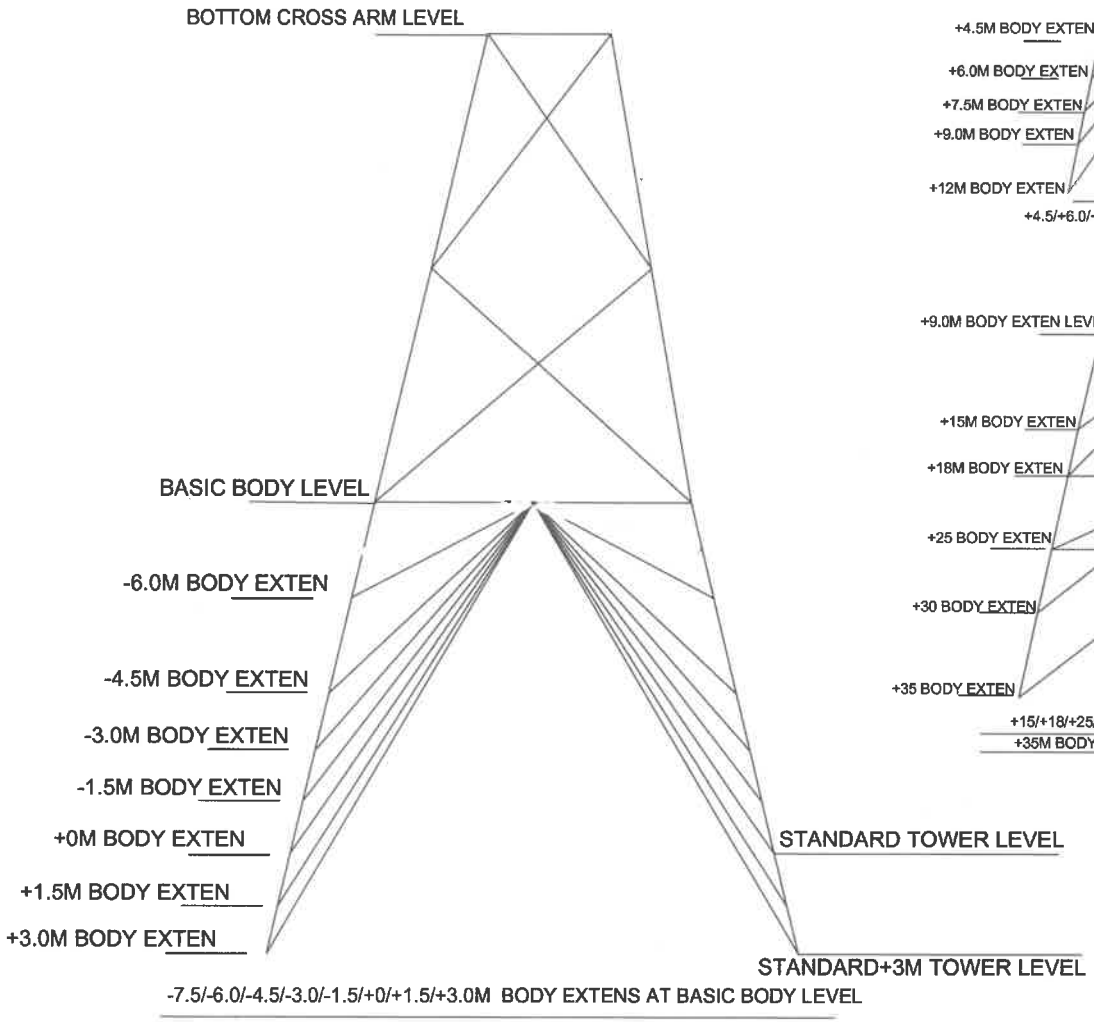
SCALE: N.T.S.

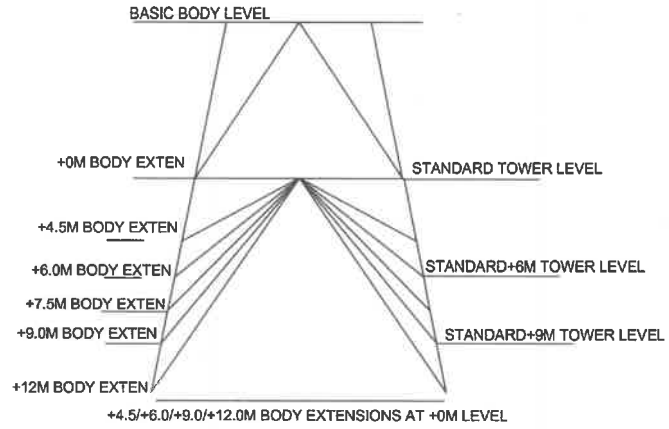
DRAWING NO: CC/ENGG/TL/ACC/EETH/PT/765/400 sheet 1/2

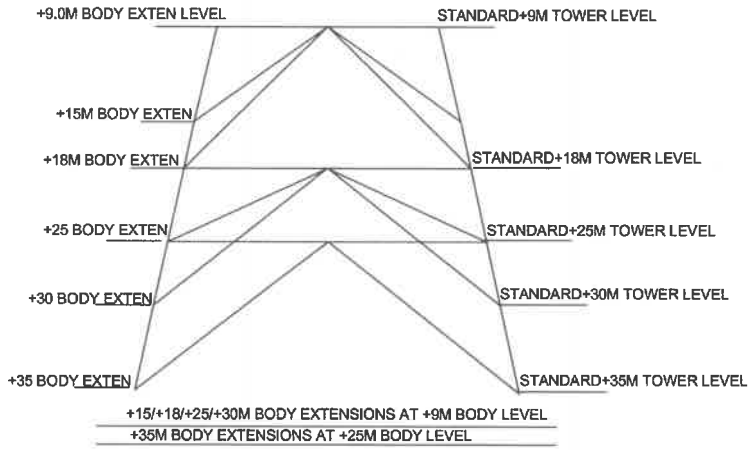




Indicative drawing/ photographs of covered type grading ring (to be used on suspension strings at tower/ cold end)







Note: The Panel height should not exceed by 14m

TENDER PURPOSE ONLY

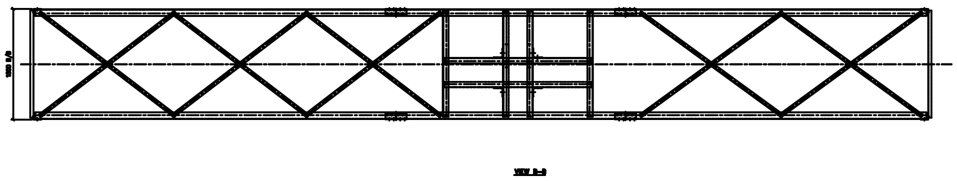
TITLE:

BODY EXTENSION SCHEME

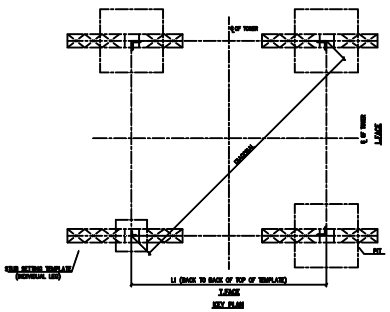
DRG.NO.-TL/TOWER/BODY EXTENSION/01

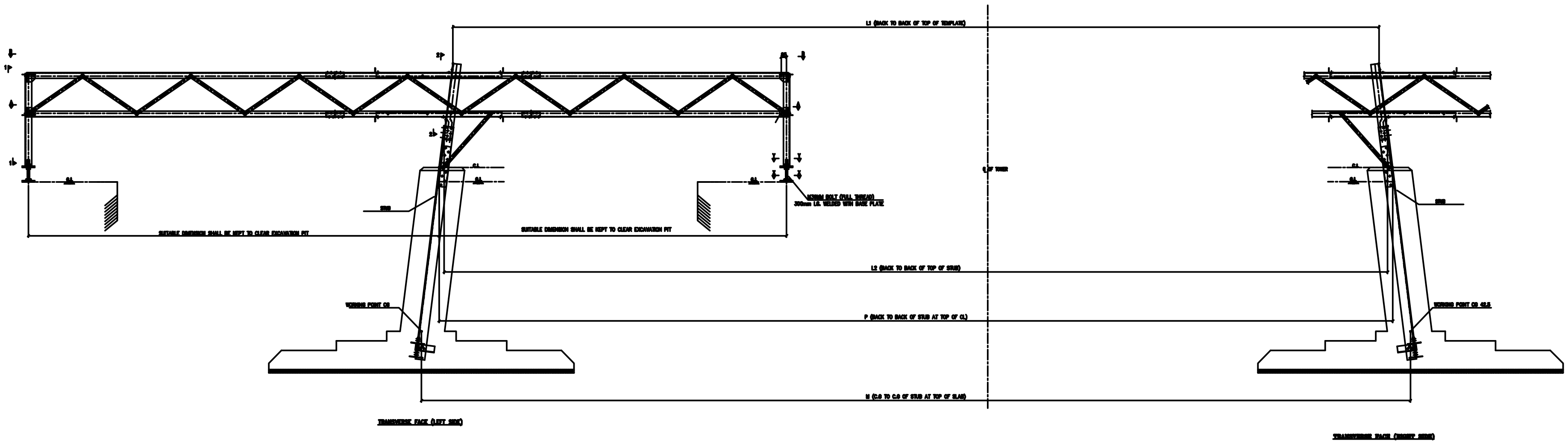
T-712

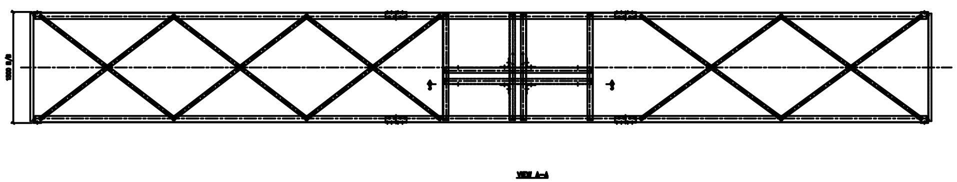
THIS IS PROPRIETARY ITEM AND DESIGN RIGHT IS STRICTLY RESERVED WITH POWER GRID. UNDER NO CIRCUMSTANCES THIS DRAWING SHALL BE USED BY ANYBODY WITHOUT PRIOR PERMISSION FROM POWER GRID IN WRITING.

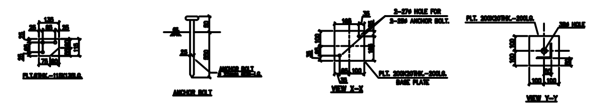


EXTENSIONS ATTACHMENT	DIMENSIONS B/B OF TOP OF TEMPLATE		DIMENSIONS B/B OF TOP OF STUD		DIMENSIONS B/B OF CONCRETE LVL.		DIMENSIONS C.G TO C.G OF STUD AT TOP OF SLAB	
	(L1)	(DIAGONAL)	(L2)	(DIAGONAL)	(P)	(DIAGONAL)	(N)	(DIAGONAL)
NORMAL TOWER								
+6M BODY EXTN.								
+6M BODY EXTN.								
+6M BODY EXTN.								





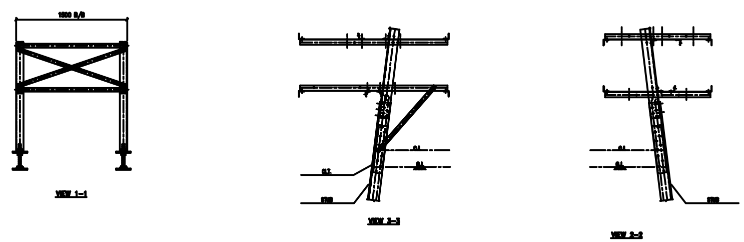




NOTES:

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
2. BOLT SYMBOLS 16ϕ — 17.5ϕ HOLES
   16ϕ — 17.5ϕ HOLES FOR STEP BOLTS
3. STRUCTURAL MEMBERS ARE STEEL ANGLE /PLATE SECTIONS U.N.O
3. STRUCTURAL STEEL SHALL BE AS PER IS 2062-2011
   (i) MILD STEEL - GRADE E250 QUALITY A - UNLESS OTHERWISE SPECIFIED.
   (ii) "H" STANDS FOR HIGH TENSILE STEEL - GRADE E350 QUALITY A
4. BOLTS & NUTS SHALL CONFORM TO IS : 12427-2001 (R-2007) FOR DIMENSIONS AND IS : 1367 (PART 3)-2002 FOR MECHANICAL PROPERTIES
5. GALVANISING SHALL CONFORM TO IS:2629-1985 (R-2006) & IS:4759-1996 (R-2006)
6. SPRING WASHER SHALL BE CONFORM TO IS 3063-1994 (R-2004)
7. SST TO BE PAINTED WITH RED OXIDE

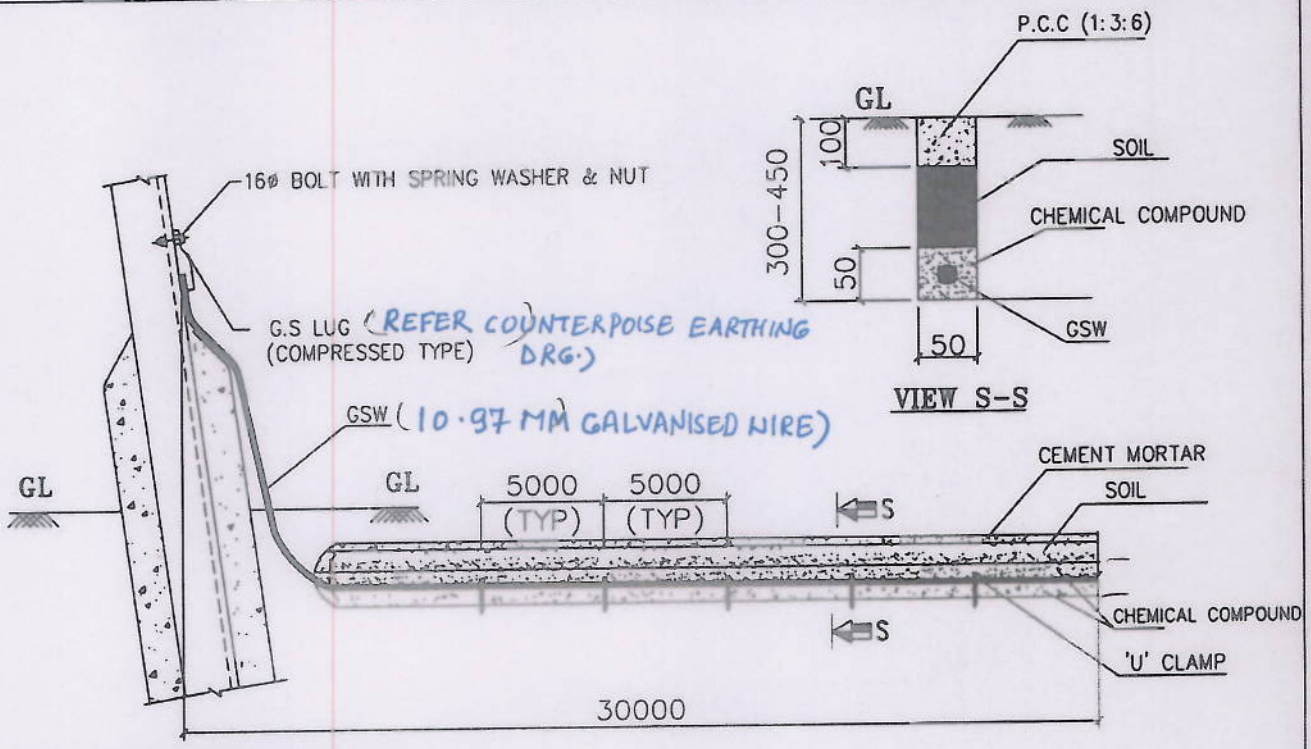
FOR BID PURPOSE ONLY



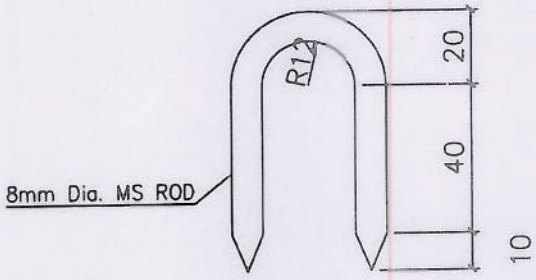
REQUIREMENT OF BOLTS, NUTS AND WASHERS			
SIZE	QTY.	GRADE	REMARKS
M16ϕx35 MM Lg.		5.6	BOLTS & NUTS
M16ϕx40 MM Lg.		5.6	BOLTS & NUTS
M16ϕx45MM Lg.		5.6	BOLTS & NUTS
M16ϕx50MM Lg.		5.6	BOLTS & NUTS
M16ϕx55MM Lg.		5.6	BOLTS & NUTS
16ϕx3.5MM THICK		-	SPRING WASHER
16ϕ 6 THK		-	PACK WASHERS
16ϕ 8 THK		-	PACK WASHERS

POWER GRID CORPORATION OF INDIA LTD

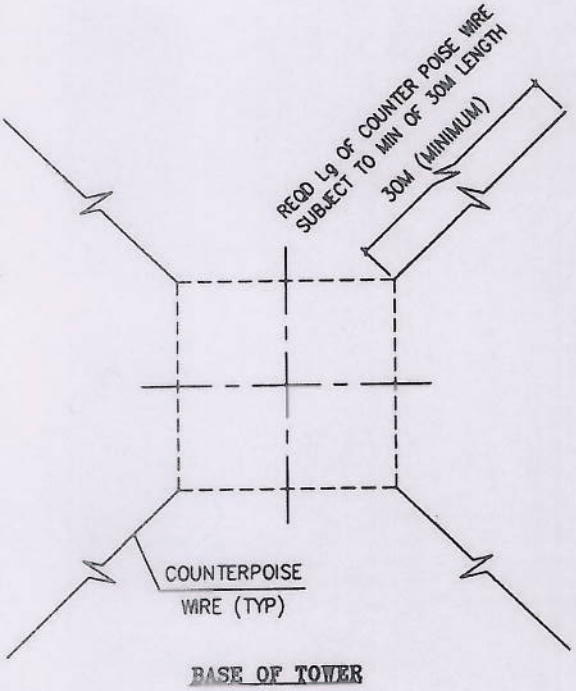
TITLE :	GA OF STUD SETTING TEMPLATE (INDIVIDUAL LEG) (ONE CORNER)	SCALE 1 : 25	SHEET NO. 1 OF 1
DRG. No.	CC:ENGG:TL:INDIVIDUAL SST	SIZE A0	REV. 0



LUG FITTING (TYP)
(FOR THREE LEGS)



U-CLAMP DETAILS



BASE OF TOWER

NOTES:-

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.

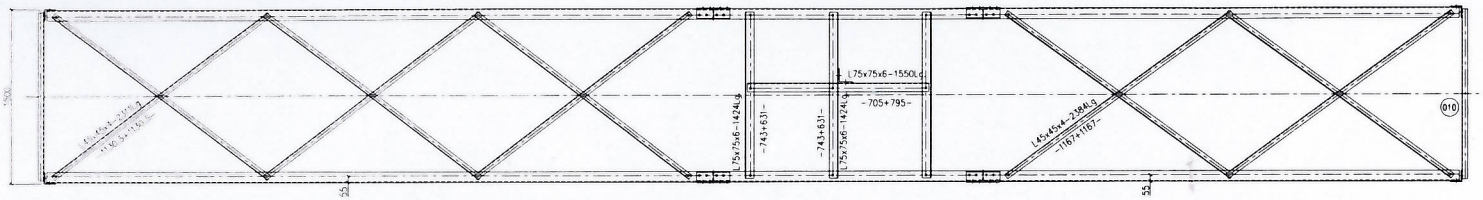
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

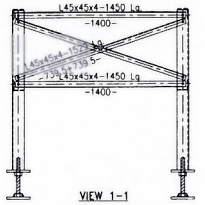
REVISION									
S.NO.	DESCRIPTION	CHKD.	REVD.	APD.	CHECKED	REVIEWED	APPROVED	SCALE: N.T.S.	DRAWING NO: CC: ENGG: TL: EARTHING: HR / REV. 0

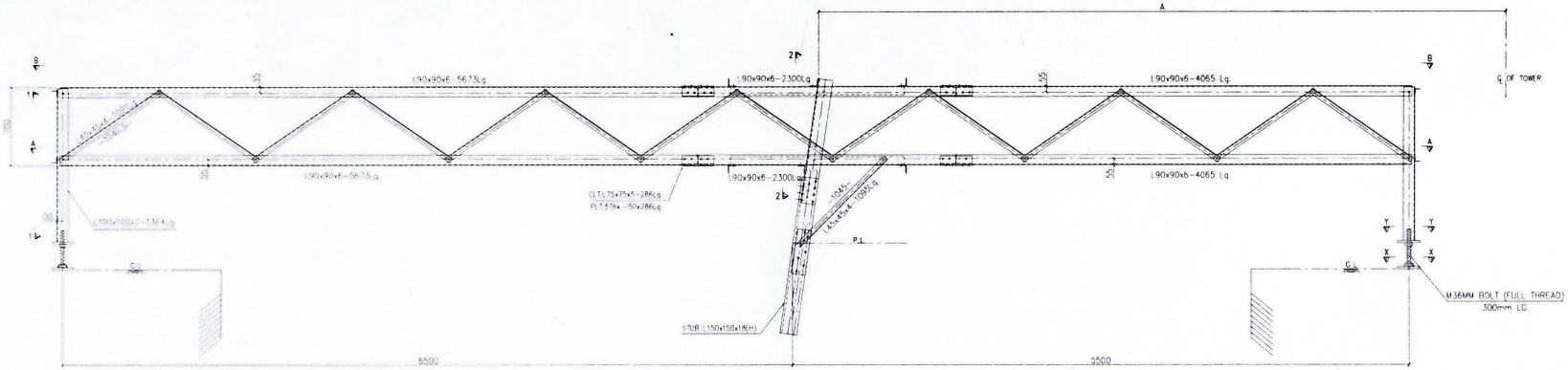
PROJECT: 765/400/220/132/66 KV TRANSMISSION SYSTEM

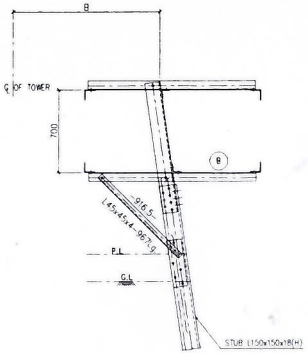
CLEARED BY

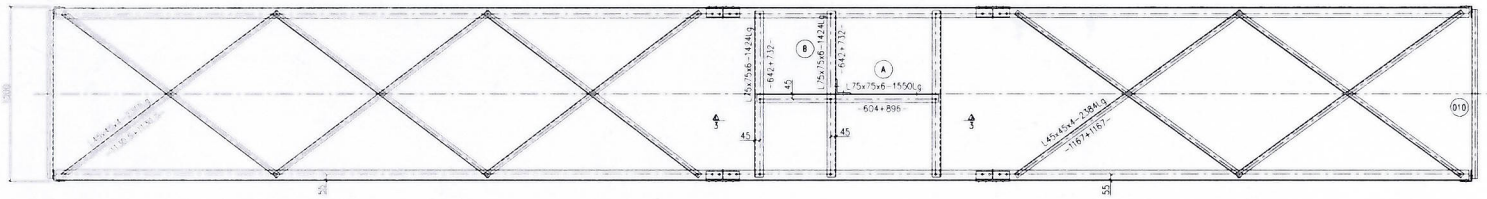
TITLE: EARTHING ARRANGEMENT FOR HARD ROCK STRATA

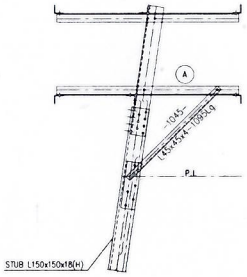


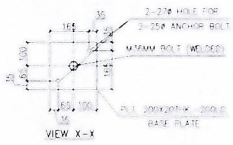


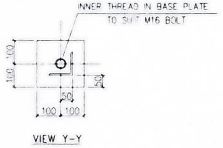


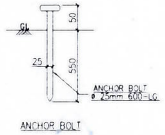


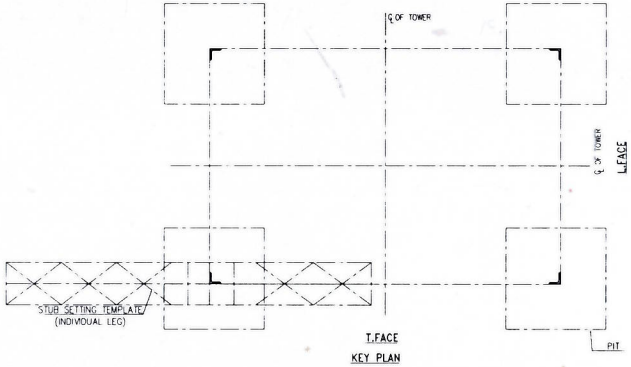












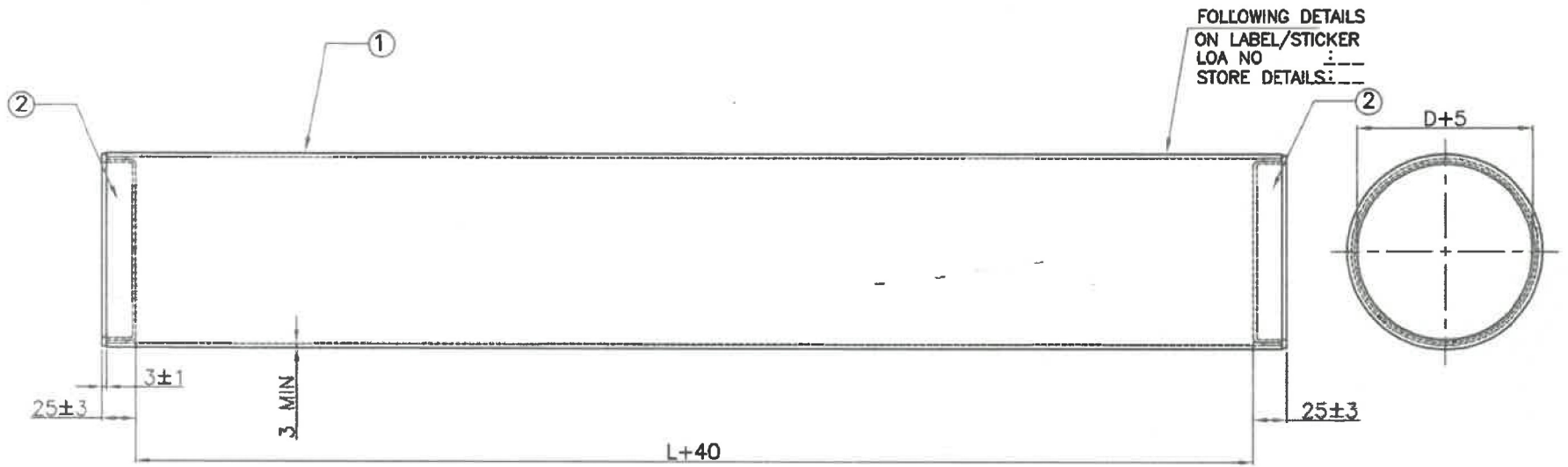
NOTES:

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
2. ALL HOLES ARE 17.5mmø FOR 16mmø BOLTS IF NOT STATED.

G.A OF STUB SETTING TEMPLATE (INDIVIDUAL LEG) (ONE CORNER) - 21.07.2017

PATH

ALL DIMENSION ARE IN "mm"



SL.NO	DESCRIPTION	MATERIAL	QTY	REMARKS
2	END CAP	PPCP	2NO'S	
1	PLASTIC TUBE	PVC/PLASTIC	1NO	

NOTE:

1. THE PACKING SHALL BE ADEQUATE FOR DAMAGE FREE TRANSPORTATION, HANDLING AND STORAGE.
2. THE PACKING SHALL PROVIDE PROTECTION AGAINST RODENT.
3. BOTH END OF THE PLASTIC TUBE SHALL BE CLOSED WITH END CAPS BY STAPLING.
4. END CAPS SHALL BE SEALED BY WATER RESISTANT HAND SHRINK WRAP.
5. THE PACKING IS SUITABLE FOR ACCOMMODATING ONE INSULATOR ONLY

WHERE:

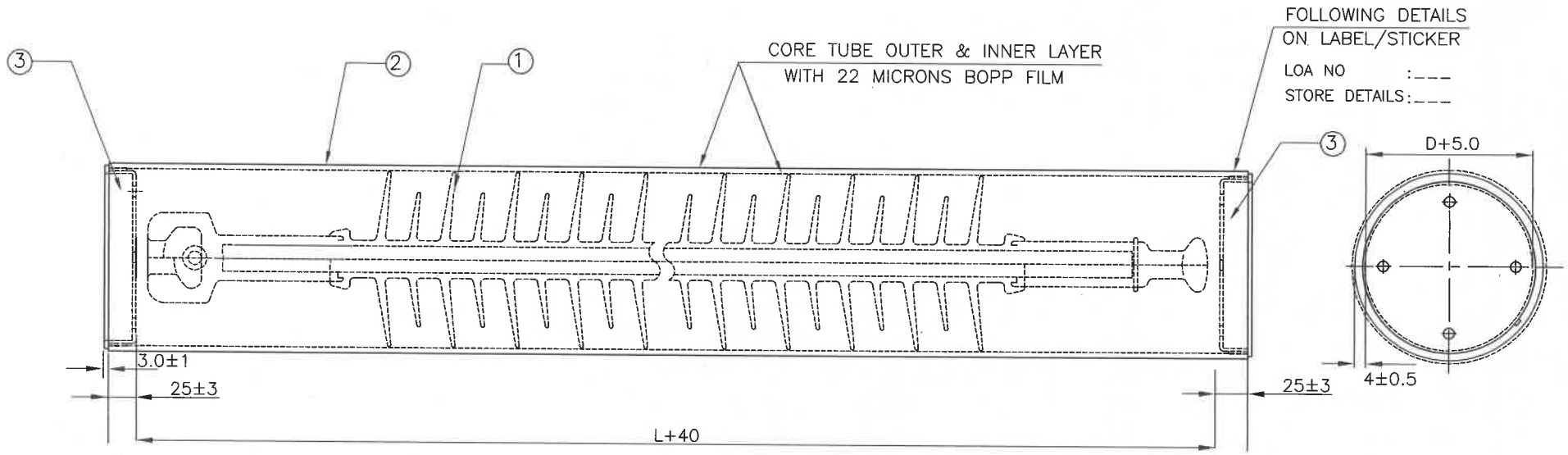
1. "L" IS THE LENGTH OF INSULATOR AS PER APPROVED DRAWING FOR E&M RATING
2. "D" IS THE DIAMETER OF LARGEST SHED AS PER APPROVED DRAWING.

STANDARD DRAWING

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

REVISION					CLEARED BY			TITLE: DRAWING OF PVC PACKING FOR COMPOSITE INSULATOR		
REV. No	DESCRIPTION	CHKD	REVWD	APPD	CHECKED	REVIEWED	APPROVED	SCALE N.T.S.	DRAWING NO:CC:ENGG:TL:INSU:PACK:PVC	REV. 0

ALL DIMENSION ARE IN "mm"



3	END CAP	PPCP	2No's	
2	WATER RESISTANT PAPER CORE TUBE	PAPER	1No.	
1	INSULATOR	COMPOSITE	1No.	
SL.NO	DESCRIPTION	MATERIAL	QTY	REMARKS

NOTE:

1. THE PACKING SHALL BE ADEQUATE FOR DAMAGE FREE TRANSPORTATION, HANDLING AND STORAGE.
2. THE PACKING SHALL PROVIDE PROTECTION AGAINST RODENT.
3. THE PACKING SHALL BE WATER RESISTANT.
4. BOTH ENDS OF THE CORE TUBE SHALL BE CLOSED WITH END CAPS BY STAPLING.
5. END CAPS SHALL BE SEALED BY WATER RESISTANT HAND SHRINK WRAP.
6. BOPP SHALL BE APPLIED SPIRALLY ON THE INSIDE SURFACE OF THE TUBE SO AS TO COVER MINIMUM 50% AREA.

WHERE:

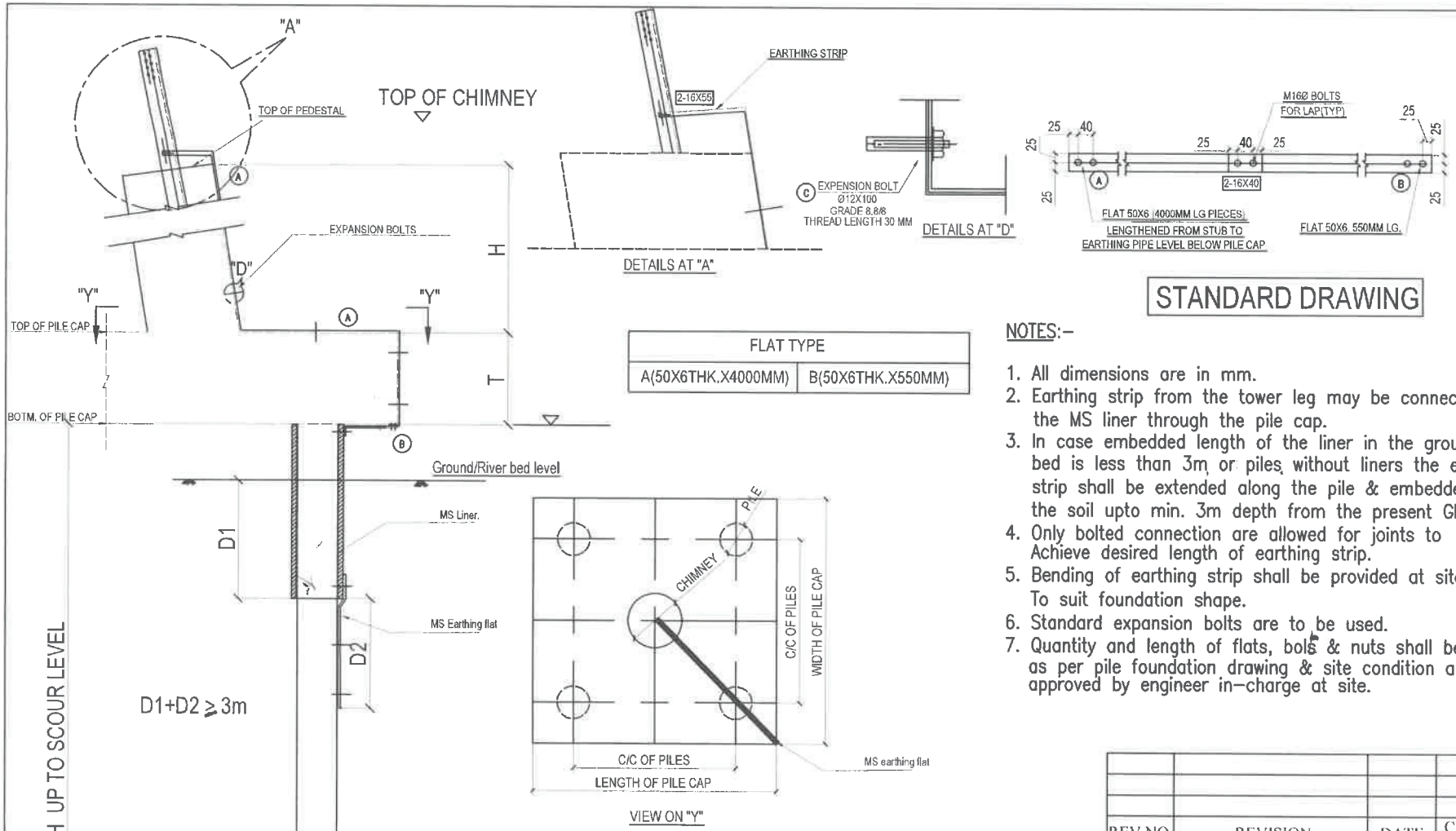
1. "L" is the length of insulator as per approved drawing for applicable E&M rating.
2. "D" is the diametre of Largest shed as per approved drawing.

STANDARD DRAWING

POWER GRID CORPORATION OF INDIA LIMITED

(A GOVERNMENT OF INDIA ENTERPRISE)

REVISION					CLEARED BY			TITLE: DRAWING FOR WATER RESISTANT INSULATOR PACKING		
REV. No	DESCRIPTION	CHKD	REVWD	APPD	CHECKED	REVIEWED	APPROVED	SCALE N.T.S.	DRAWING NO:CC:ENGG:TL:INSU:PACK	REV. 0



FLAT TYPE	
A(50X6THK.X4000MM)	B(50X6THK.X550MM)

STANDARD DRAWING

NOTES:-

1. All dimensions are in mm.
2. Earthing strip from the tower leg may be connected to the MS liner through the pile cap.
3. In case embedded length of the liner in the ground/river bed is less than 3m or piles without liners the earthing strip shall be extended along the pile & embedded in the the soil upto min. 3m depth from the present GL.
4. Only bolted connection are allowed for joints to Achieve desired length of earthing strip.
5. Bending of earthing strip shall be provided at site To suit foundation shape.
6. Standard expansion bolts are to be used.
7. Quantity and length of flats, bolts & nuts shall be determined as per pile foundation drawing & site condition and to be approved by engineer in-charge at site.

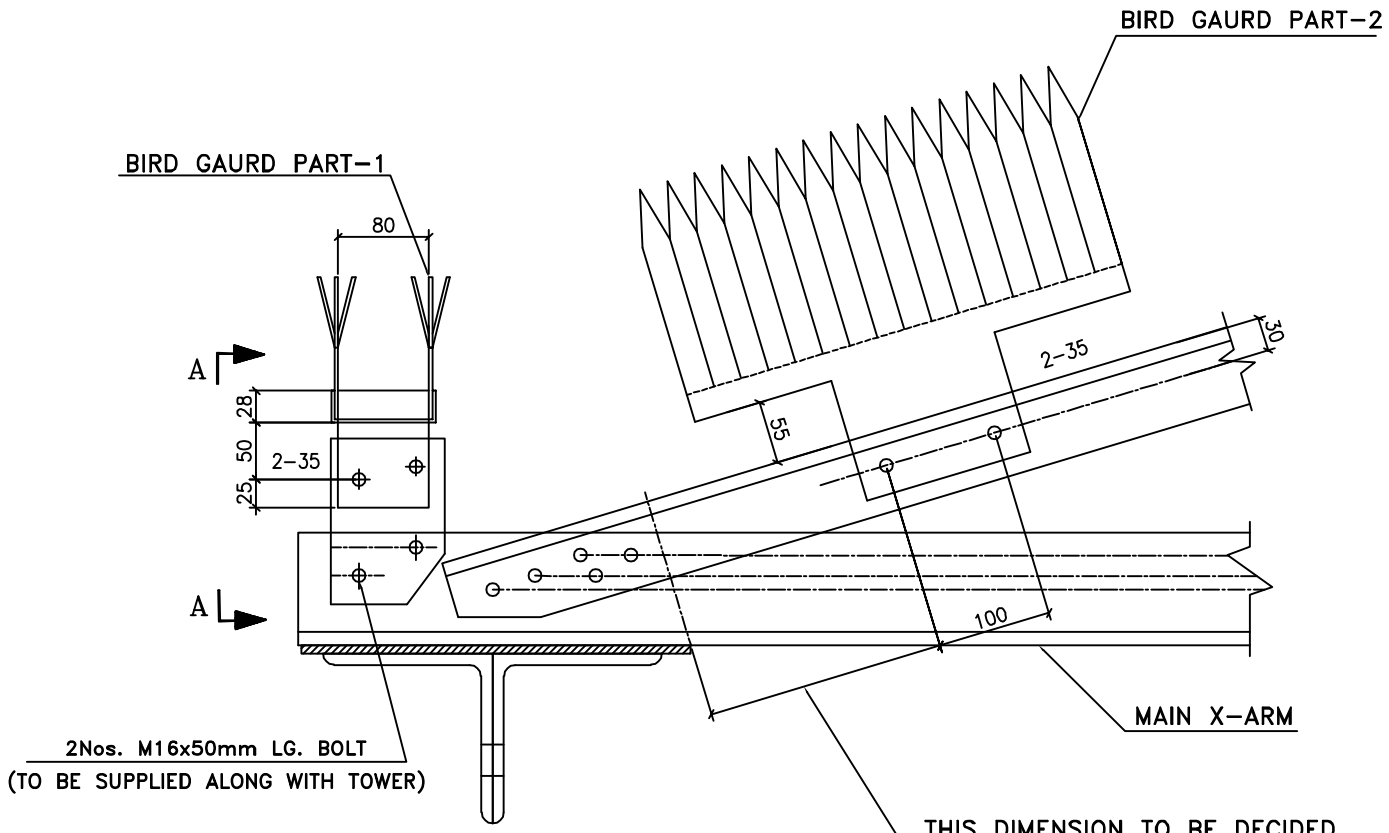
REV.NO.	REVISION	DATE	CHKD	APPD

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

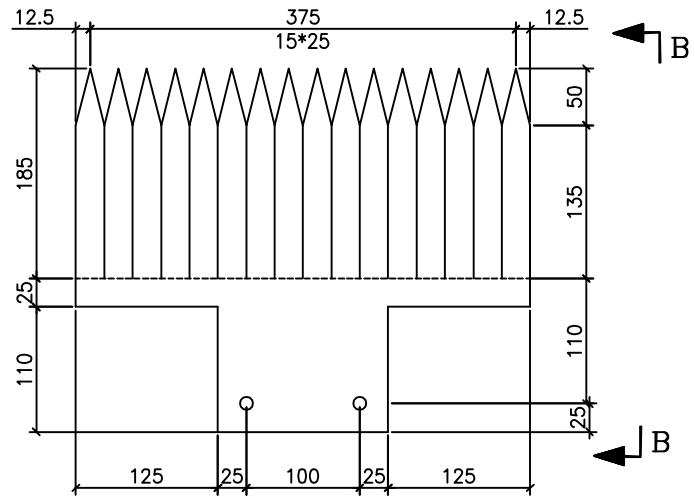
STANDARD DETAILS OF EARTHING FOR PILE FOUNDATION

REVISION	ISSUED BY	CLEARED BY
DATE		

DRAWN		CHECKED :	
DATE	26.6.19	APPROVED :	
SCALE	N.T.S.	CAD FILE:	
DRG.No.:	CC/STD/PILE/EAR/001	SHEETS: 1 OF 1	REV. 2

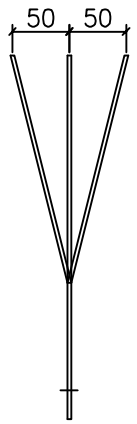


CROSS–ARM TIP DETAIL
(TYPE–1)

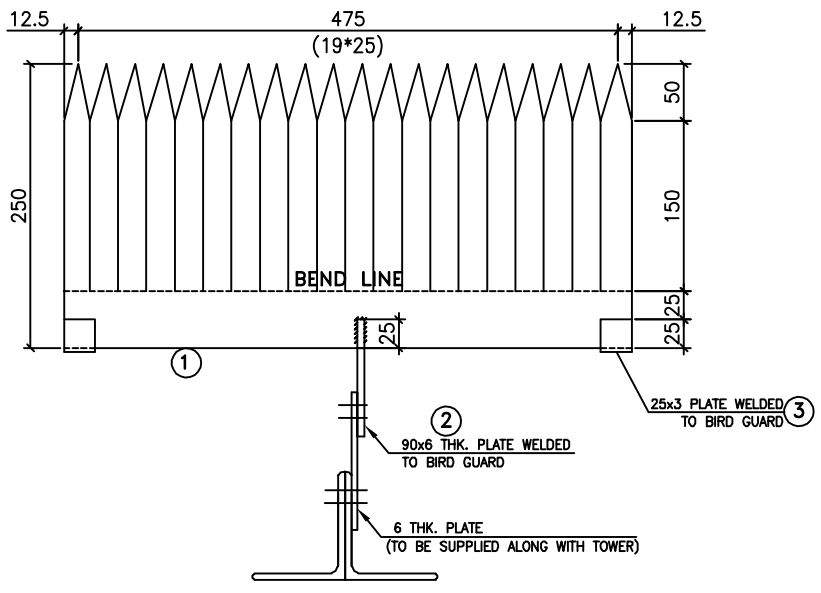


4 320x3THK.–400LG.
QTY: 2 NOS / SET

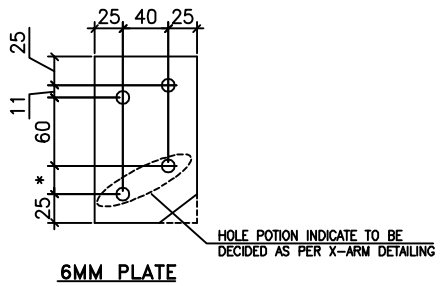
BIRD GUARD PART–2



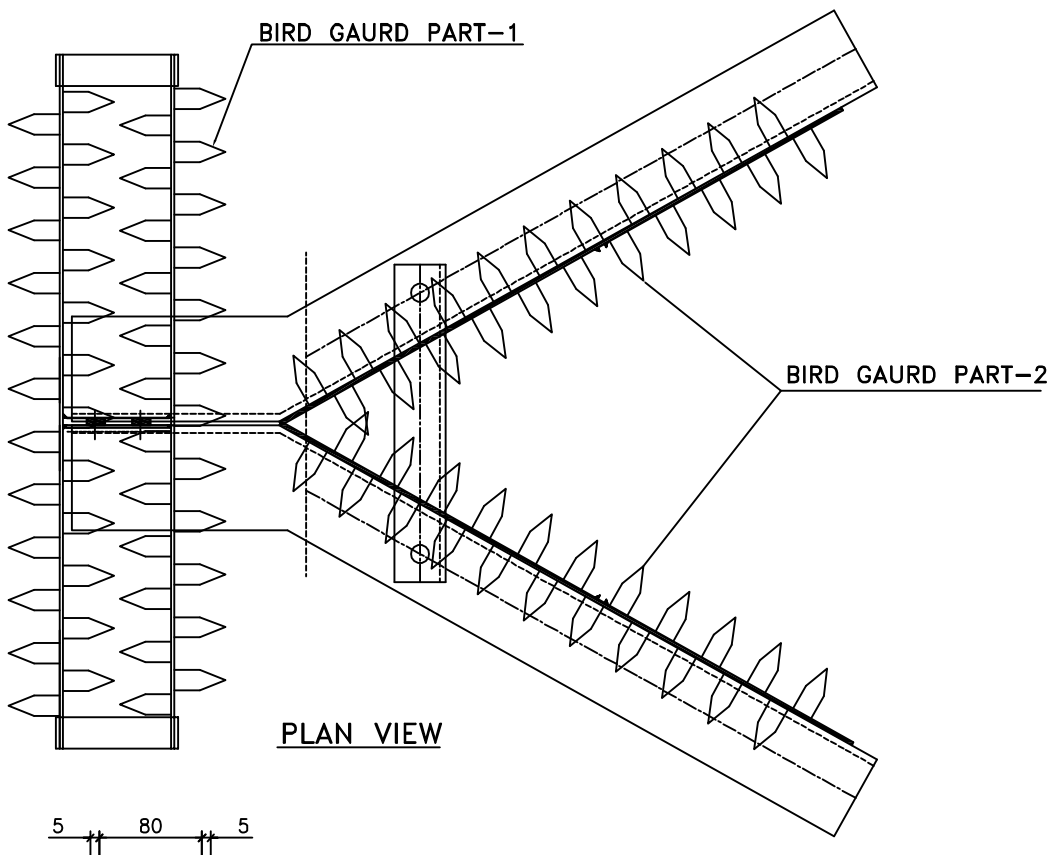
VIEW B–B



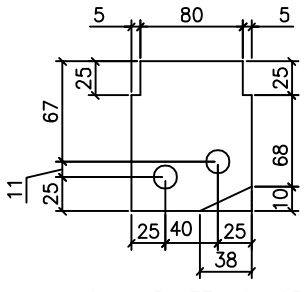
SECTION A–A



6MM PLATE
(TO BE SUPPLIED ALONG WITH TOWER)



PLAN VIEW



6mm PLATE 90x103Lg 2

MATERIAL LIST / SETS				
NO	DESC.	QTY./ SET	WT/PC (kg)	TOTAL (kg)
1	3 THK 250x500 LG	2	2.944	5.888
2	6 THK 90x103 LG	1	0.437	0.437
3	3 THK 25x140 LG	2	0.082	0.164
4	3 THK 320x400 LG	2	3.014	6.028
	16ø x35MM Lg B&N	6	0.119	0.714
	16ø 3.5mm SP.Washer	6	0.009	0.054
			GRD TOTAL=	13.285

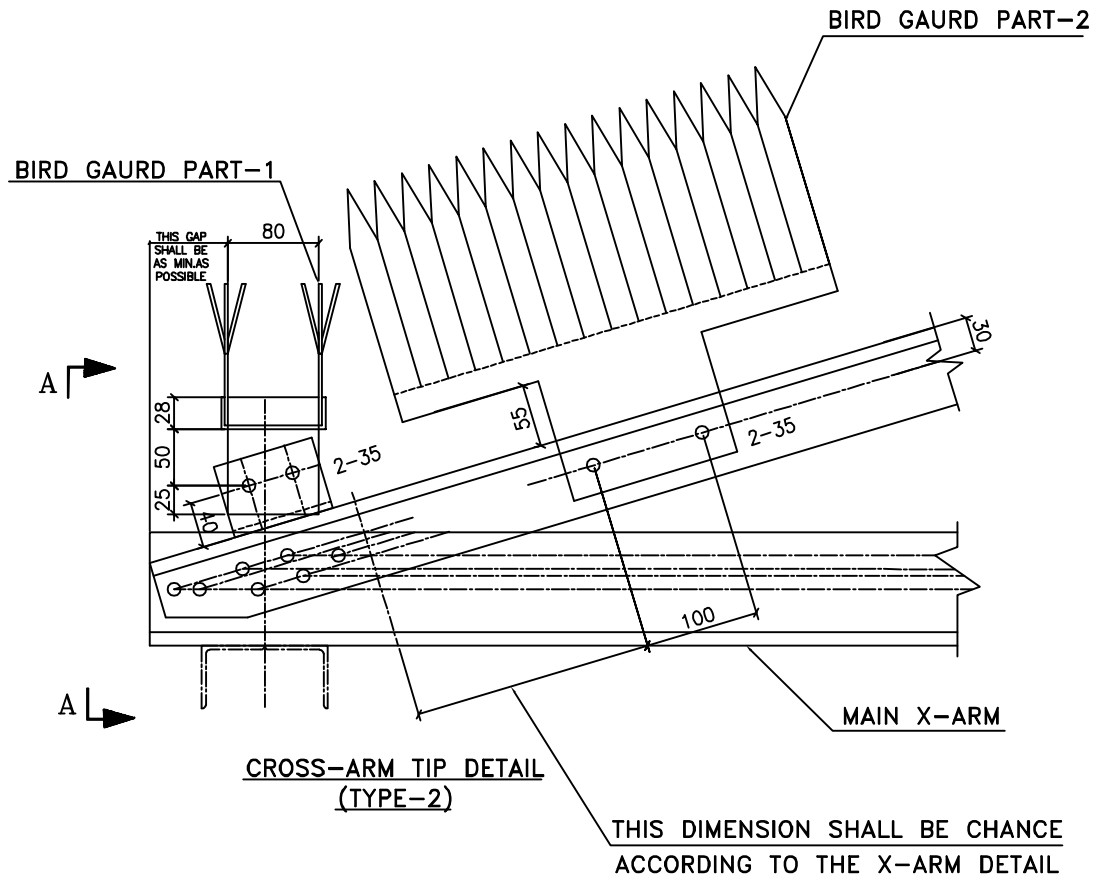
NOTES:–

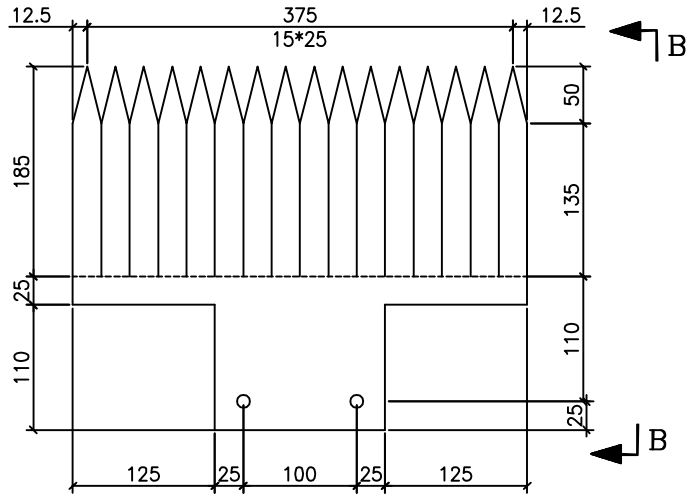
1. ALL DIMENSIONS ARE IN mm
2. GALVANIZED AFTER FABRICATION AS PER IS: 2629
3. FIXING ARRANGEMENT TO BE CHECK WITH TOWER.
4. SUITABLE PROVISION OF CLEAT/PLATE/HOLE/ TO BE PROVIDED ON SUSPENSION TOWER FACILITING INSTALLATION OF BIRD GUARD AFTER STRINGING
5. ONE SET OF BIRD GUARD FOR I–STRING (TYPE–1) INCLUDES
   A) BIRD GUARD PART–1(TYPE–1)= ONE NUMBER
   B) BIRD GUARD PART–2 = TWO NUMBER
6. HOLE FOR FIXING BG PART–2 TO BE ENSURED ON TOWER MEMBER
7. 6MM PLATE & 2Nos. M16x35 Lg BOLT & NUT TO BE SUPPLIED SUPPLIED ALONG WITH TOWER.

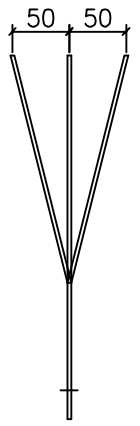
POWER GRID CORPORATION OF INDIA LIMITED

TITLE: **DETAIL OF BIRD GUARD FOR I–STRING (TYPE–1) REVISED**

DRAWING NO. CC: ENGG:TLACC:BG (1 of 2)

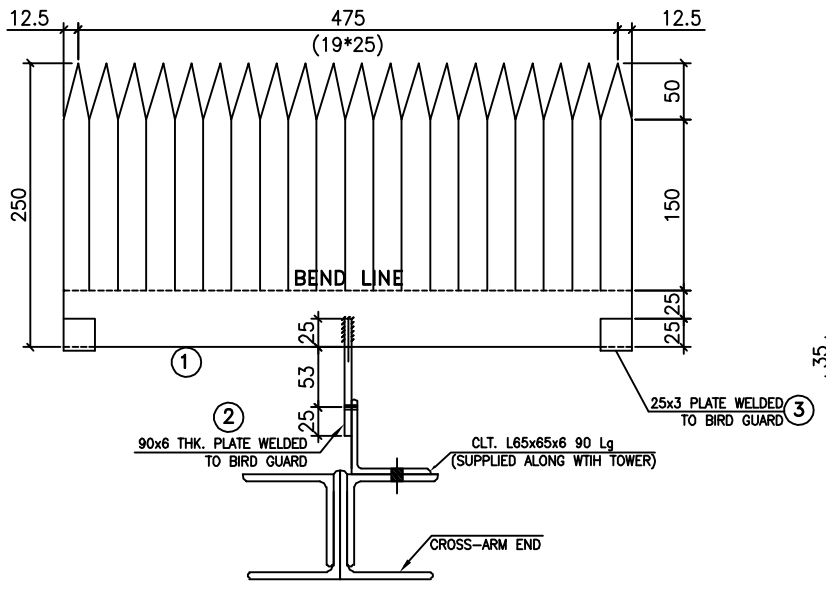




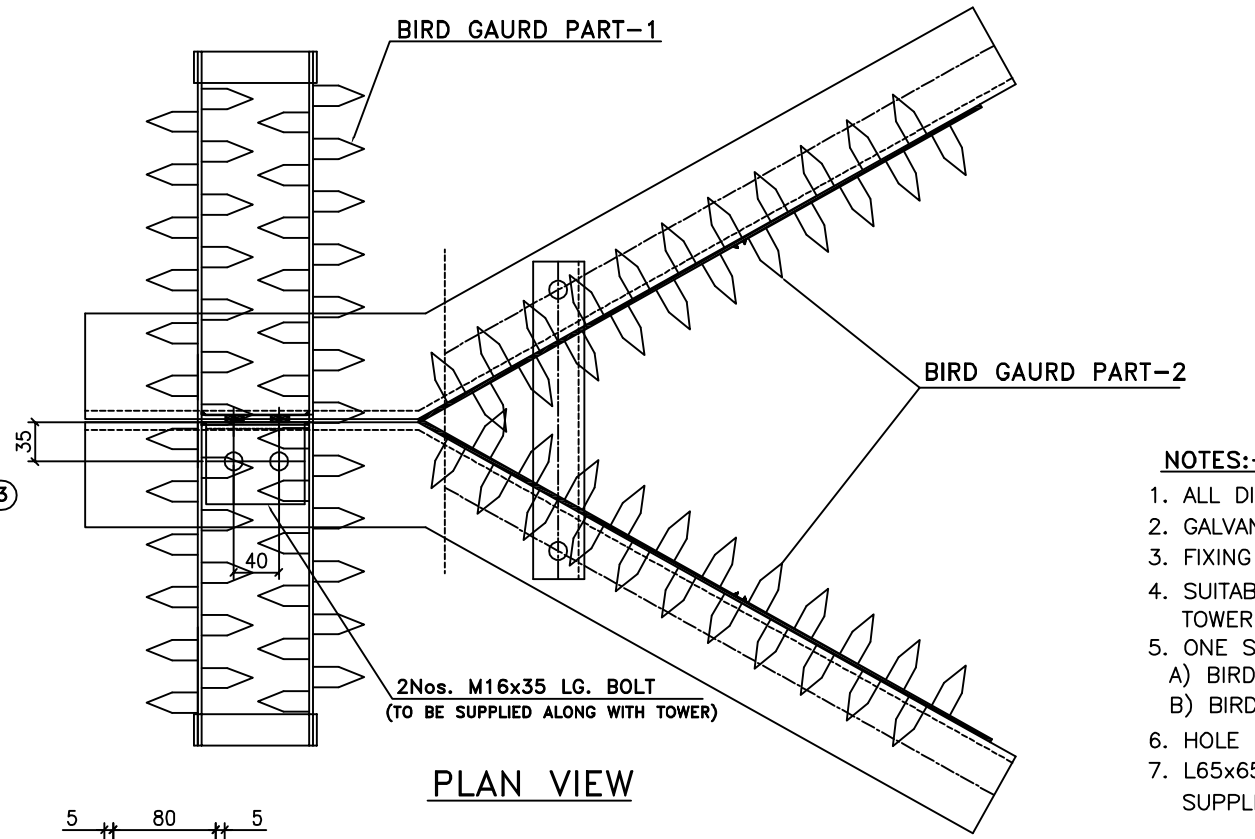


4 320x3THK.-400LG.
QTY: 2 NOS / SET

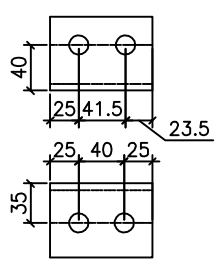
BIRD GUARD PART-2



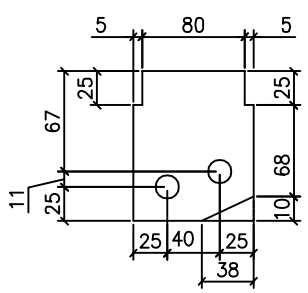
SECTION A-A



PLAN VIEW



CLT. L65x65x6 90Lg
(TO BE SUPPLIED ALONG WITH TOWER)



6mm PLATE 90x103Lg 2

MATERIAL LIST / SETS				
NO	DESC.	QTY./ SET	WT/PC (kg)	TOTAL (kg)
1	3 THK 250x500 LG	2	2.944	5.888
2	6 THK 90x103 LG	1	0.437	0.437
3	3 THK 25x140 LG	2	0.082	0.164
4	3 THK 320x400 LG	2	3.014	6.028
	16ø x35MM Lg B&N	6	0.119	0.714
	16ø 3.5mm SP.Washer	6	0.009	0.054
			GRD TOTAL=13.285	

NOTES:-

1. ALL DIMENSIONS ARE IN mm
2. GALVANIZED AFTER FABRICATION AS PER IS: 2629
3. FIXING ARRANGEMENT TO BE CHECK WITH TOWER.
4. SUITABLE PROVISION OF CLEAT/PLATE/HOLE/ TO BE PROVIDED ON SUSPENSION TOWER FACILITING INSTALLATION OF BIRD GUARD AFTER STRINGING
5. ONE SET OF BIRD GUARD FOR I-STRING (TYPE-2) INCLUDES
   A) BIRD GUARD PART-1(TYPE-2)= ONE NUMBER
   B) BIRD GUARD PART-2 = TWO NUMBER
6. HOLE FOR FIXING BG PART-2 TO BE ENSURED ON TOWER MEMBER
7. L65x65x6-90Lg & 2Nos. M16x35 Lg BOLT & NUT TO BE SUPPLIED SUPPLIED ALONG WITH TOWER.

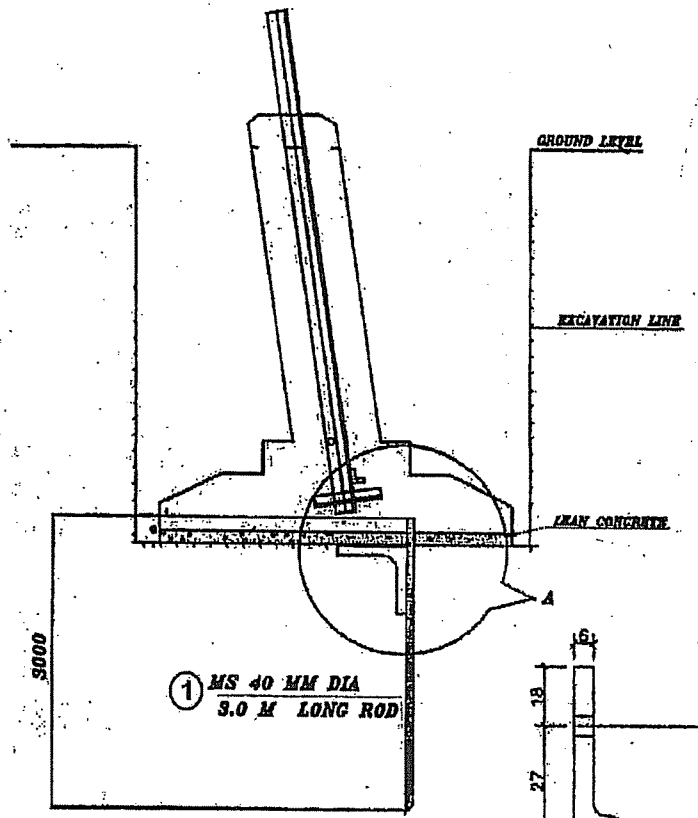
POWER GRID CORPORATION OF INDIA LIMITED

TITLE: **DETAIL OF BIRD GUARD FOR I-STRING (TYPE-2) REVISED**

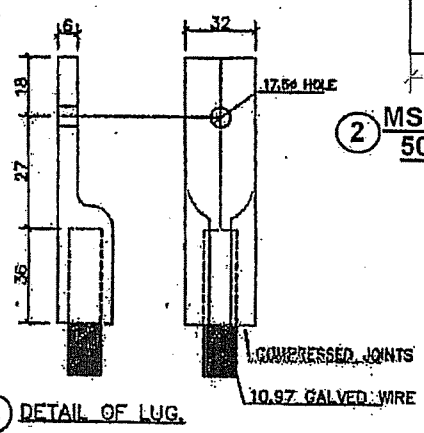
DRAWING NO. CC: ENGG:TLACC:BG (2 of 2)

Sr No	Size	Qty/ TWR
1	M16x40	1
2	16mm Dia 3.5mm Thk SP Washer	1

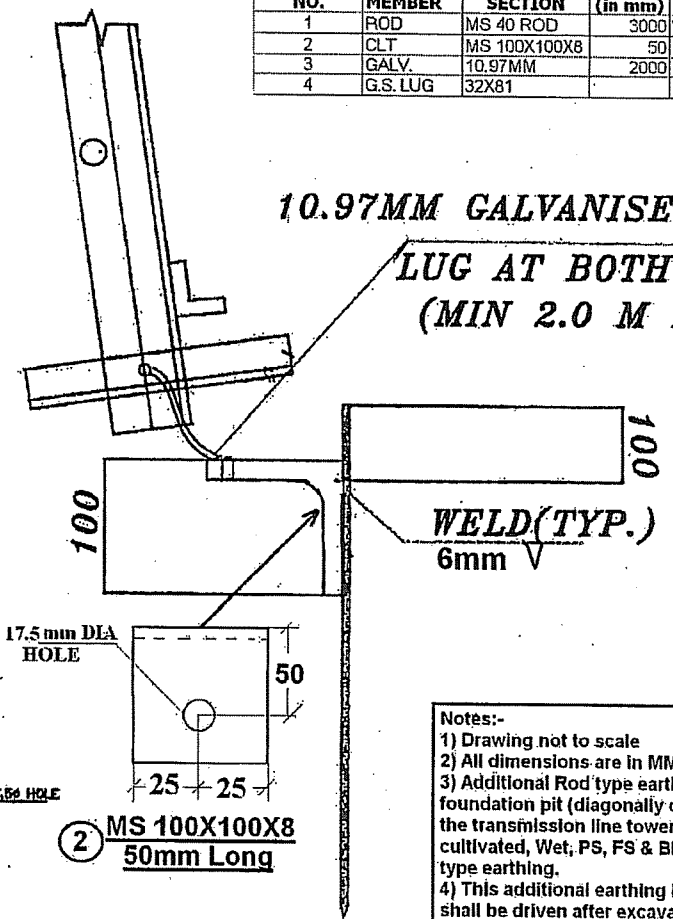
MARK NO.	MEMBER	SECTION	LENGTH (in mm)	Req/set	Remark
1	ROD	MS 40 ROD	3000 @	1	IS:2062-2011 Gr.250A
2	CLT	MS 100X100X8	50	1	(DESIGNATED YIELD-250MPa)
3	GALV.	10.97MM	2000	1	
4	G.S. LUG	32X81		2	



1 MS 40 MM DIA 3.0 M LONG ROD



4 DETAIL OF LUG.



10.97MM GALVANISED WIRE WITH G.S LUG AT BOTH END (MIN 2.0 M LENGTH) 3

WELD(TYP.) 6mm

2 MS 100X100X8 50mm Long

DETAIL A

Notes:-
1) Drawing not to scale
2) All dimensions are in MM unless otherwiss stated.
3) Additional Rod type earthing shall be provided in one of the foundation pit (diagonally opposite to pipe type earthing) of all the transmission line towers in normal soil (i.e.Dry, Wet cultivated, Wet, PS, FS & Black Cotton soil) in addition to pipe type earthing.
4) This additional earthing MS Rod of 40 mm dia & 3.0 M length shall be driven after excavation of foundation pit and connected to stub cleat.
5) Hot dip galvanising after welding

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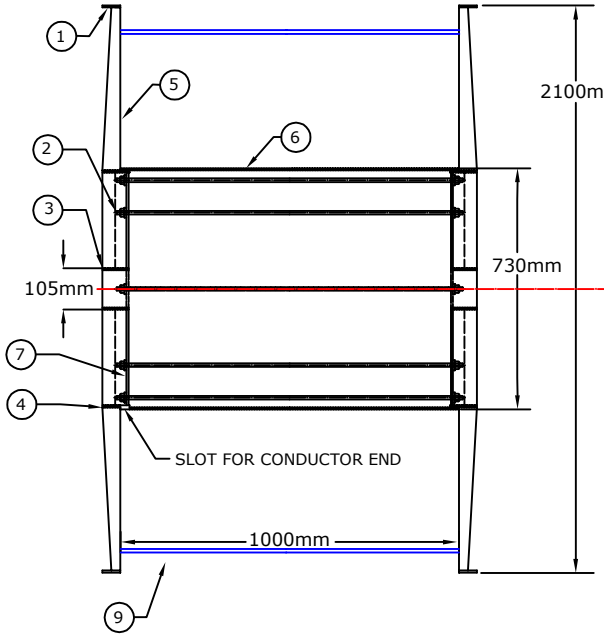
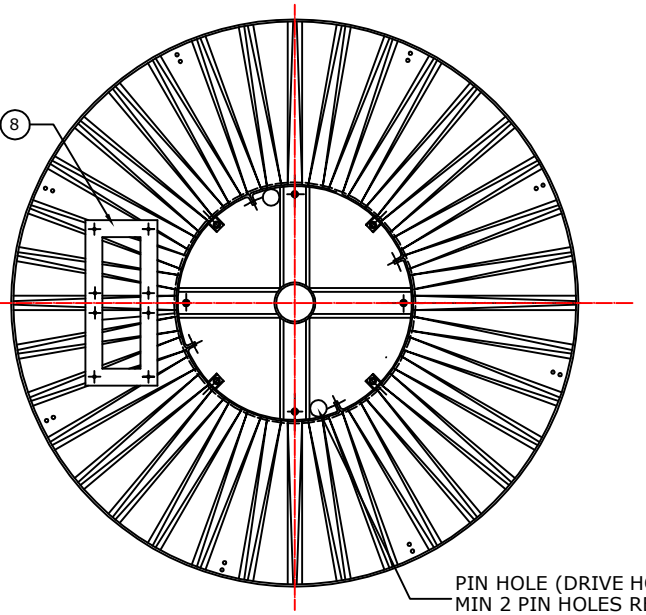
REVISION					CLEARED BY		
REV. No	DESCRIPTION	ISSUED BY	DATE	SIGN	DATE	SIGN	
			CLEARED BY		CHKD	CHKD	DSN

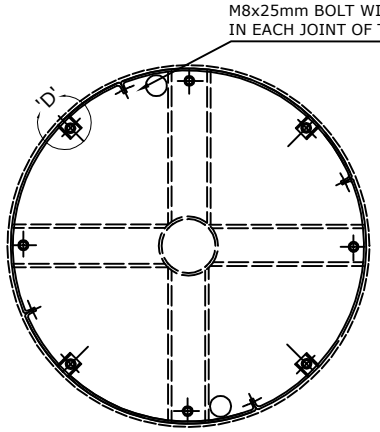
PROJECT: TRANSMISSION LINE

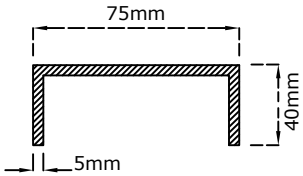
TITLE: STANDARD ROD TYPE EARTHING

SCALE N.T.S. | DRAWING NO:CC:ENGG/TL: STD/ROD/EARRH/001 | REV. 0



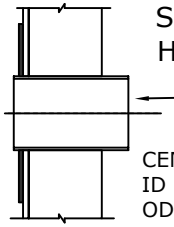






DETAIL at 'D'

BARREL IN MAXIMUM FOUR SEGMENTS



	NOTE :
(i)	Flanges shall have non corrosive primer coat and enamel paint .
(ii)	Washers are required on all bolts.
(iii)	Barrel and inner surface of flange shall have water proof protective HDPE sheet.
(iv)	Medium grade Craft/Crepe/Polythene Paper shall be used in between the Layers of Conductor.
(v)	Tolerance overall :+5mm.
(vi)	Tolerance on sheet metal :+0.1mm.
(vii)	Tolerance on other M.S items :+3mm.
(viii)	Tolerance on thickness for other M.S items :+0.5mm.
(ix)	Tolerance on bush :+2mm.
(x)	All dimensions are in mm
(xi)	All mild steel shall conform to IS-2062

	Name of the Parts	Material Specification	Quantity	Dimensions
1	OUTER RING	M.S.PLATE	2	63x8 mm (FLAT RING)
2	TIE ROD	M.S.ROD	8	18 mm DIA
3	CENTRE BUSH	M.S.PIPE	2	105 mm IDx115 mm OD
4	INNER RING	M.S.PLATE	2	100x6 mm
5	FLANGE	H.R.SHEET	Max 3 CORRUGATED SHEETS PER FLANGE	1.6 mm THICK (min 36 nos. of corrugations)
6	BARREL SHEET	H.R.SHEET	Max 4 SEGMENTS	2.5 mm THICK
7	CROSS ARM	MILD STEEL	4	100mmx70mm,6mm THICK OR MS CHANNEL 125mmX65mmX6.6mm (LC125)
8	FRAME SIZE(FOR MARKING)			250mmx400mm (APPROX)
9	SOLID PP SHEET	POLY PROPYLENE		5 mm THICK (min)

STANDARD DRAWING

STANDARD CONDUCTOR LENGTH	LAPWING	BERSIMIS	MOOSE	SNOWBIRD	ZEBRA	PANTHER
L in Meters	1800	2100	2100	2100	2200	2300

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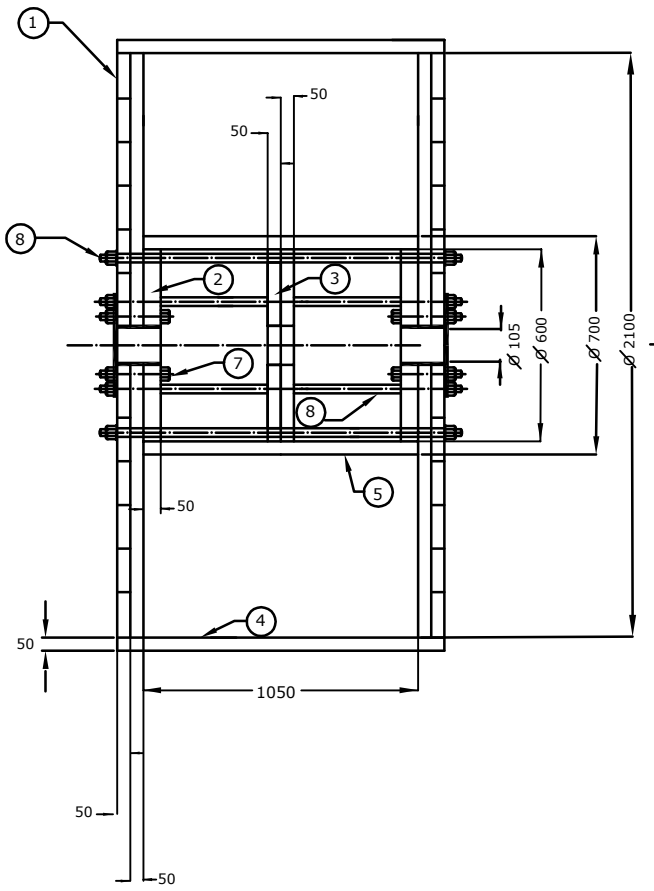
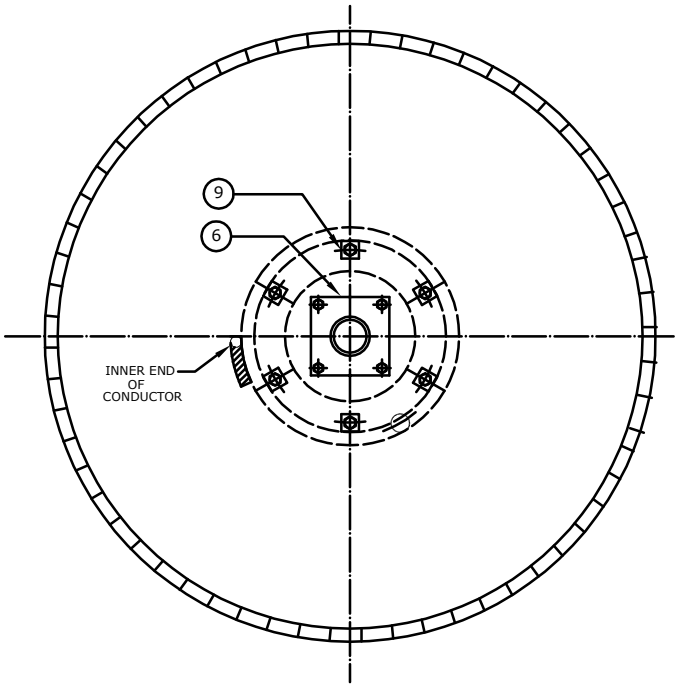
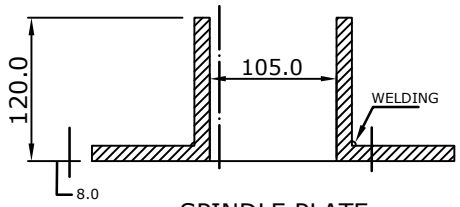
REVISION							
1	Note no. 4 added.				CLEARED BY		
REV. No	DESCRIPTION	CHKD	REVWD	APPD	CHECKED	REVIEWED	APPROVED

TITLE: **STEEL DRUM DRAWING**
FOR ACSR/ AAAC/ AI59 CONDUCTOR

SCALE	DRAWING NO:CC:ENGG:TL:COND:ST	REV.
N.T.S.		1







SPINDLE PLATE

NOTE :

1.	ALL DIMENSIONS ARE IN MM.
2.	DRUMS SHALL GENERALLY CONFIRM TO IS 1778-1980 AMMENDMMENT No.1 Of june 1989 EXCEPT OTHERWISE SPECIFIED.
3.	ONE LENGTH OF CONDUCTOR SHALL BE WOUND ON EVERY DRUM
4.	THE STANDARD LENGTH OF THE CONDUCTOR AND EQUIVALENT SIZE OF CONDUCTOR IS L mtrs (INIDCATED IN THE TABLE BELOW) WITH TOLERANCE OF ± 5%.
5.	TOLERANCE ON DIMENSIONS OF WOOD IS + 3mm.
6.	TOLERANCE ON STEEL COMPONENTS OF THE DRUM IS ± 0.50mm.
7.	INNER & OUTER SURFACE OF FLANGE & BARREL SHALL BE BITUMIN PAINTED.
8.	BARREL & INNER SURFACE OF FLANGE SHALL HAVE WATER PROOF HDPE SHEET
9.	OUTER SURFACE OF CONDUCTOR SHALL BE COVERED BY WATER PROOF POLYTHENE PAPER
10.	MEDIUM GRADE CRAFT/CREPE/POLYTHENE PAPER SHALL BE USED IN BETWEEN THE LAYERS
11.	ALL NUTS OF ROD SHOULD BE TACK WELDED.
12.	3 nos. BINDER SHALL BE USED FOR BINDING THE EXTERNAL LAGGING.
13.	FLANGE SHALL BE NAILED IN 5 CIRCLES WITH NAIL SIZE OF 125X4.

STANDARD DRAWING

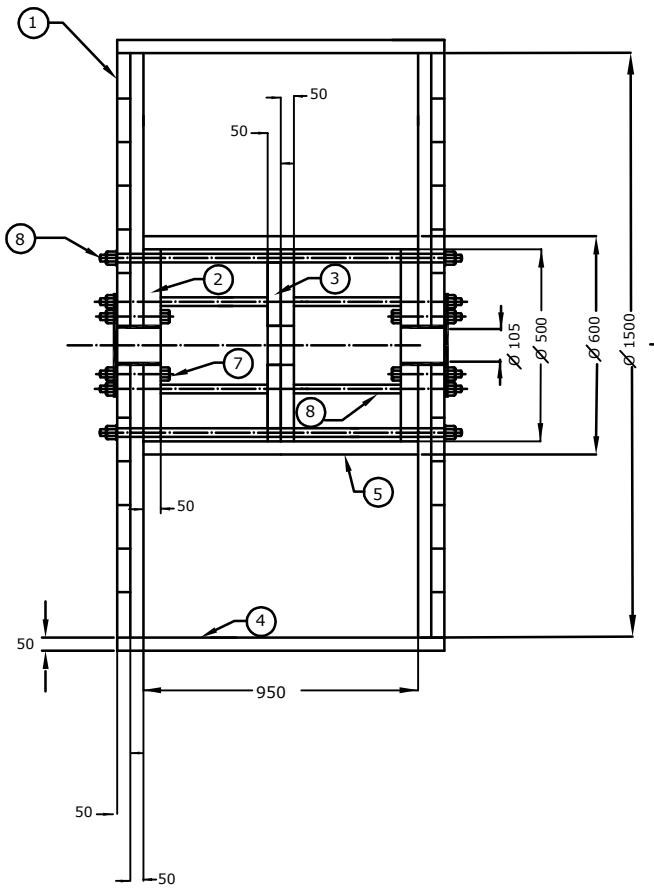
STANDARD CONDUCTOR LENGTH	LAPWING	BERSIMIS	MOOSE	SNOWBIRD	ZEBRA
L in Meters	1800	2100	2100	2100	2200

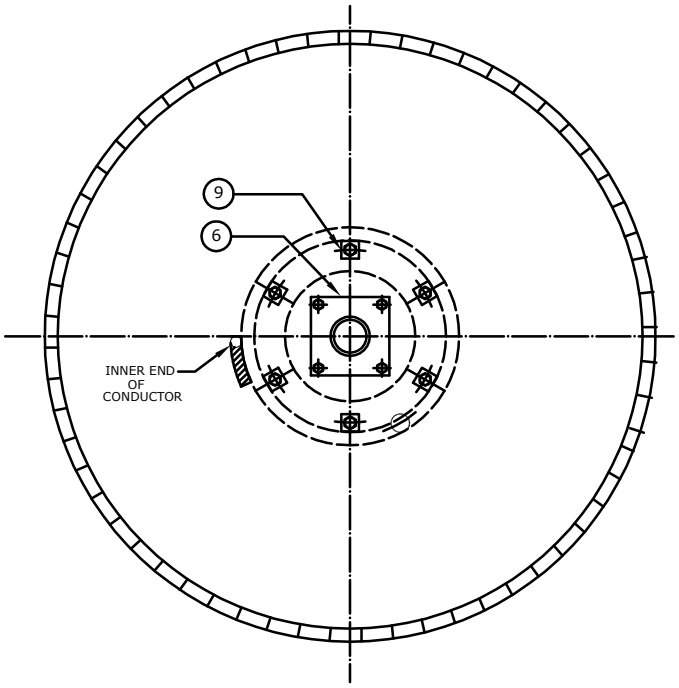
	DRUM COMPONENTS	MATERIAL SPECIFICATION	QUANTITY	DIMENSION
1.	FLANGE	SEASONED WOOD	2	Ø 2100x100(50+50)
2.	BARREL END SUPPORTS	SEASONED WOOD	2	Ø 600x50
3.	BARREL MIDDLE SUPPORT	SEASONED WOOD	1	Ø 600x100(50+50)
4.	OUTER LAGGING	SEASONED WOOD	--	1250x50
5.	BARREL BATTENS	SEASONED WOOD	--	1050x75x50
6.	SPINDLE PLATE	MS	2	300x300x8
7.	BUSH PLATE STUD	MS	8	Ø 16X180
8.	TIE ROD	MS	6	Ø 22X1325
9.	TIE ROD WASHER	MS	12	75x75x6

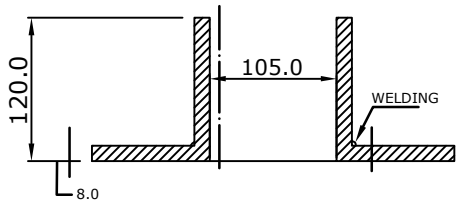
POWER GRID CORPORATION OF INDIA LIMITED

(A GOVERNMENT OF INDIA ENTERPRISE)

REVISION					CLEARED BY			TITLE: WOODEN DRUM DRAWING FOR ACSR/AAAC/AI59 CONDUCTOR	
REV. No	DESCRIPTION	CHKD	REVWD	APPD	CHECKED	REVIEWED	APPROVED	SCALE N.T.S.	DRAWING NO:CC:ENGG:TL:COND:WD / REV. 0







SPINDLE PLATE

NOTE :

1.	ALL DIMENSIONS ARE IN MM.
2.	DRUMS SHALL GENERALLY CONFIRM TO IS 1778-1980 AMMENDMMENT No.1 Of june 1989 EXCEPT OTHERWISE SPECIFIED.
3.	ONE LENGTH OF CONDUCTOR SHALL BE WOUND ON EVERY DRUM
4.	THE STANDARD LENGTH OF THE CONDUCTOR AND EQUIVALENT SIZE OF CONDUCTOR IS L mtrs (INIDCATED IN THE TABLE BELOW) WITH TOLERANCE OF ± 5%.
5.	TOLERANCE ON DIMENSIONS OF WOOD IS + 3mm.
6.	TOLERANCE ON STEEL COMPONENTS OF THE DRUM IS ± 0.50mm.
7.	INNER & OUTER SURFACE OF FLANGE & BARREL SHALL BE BITUMIN PAINTED.
8.	BARREL & INNER SURFACE OF FLANGE SHALL HAVE WATER PROOF HDPE SHEET
9.	OUTER SURFACE OF CONDUCTOR SHALL BE COVERED BY WATER PROOF POLYTHENE PAPER
10.	MEDIUM GRADE CRAFT/CREPE/POLYTHENE PAPER SHALL BE USED IN BETWEEN THE LAYERS
11.	ALL NUTS OF ROD SHOULD BE TACK WELDED.
12.	3 nos. BINDER SHALL BE USED FOR BINDING THE EXTERNAL LAGGING.
13.	FLANGE SHALL BE NAILED IN 5 CIRCLES WITH NAIL SIZE OF 125X4.

	DRUM COMPONENTS	MATERIAL SPECIFICATION	QUANTITY	DIMENSION
1.	FLANGE	SEASONED WOOD	2	Ø 1500x100(50+50)
2.	BARREL END SUPPORTS	SEASONED WOOD	2	Ø 500x50
3.	BARREL MIDDLE SUPPORT	SEASONED WOOD	1	Ø 500x100(50+50)
4.	OUTER LAGGING	SEASONED WOOD	--	1150x50
5.	BARREL BATTENS	SEASONED WOOD	--	950x75x50
6.	SPINDLE PLATE	MS	2	300x300x8
7.	BUSH PLATE STUD	MS	8	Ø 16X180
8.	TIE ROD	MS	6	Ø 22X1325
9.	TIE ROD WASHER	MS	12	75x75x6

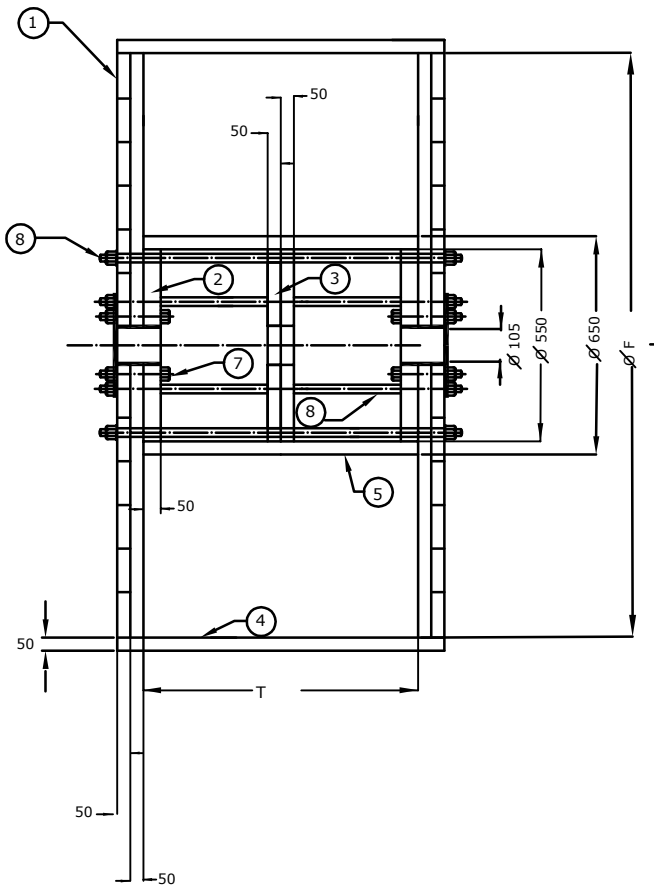
STANDARD CONDUCTOR LENGTH	ACSR PANTHER
L in Meters	2300

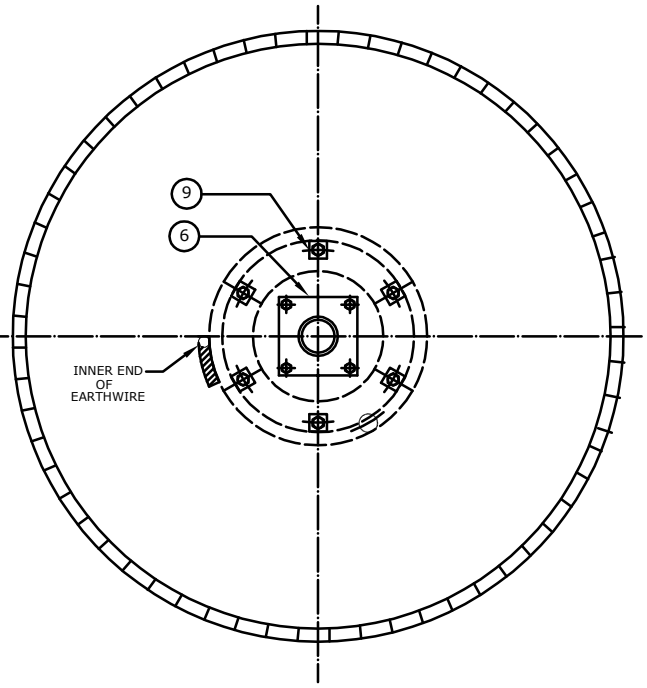
STANDARD DRAWING

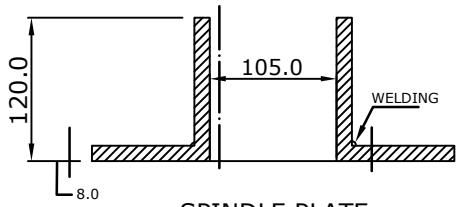
POWER GRID CORPORATION OF INDIA LIMITED

(A GOVERNMENT OF INDIA ENTERPRISE)

REVISION					CLEARED BY			TITLE: WOODEN DRUM DRAWING FOR ACSR/AAAC/AL59 PANTHER CONDUCTOR	
REV. No	DESCRIPTION	CHKD	REVWD	APPD	CHECKED	REVIEWED	APPROVED	SCALE N.T.S.	DRAWING NO:CC:ENGG:TL:COND:WD–2 / REV. 0







SPINDLE PLATE

NOTE :

1.	ALL DIMENSIONS ARE IN MM.
2.	DRUMS SHALL GENERALLY CONFIRM TO IS 1778-1980 AMMENDMMENT No.1 Of june 1989 EXCEPT OTHERWISE SPECIFIED.
3.	TWO LENGTH OF EARTHWIRE SHALL BE WOUND ON EVERY DRUM
4.	THE STANDARD LENGTH OF THE EARTHWIRE AND EQUIVALENT SIZE OF EARTHWIRE IS L mtrs (INIDCATED IN THE TABLE BELOW) WITH TOLERANCE OF ± 5%.
5.	TOLERANCE ON DIMENSIONS OF WOOD IS + 3mm.
6.	TOLERANCE ON STEEL COMPONENTS OF THE DRUM IS ± 0.50mm.
7.	INNER & OUTER SURFACE OF FLANGE & BARREL SHALL BE BITUMIN PAINTED.
8.	BARREL & INNER SURFACE OF FLANGE SHALL HAVE WATER PROOF HDPE SHEET
9.	OUTER SURFACE OF CONDUCTOR SHALL BE COVERED BY WATER PROOF POLYTHENE PAPER
10.	MEDIUM GRADE CRAFT/CREPE/POLYTHENE PAPER SHALL BE USED IN BETWEEN THE LAYERS
11.	ALL NUTS OF ROD SHOULD BE TACK WELDED.
12.	3 nos. BINDER SHALL BE USED FOR BINDING THE EXTERNAL LAGGING.
13.	FLANGE SHALL BE NAILED IN 5 CIRCLES WITH NAIL SIZE OF 125X4.

STANDARD DRAWING

	7/3.15 MM EARTHWIRE	7/3.66 MM EARTHWIRE	7/4.5 MM EARTHWIRE	19/3.0 MM EARTHWIRE
STANDARD LENGTH L in Meters	2300	2000	2000	2000
TRAVERSE,T (in MM)	700	700	700	900
FLANGE, F (in MM)	1400	1400	1500	1500

	DRUM COMPONENTS	MATERIAL SPECIFICATION	QUANTITY	DIMENSION
1.	FLANGE	SEASONED WOOD	2	Ø F x100(50+50)
2.	BARREL END SUPPORTS	SEASONED WOOD	2	Ø 550x50
3.	BARREL MIDDLE SUPPORT	SEASONED WOOD	1	Ø 550x100(50+50)
4.	OUTER LAGGING	SEASONED WOOD	--	(T+200)x50
5.	BARREL BATTENS	SEASONED WOOD	--	Tx75x50
6.	SPINDLE PLATE	MS	2	200X200X6
7.	BUSH PLATE STUD	MS	8	Ø 16X195
8.	TIE ROD	MS	6	Ø 16X(T+250)
9.	TIE ROD WASHER	MS	24	65X65X6

REVISION

REV. No	DESCRIPTION	CHKD	REVWD	APPD

CLEARED BY

CHECKED	REVIEWED	APPROVED

POWER GRID CORPORATION OF INDIA LIMITED

(A GOVERNMENT OF INDIA ENTERPRISE)

TITLE: WOODEN DRUM DRAWING FOR EARTHWIRE

SCALE	DRAWING NO:CC:ENGG:TL:EW:WD	REV.
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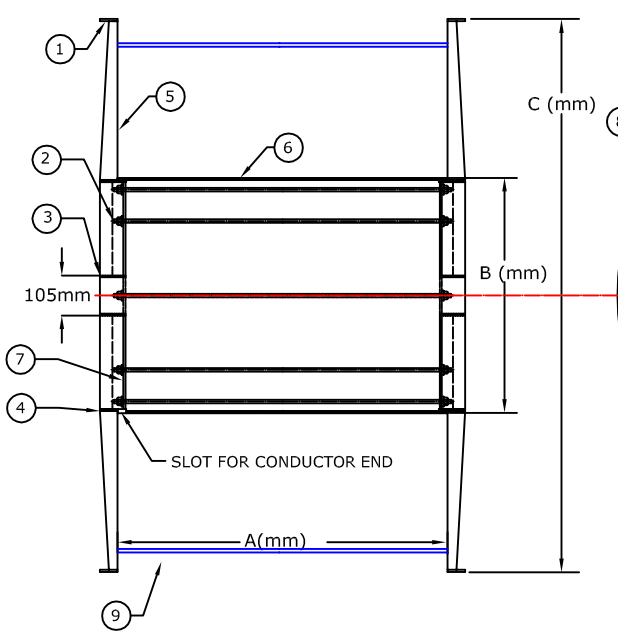
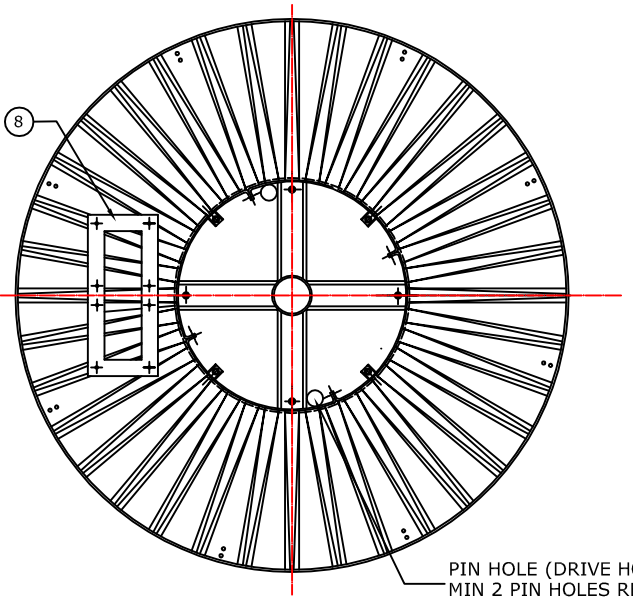
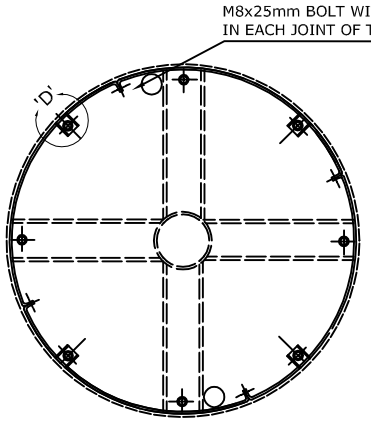
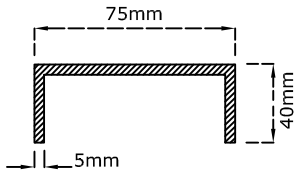




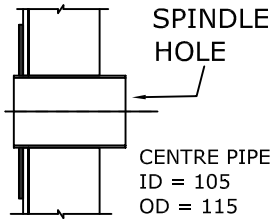
PIN HOLE (DRIVE HOLE)
MIN 2 PIN HOLES REQUIRED PER FLANGE
DIA = 65mm (5mm thick)
LENGTH=70mm





DETAIL at 'D'

BARREL IN MAXIMUM FOUR SEGMENTS



	NOTE :
(i)	Flanges shall have non corrosive primer coat and enamel paint .
(ii)	Washers are required on all bolts.
(III)	Barrel and inner surface of flange shall have water proof protective HDPE sheet.
(iv)	Medium grade Craft/Crepe/Polythene Paper shall be used in between the Layers of Conductor.
(v)	Tolerance overall :+5mm.
(vi)	Tolerance on sheet metal :+0.1mm.
(vii)	Tolerance on other M.S items :+3mm.
(viii)	Tolerance on thickness for other M.S items :+0.5mm.
(Ix)	Tolerance on bush :+2mm.
(x)	All dimensions are in mm
(xi)	All mild steel shall conform to IS-2062

	Name of the Parts	Material Specification	Quantity	Dimensions
1	OUTER RING	M.S.PLATE	2	63x8 mm (FLAT RING)
2	TIE ROD	M.S.ROD	8	18 mm DIA
3	CENTRE BUSH	M.S.PIPE	2	105 mm IDx115 mm OD
4	INNER RING	M.S.PLATE	2	100x6 mm
5	FLANGE	H.R.SHEET	Max 3 CORRUGATED SHEETS PER FLANGE	1.6 mm THICK (min 36 nos. of corrugations)
6	BARREL SHEET	H.R.SHEET	Max 4 SEGMENTS	2.5 mm THICK
7	CROSS ARM	MILD STEEL	4	100mmx70mm,6mm THICK OR MS CHANNEL 125mmX65mmX6.6mm (LC125)
8	FRAME SIZE(FOR MARKING)			250mmx400mm (APPROX)
9	SOLID PP SHEET	POLY PROPYLENE		5 mm THICK (min)

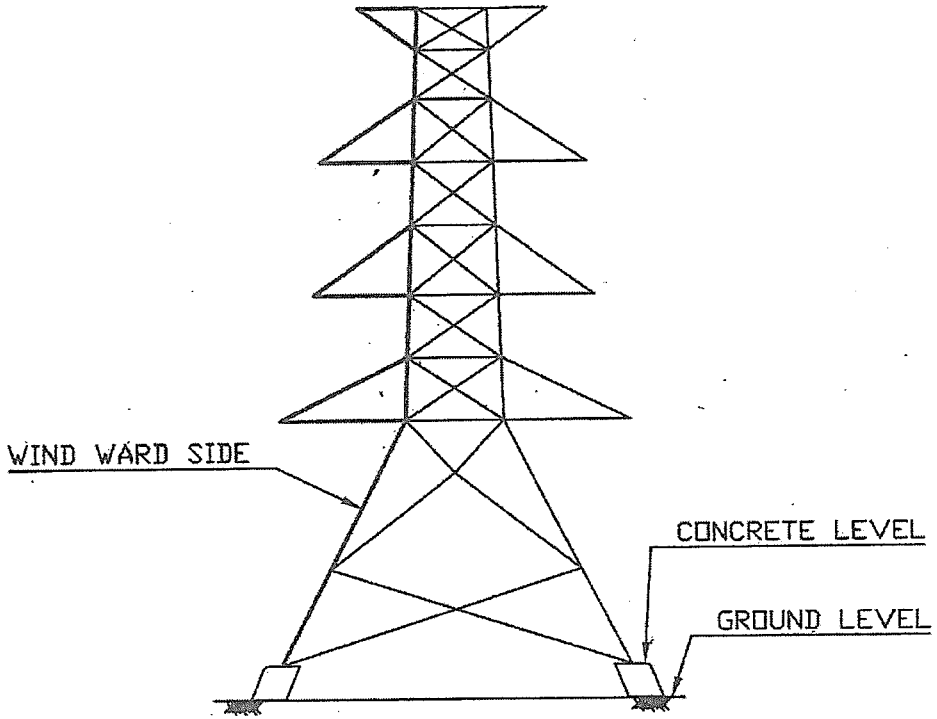
STANDARD CONDUCTOR LENGTH (in Meters)	A (in mm)	B (in mm)	C (in mm)
.....	.....	.....	.....

Note : Standard Length & Dimensions A, B & C shall be furnished by HTLS conductor supplier.

STANDARD DRAWING

पावरग्रिड POWERGRID

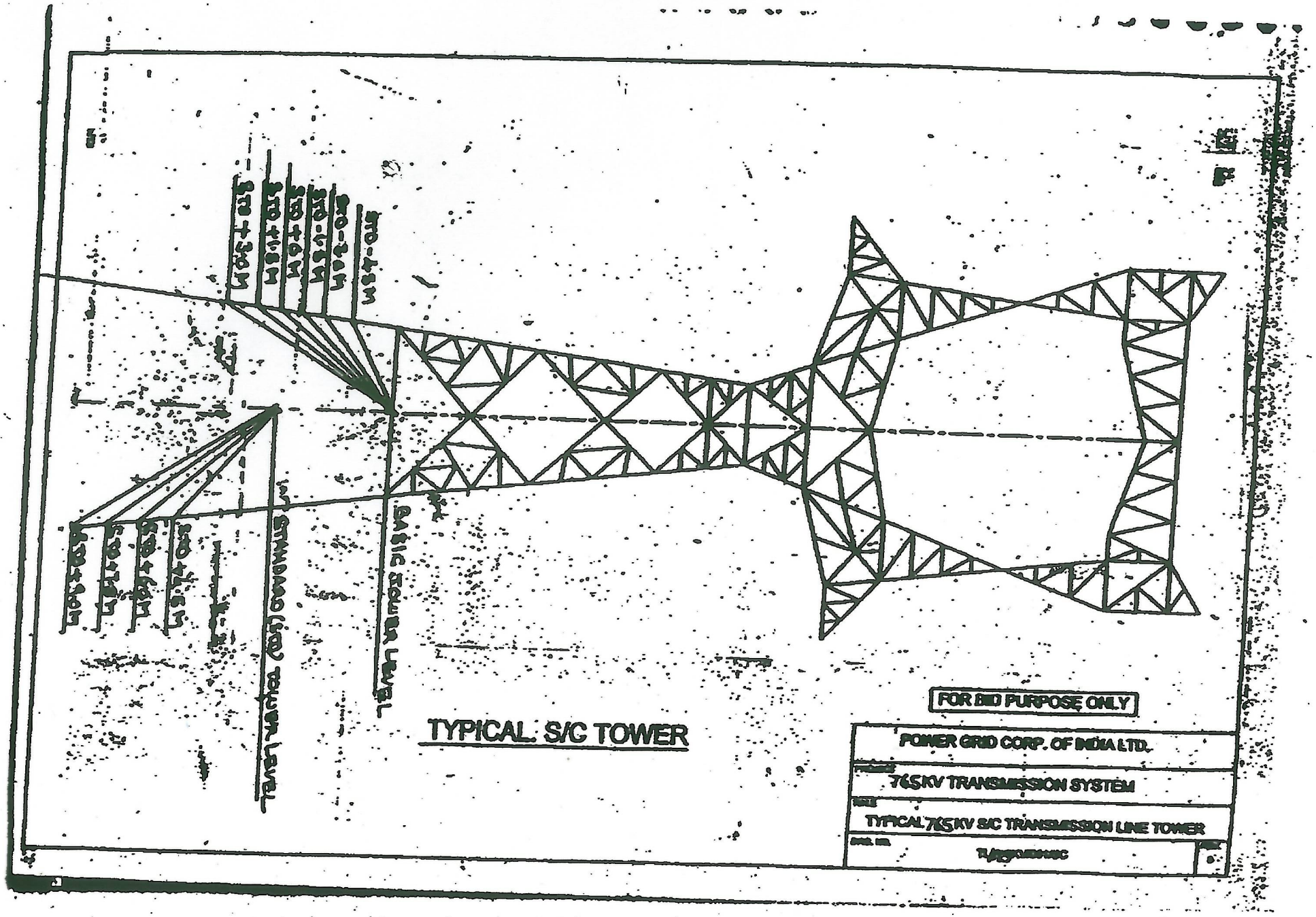
REVISION					CLEARED BY			PROJECT DETAILS:	
								TITLE: STEEL DRUM DRAWING FOR HTLS CONDUCTOR	
REV. No	DESCRIPTION	CHKD	REVWD	APPD	CHECKED	REVIEWED	APPROVED	SCALE N.T.S.	DRAWING NO:CC:ENGG:TL:COND:ST / REV. 0



TYPICAL. D/C.TOWER

FOR BID PURPOSE ONLY

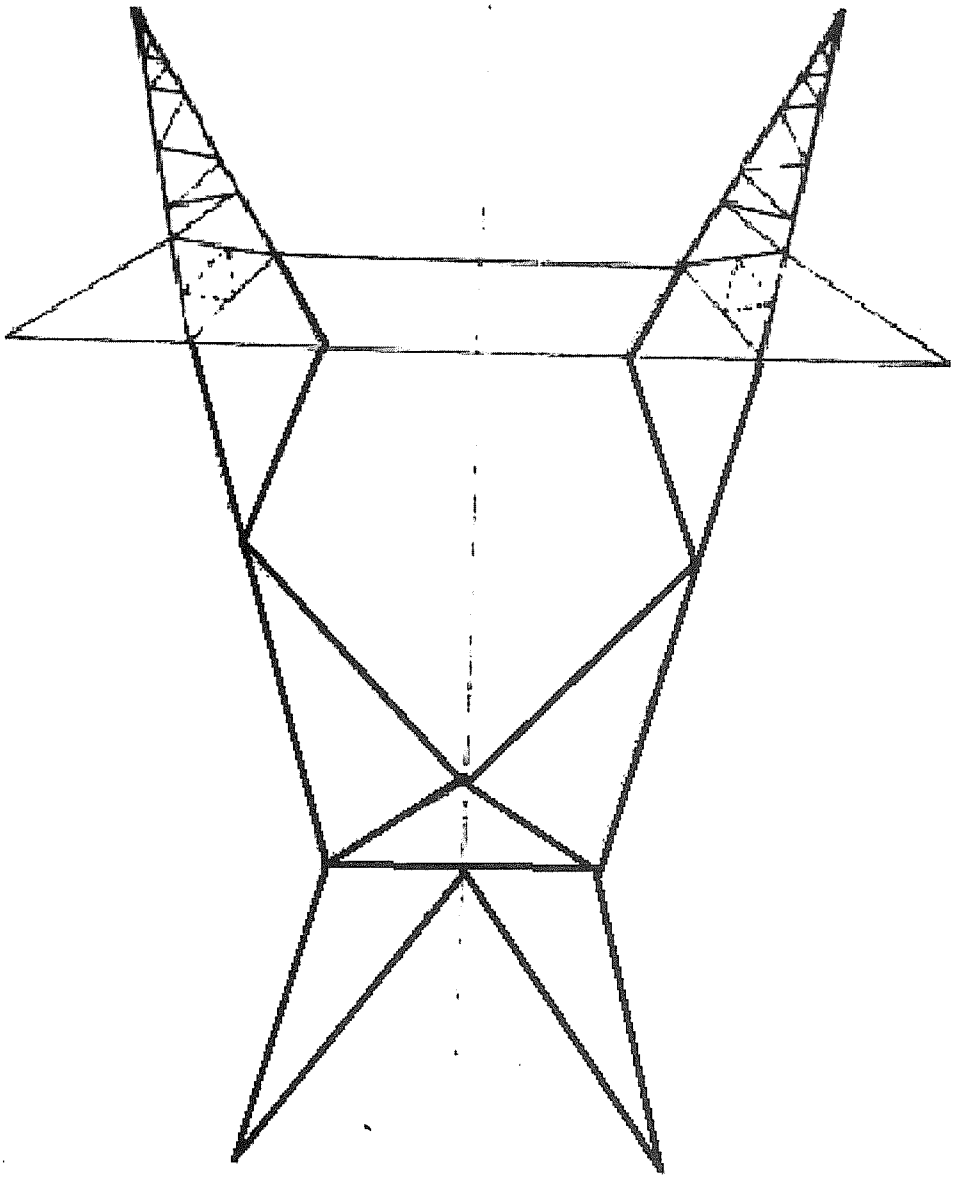
POWER GRID CORP. OF INDIA LTD.	
PROJECT: 765 kv / 400 kv Transmission System	
TITLE: TYPICAL 765/400kV TRANS. TOWER	
DRG. NO.: TL/765/400KV/DC	REV.: 0



TYPICAL S/C TOWER

FOR BID PURPOSE ONLY

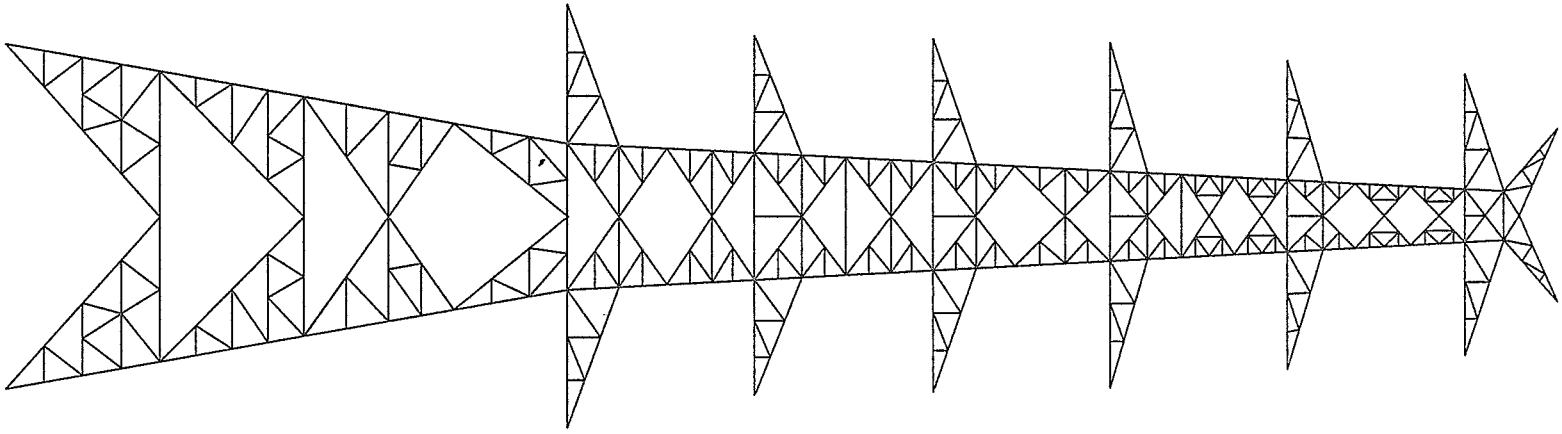
POWER GRID CORP. OF INDIA LTD.
765KV TRANSMISSION SYSTEM
TYPICAL 765KV S/C TRANSMISSION LINE TOWER
[illegible]



TYPICAL S/C HORIZONTAL TOWER

FOR BID PURPOSE ONLY

POWERGRID CORPORATION OF INDIA LTD.
Project: 765kV S/C Horizontal Towers
Drg no. TL/765/SC/HORI



TYPICAL MULTI CITCUIT TOWER.

FOR BID PURPOSE ONLY.

POWER GRID CORPORATION
OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

REVISION					CLEARED BY			PROJECT: TRANSMISSION LINE TOWER	
REV. No	DESCRIPTION	CHKD	REVWD	APPD	CHECKED	REVIEWED	APPROVED	TITLE: TYPICAL MULTICIRCUIT TOWER SKETCH	
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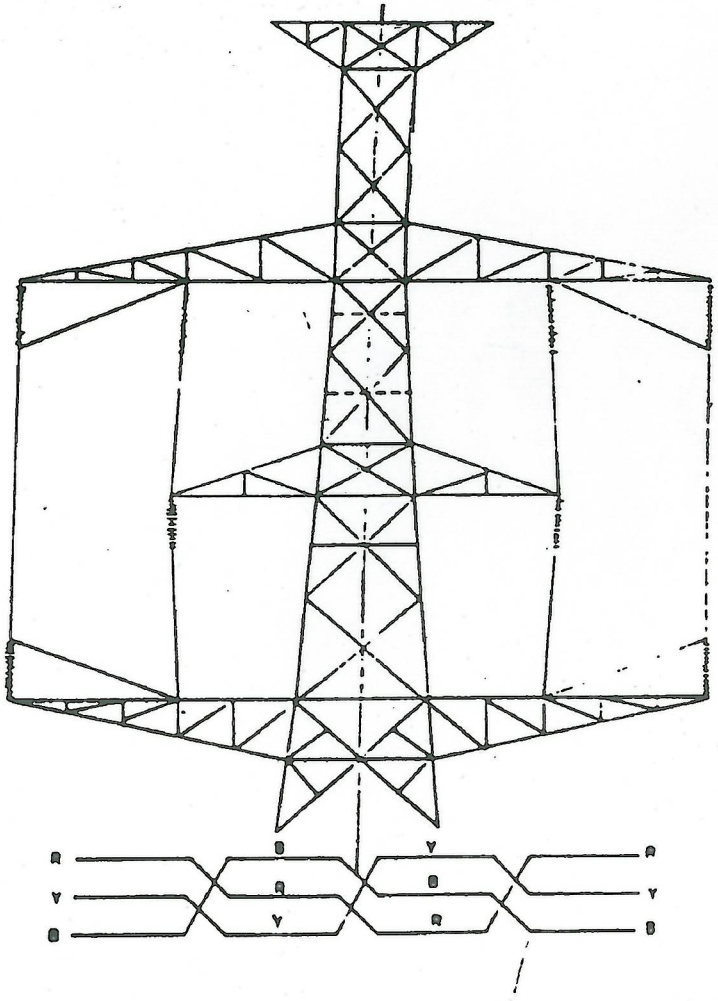
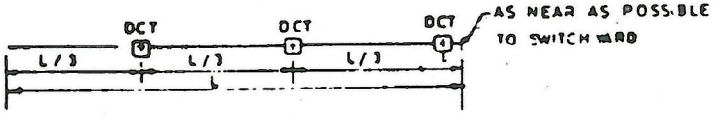
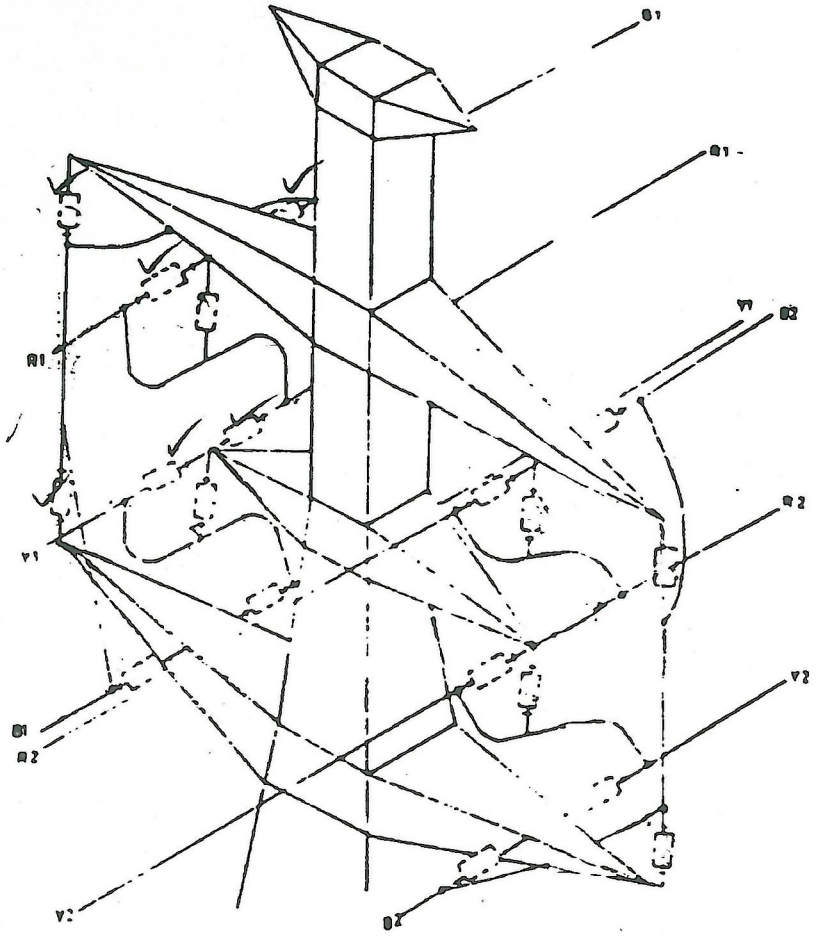
									REV. 0







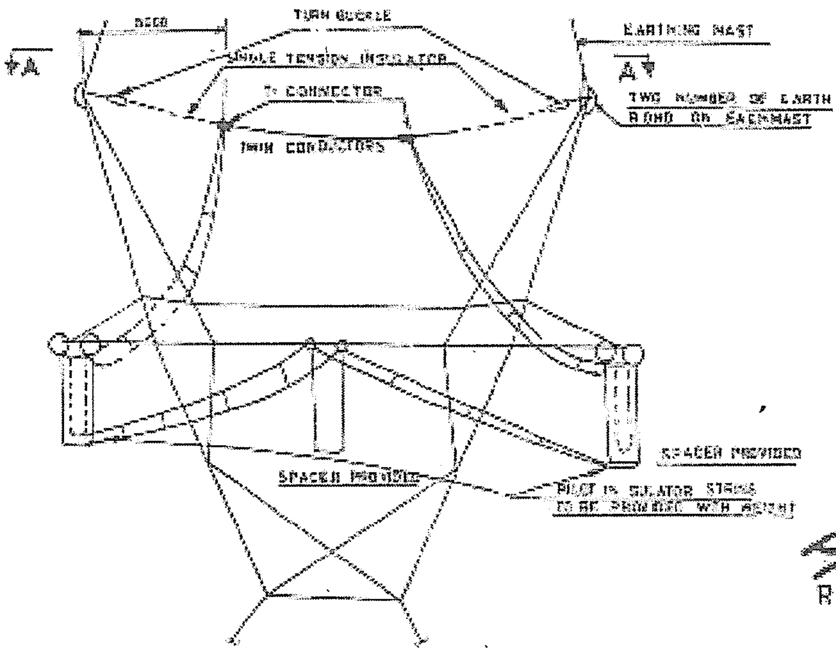
FOR BID PURPOSE ONLY

POWER GRID CORPORATION OF INDIA LTD
(A GOVT OF INDIA ENTERPRISE)

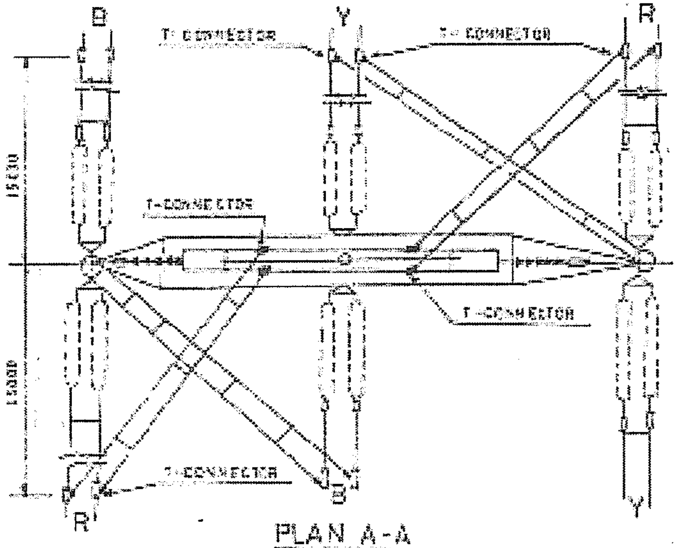
PROJECT: TRANSMISSION LINE

TITLE: DETAIL OF TRANSPOSITION ARRANGEMENT ON DC TYPE TOWER

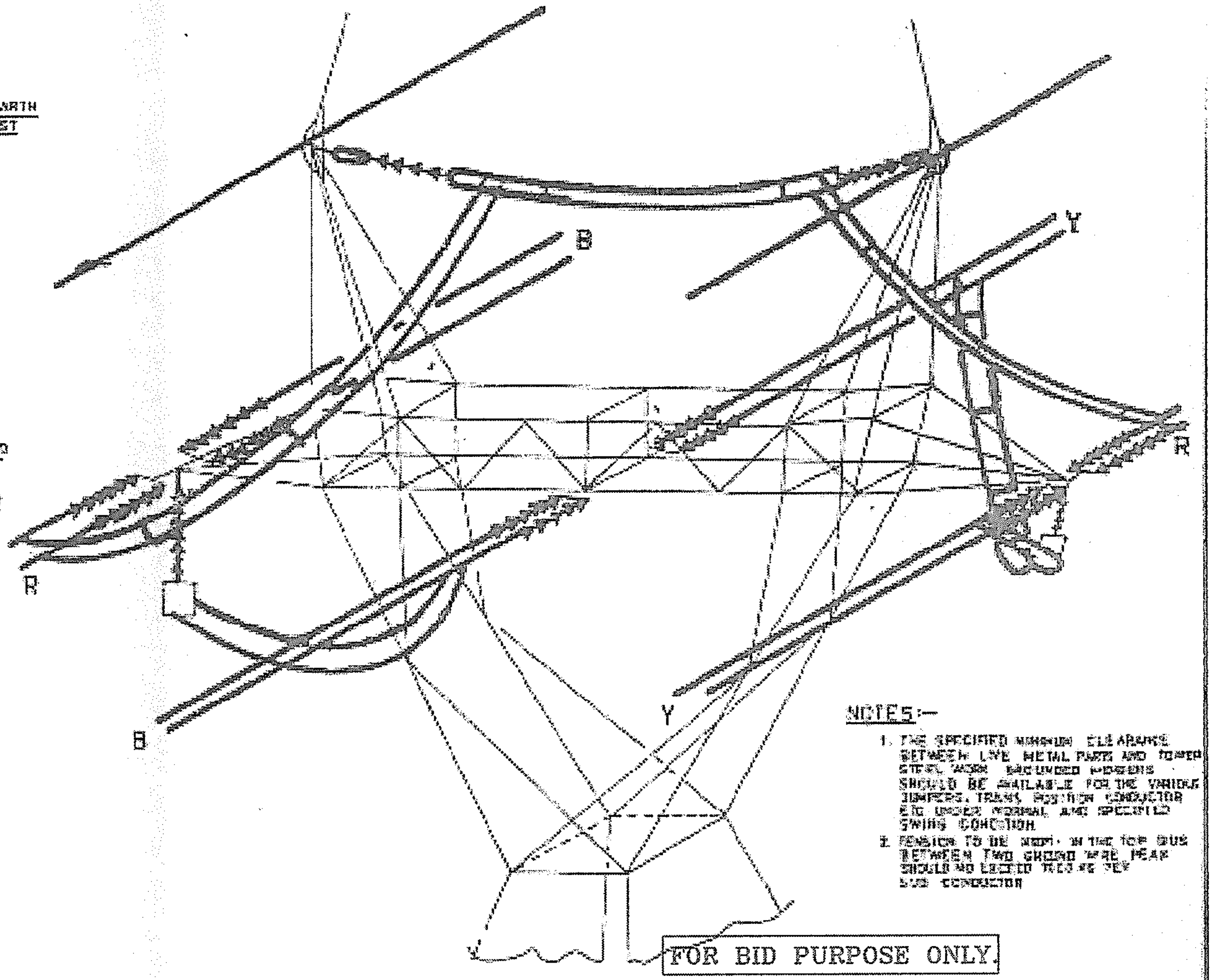
DATE	DRN	CHKD	APPD	SCALE	DRG NO	REV
25-11-96					0-0000-68-T-E-A-010	0



TRANSPOSITION ON ARRAGEMENT



PLAN A-A



NOTES:—

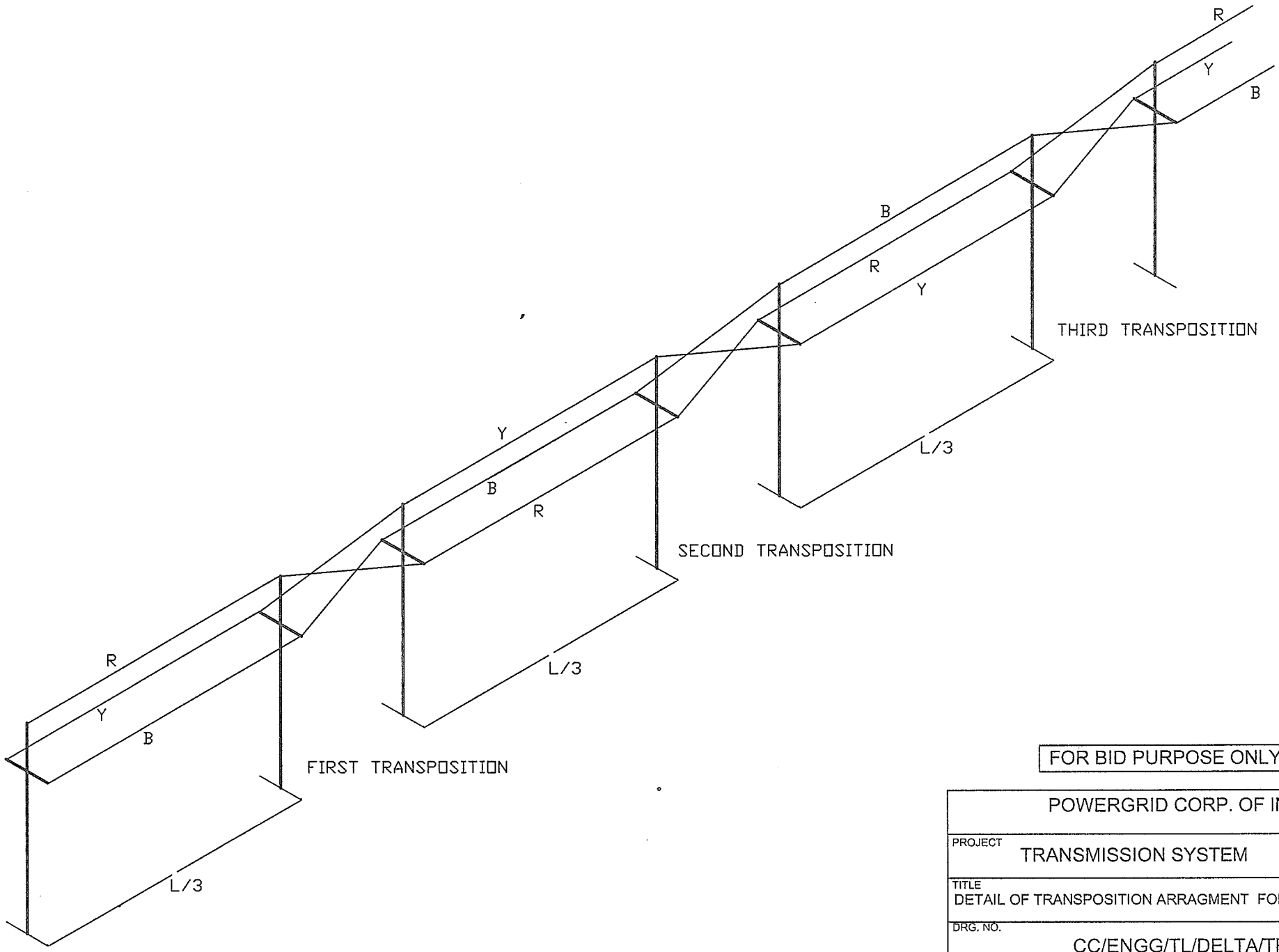
1. THE SPECIFIED MINIMUM CLEARANCE BETWEEN LIVE METAL PARTS AND TOWER STEEL WORK [illegible] SHOULD BE AVAILABLE FOR THE VARIOUS JUMPERS, TRANS POSITION CONDUCTOR ETC UNDER NORMAL AND SPECIFIED SWING CONDITION
2. TENSION TO BE [illegible] IN THE TOP BUS BETWEEN TWO GROUND WIRE PEAK SHOULD NO EXCEED [illegible] PER SUB CONDUCTOR

FOR BID PURPOSE ONLY.

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

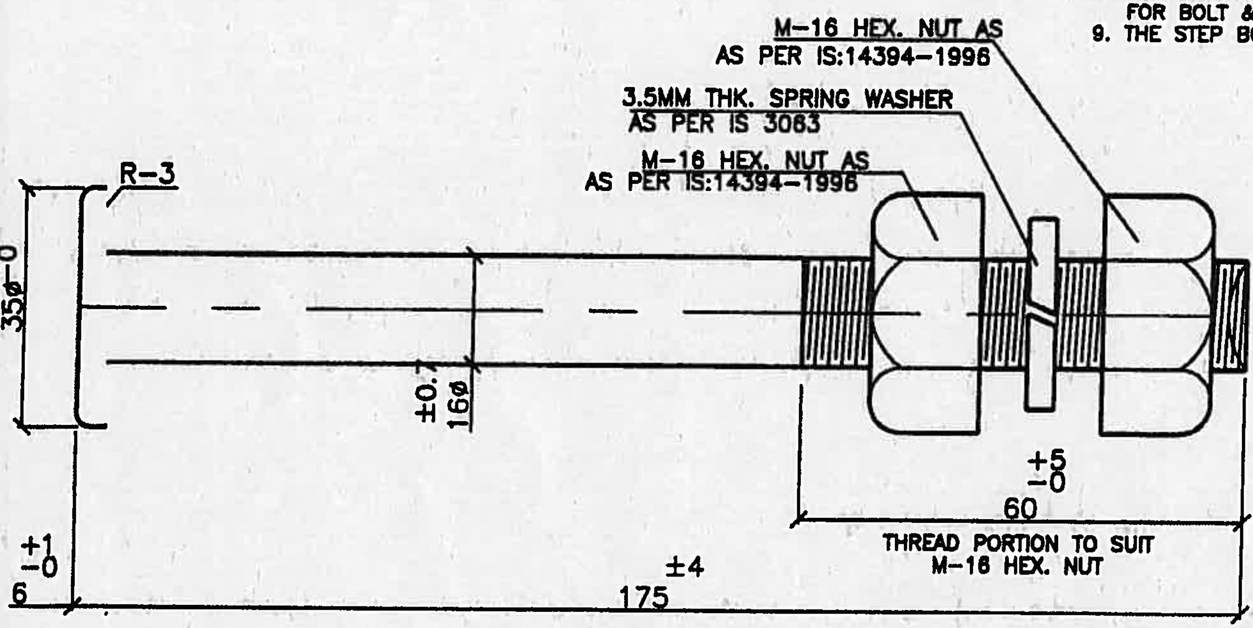
REVISION							PROJECT: *TRANSMISSION LINE TOWER*
					CLEARED BY		TITLE: *DETIAL OF TRANSPOSITION ARRANGEMENT ON S/C(HORZINTOL) CONFICURTAION.*
REV. No	DESCRIPTION	CHKD	REVWD	APPD	CHECKED	REVIEWED	APPROVED

SCALE	DRAWING NO:	REV.
N.T.S.	CC:ENGG:TL:S/C TRANSPOSITIONC	0



FOR BID PURPOSE ONLY

POWERGRID CORP. OF INDIA LTD.	
PROJECT: TRANSMISSION SYSTEM	
TITLE: DETAIL OF TRANSPOSITION ARRAGMENT FOR DELTA CONFIG.	
DRG. NO.: CC/ENGG/TL/DELTA/TRANS	REV.: 0



NOTE :-

1. ALL DIMENSIONS ARE IN MM.
2. STEP-BOLT SHALL BE HOT-DIP GALVANISED AS PER IS:1367(P.13)-1983.
3. WEIGHT/PIECE WITH TWO NUTS AND ONE SPRING WASHER=0.374 Kg
4. THREADS TO BE UNDER CUT BY 0.3MM.
5. THE STEP-BOLT SHALL BE CAPABLE OF WITHSTANDING A VERTICAL LOAD NOT LESS THAN 1.5KN.
6. SPRING WASHER SHALL CONFORM TO IS:3063 & ELECTRO GALVANIZED AS PER IS: 1573 SERVICE CONDITION 4.
7. GENERAL REQUIREMENT SHALL CONFORM TO IS 10238.
8. MECHANICAL PROPERTIES SHALL CONFORM TO CLASS 4.6 AS PER IS:1367(PART- 3) FOR BOLT & CLASS 5 AS PER IS:1367 (P-VI) FOR NUT.
9. THE STEP BOLT SHALL WITH STAND CANTILEVER TEST AS PER IS:10238

STANDARD DRAWING

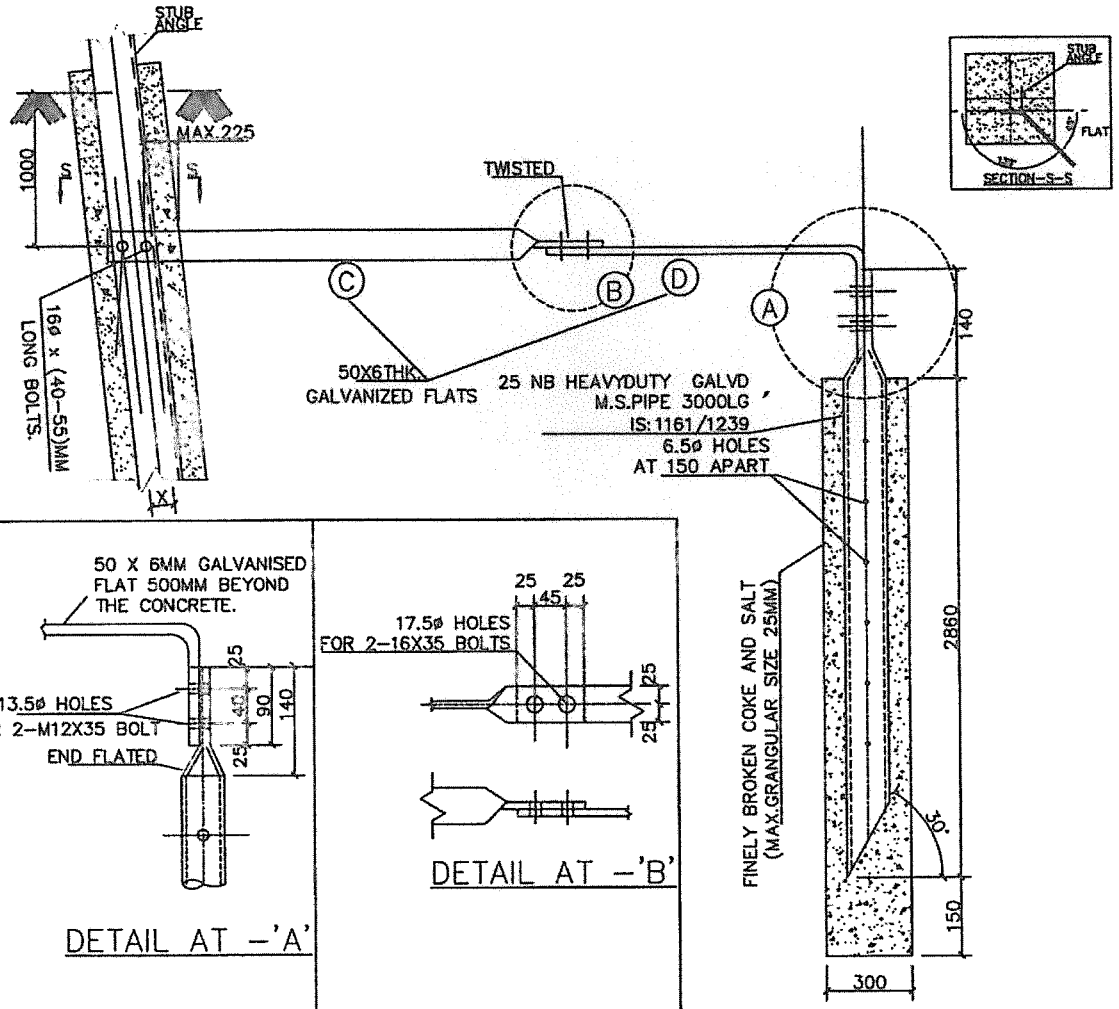
POWER GRID CORPORATION OF INDIA LIMITED

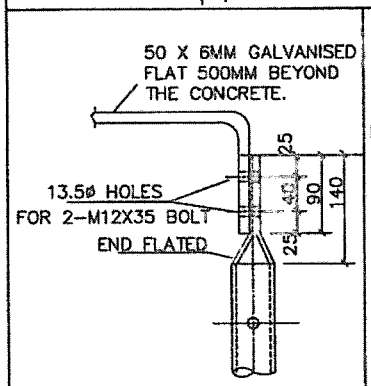
PROJECT: 765/400/220KV TRANSMISSION SYSTEM

TITLE: STEP BOLT

CLEARED BY

N.T.S.





DETAIL AT –'A'

DETAIL AT –'B'

NOTE :–

1. "C"STRIP IS TO BE PROVIDED ON ONE LEG OF EACH TOWER. WHICH WILL BE SUPPLIED WITH STUB .
2. "D"STRIP WITH PIPE EARTHING ARRANGEMENT IS TO BE PROVIDED ON ONLY ONE LEG.
3. 17.5ø HOLES SUITABLE FOR 16MM ø BOLT CONFIRMING TO IS:12427–2001, CLASS 5.6 & IS:14394–1996, Gr. 5 FOR HEX NUT UNLESS OTHERWISE SPECIFIED.
4. FOR COUNTERPOISE EARTHING STRIP 'C' SHALL BE CONNECTED WITH COUNTERPOISE WIRE THROUGH 'A' LUG.
5. ALL DIMENSIONS ARE IN MM.
6. 12 & 16MM DIA SPIRNG WASHER SHALL CONFIRM TO IS:3063–1994 TYPE B AND ELECTRO GALVANIZED AS PER IS:1573–1986.
7. HDG BOLT/NUTS TO BE GALVANIZED AS PER IS:1367(P–13)–1983.
8. C & D FLATS TO BE HOT DIP GALVANIZED AS PER IS:2629–1985.
9. MATERIAL FOR C & D FLAT AS PER IS:2062 GRADE "A".
10. X TO BE COMPATIBLE WITH STUB

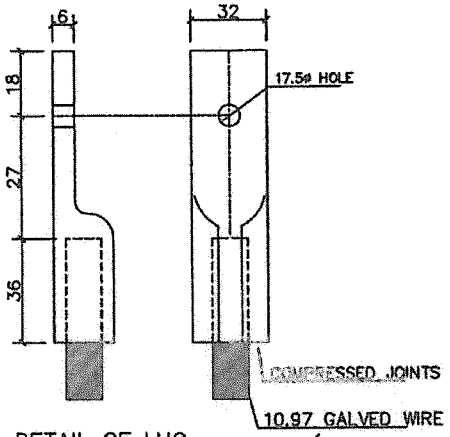
LIST OF BOLTS & NUTS / TOWER.

S.NO	SIZE					QTY
1	STUB THICK.(mm)	7–11	12–16	17–21	22–28	2
	LENGTH OF M16 BOLT (mm)	40	45	50	55	
2	M–16 x 35LG					2
3	M–12 x 35LG					2
4	16MM DIA 3.5MM THK.SP.WASHER					4
5	12MM DIA 2.5MM THK.SP.WASHER					2

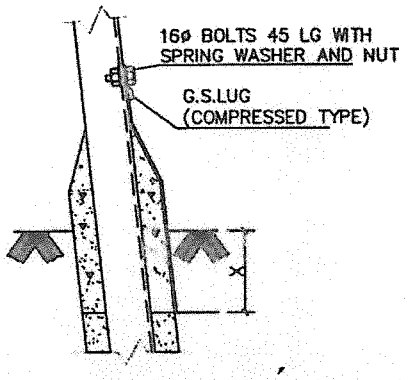
STANDARD DRAWING

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

REVISION					CLEARED BY			PROJECT: 765/400 KV TRANSMISSION SYSTEM	
REV. No	DESCRIPTION	CHKD	REVWD	APPD	CHECKED	REVIEWED	APPROVED	TITLE: PIPE TYPE EARTHING	
								SCALE: N.T.S.	DRAWING NO: CC:ENGG:TL:ACC:ERTH:PP:765/400 sheet 1/3
									REV. 0

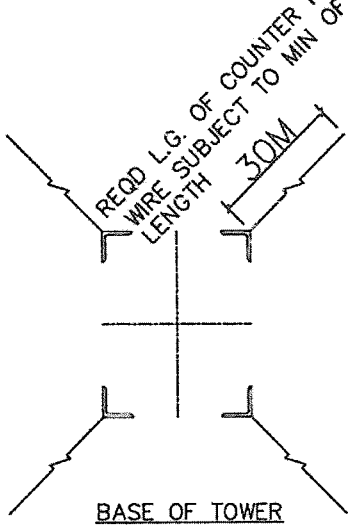


DETAIL OF LUG.

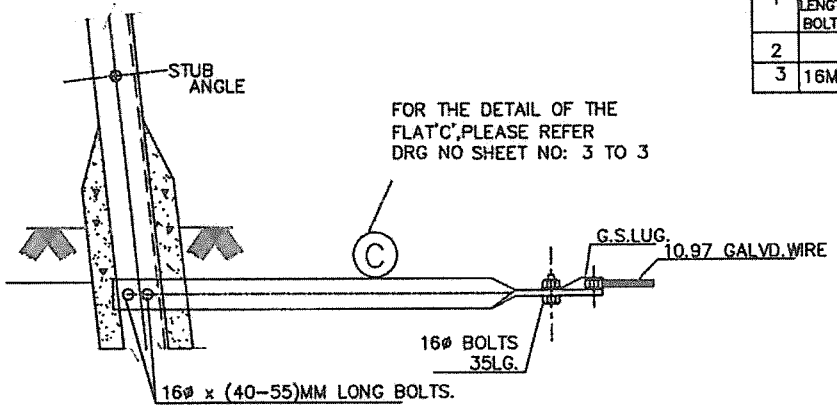


X – NOT LESS THAN 1000MM

LUG FITTING FOR THREE LEGS (TYPICAL)



BASE OF TOWER



LUG FITTING ON FOUTRH LEG

NOTES:–

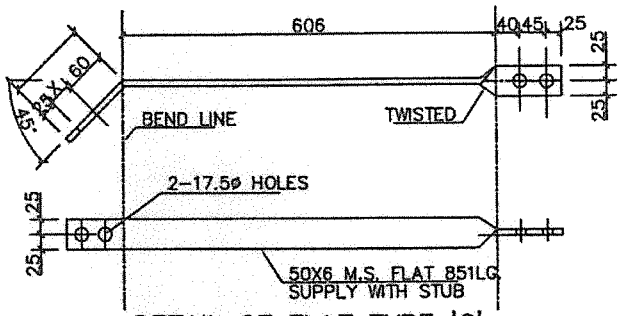
1. ALL DIMENSIONS ARE IN MM.
2. 10.97MM GALVANISED WIRE WITH G.S. LUG FORGED AT ONE END AND FREE FOR A REQURIED LENGTH OF COUNTER POISE WIRE.
3. FOUR G.S LUG WILL BE REQUIRED PER TOWER THREE LUGS WILL BE CONNECTED ON THREE LEGS AND FOURTH LUGS WILL BE CONNECTED WITH FLAT TYPE 'C' PROVIDED FOR PIPE TYPE EARTHING.
4. 10.97MM WIRE SHALL BE OUTSIDE COPPING.
5. ONE SET COMPRISING OF 4NOS OF REQUIRED LENGTH OF COUNTER POISE WIRE.
6. FOR SOIL RESISTIVITY LESS THAN 1500 OHMS–METER, 4 LENGTHS OF 30M WIRE SHALL BE PROVIDED, AND FOR SOIL RESISTIVITY GREATHER THAN 1500 OHMS–METER, 4 LENGTH OF 70M WIRE SHALL BE PROVIDED.

LIST OF BOLTS & NUTS / TOWER.						
S.NO	SIZE					QTY
1	STUB THICK.(mm)	7–11	12–16	17–21	22–28	5
	LENGTH OF M16 BOLT (mm)	40	45	50	55	
2	M–16 x 35LG					1
3	16MM DIA 3.5MM THK.SP.WASHER					6

STANDARD DRAWING

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

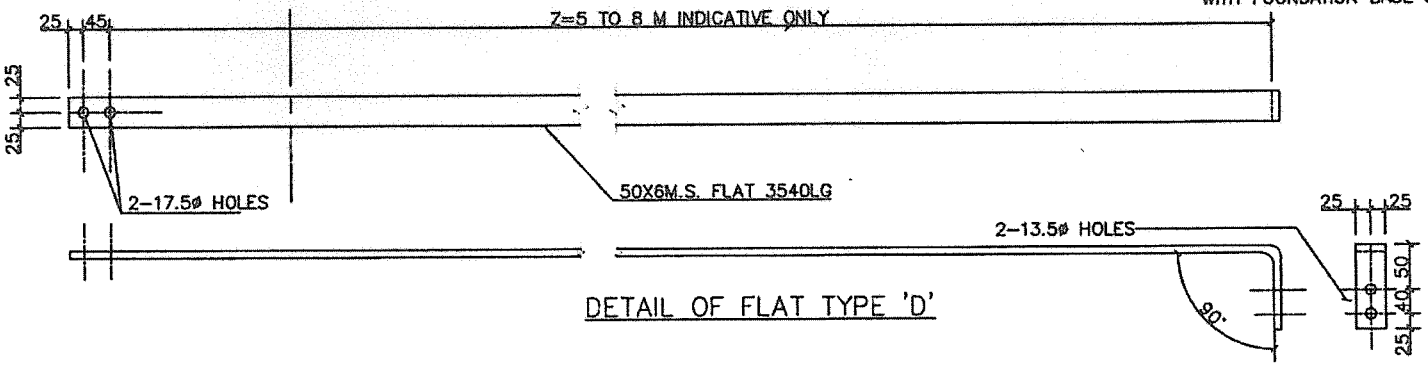
REVISION					CLEARED BY			PROJECT: 765/400 KV TRANSMISSION SYSTEM	
REV. No	DESCRIPTION	CHKD	ISSUD	APPD	CHECKED	REVIEWED	APPROVED	TITLE: COUNTERPOISE EARTHING	
								SCALE N.T.S.	DRAWING NO: CC:ENGG:TL:ACC:ERTH:PP:765/400 sheet 2/3	REV. 0



DETAIL OF FLAT TYPE 'C'

NOTE :–

1. ALL DIMENSIONS ARE IN MM.
2. AFTER FABRICATION BOTH FLATS TO BE HOT–DIP GALVANISED AS PER IS:2629.
3. FLAT TYPE 'C' IS TO BE PROVIDED ON ONE LEG OF EACH TOWER.
4. FLAT TYPE 'D' IS TO BE PROVIDED WITH PIPE TYPE EARTHING ARRANGEMENT AND TO BE CONNECTED WITH FLAT 'C' FOR THE LOCATION WHERE TOWER FOOTING RESISTANCE IS MORE THAN 10 OHMS.
5. X TO BE COMPATIBLE WITH STUB
6. VALUE OF Z MAY VARY AS PER SITE REQUIREMENT SO AS TO AVOID FOULING WITH FOUNDATION BASE SLAB.



DETAIL OF FLAT TYPE 'D'

STANDARD DRAWING

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

REVISION								
REV. No	DESCRIPTION	CHKD	REVWD	APPD	CLEARED BY			
					CHECKED	REVIEWED	APPROVED	

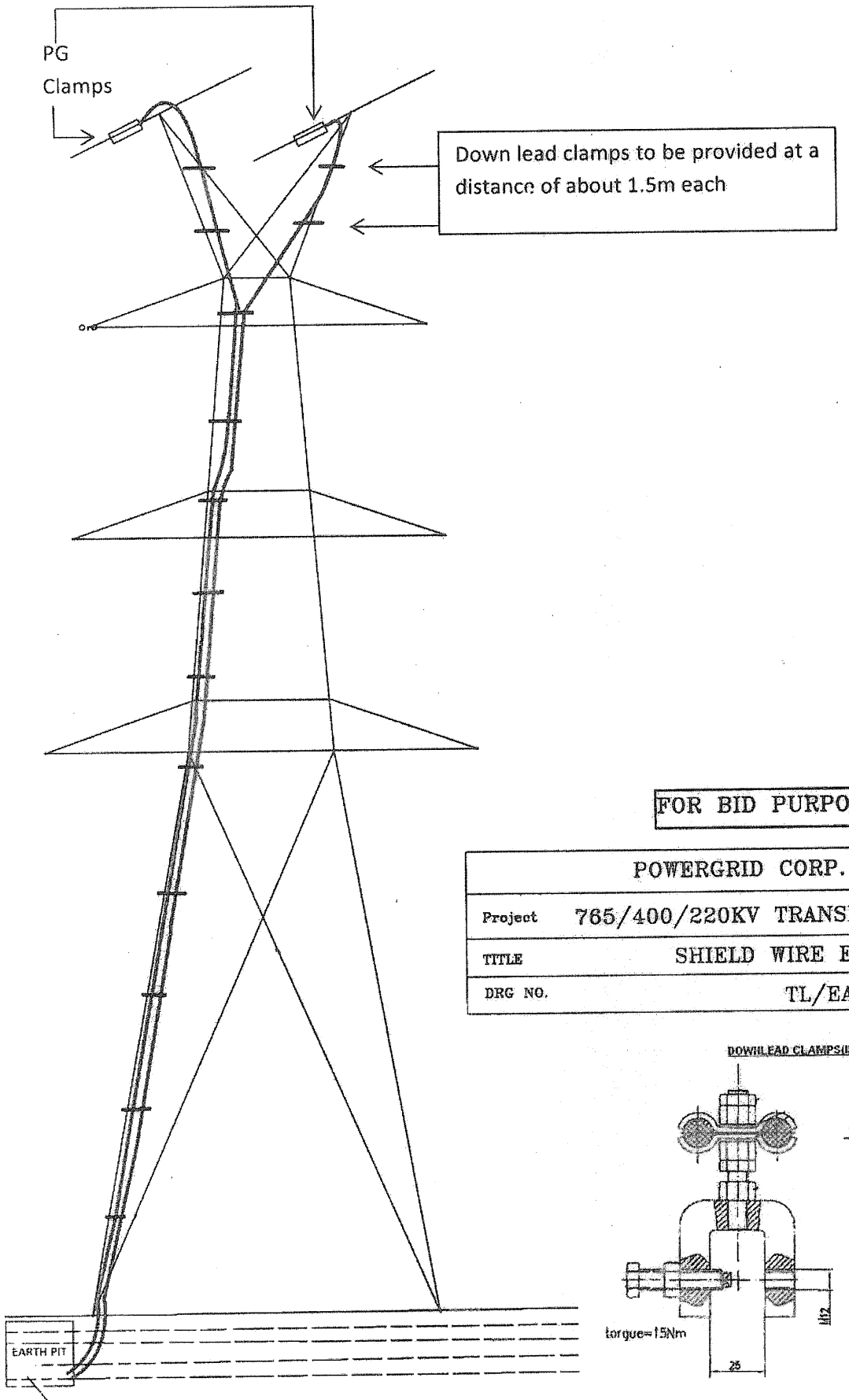
PROJECT: *765/400 KV TRANSMISSION SYSTEM*

TITLE: *FLATS FOR EARTHING*

SCALE N.T.S.

DRAWING NO: CC:ENGG:TL:ACC:ERTH:PP:765/400 sheet 3/3

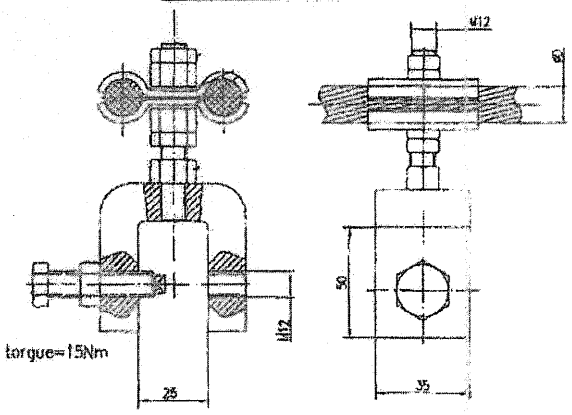
REV. 0



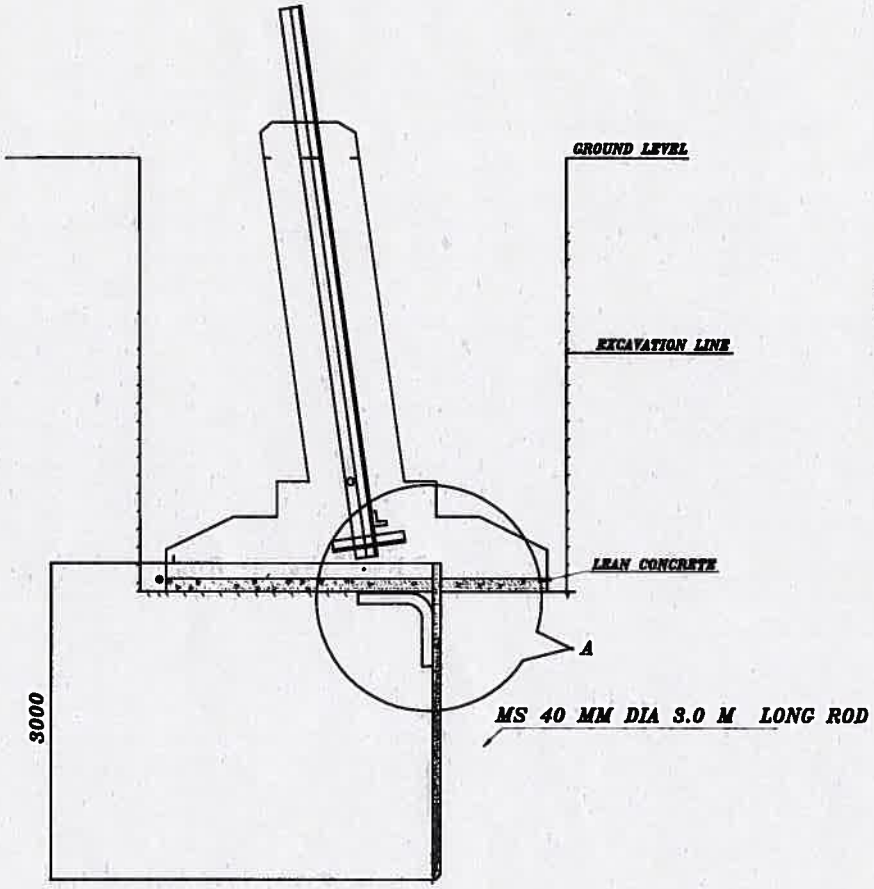
FOR BID PURPOSE ONLY

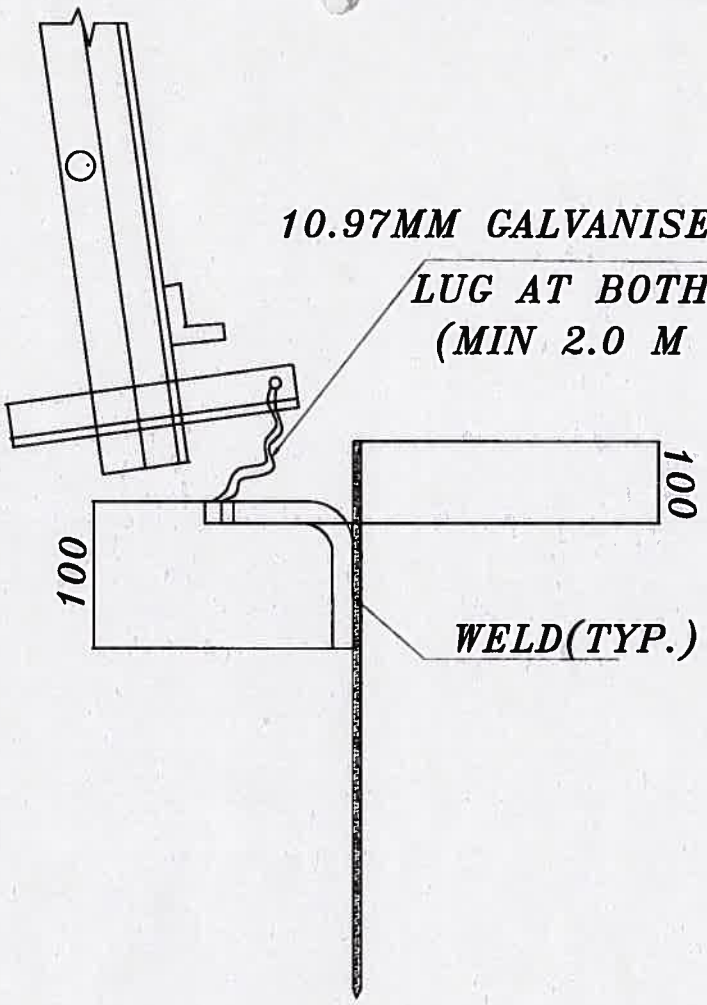
	POWERGRID CORP. OF INDIA LTD.
Project	765/400/220KV TRANSMISSION SYSTEM
TITLE	SHIELD WIRE EARTHING
DRG NO.	TL/EARTH/SW

DOWNLEAD CLAMPS(INDICATIVE SKETCH)



PIPE TYPE /COUNTER POISE EARTHING DEPENDING ON SOIL RESISTIVITY





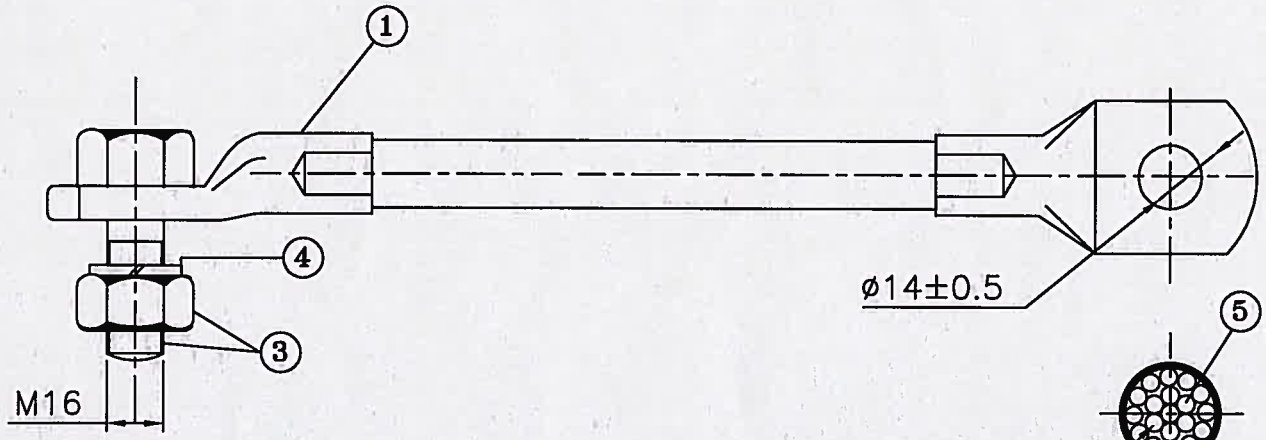
DETAIL A

NOTES:

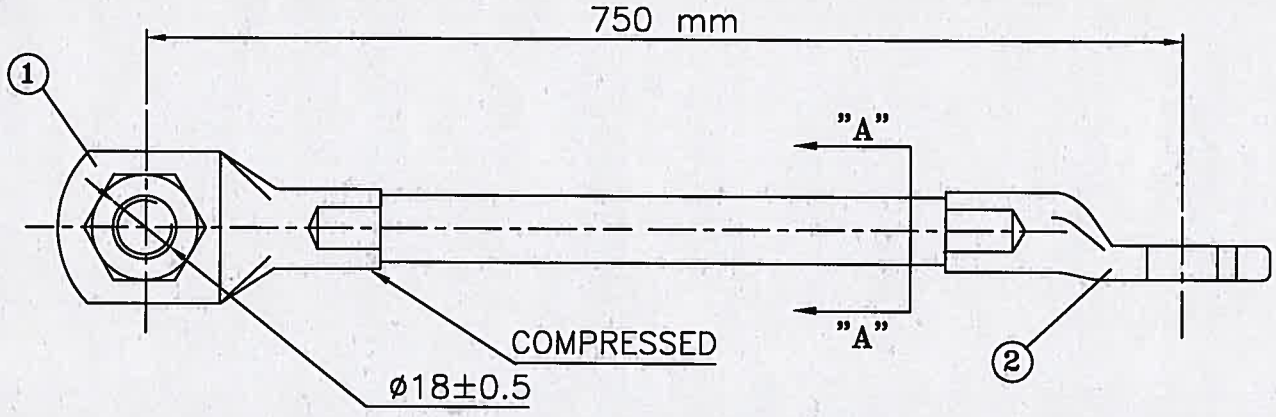
1. DRAWING NOT TO SCALE
2. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE STATED

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

REVISION					CLEARED BY			PROJECT: TRANSMISSION LINE	
					AGM (ENGG-CIVIL/TL)	GM (ENGG-TL)	ED (ENGG.)	TITLE: STANDARD ROD TYPE EARTHING	
REV. No	DESCRIPTION	ISSUED BY	DCDE / CLEARED BY	CDE	DATE / DESIGN / CHKD. / CDE (ENGG-TL) / DGM (ENGG-TL)			SCALE N.T.S.	DRAWING NO:CC:ENGG:TL: STD/ROD/EARRH/001 REV. 0



SECTION : A–A



NO.	DESCRIPTION	MATERIAL	GRADE	QTY.
5	FLEXIBLE BOND WIRE (100mm2)	ALUMINIUM ALLOY	TYPE B, IEC 60104	1
4	SPRING WASHER	SPRING STEEL	IS 4072 & IS 3083	1
3	HEX BOLT & NUT (M16 X 40 MM)	MILD STEEL	IS 1367 CL 5.6/5.0	1
2	CONNECTING LUG	ALUMINIUM ALLOY	19500/IS 733 CL 5.6/5.0	1
1	CONNECTING LUG	ALUMINIUM ALLOY	ALUMINIUM ALLOY	1

TECHNICAL DETAILS:

1) ALL DIMENSIONS ARE IN MILLIMETER
2) GENERAL TOLERANCES ±3%
3) ALL FERROUS PARTS ARE HOT DIP GALVANISED AS PER PGCB SPECIFICATION
4) TOTAL MASS: 0.48 kg (APPROX.)
5) SLIP STRENGTH 3 KN (MIN)

POWER GRID CORPORATION OF INDIA LIMITED

(A. GOVERNMENT OF INDIA ENTERPRISE)

SCALE : NOT TO SCALE	
DRAWN	NK
CHECKED	SK
APPROVED	AKV
DATE	30.9.2015

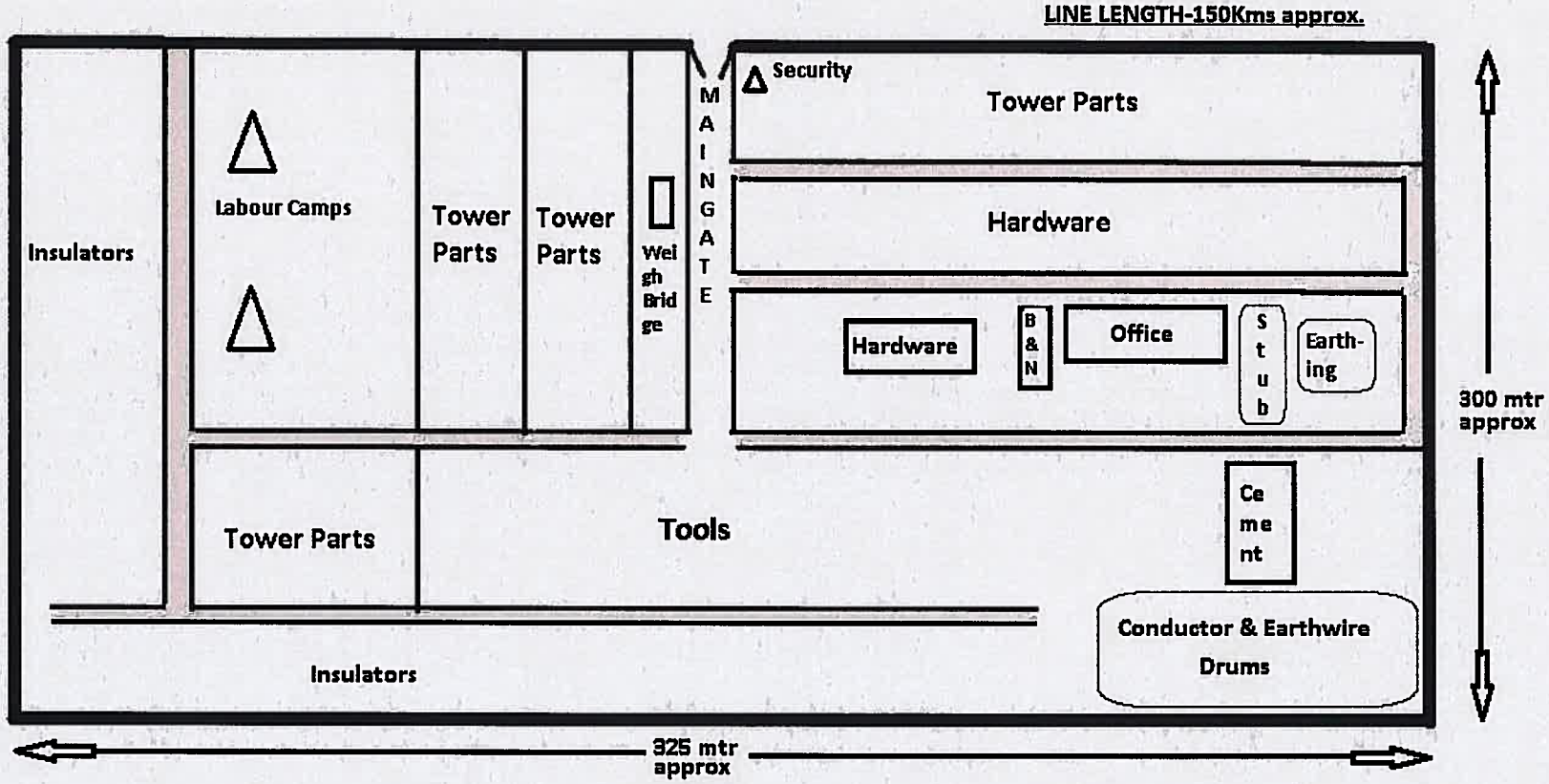
TITLE :- ALUMINIUM BOND FOR EARTHWIRE

DRG. NO : CC:ENGG:TL:AL BOND:EW

REVISION

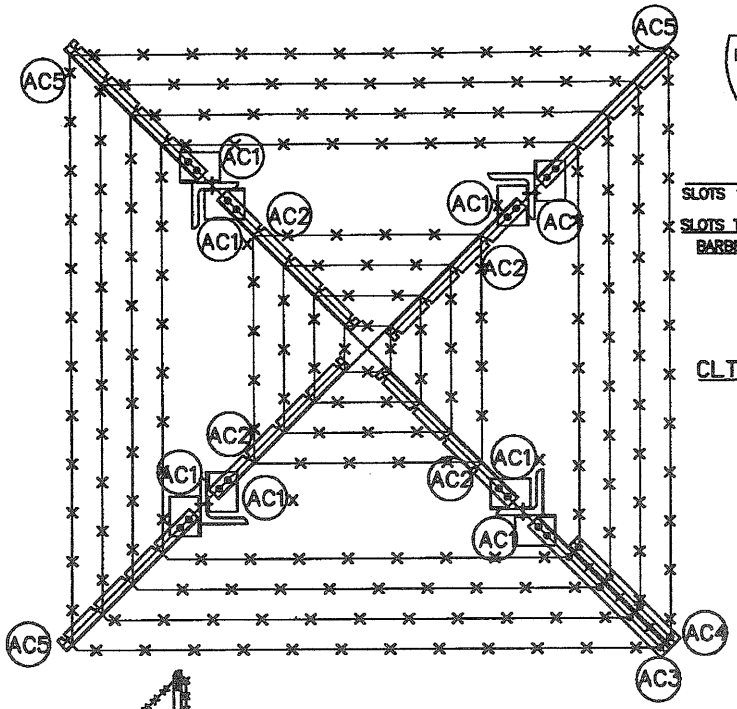
F 1902

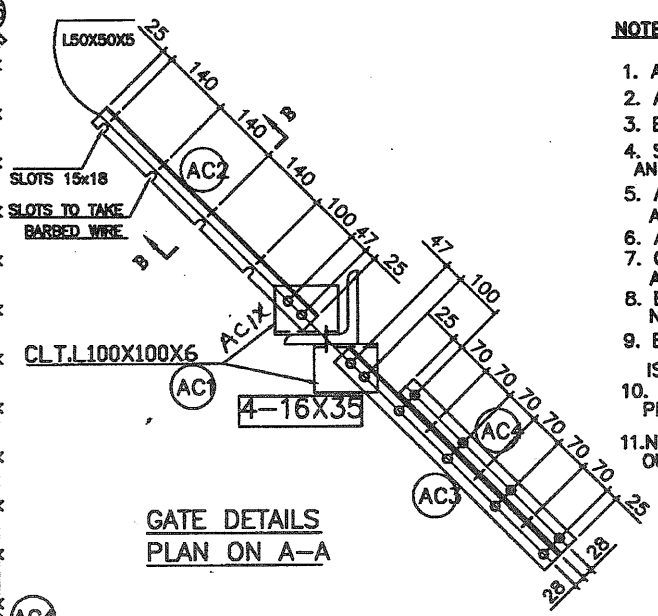
TYPICAL DRAWING FOR STORAGE OF MATERIAL UNDER TRANSMISSION LINE PACKAGES



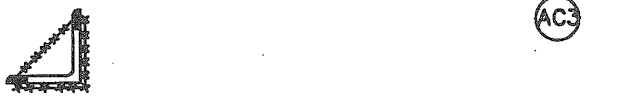
Note:

1. Cement bags shall be stored and stacked off the floor on wooden planks having 150mm to 200mm clearance from the ground in a covered building or shed
2. Structural steel shall be stored above ground level at least 150mm and shall be keptat an inclination to facilitate easy drainage of any water collected. Also, in order to prevent white rust formation, sufficient care shall be taken.
3. All the Conductor & Earthwire Drums shall be stored at a proper hard platform above ground.
4. All the Hardware fittings, accessories and Insulators shall be stored at raised platform above ground. All the aluminium parts shall be stored under a covered shed.
5. Reinforcement bars shall be stacked above ground level by atleast 150mm.
6. Detail description of storage may be referred in Clause 1.11 of Section-II of Technical Specification.
7. The above drawing is indicative only and may be moderated depending on the site condition.

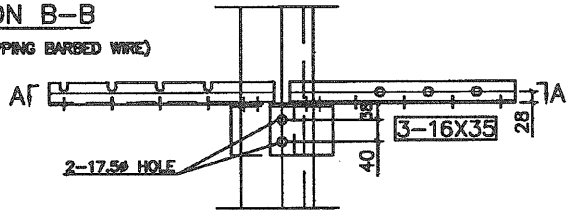




GATE DETAILS
PLAN ON A-A



VIEW ON B-B
(METHOD OF WRAPPING BARBED WIRE)



NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. ALL HOLES ARE 17.5MMø FOR 16MMø BOLTS.
3. BLANK HOLES AT GATE ARE TO RECEIVE BARBED WIRE.
4. STD. SPRING WASHER TO BE SUPPLIED WITH EACH BOLT AND SHALL CONFORM TO IS : 3063(type B)&1573 SERVICE GRADE-4.
5. ALL STEEL SHALL BE HOT-DIP GALVANISED. AS PER IS ; 2629.
6. ALL STEEL SHALL CONFORM TO IS : 2062 GRADE A
7. GALVANISED STEEL BARBED WIRE SHALL CONFORM TO A-1, IS : 278.
8. BOLT TO BE CONFORMING TO IS:12427-2001 Gr. 5.6 & NUT CONFORMING TO IS:14394-1996 (Gr. 5)
9. BOLT / NUT TO BE HOT DIP GALVANIZED AS PER IS:1367 (P-13) - 1983.
10. BARBED WIRE SHALL BE GIVEN CHROMATING DIP AS PER PROCEDURE LAID DOWN IN IS : 1340
11. NOMINAL LENGTH OF BARBED WIRE SHALL BE WORKED OUT AS PER FOLLOWING FORMULAE:

$$L = B + (X - 3.5) \times 2 \times \tan\phi \times N$$

B= B/B Width at CL for Normal Tower in Mtrs.
X= Height of Body Extn if any in Mtrs.
N= NUMBER OF BARBED WIRE TURNS
ø= TOWER SLOPE

BILL OF MATERIAL

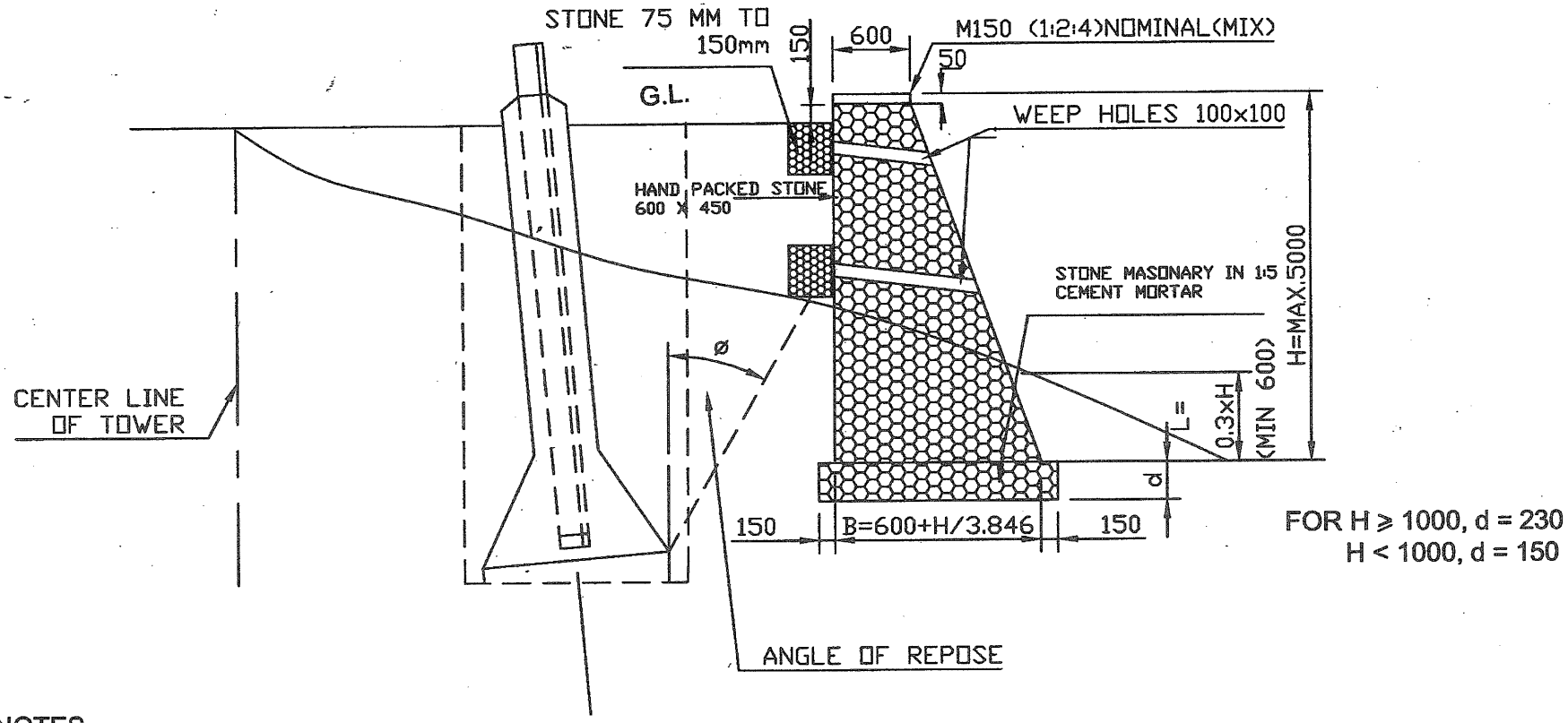
MARK NO	SECTION	LENGTH (mm)	QTY NOS
AC1/AC1X	L 100x100x6	128	4+4=8
AC2	L 50x50x5	617	4
AC3	L 50x50x5	617	1
AC4	L 50x50x5	470	1
AC5	L 50x50x5	617	3

LIST OF BOLTS & NUTS / TOWER.						
S.NO	SIZE					QTY
1	STUB THICK.(mm)	7-11	12-16	17-21	22-26	8
	LENGTH OF M16 BOLT (mm)	45	50	55	60	
2	M-16 x 35LG					19
3	16MM DIA 3.5MM THK.SP.WASHER					27

STANDARD DRAWING

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

REVISION					CLEARED BY			PROJECT: 765/400/220KV TRANSMISSION SYSTEM
								TITLE: ANTICLIMBING DEVICE
REV. No	DESCRIPTION	DRWN	REVD	APPD	CHECKED	REVIEWED	APPROVED	SCALE: N.T.S. DRAWING NO: CC-[illegible]-TL-ACD sheet 1/1 REV. 0



FOR H ≥ 1000, d = 230
H < 1000, d = 150

NOTES

1 : ALL DIM. ARE IN MM UNLESS OTHERWISE SPECIFIED.
2 : WEEP HOLES SHOULD BE OF SIZE 100mm x 100mm OR 150mm x 150mm INCASE OF LARGE SIZE REVETMENT.
3 : WEEP HOLES SHOULD BE 2.5Mt C-C APART HORIZONTAL
4 : CENTER OF TOP MOST WEEP HOLES TO BE NOT LESS THAN 300 mm BELOW TOP
5 : THE MIN. DEPTH OF REVETMENT WALL BELOW G.L. WILL BE 600mm
6 : DIM. 'B' ARE VALID ONLY FOR 'H' NOT EXCEEDING 5.00 METER
7 : SIZE OF STONE FOR MASONARY WORK. 300 x 150 x 150 & BELOW
8 : THE MASONRY WORK SHOULD BE CARRIED OUT IN 1:5 CEMENT MORTAR
9 : SIZE OF STONE PACKING AT WEEP HOLE 75 mm TO 150mm

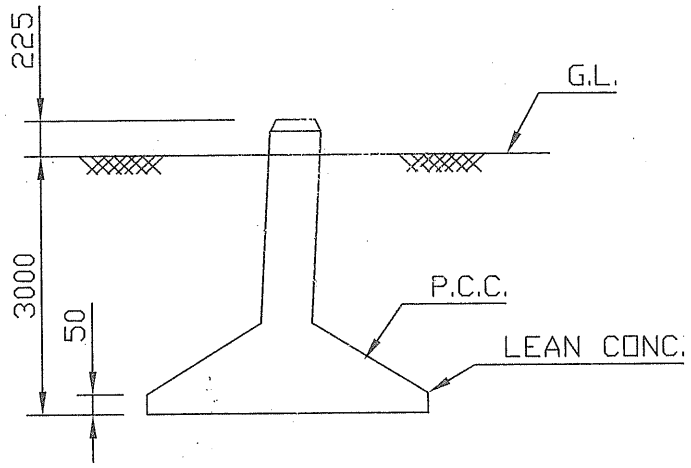
FOR BID PURPOSE ONLY

POWER GRID CORP. OF INDIA LTD.

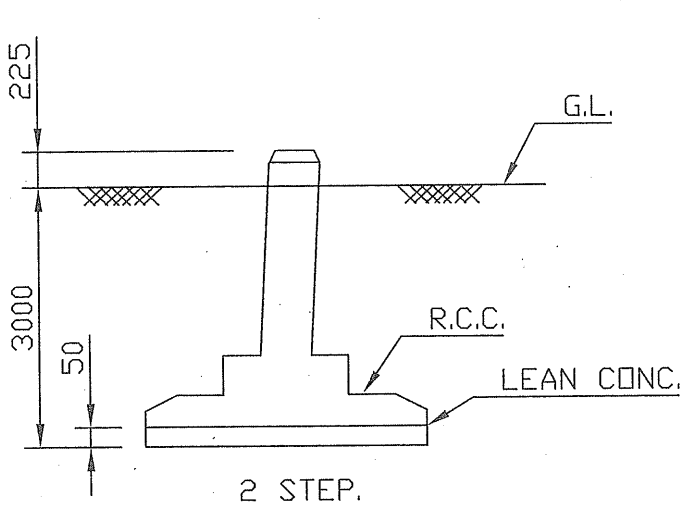
PROJECT: KV TRANSMISSION SYSTEM

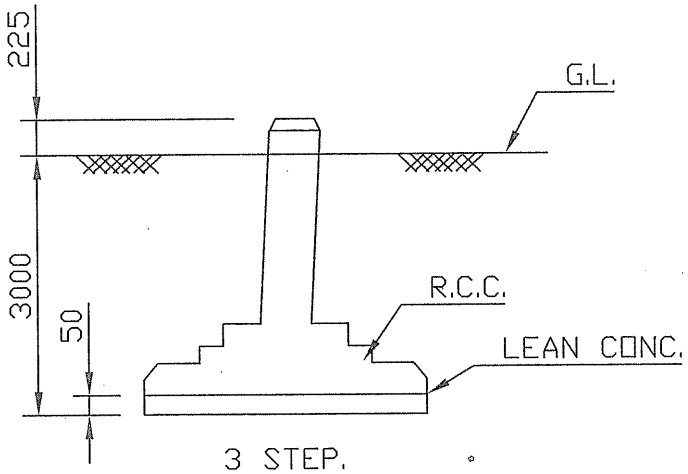
TITLE: PROTECTION OF TOWER FOOTING (DOWN/UP HILL)

DRG. NO. TL/STD/PTF | REV. 0

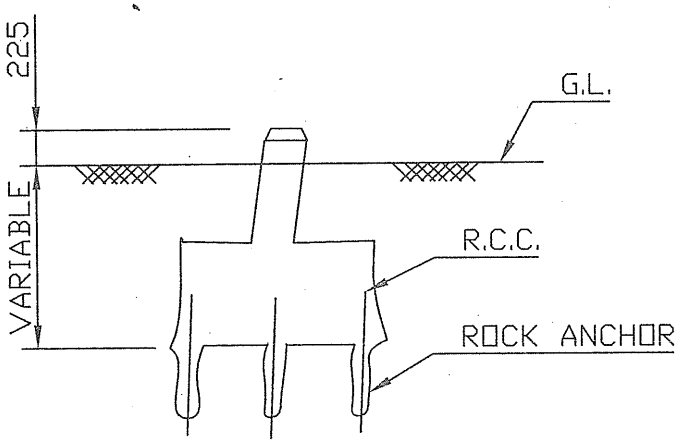


TYP. FOUNDATION SHAPE FOR P.C.C. TYPE





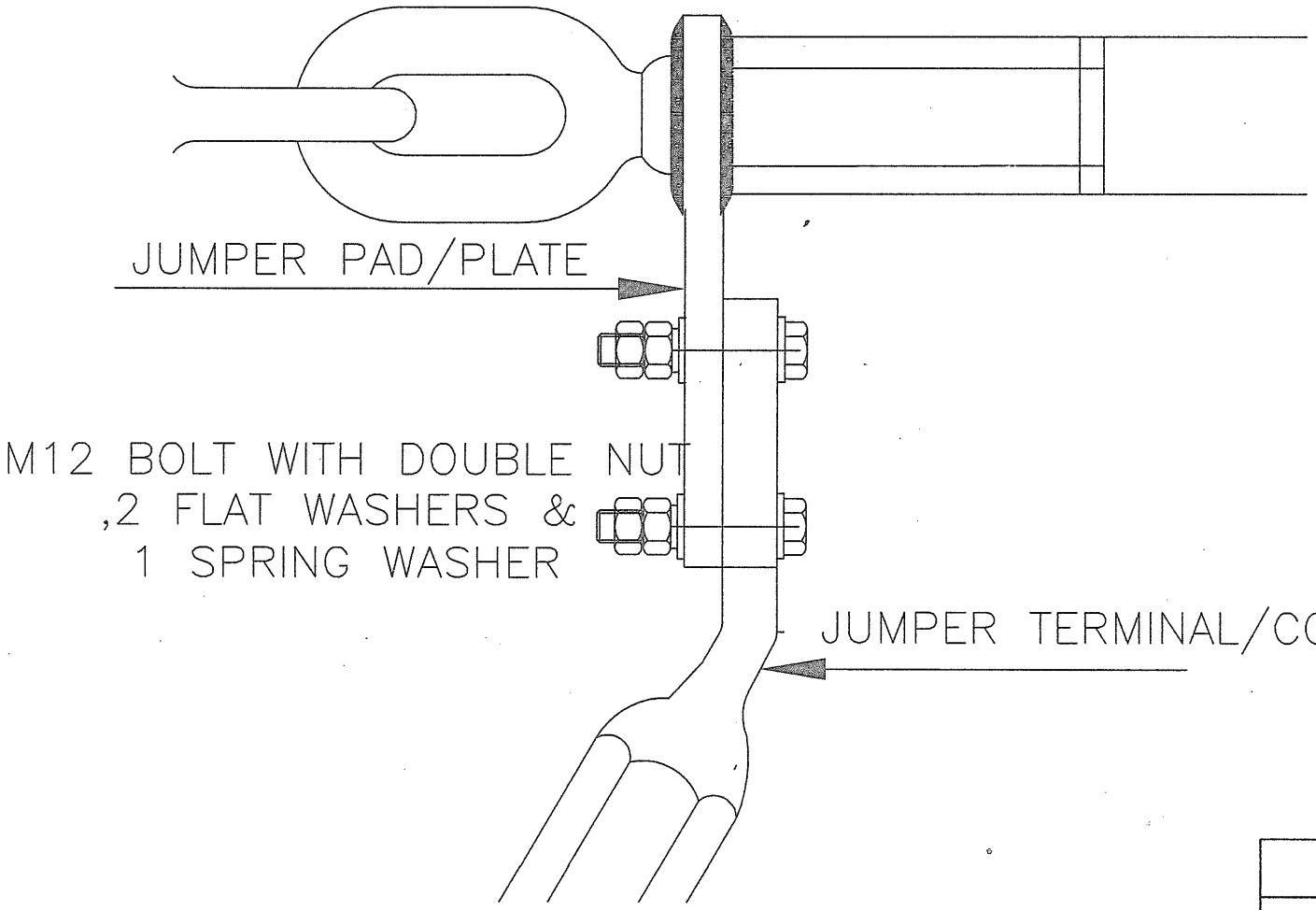
TYP. FOUNDATION SHAPE FOR R.C.C. TYPE



TYP. FOUNDATION SHAPE FOR HARD ROCK

FOR BID PURPOSE ONLY

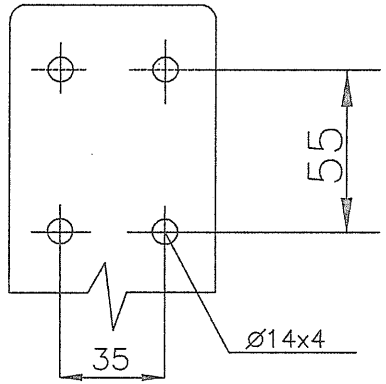
POWERGRID CORP. OF INDIA LTD.	
PROJECT: TRANSMISSION SYSTEM	
TITLE: TENTATIVE SHAPE OF TOWER FOOTINGS	
DRG. NO.: TL/STD/TF	REV.: 0



JUMPER BOLTING ARRANGEMENT

NOTES

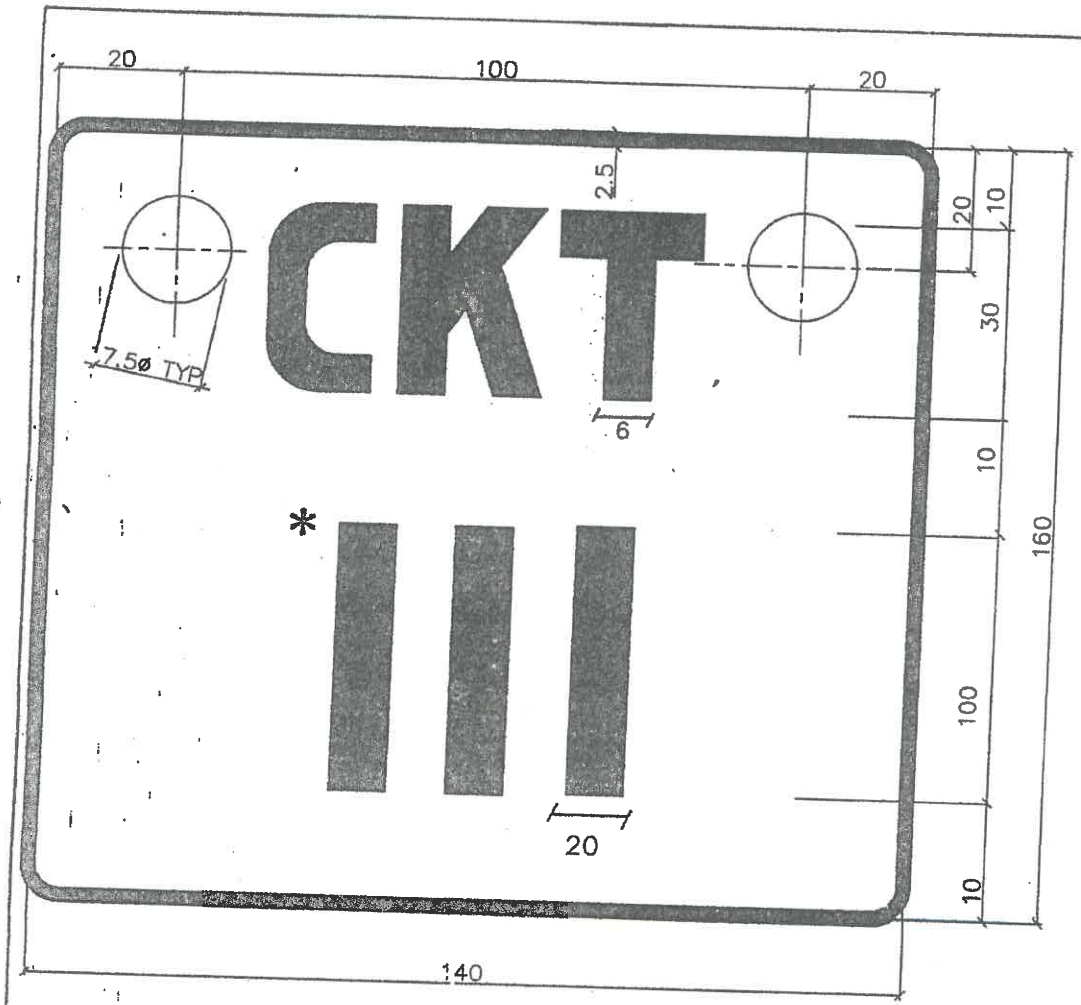
1.ALL DIMENSIION ARE IN MM.



FOR BID PURPOSE ONLY

POWERGRID CORP. OF INDIA LTD.	
Project	765/400 KV. TRANSMISSION SYSTEM
TITLE	DEAD END ASSEMBLY JUMPER BOLTING ARRANGEMENET
DRG NO.	TL/STD/DRG/JUMPER BOLTING Rev 0

Annexure – II



NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. LETTERING: RED ENAMELLED.
3. BACKGROUND: WHITE VITREOUS ENAMELLED.
4. BACK: BLACK VITREOUS ENAMELLED.
5. MINIMUM 1.6THK. M.S.PLATE AS PER IS:1079–2017(Grade-HR1)/513-2016(Grade-CR1)
6. GENERAL TOLERANCE ±3% UNLESS OTHERWISE SPECIFIED.
7. THE CORNERS OF THE PLATES SHOULD BE ROUNDED OFF.
8. ALL LETTERS SHOULD BE CENTRALLY SPACED.
9. BOLT / NUT TO BE GALVANIZED AS PER IS:1367 (P–13) – 1983.
10. EQUAL NOS OF CKT. PLATES FOR EACH CKTS ARE TO BE SUPPLIED.

* CIRCUIT NUMBER I,II,III OR IV TO BR FURNISHED BY SITE

LIST OF 16mmø BOLTS, NUTS & WASHER TO BE SUPPLIED WITH EACH PLATE

DETAILS	QTY
M–16x35MM LONG HRH BOLT AS PER IS:12427–2001 CLASS 5.6 AND NUT AS PER IS:14394–1996 CLASS 5	2
2MM THK. LEAD WASHER	4

STANDARD DRAWING

MGR(ENGG-TL)

DGM(ENGG-TL)

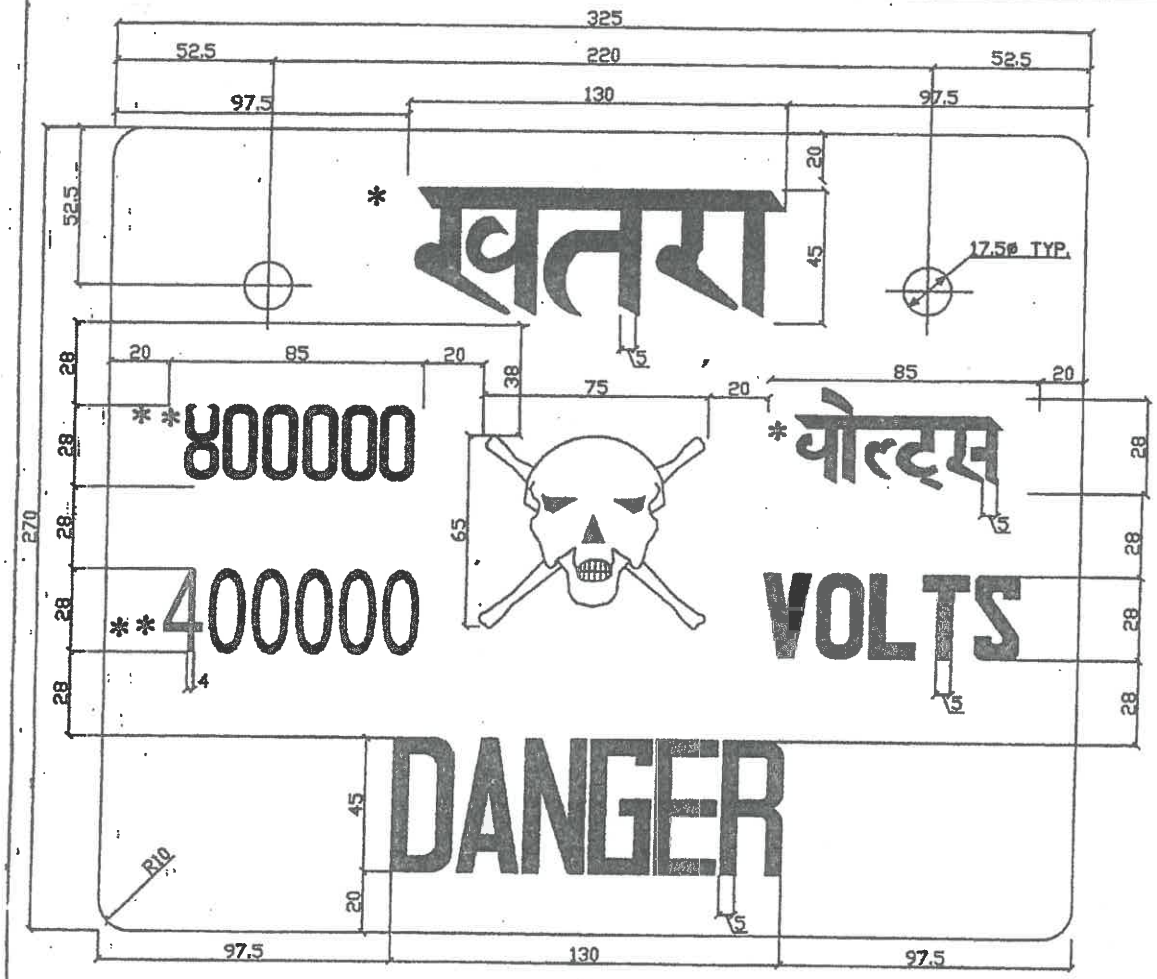
REVISION					CLEARED BY			
REV. No	DESCRIPTION	CKD	REVD	APPD	CHECKED	REVIEWED	APPROVED	DATE
1	Refer Note 5							

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

PROJECT: 765/400/220KV/132kV TRANSMISSION SYSTEM

TITLE: CIRCUIT PLATE

SCALE N.T.S. | DRAWING NO: CC:ENGG/TL:ACC:CP | REV. 1



NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. LETTERING & FIGURE: RED ENAMELLED.
3. BACKGROUND: WHITE VITREOUS ENAMELLED.
4. BACK: BLACK VITREOUS ENAMELLED.
5. MINIMUM 1.6THK. M.S.PLATE AS PER IS:1079-2017(Grade-HR1)/513-2016 (Grade-CR1)
6. GENERAL TOLERANCE ±3% UNLESS OTHERWISE SPECIFIED
7. THE CORNERS OF THE PLATES SHOULD BE ROUNDED OFF.
8. ALL LETTERS SHOULD BE CENTRALLY SPACED.
9. BOLT / NUT TO BE GALVANIZED AS PER IS:1367 (P-13) – 1983.
10. DESIGN OF DANGER PLATE IS AS PER IS 2551:1982

* IN CASE LOCAL LANGAUGAE IS OTHER THAN HINDI, HINDI LETTERS SHALL B REPLACED BY LOCAL LANGUAGE TO BE CONFIRMED FROM SITE IN CHARGE

** 765000 VOLTS, 400000 VOLTS & 220000 VOLTS TO BE WRITTEN FOR 765 KV, 400KV & 220 KV RESPECTIVELY.

LIST OF 16mmø BOLTS, NUTS & WASHER TO BE SUPPLIED WITH EACH PLATE

DETAILS	QTY
M-16x35MM LONG HRH BOLT AS PER IS:12427-2001 CLASS 5.6 AND NUT AS PER IS:14394-1996 CLASS 5	2
2MM THK. LEAD WASHER	4

STANDARD DRAWING

MGR (ENGG-TL)

DGM (ENGG-TL)

REVISION					
REV. No	DESCRIPTION	CHKD	REVD	APPD	
1	Refer Note 5				

CLEARED BY: CHECKED, REVIEWED, APPROVED

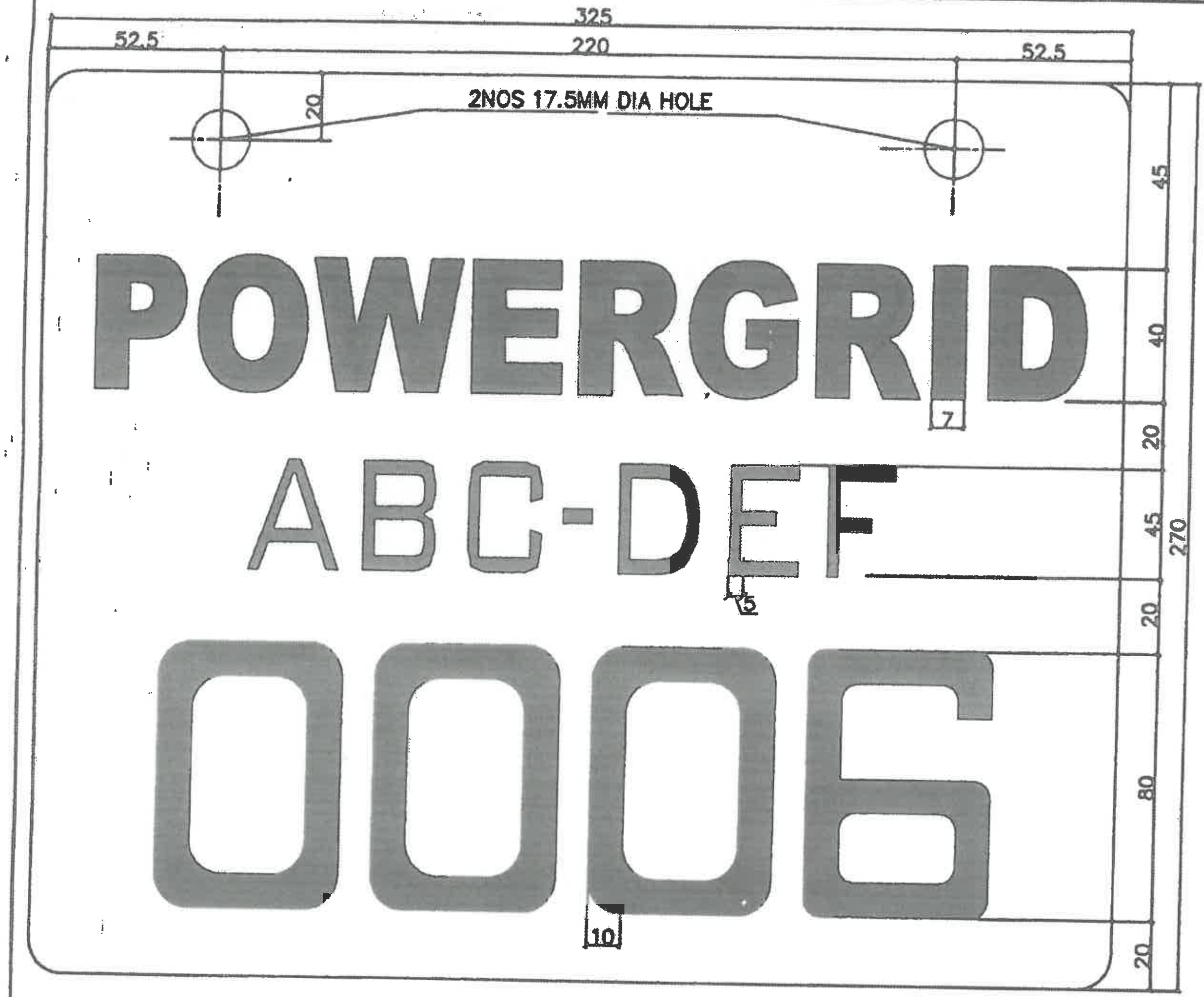
POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

PROJECT: 765/400/220KV TRANSMISSION SYSTEM

TITLE: DANGER PLATE

SCALE: N.T.S.

DRAWING NO: CC/ENGG/TL/ACC/ P



NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. LETTERING: RED ENAMELLED.
3. BACKGROUND: WHITE VITREOUS ENAMELLED.
4. BACK: BLACK VITREOUS ENAMELLED.
5. MINIMUM 1.6THK. M.S.PLATE AS PER IS:1079-2017(Grade-HR1)/IS 513-2016 (Grade-CR1)
6. EACH NUMBER WILL HAVE FOUR DIGITS AS SHOWN. NUMBERS TO BE STARTED FROM '0001' ONWARDS.
7. GENERAL TOLERANCE ±3% UNLESS OTHERWISE SPECIFIED.
8. THE CORNERS OF THE PLATES SHOULD BE ROUNDED OFF.
9. ALL LETTERS SHOULD BE CENTRALLY SPACED.
10. BOLT / NUT TO BE GALVANIZED AS PER IS:1367 (P-13) - 1993.

ABC CODE FOR SENDING END AND DEF CODE FOR RECEIVING END. TO BE FURNISHED BY SITE IN-CHARGE.

LIST OF 16mmø BOLTS, NUTS & WASHER TO BE SUPPLIED WITH EACH PLATE

DETAILS	QTY
M-16x35MM LONG HRH BOLT AS PER IS:12427-2001 CLASS 5.6 AND NUT AS PER IS:14394-1996 CLASS 5	2
2MM THK. LEAD WASHER	4

STANDARD DRAWING

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

PROJECT: 765/400/220KV/132KV TRANSMISSION SYSTEM

TITLE: TOWER NUMBER PLATE

REVISION

REV. No	DESCRIPTION	CHKD	REVWD	APPD
1	Refer Note 5			

CLEARED BY: CHECKED / REVIEWED / APPROVED

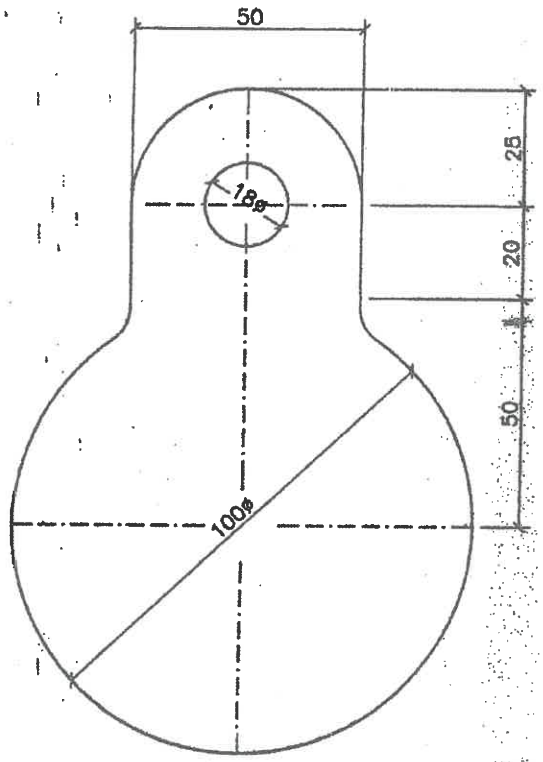
SCALE: N.T.S.

DRAWING NO: CC/ENGG/TL/ACC/TNP

REV. 1

MGR(ENGG-TL)

DGM(ENGG-TL)



TOWER PHASE PLATE

NOTES:-

1. ALL DIMENSIONS ARE IN MM.
2. M.S. PLATE–1.6MM THK.(MIN) AS PER IS:1079 – 2017 (Grade-HR1) / 513-2016 (Grade-CR1)
3. PHASE PLATE TO BE ENAMLLED RED, YELLOW AND BLUE ON FRONT AND BACK.
4. GENERAL TOLERANCE ±3% UNLESS OTHERWISE SPECIFIED.
5. PHASE PLATE SHALL BE AS PER IS:5613 (PART–2).
6. BOLT / NUT TO BE GALVANIZED AS PER IS:1367 (P–13) – 1983.
7. QUANTITY PER SET: ONE PLATE EACH OF RED, YELLOW & BLUE.
8. ONE SET FOR EACH CIRCUIT IS TO BE SUPPLIED.

LIST OF 16mmø BOLTS, NUTS & WASHER

TO BE SUPPLIED WITH EACH SET

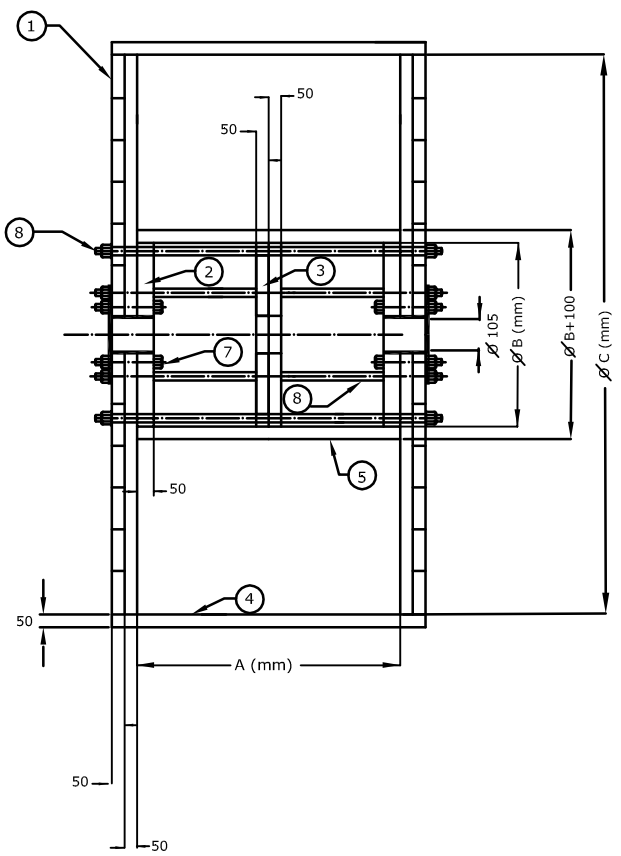
DETAILS	QTY
M–16x35MM LONG HRH BOLT AS PER IS:12427–2001 CLASS 5.6 AND NUT AS PER IS:14394–1996 CLASS 5	3
2MM THK. LEAD WASHER	6

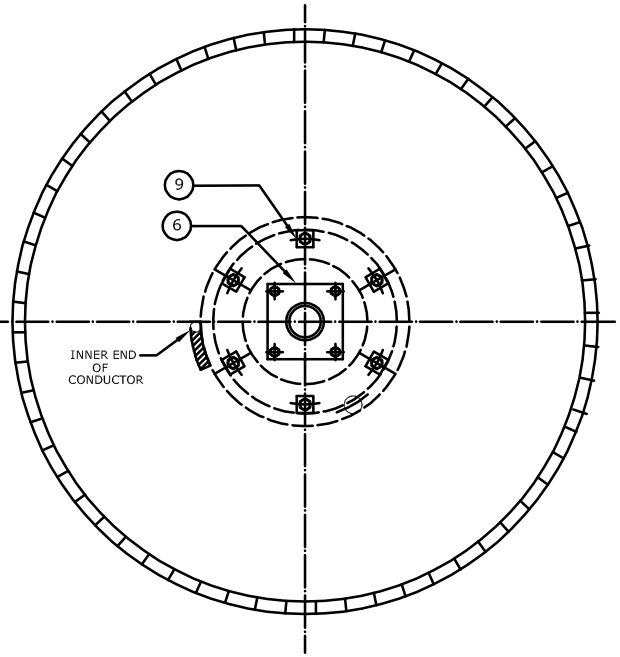
STANDARD DRAWING

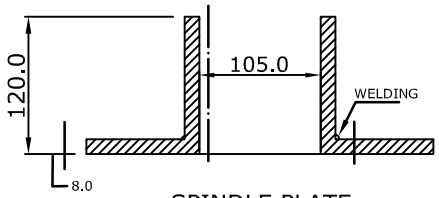
MGR(ENGG-TL) DGM(ENGG-TL)

REVISION					CLEARED BY			PROJECT: 765/400/220KV / 132 kV TRANSMISSION SYSTEM			
1	Refer to Note-2							TITLE: PHASE PLATE			
REV. No	DESCRIPTION	CHKD	REVWD	APPD	CHECKED	REVIEWED	APPROVED	SCALE N.T.S.	DRAWING NO: CC:ENGG:TL:ACC:PP		REV. 1

POWER GRID CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)







SPINDLE PLATE

	DRUM COMPONENTS	MATERIAL SPECIFICATION	QUANTITY	DIMENSION
1.	FLANGE	SEASONED WOOD	2	Ø Cx100(50+50)
2.	BARREL END SUPPORTS	SEASONED WOOD	2	Ø Bx50
3.	BARREL MIDDLE SUPPORT	SEASONED WOOD	1	Ø Bx100(50+50)
4.	OUTER LAGGING	SEASONED WOOD	--	(A+200)x50
5.	BARREL BATTENS	SEASONED WOOD	--	Ax75x50
6.	SPINDLE PLATE	MS	2	300x300x8
7.	BUSH PLATE STUD	MS	8	Ø 16X180
8.	TIE ROD	MS	6	Ø 22X1325
9.	TIE ROD WASHER	MS	12	75x75x6

NOTE :

1.	ALL DIMENSIONS ARE IN MM.
2.	DRUMS SHALL GENERALLY CONFIRM TO IS 1778-1980 AMMENDMMENT No.1 Of june 1989 EXCEPT OTHERWISE SPECIFIED.
3.	ONE LENGTH OF CONDUCTOR SHALL BE WOUND ON EVERY DRUM
4.	THE STANDARD LENGTH OF THE CONDUCTOR AND EQUIVALENT SIZE OF CONDUCTOR IS L mtrs (INIDCATED IN THE TABLE BELOW) WITH TOLERANCE OF ± 5%.
5.	TOLERANCE ON DIMENSIONS OF WOOD IS + 3mm.
6.	TOLERANCE ON STEEL COMPONENTS OF THE DRUM IS ± 0.50mm.
7.	INNER & OUTER SURFACE OF FLANGE & BARREL SHALL BE BITUMIN PAINTED.
8.	BARREL & INNER SURFACE OF FLANGE SHALL HAVE WATER PROOF HDPE SHEET
9.	OUTER SURFACE OF CONDUCTOR SHALL BE COVERED BY WATER PROOF POLYTHENE PAPER
10.	MEDIUM GRADE CRAFT/CREPE/POLYTHENE PAPER SHALL BE USED IN BETWEEN THE LAYERS
11.	ALL NUTS OF ROD SHOULD BE TACK WELDED.
12.	3 nos. BINDER SHALL BE USED FOR BINDING THE EXTERNAL LAGGING.
13.	FLANGE SHALL BE NAILED IN 5 CIRCLES WITH NAIL SIZE OF 125X4.

STANDARD DRAWING

STANDARD CONDUCTOR LENGTH (in Meters)	A (in mm)	B (in mm)	C (in mm)
.....	.....	.....	.....

Note : Standard Length & Dimensions A, B & C shall be furnished by HTLS conductor supplier.

REVISION					CLEARED BY			PROJECT DETAILS:
								TITLE: WOODEN DRUM DRAWING FOR HTLS CONDUCTOR
REV. No	DESCRIPTION	CHKD	REVWD	APPD	CHECKED	REVIEWED	APPROVED	SCALE N.T.S. / DRAWING NO:CC:ENGG:TL:COND:WD / REV. 0