

ESP-001-2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (Technical Specification For Dry Type Lighting Transformers)		Std. / Doc. Number	
				PY55090	
				Rev. No.	03
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TECHNICAL SPECIFICATION FOR DRY TYPE LIGHTING TRANSFORMER

Revisions: Refer to record of revisions	Prepared by :	Checked by :	Approved by :	Date :
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**PROJECT ENGINEERING & SYSTEMS DIVISION**
(Technical Specification For Dry Type Lighting Transformers)**1.0 INTENT OF SPECIFICATION**

This specification covers the design, manufacture, assembly and testing at manufacturer's works; packing and transportation to site of dry type lighting transformer, complete with all accessories for efficient and trouble-free operation.

It is not the intent to specify completely herein all details of the equipment; nevertheless, the equipment shall be complete and operative in all respects and shall confirm to the highest standard of engineering, design and workmanship.

2.0 SITE CONDITIONS

Site Conditions shall be as per Job Specification.

However, in case there is no specific mention of Site Conditions in the Job Specification, then the Design Ambient Temperature of 45°C and altitude not exceeding 1000 m above MSL shall be considered.

3.0 SCOPE OF WORK

Scope of work shall be as per Job Specification.

4.0 CODES AND STANDARDS

- 4.1 The equipment to be furnished under this specification shall be in accordance with the applicable section of the latest version of the following BIS standards unless otherwise specified:

Specification	Description
IS: 11171	Dry type Power Transformers
IS: 5	Colors for ready mixed Paints and Enamels
IS: 2026	Power Transformers
IS: 10028	Code of practice for selection, installation and maintenance of transformers
IS:2705 (PART-I & III)	Current Transformers
IS: 1271	Electrical insulation-thermal evaluation and designation
IS/ IEC: 60529	Degree of protection provided by enclosures (IP Code)

- 4.2 The equipment shall also confirm to the provisions of Indian Electricity Rules and other statutory regulations currently in force in the country.
- 4.3 For project specific requirements refer document Job Specification (Annexure-1).
In case of any contradiction between various specifications/data sheets, the following order of decreasing priority shall govern:
- Statutory Regulations (Maximum Priority)
 - Job Specification (Annexure-1)
 - This Specification(PY55123)
 - Indian Standards (Minimum priority)

**PROJECT ENGINEERING & SYSTEMS DIVISION**
(Technical Specification For Dry Type Lighting Transformers)**5.0 GENERAL REQUIREMENTS**

- 5.1 The offered equipment shall be brand new with state of art technology and proven field track record. No prototype equipment shall be offered.

6.0 TECHNICAL REQUIREMENTS

- 6.1 The transformer shall be *two-winding, three-phase, dry type, ANAN cooled*, moisture proof and suitable for indoor installation.
- 6.2 The transformer shall be housed in at least IP33 enclosure fabricated from sheet steel minimum 2mm thick with air ventilating louvers along with fine wire mesh. Transformer and the enclosure shall be suitably reinforced to prevent distortion during handling.
- 6.3 The transformer shall be of double wound core type. Cores shall be built from cold rolled, low loss, grain oriented silicon steel laminations and fully insulated for rated voltage and clamped to minimize vibration and noise. Core fastening bolts shall be insulated to reduce losses and to avoid hotspots. All parts of the magnetic circuit shall be effectively connected to the earth system. Lifting eyes (or any other provision) for lifting the core from the tank shall be provided.
- 6.4 The winding shall be of high conductivity electrolytic copper. Winding shall be designed for full load current and to withstand the thermal and electromagnetic stresses arising due to the through fault current. The winding joints shall be electrically brazed. Foil type windings are not acceptable.
- 6.5 Winding insulating material shall be of class "F" and temperature rise shall be limited to class "B" for lighting transformers up to 100 KVA. It shall be of class "H" and temperature rise shall be limited to class "F" for lighting transformers above 100 KVA. The enclosure temperature rise shall not be more than 10°C above ambient temperature. The winding insulation shall be uniform. The Power frequency withstand voltage and Lightning impulse withstand voltage of the winding insulation shall be as per IS.
- 6.6 Windings shall be brought out and terminated in cable boxes. Cable boxes with double compression glands and crimped type tinned copper lugs shall be provided on both primary and secondary sides to suit the specified cable sizes. Gland plate shall be removable type. The arrangement shall be such that the core coil assembly can be removed without dismantling primary and secondary side cables. Cable boxes shall be self-supporting, weatherproof and air-filled type. Primary (Delta) side cable box shall be suitable for a fault level of 50kA for 0.25 second while secondary (Star) side cable box shall be suitable for a fault level of 10kA for 1 second. Degree of protection of Cable Boxes and shall be minimum IP55.
- 6.7 Different non-current carrying parts of the transformers shall be connected by copper flexibles for earth continuity purpose. All doors and movable parts of panel mounted transformer shall be earthed, using flexible copper connections, to the fixed frame of the panel. Two nos. suitable size studs along with nuts, bolts and washers shall be provided on the sides of the enclosure to accommodate the connection of GI strip (50x6mm) for enclosure earthing.
- 6.8 Base channels shall be provided with pulling eyes to facilitate handling.
- 6.9 The transformer shall be provided with flat type bi-directional rollers, lifting lugs and earthing terminals.



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- 6.10 A separate neutral terminal (other than that provided in terminal chamber) for grounding star connected windings shall be brought outside the enclosure by a suitable bushing, located at an approximate height of 300mm from base of the roller.
- 6.11 Transformer shall be supplied with Marshalling Terminal Box having thermostat operated space heater, LED Lamp for illumination with door limit switch and 5A socket. Degree of protection of Marshalling Box shall be minimum IP55.
- 6.12 *For transformers rated 100 kVA and above:* Two nos. of PT100 (RTD) on each limb shall be provided as the temperature-sensing element. Winding temperature indicator shall be provided which shall be compatible with PT100 and shall be provided with 6 nos. of inputs along with alarm and trip contacts. The Indicator shall be fully configured along with appropriate set points. *The configuration details shall be provided as part of Transformers' O&M Manual.*
- 6.13 Tapping shall be provided on the primary (delta) side. Tap changer shall be Off-Circuit type. Under conditions of external short circuit, tap changing equipment shall be capable of carrying the same current as the winding. Tap changing mechanism shall be easily accessible and it shall be possible to change the taps without opening the main transformer enclosure. Link Type tap changing mechanism is preferable. Padlocking facility shall be provided on the tap changer. The transformer shall operate satisfactorily at any tap setting with a sustained voltage of 110% of rated tap voltage.
- 6.14 Unless otherwise specified, primary cable box and secondary cable box with the neutral bushing shall be at 180° orientation.
- 6.15 Noise level: Audible noise level for the transformers shall not exceed the limits specified as below:

kVA Range	Average Noise Level in decibels (dBA) at 30cm from transformer
0 – 50	50
51 – 150	55
151 - 300	58
301 - 500	60

- 6.16 Minimum guaranteed efficiency at Normal Load (at 0.8 pf) shall be as specified below. *(Losses shall be inclusive of positive tolerance at nominal tap.)*

kVA Range	Minimum Guaranteed Efficiency (at Normal Load and 0.8 pf)
≥ 200 kVA	98%
< 200 kVA	95%

The Normal Load and the load at which maximum efficiency of transformer is required shall be as per Job Specification.

- 6.17 Rating & Diagram Plate shall be provided.
- 6.18 Gasket at mating surfaces shall be non-deteriorating, resilient and heat resisting (up to 100°C).

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6.19 All the fasteners and bolts shall be galvanized. Transformer metal parts shall be thoroughly cleaned, degreased and treated with minimum SA2½ surface preparation. After surface preparation, one coat of zinc chromate primer and two coats of synthetic paint shall be applied. If surrounding atmosphere is specified as corrosive in Job Specification, the finishing paint shall be corrosion resistant for the type of atmosphere specified. Paint Shade and Thickness shall be as per Job Specification.

6.20 All paints shall be carefully selected to withstand tropical heat, extremes of weather and the surrounding atmosphere conditions specified. The paint shall not scale off or crinkle or be removed by abrasion due to normal handling.

6.21 A warning inscription "DO NOT OPEN WHEN ENERGIZED" shall be provided on panel mounted transformer. The warning inscription shall be embossed on the enclosure or separate warning plate with above inscription shall be fixed to the enclosure with screws. Warning plate shall be of nickel-plated brass/stainless steel.

7.0 INSPECTION & TESTING

7.1 During fabrication, the transformer shall be subjected to inspection by Owner or by an agency authorized by the Owner. Manufacturer shall furnish all necessary information concerning the supply to Owner’s inspectors. Owner/ BHEL may make multiple visits during manufacturing and testing for review of progress, quality documents verification, verification of materials in compliance to specifications/ standards. Owner/ BHEL may make final visit for final inspection and verification of shipment documents. The same shall be included in the manufacturing quality assurance plan. Actual visits and inspection shall be as per the approved manufacturing quality assurance plan.

7.2 The equipment shall be offered for final inspection at suppliers’ works. Following Tests have to be performed:

a) All routine tests as per IS: 11171 shall be conducted on each transformer.

b) Heat Run Test shall be conducted on one transformer of each type and rating.

7.3 Except Heat Run Test, Type test certificates (Short circuit, Impulse, Acoustic sound, Partial discharge, IP certificate for Transformer enclosure & cable box), not older than 5 years, shall be furnished for similar rating of transformer. In case the type test certificates are not submitted or are invalid, the tests shall be conducted without any commercial implications.

8.0 QUALITY ASSURANCE

8.1 Quality assurance shall follow the requirements of BHEL Quality assurance document as applicable.

8.2 QA involvement will commence at the enquiry and follow till complete acceptance, thus ensuring total conformity to BHEL requirements.

9.0 DOCUMENTATION

9.1 Documents to be submitted along with the technical bid/ offer:

1. Deviation schedule

2. Un-priced price format.

3. Type Test Certificates.

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9.2 Documents to be submitted after receipt of order for approval.

1. 6 sets of GA, Foundation Details, Rating & Diagram Plate Details, BOM, Circuit Diagram and Technical Data Sheets shall be furnished within 15 days of Lol/ PO for purchaser's approval. BHEL shall provide comments/ approval within 10 days of receipt of drawings. Vendor shall incorporate comments, if any and submit revised drawings within 7 days. *Vendor is responsible for completion of approval cycle and minimizing number of revisions.*

2. 15 sets each of all the above documents' final As-manufactured copies and O&M Manuals, test certificates shall be furnished in hardbound folder within a week after inspection. Soft copy of O&M manual and drawing shall be furnished in 2 compact discs.

10.0 PACKING & DISPATCH

All equipments shall be suitably divided into several sections for protection & ease of handling during transportation. All equipments shall be suitably protected, coated, covered, boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection. While packing all the material, the limitations of weight, dimension etc. for transportation by railways and roadways, as applicable, should be taken into account. Packing crates/cases shall have skid bottom for handling. In order to prevent movement of equipments/components within the crates, proper packing supports shall be provided. The transformer may be stored outdoors for long periods before installation. The package shall be completely suitable for outdoor storage in areas with heavy rainfall/high ambient temperature. All loose components/hardware supplied loose shall be packed in wooden box and properly tagged. For easy identification, the equipment/part no. in the shipping list shall also be marked on the equipment/part and on its package.

Bidder shall specifically indicate weight and dimension of the heaviest piece to be transported.

11.0 PRICE FORMAT

Price Format shall be as per Job Specification.

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12.0 DEVIATION SCHEDULE**PROJECT** _____**ENQUIRY NUMBER** _____ **NAME OF BIDDER** _____**ITEM** _____ **OFFER REF NUMBER** _____

SN	Clause/ Spec Number	Description	Deviation	Nature of Deviation	Remarks
1					
2					
3					
4					
5					

NOTES:

- Technical offer of the bidder will be evaluated only on the basis of Deviation Schedule. Deviation Schedule constitutes this sheet (with these Notes) duly signed and stamped.**
- Deviations, if any, shall be clearly brought out only in this format. Deviations mentioned/ taken elsewhere or in any other format will be ignored.
- Additional sheets in the same format can be attached by the vendor, if necessary.
- Nature of Deviations shall only be of Design/ Manufacturing constraints and non-availability of items/ components/ makes in market.
- No price implications shall be entertained for deviations withdrawn during the technical scrutiny. If any deviations are accepted by BHEL during technical scrutiny then also there will be no price implication. Hence, in no case there will be consideration of Price implications.
- Reasons for the deviations shall be specified in the Remarks column.
- If there are no deviations from the specifications, bidder still has to submit the Deviation Schedule by writing "NO Deviations" in this format.
- If the "Deviation Schedule" is not submitted along with the offer, the bidder's offer is likely to be rejected without any further interaction with the bidder.
- Only the accepted deviations in conjunction with the original tender shall constitute the contract document for the award of job to the bidder.

SIGNATURE OF BIDDER _____**NAME** _____**DESIGNATION** _____**DATE** _____**COMPANY SEAL**



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13.0 DATASHEET

(TO BE FILLED-IN AND FURNISHED BY VENDOR AFTER ORDER PLACEMENT)

(On Vendors Letter-head)

SN	Description	Data	
1.1	Manufacturer and Place		
1.2	Reference standard		
1.3	Rating (kVA)		
1.4	Rated Voltage and Connection Primary Secondary		
1.5	% impedance at nominal tap at 75°C		
1.6	No load current as a % of normal current at 100% voltage		
1.7	No load current as a % of normal current at 110% voltage		
1.8	No load loss (kW) at rated frequency At 100% rated voltage At 110% rated voltage		
1.9	Full load Cu loss (kW) at normal rated current and 75°C		
1.10	Maximum Temp. Rise of winding over design ambient temperature at full load at 0.8 pf		
1.11	Efficiency at 75°C & at upf/ 0.8 pf At 100% full load At 75% full load At 50% full load	upf	0.8 pf
1.12	Load for maximum efficiency		
1.13	Maximum efficiency		
1.14	Voltage regulation at full load at 75°C at upf/ 0.8 pf	upf	0.8 pf
1.15	Type of magnetic circuit		
1.16	Type of winding (Spiral/Helical) Primary Secondary		
1.17	Weight of Core & Coil assembly Enclosure & Fittings		
1.18	Total weight		
1.19	Materials Core Winding Insulation Bushing/Insulators		
1.20	Overall dimensions (L x B x H) (mm)		

(Signature of vendor along with stamp)

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14.0 CHECKLIST FOR BID SUBMISSION

(TO BE FILLED BY THE BIDDER AND SUBMITTED ALONG WITH THE OFFER)

(Tick the checkboxes to confirm in affirmative.)

S/N	Description	Confirmation
1	Bidder has read each Clause of the Job Specification and the Standard Specification (PY55090).	☐
2	Bidder has explicitly specified the nature and extent of Deviation against any Clause (referred above in Point 1) in the Deviation Schedule (part of Job Specification).	☐
3	Any conflict between provisions of the Specification has been included by the Bidder in the Deviation Schedule itself.	☐
4	Bidder confirms that they have read the provisions of the Deviation Schedule and have included the Schedule in the Offer after agreeing to the said provisions.	☐
5	Bidder confirms that Prices for all items mentioned in the Price Format have been quoted; Unpriced and Priced Schedules have been included in the Techno-commercial Offer and Priced Offer respectively.	☐
6	Bidder confirms that Type Test Certificates have been included in the Offer.	☐
7	Bidder confirms compliance to Sub-Vendor List provided in the Job Specification.	☐

NOTES:

- Offer received without affirmative confirmation against any of the above points may not be considered for evaluation.

SIGNATURE OF BIDDER**NAME****DESIGNATION****DATE****COMPANY SEAL**



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LIST OF LIGHTING TRANSFORMERS COVERED IN THIS SPECIFICATION

VAR.NO	DESCRIPTION	MATERIAL CODE
00	415/415V, 35KVA,LIGHTING TRANSFORMER	PY9755090002
01	415/415V, 25KVA,LIGHTING TRANSFORMER	PY9755090010
02	415/415V, 50KVA,LIGHTING TRANSFORMER	PY9755090029
03	415/415V, 75KVA,LIGHTING TRANSFORMER	PY9755090037
04	415/415V, 100 KVA, LIGHTING TRANSFORMER	PY9755090045
05	415/415V, 150 KVA, LIGHTING TRANSFORMER	PY9755090053
06	415/415V, 200 KVA, LIGHTING TRANSFORMER	PY9755090061
07	415/415V, 250 KVA, LIGHTING TRANSFORMER	PY9755090070
08	433/433, 25 KVA ,LIGHTING TRANSFORMER	PY9755090088
09	433/433, 50 KVA ,LIGHTING TRANSFORMER	PY9755090096
10	433/433, 75 KVA ,LIGHTING TRANSFORMER	PY9755090100
11	433/433, 100 KVA ,LIGHTING TRANSFORMER	PY9755090118
12	433/433, 150 KVA, LIGHTING TRANSFORMER	PY9755090126
13	433/433, 200 KVA, LIGHTING TRANSFORMER	PY9755090134
14	433/433, 250 KVA, LIGHTING TRANSFORMER	PY9755090142
15	415/433, 25 KVA ,LIGHTING TRANSFORMERS	PY9755090150
16	415/433, 50 KVA ,LIGHTING TRANSFORMERS	PY9755090169
17	415/433, 75 KVA ,LIGHTING TRANSFORMERS	PY9755090177
18	415/433V, 100 KVA, LIGHTING TRANSFORMER	PY9755090185
19	415/433V, 150 KVA, LIGHTING TRANSFORMER	PY9755090193
20	415/433V,200 KVA, LIGHTING TRANSFORMER	PY9755090207
21	415/433V, 250 KVA, LIGHTING TRANSFORMER	PY9755090215
22	433/380V, 25 KVA, LIGHTING TRANSFORMER	PY9755090223
23	433/380V, 50 KVA, LIGHTING TRANSFORMER	PY9755090231
24	433/380V, 75 KVA, LIGHTING TRANSFORMER	PY9755090240
25	433/380V, 100KVA, LIGHTING TRANSFORMER	PY9755090258
26	433/380V, 150KVA, LIGHTING TRANSFORMER	PY9755090266
27	433/380V, 200KVA, LIGHTING TRANSFORMER	PY9755090274
28	433/380V, 250KVA, LIGHTING TRANSFORMER	PY9755090282
29	415/380V, 25 KVA, LIGHTING TRANSFORMER	PY9755090290
30	415/380V, 50KVA,LIGHTING TRANSFORMER	PY9755090304
31	415/380V, 75 KVA, LIGHTING TRANSFORMER	PY9755090312
32	415/380V, 100KVA,LIGHTING TRANSFORMER	PY9755090320
33	415/380V, 150KVA,LIGHTING TRANSFORMER	PY9755090339
34	415/380V, 200KVA, LIGHTING TRANSFORMER	PY9755090347
35	415/380V, 250KVA, LIGHTING TRANSFORMER	PY9755090355
36	Complete Set of Gasket	PY9755090363
37	WTI with A/T contacts	PY9755090371
38	Set of Fuses/ MCB of each rating for Marshalling Box	PY9755090380



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JOB SPECIFICATION

FOR DRY TYPE LIGHTING TRANSFORMER

ANNEXURE-1 to PY55090

(To be read along with Standard Specification for Dry Type Lighting Transformers – PY55090.)

PROJECT	REVAMPING AND UPGRADATION OF 4 NOS. OF ESPS OF BOILERS IN THERMAL POWER PLANT
CUSTOMER	RASHTRIYA ISPAT NIGAM LIMITED, VIZAG, ANDHRA PRADESH
CONSULTANT	M.N. DASTUR & COMPANY (P) LTD CONSULTING ENGINEERS, KOLKATA

Revisions:
Refer to record of revisions

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16.10.2020

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C O N T E N T S

SN	DESCRIPTION
1.0	Intent of Specification
2.0	Site Conditions
3.0	Scope of Work
4.0	Operating Conditions
5.0	Design Parameters
6.0	Painting
7.0	Price Format



1.0 INTENT OF SPECIFICATION

- 1.1 This specification covers the Project Specific Requirements for two-winding, three-phase, Dry Type Lighting Transformers. The General Requirements for design, manufacture, testing and supply of factory-assembled transformers are specified in the Standard Specification for Dry Type Lighting Transformers, accompanying this document.
- 1.2 The Transformers shall be designed to meet both the Project Specific and General Requirements. In case of any conflict arising between the two, the details provided in this document shall prevail.

2.0 SITE CONDITIONS

SN	Description	Data
2.1	Design ambient temperature	45°C
2.2	Max monthly mean humidity	88%
2.5	Altitude above MSL	<5.5m
2.6	Environment	Humid and Highly corrosive
2.7	Seismic zone	Zone-II as per IS 1893
2.8	Site location	Visakhapatnam, AP

3.0 SCOPE OF WORK

- 3.1 Supply of transformers as per Enquiry.
- 3.2 Anti-Earthquake clamps for Seismic zone-IV and above.

4.0 OPERATING CONDITIONS

SN	Parameter	Value
4.1	Voltage (Nominal)	415 V
4.2	Voltage Variation	± 6%
4.3	Frequency (Nominal)	50 Hz
4.4	Frequency Variation	± 3%

5.0 DESIGN PARAMETERS

- 5.1 The Project Specific Design parameters of transformers are given below. These data pertain to key variable parameters only. These shall be used in conjunction with the details provided in the Standard Specification for Dry Type Lighting Transformers accompanying this document.

SN	Description	Data
5.1.1	Rating	35 kVA, 25 kVA
5.1.2	Rated Voltage <i>Primary</i>	415 V
	Rated Voltage <i>Secondary</i>	415 V
5.1.3	Connection <i>Primary</i>	Delta
	Connection <i>Secondary</i>	Star
5.1.4	Vector Group	Dyn11
5.1.5	% impedance at nominal tap at 75°C	4%
5.1.6	Type of Transformer	Synthetic Resin Vacuum Pressure Impregnated
5.1.7	Tap Changer Type	Off Circuit Tap Changer
	Tap Changer Range	±5% in steps of 2.5%



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	Tap Changer Location	Primary (on Delta side)
	Tap changer operation	Operating handle outside Enclosure
5.1.8	Cable size on Primary & Secondary from top entry	1 Runs of 4Cx50Sqmm Al Armoured XLPE for Both 35 & 25kVA transformers for both Primary & secondary side
5.1.9	Cable glands and lugs	Not Required
5.1.10	Load at which maximum efficiency occurs	Between 30% and 40%
5.1.11	Normal Load on Transformer	30-40% at 0.8 pf
5.1.14	Heat Run test to be conducted	Required

6.0 PAINTING

- 6.1 Surface preparation shall be pickling or white blast cleaning to Sa 2½. The clean surface shall be given a phosphate coating consisting of a thin layer of zinc, iron or manganese phosphate deposited either by immersion or powder spray. The coating weight shall not be lower than 5 gm per sq m; the coating shall be tested, when required, by a continuous salt spray as per ASTM B 117. The phosphate coated surface shall have one coat of baking primer of zinc phosphate - butylated melamine - alkyd resin based and two coats of finish paint of amino-alkyd resin stove enamel as specified in below table. Final paint shade shall be RAL7032 or 631 of IS:5.

Surface Quality	No. of Coats	DFT per Coat in micron	Paint System	Total DFT in micron
Pickling or Sa2.5 Phosphate treatment	1 Primer	25	Zinc phosphate - butyrate melamine - alkyd resin baking primer	75
	1 Intermediate		Aminoalkyd resin putty	
	2 Primer	25	Aminoalkyd resin baking enamel paint	

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7.0 PRICE FORMAT**PROJECT** _____**ENQUIRY NUMBER** _____ **NAME OF BIDDER** _____**ITEM** _____ **OFFER REF NUMBER** _____

(TO BE FILLED-IN BY VENDOR AND FURNISHED ALONG WITH OFFER)

MAIN EQUIPMENT & TEST CHARGES

SN	Description	Quantity	Weightage	Quoted Yes/No	Remark
1.0	Main Equipment				
	415V/ 415V, 35				
1.1	kVA, LIGHTING TRANSFORMER	2 Nos.	0.6382		
	415V/ 415V, 25				
1.2	kVA, LIGHTING TRANSFORMER	4 Nos.	0.3618		

NOTES:

1. Vendor shall strictly submit the prices in the online Portal. Prices quoted in any other format shall not be considered for evaluation.
2. Bidder to attach Duly signed & stamped un-priced bid without disclosing rates/ price but mentioning only 'quoted' against each item in part-I bid. If not submitted in this format or any field is left blank/Not quoted, the offer will be liable for rejection.
3. For bid evaluation, items mentioned at Sl. No. 1.1 to 1.2 above shall be considered on overall package basis.

(Signature of the bidder along with stamp)



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QAP GUIDELINES, FORMAT & TYPICAL MANUFACTURING QAP FOR DRY TYPE LIGHTING TRANSFORMER

ANNEXURE-2 to PY55090

(The QAP format and Guidelines for filling up the format shall be used by vendor for preparation and submission of QAP after order placement.)

Note :

Typical /Indicative /Standard QAP(s) for equipment /package attached is reference document and to use by successful bidder in future for preparation and submission of QAP for BHEL /CUSTOMER approval.

No deviation to reference document is acceptable.

PROJECT	REVAMPING AND UPGRADATION OF 4 NOS. OF ESPS OF BOILERS IN THERMAL POWER PLANT
CUSTOMER	RASHTRIYA ISPAT NIGAM LIMITED, VIZAG, ANDHRA PRADESH
CONSULTANT	M.N. DASTUR & COMPANY (P) LTD CONSULTING ENGINEERS, KOLKATA

**PROJECT ENGINEERING & SYSTEMS DIVISION**
(QAP GUIDELINES, FORMAT & TYPICAL MANUFACTURING QAP
FOR DRY TYPE LIGHTING TRANSFORMER)

GUIDELINES TO VENDORS

FOR PREPARATION OF QUALITY ASSURANCE PLAN

1. QAP shall be made in landscape mode on A4 size paper as per the format enclosed. Font size shall be minimum 10.
2. Each page of QAP shall contain the following information:
 - a) *Vendor's name & address.*
 - b) *Customer: BHEL, Hyderabad.*
 - c) *Project.*
 - d) *BHEL Product Standard Number/revision number as referred in P.O.*
 - e) *BHEL Purchase Order Number & Date.*
 - f) *Product as per P.O. description.*
 - g) *QAP Number (unique and shall not repeat)/revision number/date.*
 - h) *Page number and number of pages.*
3. QAP shall contain four parts / stages as follows.
 - a) *Raw materials and bought out items.*
 - b) *In process Control / Inspection.*
 - c) *Final assembly, Inspection & Testing.*
 - d) *Painting, preservation & packing.*
4. Under 'Component', indicate name of the component (say casing, rotor, pressure gauge, etc.).
5. Under 'Characteristics', indicate appropriately (say chemical analysis, mechanical properties, NDT (UT, DP etc.), hydrostatic test, calibration check etc.)
6. Under 'Class', indicate minor, major or critical depending on the importance of characteristic.
7. Under 'Type of check', indicate appropriately (say chemical, mechanical, UT, DP etc.)
8. Under 'Quantum of check', indicate appropriately (say 100%, 10%, sample, per melt, per heat, all pieces etc.)
9. Under 'Reference document' and 'Acceptance norms', appropriate National & International standards, BHEL standards, approved drawing references etc. should be indicated. It is not correct to mention as "Vendor's internal standards or Vendor's

ESP-001-2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (QAP GUIDELINES, FORMAT & TYPICAL MANUFACTURING QAP FOR DRY TYPE LIGHTING TRANSFORMER)	Std. / Doc. Number	
			Annexure-2 to PY55090	
			Rev. No.	00
			Sheet 3 of 10	

standard practice etc.” If vendors’ internal standards are referred, same shall be in line with BHEL Specification as indicated in the P.O. These may require review & approval by our Engineering Department.

10. Under ‘Format of record’, indicate appropriately supplier’s test certificate, calibration certificate, lab report, inspection report etc.
11. Please refer ‘Agency’ in QAP format. Under **P: Perform**, **W: Witness**, **V: Verify** - indicate against each characteristic:

1: (BHEL CQS/Nominated inspection agency), OR

2: (Vendor / Sub vendor)

Note: Performing agency is normally vendor or his sub vendor (Legend 2). Where witness points are indicated in specification, P.O., Drawing etc., for such operations, under Witness (W) column use 1. Under 'Verify' column, use Code 1.

12. Under ‘D’ please put (☐ Tick) against each characteristic where vendor proposes to submit test certificate/report etc., OR as required as per BHEL Specification.
13. Vendor’s signature & stamp should be available on each page of QAP.
14. Vendor should read the BHEL Product Standard thoroughly and QAP should be made only inline and relevant to the Specification & Approved Drawings.
15. The following operations/characteristics/check points may be included (AS APPROPRIATE)
 - a) Visual check
 - b) Dimensional check
 - c) Mechanical and Chemical properties.
 - d) Surface preparation before painting (by chemical cleaning, sand blasting, and shot blasting etc. as the case may be.)
 - e) Painting check for shade, Dry Film Thickness (DFT), Adhesion/ peel off test etc.
 - f) Check for correctness for all components mounted as per General arrangement Drawing, Bill Of Materials (BOM), etc. for range, rating, make, color, size, location as per GA, quantity, label description including tag nos., annunciator fascia, loose components, accessories, spares etc.
 - g) Verification of test certificate for protection class for the enclosures.
 - h) Mechanical functioning of switches.
 - i) Continuity of earthing and provision of earth points.
 - j) Colour coding of wiring, size, tightness & dressing of wiring.

**PROJECT ENGINEERING & SYSTEMS DIVISION**
(QAP GUIDELINES, FORMAT & TYPICAL MANUFACTURING QAP
FOR DRY TYPE LIGHTING TRANSFORMER)

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Sheet 4 of 10

k) Review of test certificates of assembled items, raw materials, internal test reports etc.

l) Witness of functional checks, which may include mechanical run & electrical run, HV Test, IR measurement, Electrical and Mechanical tests etc.

m) PQR, WPS, Welder Qualification Record, welding records (fit up, DP) etc.

n) Material identification (for punch marks of serial numbers, Heat No, Melt No, Inspector's stamp etc.)

o) Hydraulic Pressure Test, Pneumatic Pressure Test, Liquid Penetration Examination and other Non-Destructive Tests.

p) Tests on Galvanized items (Visual, Hammer Test, Knife Test, Thickness, Pierce Test (Copper sulphate test), Hydrogen evaluation test, Stripping test (for Mass of Zinc coating)

q) All tests as per BHEL Product Standard & approved drawings including Type tests and Routine tests on individual items and on System as a whole.

r) Packing and Preservation.

16. **QAP Format is enclosed.**

17. **Typical Manufacturing QAP Format is enclosed.**

**PROJECT ENGINEERING & SYSTEMS DIVISION****RC PURAM, HYDERABAD.****QUALITY & BUSINESS EXCELLENCE****INSPECTION / TC REVIEW FORMAT**

1	Vendor's Name:		5	Applicable BHEL Spec No:	
2	Project:		6	Approved Drawing No:	
3	PO No:		7	Approved Data Sheet No:	
4	Item Description:		8	Approved QAP No:	

OFFER LIST

S.No	BBU/ PO Sr. No.	Item Description	Total Qty as per PO/BBU	Qty. already accepted	Qty offered for TC review	Cumulative Qty	Balance Qty
A							
B							
C							
D							

TC REVIEW REQUISITION

BBU / PO Sr. No.	QAP Clause No.	Format of Record	Certificate No. & Date	Page No.	REMARKS
---------------------	-------------------	---------------------	------------------------	-------------	---------

A. Item Description:

B. Item Description:

C. Item Description:

D. Item Description:

E. Item Description:

SUPPLIER / VENDOR SIGNATURE WITH SEAL**BHEL/ BHEL's TPIA SIGNATURE WITH SEAL****Dt:****Dt:**

		TYPICAL MANUFACTURING QUALITY PLAN						QP. NO.:					
		PROJECT ENGINEERING & SYSTEMS DIVISION, BHEL, RC PURAM, HYD-502032			PROJECT: RINL ESP Revamp PRODUCT: Dry Type Lighting Transformer BHEL Spec: PY55419 R00			REV NO:		DATE:			
								PAGE 1 OF 5					
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P W V			REMARKS
1.0	RAW MATERIALS & BOUGHT OUT ITEMS												
1.1	Incoming material like Copper conductor, Insulation material, Laminations, Steel plate etc.	Check of Physical, Chemical and Electrical Properties.	Major	Chemical & Mechanical.	100%	As per BHEL Spec, Appd Drgs/DS or applicable standards	As per BHEL Spec, Appd Drgs/DS or applicable standards	Material Test Certificates / Test records	√	2		1	
1.2	Bought out accessories like Marshalling box, Relays, Current Transformer, Bushings and Insulator, PRVs, cable glands, lugs, OCTC, gaskets etc,	Review of Manufacturer's test certificates. Functional check on accessories. Degree of protection, IR,HV for Marshalling box	Major	Visual	100%	-do-	-do-	Material Test Certificates / Test records	√	2		1	
1.3	Spares (if any)	Make, Model, BOM check	Major	Physical	100%	-do-	-do-	Test certificates /COC	√	2		1	
2.0	INPROCESS INSPECTION												

LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICATE REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY & 2 FOR VENDOR/SUB VENDOR 3. CUSTOMER /CUSTOMER CONSULTANT AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.

		TYPICAL MANUFACTURING QUALITY PLAN						QP. NO.:					
		PROJECT ENGINEERING & SYSTEMS DIVISION, BHEL, RC PURAM, HYD-502032			PROJECT: RINL ESP Revamp PRODUCT: Dry Type Lighting Transformer BHEL Spec: PY55419 R00			REV NO:		DATE:			
								PAGE 2 OF 5					
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	
2.1	Transformer Assembly & Fabrication	Visual, Dimensional, BOM check	Major	Visual, Test	100%	As per BHEL Spec, Appd Drgs/DS or applicable standards	As per BHEL Spec, Appd Drgs/DS or applicable standards	Test Records		2	1	1	
3.0	FINAL INSPECTION & TESTING												
3.1	Transformer (Routine Tests)	1) Physical Verification, Dimensional Check and electrical clearance, rating plate details, terminal/tapping markings and verification of BoM, 2) Measurement of voltage ratio and phase displacement 3) Measurement of winding resistance on all the taps 4) Vector group and polarity check 5) Measurement of no-load current 6) Measurement of no-load losses and current at 90%, 100% and 110% of rated voltage 7) Measurement of load loss and Impedance	Major	Visual, Test	100 %	As per BHEL Spec, Appd Drgs/DS or applicable standards/IS:11171	As per BHEL Spec, Appd Drgs/DS or applicable standards /IS:11171	Inspection Test Records	√	2	1		
LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICATE REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY & 2 FOR VENDOR/SUB VENDOR 3. CUSTOMER /CUSTOMER CONSULTANT AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.													

		TYPICAL MANUFACTURING QUALITY PLAN						QP. NO.:					
		PROJECT ENGINEERING & SYSTEMS DIVISION, BHEL, RC PURAM, HYD-502032			PROJECT: RINL ESP Revamp PRODUCT: Dry Type Lighting Transformer BHEL Spec: PY55419 R00			REV NO:		DATE:			
								PAGE 3 OF 5					
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	
		voltage/short-circuit impedance on principal and extreme taps 8) Measurement of insulation resistance 9) IR measurement on windings corresponding to levels 10) Separate Source Voltage Withstand Test 11) Induced overvoltage test 12) Repeat of no-load current, no-load loss and IR measurements after completion of all electrical tests 13) Cable box : thin paper sheet insert check											
3.2		Heat Run test	Major	Test	One no. sample for each type & rating	As per BHEL Spec, Appd Drgs/DS or applicable standards/IS:11171	As per BHEL Spec, Appd Drgs/DS or applicable standards/IS:11171	Inspection Test Records	√	2	1		
LEGEND: P: PERFORM, W: WITNESS, V: TEST CERTIFICAT REVIEW. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY& 2 FOR VENDOR/SUB VENDOR 3. CUSTOMER /CUSTOMER CONSULTANT AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.													

 			TYPICAL MANUFACTURING QUALITY PLAN					QP. NO.:					
PROJECT ENGINEERING & SYSTEMS DIVISION, BHEL, RC PURAM, HYD-502032				PROJECT: RINL ESP Revamp PRODUCT: Dry Type LightingTransformer BHEL Spec: PY55419 R00				REV NO:		DATE:			
									PAGE 4 OF 5				
SL NO	COMPONENTS	CHARACTERISTICS	CLA SS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	
3.3	Type tests	1)Acoustic Noise test 2)Lightning Impulse test 3) Short circuit test 4) Partial discharge 5) IP certificate for transformer enclose and cable box	Maj or	Test	One no. sample	As per BHEL Spec, Appd Drgs/DS or applicable standards/IS:11 171	As per BHEL Spec, Appd Drgs/DS or applicable standards/IS:11 171	Type test reports	√	2		1	
3.2		Paint shade, Thickness	Maj or	Visual, Measureme nt	Random	As Per Bhel Spec	As Per Bhel Spec	Inspection test records		2	1		
4.0	PAINTNG, PRESERVATION & PACKING												
		Preservation, Packing & Marking of cases	Maj or	Visual	100%	As Per Bhel Spec	As Per Bhel Spec	Inspection test records		2		1	

Notes:

1. This typical MQP should be read along with specification (latest revision as per PO), approved drawings & approved datasheet, approved BOM (as applicable).
2. Approved drawing/datasheet & specification shall prevail over quality plan in case contradiction if any.
3. Any other tests/ checks indicated in specification, P.O., or drawing/data sheet & any additional checks envisaged by BHEL/Customer as part of correspondence to ensure workmanship, finish, aesthetics, etc. shall also be conducted and witnessed/verified by BHEL /TPIA /Customer as per project requirement..
4. All documents issued by statutory authorities such as CCOE, CMRI, ATEX etc., shall be submitted during inspection.
5. Only type test certificate of same design and same Material of Construction of equipment to be submitted, wherever required.
6. All the relevant test reports /certificates shall be submitted during inspection. The reviewed and certified documents by BHEL/TPIA/Customer shall be submitted to BHEL as documentation package.

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		TYPICAL MANUFACTURING QUALITY PLAN						QP. NO.:					
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SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P W V			REMARKS

7. All sub-ordered items, bought out items, electrical & instrumentation Items shall be procured from approved / agreed vendor list with BHEL/BHEL's Customer.

Abbreviations:-

MTC – Material Test certificate
 IR – Inspection Report

TC – Test Certificate
 BOM – Bill of Material

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