

**ODISHA SPACE APPLICATIONS CENTRE (ORSAC)**  
**Dept. Of Science & Technology, Govt. of Odisha**  
**Plot No.45/48(P), JayadevVihar, Near Gopabandhu Academy of Administration**  
**Unit-16, Bhubaneswar-751 023**

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**TENDER NOTICE No. 03 / 2022**

Procurement of Supply, Installation, Testing & Commissioning of Lightning Protection, Earthing and Surge Protection system

Sealed tenders are invited from the registered firms / OEM for Supply, Installation, Testing & Commissioning of Lightning Protection, Earthing and Surge Protection system to ORSAC.

Cost of Tender Paper : Rs. 2000/-  
Period of Issue of Tender Paper : 14.04.2022 to 28.04.2022 (11AM to 4 PM)  
Earnest Money Deposit : Rs.50,000/-  
Last Date of Submission of Tender : 28.04.2022 upto 4.00 P.M.  
Opening of Technical/Commercial Bid : 29.04.2022 at 3.30 P.M.

ORSAC reserves the right to change the procurement programme without assigning any reason thereof.

For details, please visit <http://www.odisha.gov.in> or <http://www.orsac.gov.in> or in the above office for the tender papers.

**CHIEF EXECUTIVE, ORSAC**

## DOCUMENT CONTROL SHEET

Cost of Tender Paper	Rs.2000/-
Date of Issue of Tender Paper	14.04.2022
Earnest Money Deposit	Rs,50,000/-
Pre Bid Conference	25.04.2022 at 11.30 AM (Conference hall of ORSAC)
Last Date of Submission of Tender	28.04.2022 up to 4.00 PM
Opening of Technical Bid	29.04.2022 at 3.30 PM
Opening of Price Bid	30.04.2022 at 3.30 PM
Place of Opening of Bids	ODISHA SPACE APPLICATIONS CENTRE (ORSAC) Dept. of Science & Technology, Govt. of Odisha Plot No.45/48(P), JayadevVihar, Near Gopabandhu Academy of Administration Unit-16, Bhubaneswar-751 023
Address of Communication	ODISHA SPACE APPLICATIONS CENTRE (ORSAC) Dept. of Science & Technology, Govt. of Odisha Plot No.45/48(P), JayadevVihar, Near Gopabandhu Academy of Administration Unit-16, Bhubaneswar-751 023 Tel:+91 674 2303625, Fax:+91 674 2300681 Email:orsac2012@gmail.com/orsac.od@nic.in Website: <a href="http://www.orsac.gov.in">http://www.orsac.gov.in</a>

**ODISHA SPACE APPLICATIONS CENTRE (ORSAC)**  
**Dept. of Science & Technology, Govt. of Odisha**  
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**TENDER NOTICE NO. 03/2022**

Sealed tenders are invited from registered firms / OEM for Supply, Installation, Testing & Commissioning of Lightning Protection, Earthing and Surge Protection system at Odisha Space Applications Center, Bhubaneswar.

Sl. No	Item Description	Quantity	Cost of tender paper (in Rs.)
1	Supply, Installation, Testing & Commissioning of Lightning Protection, Earthing and Surge Protection system	As per <b>Annexure-A</b>	Rs.2000/-

1. Non-transferable tender documents for supply of the item stated above will be available from office of the Odisha Space Applications Centre (ORSAC), Bhubaneswar on payment of tender document cost as specified above. The tender document cost, which is non-refundable, is payable in shape of crossed Demand Draft of any Nationalized Bank payable at Bhubaneswar drawn in favour of Odisha Space Applications Centre, Bhubaneswar, Odisha. This tender notice can be accessed through Internet in the ORSAC website: <http://www.orsac.gov.in> or from Govt. of Odisha web site <http://www.odisha.gov.in> and bid document can be downloaded. The downloaded bid document can also be used provided it is accompanied with a crossed Demand Draft towards cost of the tender document. Tenderers interested to receive tender documents by Registered Post should pay additional amount of Rs.100/- (Rupees One hundred) only. However, ORSAC will not be responsible for postal delays in delivery of the documents.
2. The Tenderers are required to furnish attested copies of GST clearance certificate from the sales tax authority of the State of Odisha along with the tender.
3. The Tenderers are required to deposit Rs.50,000/- (Rupees Fifty thousand) only as Earnest Money Deposit (EMD) in shape of Bank Draft/Bank Guarantee issued by a Nationalized Bank payable at Bhubaneswar pledged in favor of Odisha Space Applications Center, Bhubaneswar.  
  
Performance security shall be deducted from Bills as per guidelines given in the tender documents.
4. The items conforming to required specifications are to be delivered to consignee at Bhubaneswar in Odisha and the tendered has to quote the rates giving details of taxes, levies charges, premium etc. separately as stated in the tender document.
5. The tenders should be submitted after due compliance with guidelines given in the tender documents under Schedule (A) Conditions of Contract, Schedule (B) Technical specifications,

Annexure – A, (C)- Price Schedule Tenders submitted in incomplete form shall be rejected outright.

6. The filled in sealed tenders containing Technical Bid and Price Bid in double cover system as per instruction given in tender documents, shall be submitted in the Office of ORSAC, Bhubaneswar by Registered Post, Courier service or hand delivery. Tenders received after due date and time shall not be entertained.
7. A pre-bid conference will be held on 25.04.2022 at 11.30 AM to explain and clarify scope of work and various terms and conditions of the Tender to facilitate a clear understanding for prospective Bidders to enable them to participate in the Tender effectively.
8. The tender papers will be available for sale in the office of ORSAC between 11.00 AM to 4.00 PM on Odisha govt. official working days till 28.04.2022. The sealed tenders will be received till 4.00 PM on 28.04.2022 in Office of the ORSAC. The technical bids will be opened on 29.04.2022.at 3.30 PM in presence of the Tenderers or their authorized representatives, if they so desire. The Price Bids of Technically qualified bidders will be opened in presence of the tenderers or their authorized representatives either on that day or on a date to be notified later on.
9. ORSAC reserves the right to cancel any or all tenders without assigning any reason thereof.

CHIEF EXECUTIVE

## **Schedule (A) – Conditions of contract for Tender No. 03/2022**

- 1) The Tender papers include instructions issued in the Tender notice along with the Schedule (A) - Conditions of Contract, Schedule – (B) Technical Specifications with Annexure-A & (C) – Price Schedule.
- 2) The Tenderers shall submit the following documents and information with the tender. Lack of complete and adequate information under any of the parameter may render the bid disqualified.
  - a) For Technical Bid:
    - i) Copy of Tender Notice
    - ii) Acceptance of Schedule (A) & Schedule – (B) Technical Specifications with Annexure -A
    - iii) Documentary evidence that the tendered is the manufacturer or the authorized dealer of the OEM.
    - iv) Attested copies of relevant Tax registration certificate and latest GST Clearance Certificate issued by the competent authority.
    - v) Technical information and specifications prescribed by the manufacturer for the item.
    - vi) Documents in support of supplies made during last 3 years to different Govt./ public sector undertaking / Corporate House.
    - vii) Cost of Tender document (in shape of Bank Draft) if down loaded from Website and used.
    - viii) Earnest Money Deposit
    - ix) Tax clearance certificate of last 3 years.
    - x) Attested copies of Audited Balance Sheet for last 3 years
  - b) For Price Bid:
    - i) Filled up Schedule (C) – Price Schedule
    - ii) Filled up Schedule (D) – Bid form
    - iii) Filled up Schedule (E) – Price Schedule
    - iv) CAMC cost after 5 years warranty period
- 3) The firms can inspect the space of Office Building during office hours in any working days in consultation with Electrical Engg. I/c before quoting. The item should be shown separately along with the basic rate. Prices written in words shall be accepted in case of any discrepancy. Rates with conditionality or provision of escalation will be rejected.
- 4) Validity of period of the Tender shall be 90 days from the date of opening of the price bid.
- 5) The Earnest Money Deposit shall be submitted in shape of Bank Draft or Bank Guarantee issued by any Nationalized Bank at Bhubaneswar. The Bank Draft or Bank Guarantee should be pledged in favor of Odisha Space Applications Center, Bhubaneswar for a period of 30 days beyond the period of validity of the tender counted from date of opening of the price bid.
- 6) The items are to be delivered in good condition at ORSAC
- 8) If any item fails to satisfy requirement of standards, the item shall not be accepted and the bidder at his own cost shall remove it from point of delivery.

- 9) **INSTALLATION:** The item is to be delivered within 30 days of issue of Purchase Order. Part delivery will be allowed to continue the work. The installation, Testing & commission must complete within 60 days from the date of sight clearance.
- 10) **WARRANTY :** The tenderer shall give a minimum warranty for a period of 5 years or as per company norms which ever is more from the date of supply, installation, Testing & commission of the item at destination. This shall not relieve the bidder from liabilities arising out of normal warranty available with the product. The bidder will also mention the CAMC cost after expiry of guarantee period in a separate sheet in commercial bid.
- 11) If the bidder fails to supply the item within prescribed time period it shall be treated as breach of contract. The EMD will be forfeited and the supply order will be cancelled for which the bidder shall remain fully responsible without any liability of ORSAC.

If items are not supplied in time, ORSAC will consider receiving the items by imposing liquidated damage of 0.50 (zero point five zero) percent of cost per week of delay subject to maximum penalty of 5% of the value of each item inclusive of all taxes, duties, levies and charges. Part of the week shall be reckoned as one week.

- 12) Tenders are to be submitted in double cover system. The 1st sealed envelope shall contain the Technical Bid and the 2nd sealed envelope shall contain the Price Bid. Both the 1st and 2nd sealed envelopes are then to be put inside a 3rd envelope and sealed. On the 1st sealed cover it shall be written "Technical Bid for Supply, Installation, Testing & Commissioning of Lightning Protection, Earthing and Surge Protection system ( As per Annexure-A) " of Tender No. 03 /2022. On the 2nd sealed cover it shall be written "Price Bid for Supply, Installation, Testing & Commissioning of Lightning Protection, Earthing and Surge Protection system of Tender No.03 /2022. On the 3rd cover (containing the 1st and 2nd envelope) it shall be written," Supply, Installation, Testing & Commissioning of Lightning Protection, Earthing and Surge Protection system." From and to addresses shall be written on each of the envelopes.
- 13) Submission of sealed tenders shall be by Registered Post, courier service or hand delivery. ORSAC shall not be responsible for postal or courier service delays or missing of the documents during transit. Tenders reaching late (as per time mentioned in the Tender Notice) shall not be considered by ORSAC.
- 14) Intimation regarding their selection in Technical Bid may be sent to bidders on request through Post/ E-mail. Purchase order shall also be sent to the successful Tendered by Post after evaluation of Price Bid. Tenderers are to furnish their Telephone No./ E- mail id along with the correct postal address. The bidders must have service office with service engineer / technician in Bhubaneswar positively to attend the complain immediately.
- 15) Bidding Documents should be submitted with an index with page of the documents.
- 15.1 Pre-Bid Conference: A pre-bid conference will be held on 25.04.2022 at 11.30 AM to explain and clarify scope of work and various terms and conditions of the Tender to facilitate a clear understanding for prospective Bidders to enable them to participate in the Tender effectively.

- 16) Amendment of Bidding Documents:
- 16.1 At any time before the deadline for submission of bids, the Chief Executive, ORSAC may, for any reason, whether at own initiative or in response to a clarification requested by a prospective Bidder, modify the bidding document by amendment.
- 16.2 All prospective Bidders who have received the bidding document shall be notified of the amendment in writing by e-mail and / or post, and all such amendments shall be binding on them. The amended bid document shall also be kept on the website (Odisha Government Portal).
- 16.3 If required, in order to allow prospective Bidder reasonable time to take the amendment into account in preparing their bids, the Chief Executive, ORSAC reserves the rights to extend the deadline for the submission of bids.
- 17) The Chief Executive, ORSAC or his representative can have negotiation with the L1 vendor or any matter relating to supply and installation of the materials.
- 18) **Terms of Payment:** Payment to the successful tenderer shall be made only after items are received in good, serviceable condition and successfully installed & commissioned at ORSAC as per conditions stipulated in the tender documents along with required documents submitted to ORSAC in support of Bills. 90% of the bill amount will be released after successful supply, Installation, Testing & commissioning of the item & 10% of the Bill amount will be retained towards “Performance Security”. This amount can be released on submission of Bank Guarantee for equal amount issued by any Nationalized Bank at Bhubaneswar, which will remain valid till three month beyond the Guarantee period.
- 19) The tendered shall not raise any claim in any manner after the Bill amounts are cleared against the purchase order.
- 20) The quantity tendered can be decreased/increased/dropped as per the requirements at the time of placing of order.
- 21) In case of any dispute between the Tenderers and ORSAC regarding interpretation of Tender document conditions, the decision of the Chief Executive, ORSAC shall be final and binding.
- 22) Jurisdiction of Court – Civil Suits, if any, arising out of the contract shall have to be filed at Bhubaneswar under Khurda district. Writ petitions, Civil & Criminal, shall be filed in the High Court of Odisha, Cuttack.

Accepted the above conditions under schedule (A) of tender.

(Signature of Tenderer)

Name:

Address:

## EXTERNAL LIGHTNING PROTECTION SYSTEM AS PER INDIAN STANDARDS

### IS/IEC 62305-3 & NBC-2016

#### General

There are no devices or methods capable of modifying the natural weather phenomena to the extent that they can prevent lightning discharges. Lightning flashes to, or nearby, structures (or lines connected to the structures) are hazardous to the structures, their contents and installations as well as to lines. This is why lightning protection measures are essential

Lightning Protection System shall be in accordance with IS IEC 62305-3 & NBC-2016. Lightning Protection consists of external Protection for the building with Air termination, Down Conductors and Earthing and Internal protection for power lines with Surge Protective devices.

Generally lightning between cloud and ground creates failures. However inter-cloud and intra-cloud lightning also can create potential differences and failures in electronic installation. More than 95 % of Lightning strikes are of Negative impulse and less than 5 % are of positive impulse. Positive impulses are mainly due to dry lightning in cold areas.

Current parameters as per IS/IEC 62305 and the effects of lightning are as below

Current Parameters	Symbol	Unit	Lightning Protection Level				Effect
			I	II	III	IV	
<b>First positive Impulse</b>							
Peak Current	I	kA	200	150	100	Mechanical	
Impulse charge	QSHOR T	C	100	75	50	Thermal (arc)	
Specific Energy	W / R	MJ/Ω	10	5.6	2.5	Mechanical & Thermal	
Average Steepness	di / dt	kA / μS	20	15	10	Surges and flashover	
Time Parameters	T1 / T2	μS / μS	10/350				
<b>First Negative Impulse</b>							
Peak Current	I	kA	100	75	50	Mechanical	
Average Steepness	di / dt	kA / μS	100	75	50	Surges and flashover	
Time Parameters	T1 / T2	μS / μS	1 / 200				

Damages from lightning strike are due to Peak Current (I), Charge (C), Specific Energy (W/R) & Rate of change of current (di/dt). Lightning protection is designed to take care of these effects of lightning and hence the following parameters shall be strictly followed.

Effect of Lightning on External LPS (Air termination, Down Conductor and Earthing)

Effects on air-termination systems arise from both mechanical and thermal effects. Effects on down-conductors are thermal effects due to resistive heating & mechanical effects in parallel conductors and in Bends. The real problems with earth-termination electrodes are linked with chemical corrosion and mechanical damage caused by forces other than electro dynamic forces.

Sizing and fixing of Materials are selected to handle the mechanical and thermal effects. Bends in down conductor shall strictly NOT be at 90 degree (right angles) & should have a curved path of 45 degree



bend. Earth electrodes are selected based on the current handling capacity up to 1 second. To avoid corrosion problems as explained in IS/IEC 62305 (clause E.4.3.4 and E.5.4.3.2), GI is strictly not recommended inside concrete and in soil.

Effect of Lightning on Internal LPS (SPD's for POWER, DATA lines etc)

Effect on internal LPS is mainly due to coupling and the rate of change of current. Due to Very high di/dt of the first negative stroke. The expected problem is the response time of SPD and the voltage drop in the connecting wires. SPD's at the incoming panels shall have a response time less than 1 nano sec & shall be of BUSBAR Mounted type to avoid connecting wire length.

**LPL (Lightning Protection Level)**

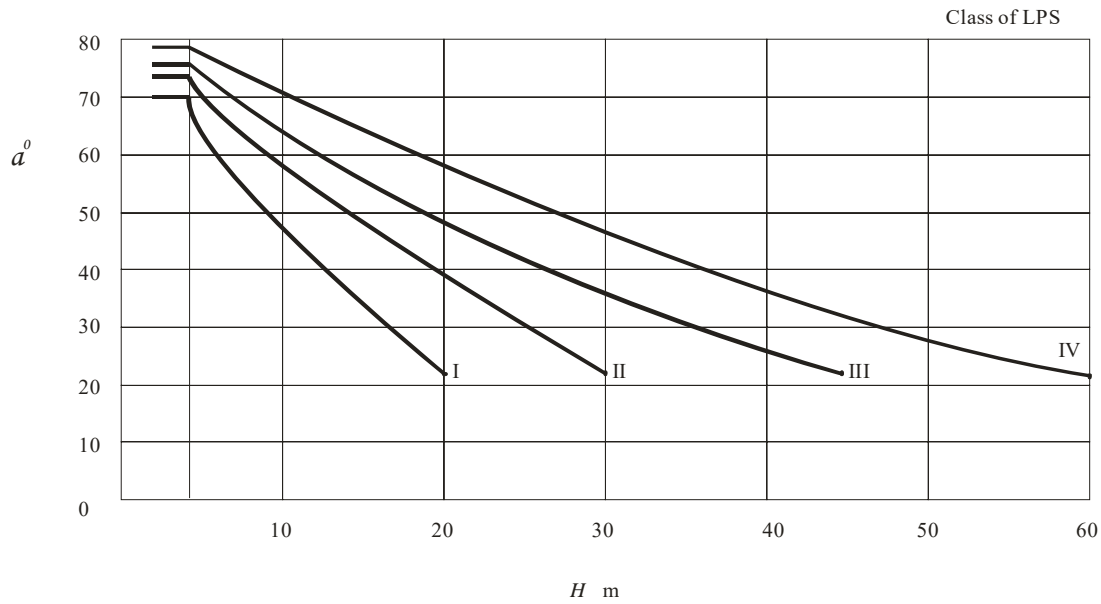
LPL is a number associated with a set of lightning current parameters relevant to the probability that the associated minimum & maximum values do not exceed the normally occurring lightning. LPL can be determined by Risk analysis as explained in IS IEC 62305-2 or can be selected based on the guideline in NBC-2016.

Application	LPL*
Computer Data Centers, Military Applications, Nuclear Power Stations, High raise Hotels/Hospitals, airports, essential services such as telecom towers	1
EX-Zones in the industry and chemical sector, Low raise Hospitals & Hotels, fuel retail outlets, gas station, compressor station etc	2
Schools, Banks, Residential Buildings, Temple, Churches, Mosques	3/4

LPL levels, probability and basic design consideration:

Class of LPS	Lightning current MINIMUM	Lightning current MAXIMUM	Interception probability	Rolling sphere radius (m)	Mesh size (m)	Down Conductor Spacing
1	3 kA	200 kA	98%	20	5*5	10
2	5 kA	150 kA	95%	30	10*10	10
3	10 kA	100 kA	88%	45	15*15	15
4	16 kA	100 kA	81%	60	20*20	20

Protection angle w.r.t Height



### Air termination system:

Material, Configuration and Minimum cross sectional area of air terminal & down conductors

Air Termination mesh conductor and down conductors: 8 mm Aluminium alloy round conductor (50 mm<sup>2</sup>)

Air Termination Rod: 10 mm, 16 mm & 40 mm solid Aluminium rods (combination of sizes) (tubes are not allowed)

Joints / Connectors / Fixing materials:

Connection materials	Connector type	GI fixing materials shall not be used
Aluminium to Aluminium	Aluminium or SS	
Aluminium to Steel	SS	

Aluminium accessories if connection is between Aluminium materials are necessary. SS accessories if connections are between aluminum and copper / copper coated materials.

Earth Termination Conductor: 10 mm solid copper coated steel conductor (100 microns min coating)

Earth Termination Joints in soil: Exothermic welding

GI material for earthing shall not be used as per the recommendation in IS/IEC62305 as well as Kerala electrical inspectorate guideline.

If the structure height is more than 60 meters, top 20% of the height of the structure shall be protected with a lateral air termination system. This is needed because the probability of flashes to the side is generally more for structures more than 60 meters in height. More importance need to be provided to Corners, Edges and significant protrusions such as balconies. Metallic handrails/ Aluminium frame of wall cladding if used in balconies shall be conned to air termination / down conductors.

In PEB / Steel buildings where GI sheet roofing, air termination mesh / Rod shall be directly mounted on the sheet. Fixing materials used shall be in good electrical contact with the sheet, shall not create water leakage.

No drilling is allowed in the terrace for fixing the air terminal, if the roof is made of concrete. Parapet wall is exception to this.

### Air terminal holder:

Concrete Roof structure: Conductors shall be securely fixed on the terrace by means of concrete air terminal holders with suitable fixing materials which is fixed on the roof by adhesive or cement mortar taking care of varying weather conditions. Plastic air termination conductor holder is not allowed. The minimum height of this air terminal holder shall be 50 mm to avoid the contact of conductor with water

Metal Roof structure: Conductors shall be securely fixed on the terrace by means of air terminal holder which is fixed on the roof by metal conductor holder made of Stainless steel. As metal roof structures are normally tapered at an angle, there are no min height criteria for metal conductor holder.

Recommended fixing distance of air terminal and down conductors

Arrangement	Recommended distance	
	TAPE / Strip	ROUND
Horizontal conductor on horizontal surface	500 mm	1000 mm
Horizontal conductor on vertical surface	500 mm	1000 mm
Vertical conductor from Ground to 20m height	1000 mm	1000 mm
Vertical conductor above 20m height	500 mm	1000 mm

If antenna, Chillers or any other roof top electrical equipment is present in terrace, the same have to be protected by using vertical air terminal after calculating the safety or separation distance. The vertical air terminal has to have suitable supports to hold it. Wind speed need to be taken into account. Vertical air terminal must be connected to horizontal air terminal by using suitable connectors.

At the crossings of the horizontal air terminals, suitable Cross connector has to be used.

Safety or Separation distance: (not required for LPS using structural natural components)

To avoid flash over to electrical/electronic apparatus, this equipment shall be kept at a distance away from LPS components more than the safety distance as per the following calculation.

Safety/Separation distance (S) in m =  $(k_i * k_c * L) / km$

Coefficient  $k_i$  depends on class of LPL/LPS ( $k_i = 0.08$  for LPL1,  $0.06$  for LPL 2,  $0.04$  for LPL3 and 4)

Coefficient  $k_c$  depends on no of down conductors:  $k_c = 0.66$  for 2 down conductors,  $k_c = 0.44$  for 3 or more down conductors

Value of coefficient  $k_m = 1$

Value of L is the total distance between the equipment to be protected (for e.g. Antenna) to the equipotential bonding bar situated just above the ground.

### Down conductor system

In order to reduce the probability of damage to electronic/electrical equipment, the down conductors shall be arranged in equal distance in such a way that from the point of strike to earth, several parallel current paths should exist & length of the current path should be minimum. Down conductors should be installed at each exposed corner of the structure as a minimum.

### Test joints:

At the connection to the earth conductor, a test joint should be fitted on each down conductor at a height of 1 m from the ground, except in the case of natural down conductors combined with foundation earth electrode. The purpose of test joint is to measure the earth resistance value. The remaining portion of down conductor (i.e., after the test joint should be mounted inside a plastic pipe of minimum 3 mm thickness.)

## **Earth Terminations**

For earth termination system, 2 basic types of earth electrode arrangements are applicable. Type A & Type B arrangement.

Type A arrangement: Comprises of horizontal or vertical earth electrode installed outside the structure to be protected connected to each down conductor.

If horizontal electrodes are used, the length shall be double. In type A arrangement, the total number of earth electrodes shall not be less than two. Type A arrangement is suitable in places where electronic equipment are not located.

Type B arrangement: This type of arrangement comprises either a ring conductor external to the structure to be protected, in contact with the soil for at least 80% of its total length or a foundation earth electrode. Ring earthing must be 1 meter away from the building and 0.5m below the ground as a closed loop. Such earth electrodes can also be meshed. For structures with extensive electronic systems or with high risk of fire, type B earthing is most preferable method. There is no limit in the resistance of Ring Earthing if the ring radius of the ring is larger than 50 meters or 80 meters for LPL 1 and 2. For LPL 3 and 4 this radius is about 5 meters. The overall resistance of earthing system shall not exceed 10 ohms.

Galvanized steel (GI) as earthing material shall not be used.

Lightning Counters: At least 2 down conductors in an installation shall have a lightning counter tested as per IEC 62561. The counter shall be digital type with replaceable battery. Battery life shall be minimum 3 years. The minimum measuring current is 1KA (8/20) and the maximum is 100 KA (10/350). The counter shall be outdoor type, IP65 and shall be able to record date, time and no of strikes.

## **Quality and Confirmations**

All materials and accessories shall be tested as per IEC 62561 for its mechanical / corrosion resistant / electrical conductivity. Vendor shall provide test reports along with completion certificate. GI (Hot dip galvanized or zinc electroplated) fixing materials and fasteners are not allowed.

## **References:**

### **IS/IEC62305 – PROTECTION AGAINST LIGHTNING:**

Part 1: General Principles

Part 2: Risk Management

Part 3: Protection of structures

Part 4: Protection of Electrical & Electronic equipment within structure

NBC-2016: National Building Code of India – 2016

IS3043: 1987: Code of practice for earthing.

**Schedule – B**  
**Scope of Job for Lightning and Surge Protection scheme**

This work includes Design, Supply, Installation, and Testing & Commissioning of the Lightning & Surge protection system of Odisha Space Applications Centre.

The bidder has to submit the BOM of Lightning and Surge protection for all the buildings mentioned under the tender. The bidder has to arrange his own arrangement for calculating the quantities. The design basics must be congruent with the IS/IEC 62305 & NBC 2016. If bidder fails to submit the needed details in Technical bid the bid will be disqualified. All the Lightning Protection and Earthing components are tested as per IEC 62561-1 & 2.

Bidder has to calculate and ensure the correctness of the design data, material data etc. required for the installation work. The design shall include material details, quantity needed without affecting the effectiveness of the Lightning and Surge corrections.

Following is the tentative material required for protection:

- A. Air Termination System
- B. Down Conductor System
- C. Earthing System

**Air Termination system shall include following items:**

1. Supply, Installation, Testing and Commissioning of minimum 8 mm (50 sq mm) Aluminum Alloy Solid Round Conductor for building terrace as a horizontal air terminal as per required LPL and should be tested for Electrical resistivity, Tensile strength, Yield strength, % elongation, salt spray & humidity test, to meet the requirements of **IS/IEC62305 and IEC 62561-1&2**.
2. Supply, Installation, Testing and Commissioning of Parapet Conductor Holder suitable for min. 8mm Aluminium conductor to be fixed above concrete Parapet at every 1Mtr with fixing Screws to meet the requirement of IS/IEC – 62305.
3. Supply, Installation, Testing and Commissioning of Flat roof Conductor Holder suitable for min. 8mm aluminum conductor to be fixed above flat roof without puncturing RCC/Surface at every 1 Mtr, to meet the requirement of IS/IEC – 62305.
4. Supply, Installation, Testing and Commissioning of Stainless-Steel cross connector suitable for min. 8mm aluminum conductor and should be tested for Electrical resistivity, Mechanical strength, salt spray & humidity test, to meet the requirement of IS/IEC - 62305 and IEC 62561-1&2.
5. Supply, Installation, Testing and Commissioning of Expansion Piece with connector at every 20mtr of horizontal air terminal to compensate the expansion and contraction of Solid Round Al. Conductor during temperature variations and should be tested for Electrical resistivity & Mechanical strength, to meet the requirement of IS/IEC - 62305.
6. Supply, Installation, Testing and Commissioning of Straight conductor connector for connecting for min. 8mm Aluminium conductor and should be tested for electrical resistivity & Mechanical strength, to meet the requirement of IS/IEC 62305. Tested for Electrical, Mechanical and chemical as per IEC 62561.
7. Supply, Installation, testing, commissioning of metal roof conductor holder as per IS/IEC-62305 & IEC-62561.

8- Supply of suitable Stainless-steel clamp for equipotential bonding of extraneous metal parts & metal roofs. The clamps should be confirming to IS/IEC-62305 & IEC-62561.

9. Supply, Installation, Testing and Commissioning of Vertical Air terminal of diameter 16-10 mm with Complete mounting Support, selected as per angle of protection chart to meet the requirement of IS/IEC 62305. Tested for Electrical, Mechanical and Chemical as per IEC 62561.

### **B. Down Conductor system:**

10. Supply, Installation, Testing and Commissioning of Minimum 8mm (50sqmm) Aluminium Alloy Solid Round Conductor suitable for down conductor in the building as per required LPL and should be tested for electrical resistivity, Tensile strength, Yield strength, % elongation, salt spray & humidity test, in accordance with IS/IEC 62305 and IEC 62561-2. Tested for Electrical, Mechanical and Chemical as per IEC 62561 complete as per specifications.

11. Supply, Installation, Testing and Commissioning of Stainless-steel Conductor Holder suitable for min. 8mm Aluminium conductor to be fixed on side wall for vertical mounting of conductors at every 1Mtr with fixing Screws as per **IS/IEC62305 and IEC 62561-1&2.**

12. Supply, Installation, Testing and Commissioning of Lightning counter - LCD screen shows the number of lightning strikes, hour and date of lightning events Buttons enable TIME/DATE setting and log viewing. Replaceable battery, working life minimum five years, complies with IEC/EN 62561-6. Threshold Current (10/350  $\mu$ s)[ITC]-1 KA. Maximum Withstand Current (10/350) [Imow]-100 KA. Environmental Ingress Protection (IP)- IP 65. Temperature Range- -4 °F to +140 °F [-20 °C to +60 °C].

13. Supply, Installation, Testing and Commissioning of Straight connector for connecting min. 8mm Aluminium conductor and should be tested for electrical resistivity & Mechanical strength as per **IS/IEC62305 and IEC 62561-1&2.**

14. Supply, Installation, Testing and Commissioning of Stainless-Steel Test Joint with IP65 enclosure suitable for connecting min. 8mm Al. conductor & 10 mm round copper coated round conductor as per **IS/IEC62305 and IEC 62561-1&2.**

### **C. Earthing System:**

15. Supply, Installation, Testing and Commissioning of suitable 10 mm copper bonded Solid Steel Round Conductor with average coating thickness 70 $\mu$ m for Type-A Earthing and should be tested for Tensile strength, Electrical Resistance, salt mist, Bend & Adhesion

16. Supply, Installation, Testing and Commissioning of Stainless-Steel conductor holder for fixing the 10 mm dia Aluminium down conductor on side wall at every 1 Mtr and should be tested for Mechanical load test & Salt spray test

17. Supply, Installation, Testing and Commissioning of UL listed & CPRI tested Copper bonded Earth rod of 20 mm dia , 3000 mtr length with copper coating thickness of 254 microns . The rod has been tested for Dimension, Marking, Tensile Strength, Salt mist, coating thickness, Electrical resistivity test before and after corrosion test as per IEC 62561-2 & UL 467. Earth Enhancing compound of 25 Kg (NO BENTONITE) earth enhancing mineral compound tested for leaching and TCLP with NABL accredited Lab as per IEC **62561-7 .**

18. Supply, Installation, Testing and Commissioning of suitable 10 mm copper bonded Solid Steel Round Conductor with average coating thickness 70µm for Type-B ring Earthing and should be tested for Tensile strength, Electrical Resistance, salt mist, Bend & Adhesion as per IS/IEC-62305 & IEC-62561.

19. Supply, installation, testing, commissioning of exothermic welding for joining ring earthing conductor with vertical earthing, consisting of T-joint, X-joint and straight Joint with the use of Mould, Aluminothermic welding, Flint Gun and other accessories.

20. Supply, installation, testing, commissioning of stainless-steel Clamp with minimum 3 mm thickness & arrangement for termination of 10 mm solid round copper conductor, to be mounted on earth electrode.

21. Supply, installation, testing, commissioning of Concrete chamber along with RCC cover plate, of **M20 grade**. Inside dimension of chamber box will be 350x350x325 mm and wall thickness min. 50mm with smooth cement plaster finish. Supply & installation of 25 mm thick RCC cover plate of M20 grade, on the top portion of the earth pit chamber with suitable handle for lifting arrangement. The Earth pit cover having a dimension of 450mmx450mmx25mm. Test certificate for the RCC chamber is to be provided.

### **Surge Protective Devices**

SPD's are to protect electrical and electronic equipment connected in the mains power supply for the purpose of protection against transient over voltages created by lightning and other switching actions. SPD's shall conform to IS/IEC 62305 & NBC-2016. SPD's also serve the purpose of insulation coordination as per IEC 60664-1 (protective control).

SPD's are voltage operated devices connected in parallel, which are subjected to voltage fluctuations in the line, TOV's due to fault in HT lines and Neutral failure in LV system. Due to this inherent voltage operational characteristics, SPD's create short circuits which may lead to failures/fire in panels and other parts of electrical installation. In order to ensure safe operation SPD's must meet the following parameters.

- Tested according to IS 16463(part 11): 2016 (IEC 61643-11: 2011).
- VDE tested and UL Listed
- Visual indication and remote contacts in all modules.
- Pluggable to test insulation resistance of the installation (irrespective of L to N or N to PE)
- Safety locking system between base and upper part as per IS 16463(part 11): 2016 to avoid accidents.
- 120 minutes TOV withstand - 440 volts.
- Safety of SPD's is ensured by using proper back up protection recommended by the manufacturer.

Power Line SPD's are to be connected at the mains incoming panel and in addition distribution boards which are more than 10 meters away from the incoming panel as recommended in IS/IEC 62305-4 & IEC 61643-12. If cables are armoured & armouring is connected to metal panel body (at source and load) through double compression gland and the cables are routed through metal closed cable trays satisfying the requirement of IS 732 the distance can be up to 50 meters. In case of BUSBAR trunking system, cable distance can be up to 50 meters.

Multi floor buildings having vertical Busbar raisers shall have type 2 SPD's at every floor level preferably in the distribution board near to the load. In places where UPS supply is used, SPD shall be in the DB near to sensitive equipment.

For DB's feeding power to critical and sophisticated electronic equipment such as drive panels, UPS, Lift / elevator equipment, firefighting equipment, security, IT equipment, BMS system panels etc, SPD's must be installed ignoring the cable distance as recommended in NBC-2016. DB's feeding power to LED lights will improve the life of LED lights and reduce converter failure.

**Myth: SPD's capacity in kA is selected based on the impulse / discharge current handling and not based on fault level of panel boards. SPD's current handling capacity in kA is**

1. Type 1+2 are tested with 10/350  $\mu$ s impulse current.
2. Type 2 (class II or class C) are tested with 8/20  $\mu$ s impulse current.
3. Fault level of panel boards are its short circuit withstanding capacity for 1 second or 3 seconds.

**Technical Requirement of SPD's:**

- **Type of Network** – 3 phases, 4 wire, 230 / 415 volts
- **Backup Fuse:** Manufacturer's recommended backup gL/gG – HRC fuses must be provided as backup protection for the SPD. This shall be cross checked with VDE test report for fault levels withstand capacity of SPD.
- **TOV withstand for 120 minutes:**  $\geq$  440 volt as specified in IEC 61643-11 and 12 and NBC-2016
- **Connecting Wire Length:** Connecting wires including the backup fuses shall be less than 250 mm as specified in IEC 60364-5-53 and IEC 61643-12. In case of difficulties, earth bus bars shall be extended near to the SPD location. An additional connection (with a short wire) from earth terminal of SPD to metal body of panel board is preferable to reduce voltage drop in connecting wire lead.
- **Compartment and isolation:** SPD as well as backup fuse shall be in separate compartment if DIN rail SPD is used with backup fuse.
- SPARKGAP SPDs shall not be used due to follow current problems between Phase and Neutral.

**Specifications:**

**Mains Incoming: Type 1+2 Three Phase SPD**

3 numbers of Type 1 + 2 SPD for connection between Phase and Neutral and one number of SPD between Neutral and Earth with the following ratings as first stage protection between LPZ0 and LPZ1 to confirm NBC-2016 requirement

Sl. No	Parameters	Specifications	
		L to N (3 nos)	N to EBB (1 no)
1	Nominal Voltage, Un	230V, 50/60 Hz	
2	Maximum Continuous operating voltage	> 255 V	
3	120 mins TOV withstand (L to N)	440 V	1200 V (200 mS)
4	Voltage Protection Level, Up	< 1.5 kV	< 1.5 kV
5	Lightning Impulse Current (10/350 $\mu$ S)	12.5 kA	50 kA
6	Nominal discharge current (8/20 $\mu$ S)	20 kA	40 kA
7	Maximum discharge current (8/20 $\mu$ S)	65 kA	100 kA
8	Short Circuit withstand (ISCCR)	50 kA	NA
9	Max. Backup fuse of short circuit withstand	315 Amps	NA



10	Response Time	< 100 nS
11	Operating temperature range	-40°C to +85°C
12	Permissible humidity	5% to 95 %
13	Mounting	Din Rail
14	Degree of Protection	IP 20
15	Operating indication in all modules	Green / Red
16	Remote Monitoring facility in all modules	NO/NC contact
17	Test certificate / Approvals for safety	VDE and UL

### **Sub Distribution Board (SDB) / LT Panel Type 2 Three Phase SPD**

3 numbers of Type 2 SPD for connection between Phase and Neutral and one number of SPD between Neutral and Earth with the following ratings as second stage protection

Sl. No	Parameters	Specifications	
		L to N (3 nos)	N to EBB (1 no)
1	Nominal Voltage, Un	230V, 50/60 Hz	
2	Maximum Continuous operating voltage	> 255 V	
3	120 mins TOV Safe fail (L to N)	440 V	1200 V (200 mS)
4	Voltage Protection Level, Up	< 1.5 kV	< 1.5 kV
5	Nominal discharge current (8/20 μS)	20 kA	40 kA
6	Maximum discharge current (8/20 μS)	50 kA	65 kA
7	Max. Back up fuse for Short Circuit withstand (ISCCR) 50 kA	250 A	NA
8	Max. Back up fuse for Short Circuit withstand (ISCCR) 25 kA	315 A	NA
9	Response Time	< 100 nS	< 100 nS
10	Operating temperature range	-40°C to +85°C	
11	Permissible humidity	5% to 95 %	
12	Mounting	Din Rail	
13	Degree of Protection	IP 20	
14	Operating indication in all modules	Green / Red	
15	Remote Monitoring facility in all modules	NO/NC contact	
16	Test certificate / Approvals for safety	VDE and UL	

### **Type 2 Single phase SPD (specified in NBC-2016)**

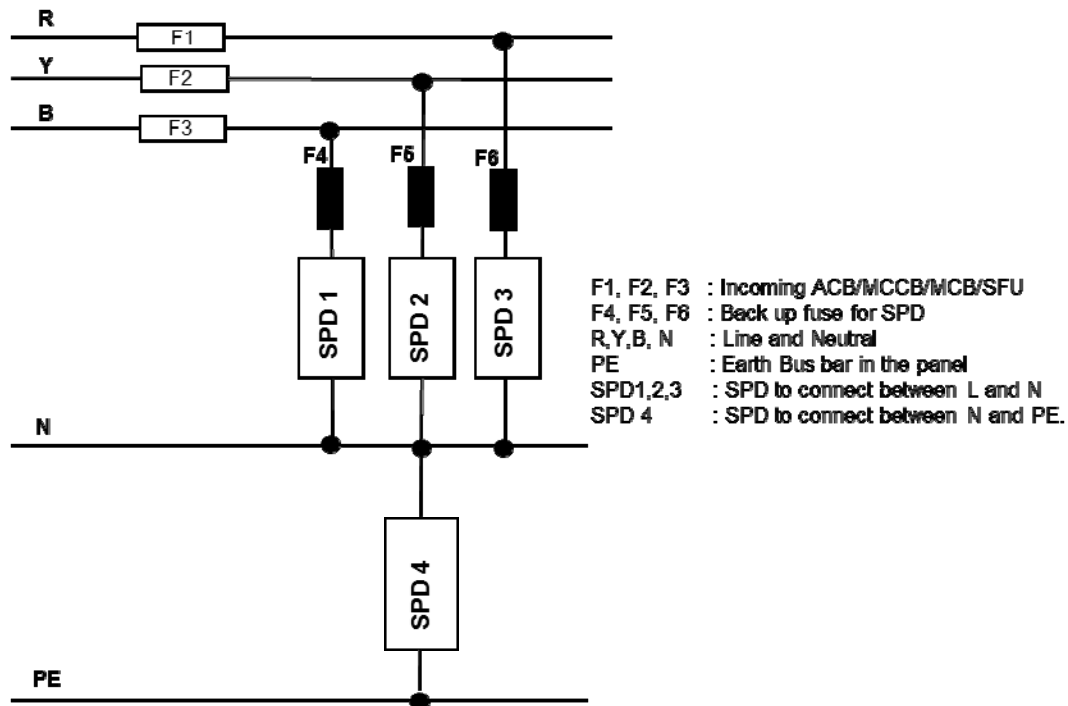
Critical loads need continuity of supply and continuity of protection. Lightning and Transient surges are of repetitive and some time in continuous nature. Failure of an SPD module may lead to non-availability of protection to this sensitive equipment until the failed SPD is replaced. To avoid such incidents, SPD's shall have 2 protection modules in built to provide redundancy. Once when the first protection module fails, indicator shall show green to Yellow. The redundant protection module in the SPD keeps protecting the sensitive load. This enables the user to have protection until replacement of SPD cartridge.

These critical loads are drive panels, UPS, Lift / elevator equipment, fire fighting equipment, security, IT equipment, BMS system panels etc specified in NBC-2016.

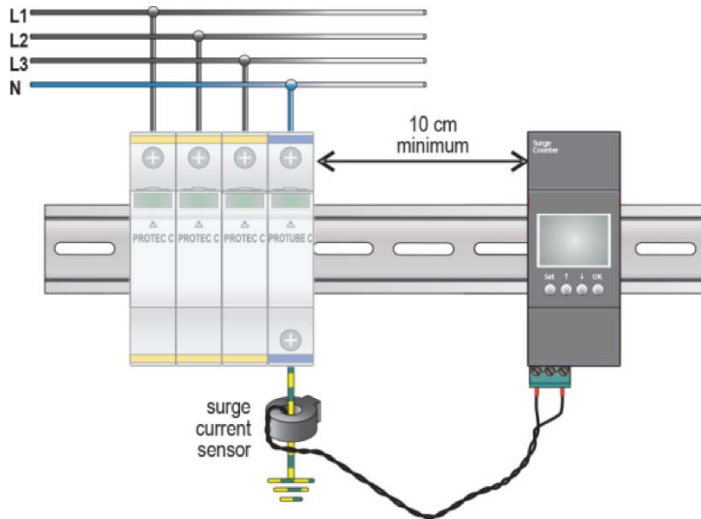
3 numbers of Type 2 redundant SPD for connection between Phase and Neutral and one number of SPD between Neutral and Earth with the following ratings as second stage protection

Sl. No	Parameters	Specifications	
		L to N (3 nos)	N to EBB (1 no)
1	Nominal Voltage, Un	230V, 50/60 Hz	
2	Maximum Continuous operating voltage	> 255 V	
3	120 mins TOV failsafe (L to N)	440 V	1200 V (200 mS)
4	Voltage Protection Level, Up	< 1.5 kV	< 1.5 kV
5	Nominal discharge current (8/20 $\mu$ S)	20 kA	40 kA
6	Maximum discharge current (8/20 $\mu$ S)	50 kA	65 kA
7	Max. Back up fuse for Short Circuit withstand (ISCCR) 50 kA	160 A	NA
8	Response Time	< 25 nS	< 100 nS
9	Operating temperature range	-40°C to +85°C	
10	Permissible humidity	5% to 95 %	
11	Mounting	Din Rail	
12	Degree of Protection	IP 20	
13	Operating indication in all modules	Green / Red	
14	Remote Monitoring facility in all modules	NO/NC contact	
15	Test certificate / Approvals for safety	VDE and UL	

Connection Diagram for 3 phase 4 wire SPD in panels



Connection Diagram for Surge Counters in panels:



**DEFECT LIABILITY PERIOD: -**

5 years defect liability period for both material & installation is to be provided subjected to following terms.

**DEFECT LIABILITY PERIOD TERMS& CONDITIONS: -**

- Free inspection & testing of installed LPS & earth installation will be done, five times in a year (During monsoon period) within the DLP, by the supplier/installers.
- The inspection will be conducted jointly with the presence of ORSAC representative & photographic evidence of actual system will be maintained.
- Any type of tampering or interference with the installed LPS & earth system & conductor will not be accepted either by the bidder or by the ORSAC because. in case of such man-made tampering situation, any damage or alteration of LPS & earth conductor will not be covered under DLP.
- Any damage or alteration, due to natural calamity or any such cause, which are beyond the supplier/installers control, will not be covered under DLP.
- Any type of manufacturing or installation anomalies, which will affect the LPS installation in a Functional way will be covered under DLP.

**PREE & POST MONSOON INSPECTION: -**

Pree & Post monsoon inspection of installed LPS will be conducted annually within the DLP period.

**Make list: - CAPE/FURSE/ABB/A W WALLIS**

**Annexure – A**

<b>SL.No</b>	<b>AIR TERMINATION SYSTEM</b>	<b>UNIT</b>	<b>QTY</b>
<b>1)a</b>	Supply & installation of air termination rod (Vertical Air Terminal) of appropriate length of material AlMgSi of diameter ø 16/10 mm crimped on both the ends (Tapped Type). The rod shall be mounted with Supporting stone and fixing accessories, depending upon requirement. Test Parameter: Mechanical Load Test for individual aluminum alloy rods - 120 to 280 N/mm <sup>2</sup> Salt Spray Test-No sign of corrosion Tested as per IEC 62561-1&2 .Vertical air terminal is selected as per <b>Angle of protection method</b> confirming to IS/IEC 62305-3. Folded clamps are considered for metal structures.)	<b>NOS</b>	<b>35</b>
<b>1)b</b>	Supply & installation of Aluminum alloy Solid Round Conductor of material AlMgSi used in air termination system. Cross sectional area of conductor should be 50 mm <sup>2</sup> . Conductor is tested for Lightning Impulse current of 100 kA for 10/350 µelectrical Resistivity, Tensile strength & Corrosion test as per IEC 62561-2.	<b>Mtr</b>	<b>1239</b>

	<p>Parapet holder of UV resistance Nylon Holder for fixing on the Parapet wall for clamping 8 mm dia Aluminum alloy round Conductor .Stainless steel cross connector for connecting 8 mm aluminum conductor at cross/Tee junction .Expansion Piece with connector to compensate the expansion and contraction of Solid Round Al. Conductor during temperature variations. All the connectors/clamps used in the air termination should be of Stainless Steel 304 grade material. All the Lightning Protection components are tested as per IEC 62561-1&amp;2. Supply &amp; installation of flat roof conductor holder, so that no hole will be drilled on the flat roof for installation of conductor, as per IS/IEC-62305. Supply &amp; installation of metal roof conductor holder for mounting of conductors on metal roof. As per IS/IEC-62305 &amp; IEC-62561. Supply &amp; Installation of stainless-steel clamp for equipotential bonding of extraneous metal parts &amp; metal roofs in accordance with IS/IEC-62305 &amp; IEC-62561.</p>		
<b>DOWN CONDUCTOR SYSTEM</b>			
<b>2</b>	<p>Supply &amp; installation of 8 mm dia Aluminum alloy Solid Round Conductor of material AlMgSi used in Down conductor system . Cross sectional area of conductor should be 50 mm<sup>2</sup> . Conductor is tested for Lightning Impulse current of 100 kA for 10/350 μs. Electrical Resistivity ,Tensile strength &amp; Corrosion test as per IEC 62561-2.Supply of Stainless steel Conductor Holding clip for fixing the 8mm dia solid aluminum round conductor on the side wall for clamping 8 mm dia Aluminum alloy round Conductor in RCC building .Lightning counter is required in the building and it will record number of lightning Strike in the building with date and time . Stainless steel Test joint with IP-65 Enclosure is to be fixed in the building. All the connectors/clamps used in the air termination should be of Stainless Steel 304 grade material. The materials &amp; Installation should be in accordance with IS/IEC-62305 &amp; IEC-62561.</p>	<b>mtr</b>	<b>1029</b>
<b>Earth Termination System</b>			
<b>3)a</b>	<p>Supply &amp; installation of Rust resistant non corrosive 10 mm dia Copper bonded round conductor used for Ring Earth inside the concrete and soil.</p>	<b>mtr</b>	<b>1242</b>

	<p>Short circuit current test for copper bonded conductor: Test 6 kA ratings, as per cross sectional area for 1 sec (IS3043/IEEE80); Electrical Resistivity before &amp; after salt mist spray test: 0.25<math>\mu\Omega</math>m max. Tensile Test 290 to 510 N/mm<sup>2</sup>. Adhesion no peel or crack &amp; Bend test no separation of Cu, Cu Coating thickness min. 70<math>\mu</math>m.</p>		
	Tested as per IEC 62561-2.		
	Supply & Installation of Exothermic Welding consisting of T-joint, X-joint and straight Joint with the use		
	of Mould, Aluminothermic welding and other accessories, as per IS/IEC-62305. Supply & Installation of Stainless-steel straight connector suitable for 10 MM solid copper bonded steel round conductor confirming to IS/IEC-62305 & IEC-62561.		
3)b	Supply & Installation of UL Listed Maintenance Free Copper bonded Earth rod of 3 Mtr. length having the dia of 20 mm with copper coating thickness of 254 microns. The rod has been tested for Dimension, Marking, Tensile Strength, Salt mist, coating thickness, Electrical resistivity test before and after corrosion test as per IEC 62561-2 & UL 467.	set	50
	Supply & installation of earth enhancing mineral compound tested for leaching and TCLP with		
	NABL accredited Lab as per IEC 62561-7 - 25 kg		
	Supply of Universal Clamp made up of stainless steel with a thickness not less than 3 mm, for terminating cable / flat conductor, suitable for the 20 mm dia copper bonded electrode . Supply of stainless-steel connecting point for 10 mm conductor.		
	Supply & Installation of RCC chamber along with cover plate of M20 grade. Inside dimension of chamber box will be 350x350X325 mm and wall thickness min. 50 mm with smooth cement plaster finish. Supply & installation of 25 mm thick RCC cover plate of M20 grade, on the top portion of the earth pit chamber		
	with suitable handle for lifting arrangement. The Earth pit cover having a dimension of 450mmx450mmx25mm.		
4	Supply, Installation, Testing and Commissioning of Single phase Class 2 Surge protection system for UPS room Building as IEC 61643-11:2011 & UL 1449 4th edition . The SPD must be installed in a Thermoplastic Poly Carbonate Enclosure with IP 65 Protection having transparent front door and all accessories.	Nos	1

5	Supply, Installation, Testing and Commissioning Three phase Class 2 of Surge protection system for Annex building as per IEC 61643-11:2011 & UL 1449 4th edition and all accessories .	<b>NOS</b>	<b>2</b>
6	Supply, Installation, Testing and Commissioning of Three phase Class 1+2 Surge protection system for Main building as per IEC 61643-11:2011 & UL 1449 4th edition and all accessories .	<b>NOS</b>	<b>5</b>
7	Supply, Installation, Testing and Commissioning of Three phase Class 2 Surge protection system for Guest House as per IEC 61643-11:2011 & UL 1449 4th edition and all accessories .	<b>NOS</b>	<b>1</b>
8	Supply, Installation, Testing and Commissioning of Single phase Class 2 Surge protection system for DVR as per IEC 61643-11:2011 & UL 1449 4th edition and all accessories .	<b>NOS</b>	<b>1</b>
9	Supply, Installation, Testing and Commissioning of Single phase Class 2 Surge protection system for Server room as per IEC 61643-11:2011 & UL 1449 4th edition and all accessories .	<b>NOS</b>	<b>1</b>

**SCHEDULE "C" SUPPLY DESTINATION FOR TENDER NO. 03 /2022 ORSAC**

Sl. No	Item	Qty.	Delivery Destination/Consignee
			ODISHA SPACE APPLICATIONS CENTRE (ORSAC)  Dept. of Science & Technology, Govt. of Odisha, Plot No.45/48(P), JayadevVihar, Near Gopabandhu Academy of Administration Unit-16, Bhubaneswar-751 023

Accepted the above-mentioned conditions under schedule ( C ) of the tender for our CAMC service.

Signature of Tenderer  
Name:  
Address:



**SCHEDULE (D) – Bid Form of Tender Notice No. 03 /2022**

**To**

The Chief Executive  
Odisha Space Applications Centre  
Bhubaneswar

Sir,

I/ we have gone through the Tender Notice No. 03/2022 of Odisha Space Applications Centre (ORSAC) and the schedule (A), (B), (C), (D) and (E) with Annexure-A of Tender document.

A sum of Rs...../- (Rupees thirty thousand) only is hereby tendered in shape of \_\_\_\_\_ duly pledged as Earnest Money Deposit (EMD) towards tendered value.

I/ We agree the ORSAC shall be at liberty to forfeit the EMD and performance security as per conditions of the contract in case of defaults on my/ our part in fulfilling contractual obligations.

I/We have gone through all terms and conditions stated in the Tender documents and agree to all the terms and conditions.

Date:

(Signature of Tenderer)

Name:

Address:

**Schedule (E) – Price Schedule for Tender Notice No. 03/2022 ORSAC**

Description	Items for which rate is quoted	Item wise description (mention as per Tender Notice)	Destination (as per Schedule-C)	Price for each unit (mention in figures and words)				Total price in Rs. (mention in figures and words)
				Items (in Rs.)	Taxes (Mention each tax separately) in Rs.	Other charges (mention each separately) in Rs.	Total unit price in Rs.	
1	2	3	4	5	6	7	8	9

Grand Total :Rs. (In Figures & words)

(Signature of Tenderer)

Name:

Address: