**SCHEDULE OF TECHNICAL DATA FOR INDUCTIVE VOLTAGE TRANSFORMERS**

**WAPDA/NTDC Specifications (P-129:201)**

**Bid/ Tender No.------------------------------**

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| **Sr.#** | **DESCRIPTION** | |  |  |
| **A.** | **General** | |  |  |
| 1. | Manufacturer’s name & address.  (Attach Manufacturer’s catalogue with the bid) | |  |  |
| 2. | Type/designation of offered Voltage Transformer. | |  |  |
| 3. | Type Test Report (Attach copy of type test report). | | Yes/No |  |
|  | a. | i) Issuing Laboratory.  ii) No and Date. |  |  |
|  |
|  | b. | Rated Voltage. |  |  |
|  | c. | Rated normal primary voltage. | kV |  |
|  | d. | Rated secondary voltage. | V |  |
|  | e. | Resistance of primary winding. |  |  |
|  | f. | Resistance of secondary winding. |  |  |
|  | g. | Temperature rise. | oC |  |
| 4. | **Details of following Type Test if performed.** | | **Date of Test** | **Name of Lab.** |
|  | a. | Dielectric tests. |  |  |
|  | b. | Short circuit withstand test. |  |  |
|  | c. | Partial discharge Measurement. |  |  |
|  | d. | Radio Interference Voltage (RIV) Test. |  |  |
|  | e. | Measurement of Temperature-Rise. |  |  |
|  | f. | Measurement of resistance of Primary and secondary windings. |  |  |
|  | g. | Determination of percentage voltage (ratio) errors and phase displacement at 80%, 100% and 120% of rated voltage, at rated frequency and at 25% and 100% of rated burden for measuring winding and at a power factor of 0.8 lagging for measuring accuracy class before & after Short circuit test. |  |  |
|  | h. | Determination of percentage voltage (ratio) errors and phase displacement at 5% of rated voltage and at rated voltage multiplied by the rated voltage factor, with protective burden of between 25% and 100% of protective winding and at a power factor of 0.8 lagging for protective accuracy class before & after Short circuit test. |  |  |
|  | i. | Wet Test. |  |  |
|  | j. | Measurement of C & DF. |  |  |
|  | k. | Mechanical Test. |  |  |

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| **B.** | **Ratings** | |  |  |
| 1. | Rated Primary Voltage, Um, kV, rms. | | kV |  |
| 2. | Rated Secondary Voltage, Um, V, rms. | | V |  |
| 3. | Nominal Primary Voltage, Un, kV,rms. | | kV |  |
| 4. | Rated Secondary Voltage, Um, kV, rms. | | V |  |
| 5. | Rated Frequency. | | Hz |  |
| 6. | Rated Secondary Output: | |  |  |
|  | a. | Measuring winding. | VA |  |
|  | b. | Protective winding. | VA |  |
| 7. | Accuracy Class: | |  |  |
|  | a. | Measuring winding. |  |  |
|  | b. | Protective winding. |  |  |
| 8. | Rated Voltage Factor: | |  |  |
|  | a. | Continuous duty. |  |  |
|  | b. | 30 second duty. |  |  |
| 9. | Temp. Rise at 1.2 times the rated primary voltage. | |  |  |
|  | a. | Winding, max. | oC, |  |
|  | b. | Oil, max. | oC, |  |
| 10. | Temperature Rise under short circuit condition: | |  |  |
|  | a. | Winding, max. | oC, |  |
|  | b. | Oil, max. | oC, |  |
| 11. | Lightning Impulse withstand voltage (Primary winding). | | kV |  |
| 12. | Power frequency withstand Voltage (Primary winding). | | kV |  |
| 13. | Power frequency withstand Voltage (secondary winding). | | kV |  |
| 14. | Creepage Distance. | | Mm |  |
| 15. | Resistance of primary winding at 20oC ambient temperature. | |  |  |
| 16. | Resistance of secondary winding at 20oC ambient temperature. | |  |  |
| 17. | Rated Mechanical Static Withstand load: | |  |  |
|  | a. | Voltage terminals. | N |  |
|  | b. | Through current terminals. | N |  |

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| 18. | Rated Mechanical dynamic Withstand load: | |  |  |
|  | a. | Voltage terminals. | N |  |
|  | b. | Through current terminals. | N |  |
| 19. | Partial Discharge, | |  |  |
|  | a. | Um. | pC |  |
|  | b. | 1.2Um. | pC |  |
|  | c. | 1.2Um/√3. | pC |  |
| 20 | Short circuit withstand capability. | | Sec. |  |
| 21. | C & D F, (tan δ). | |  |  |
| 22. | Max. Radio Interference Level 1.1Ur/√3 (RIV). | | µV |  |
| 23. | Permissible secondary short circuit current. | |  |  |
| 24. | Whether percentage voltage (ratio) errors and phase displacement for measuring winding conform to the values given in IEC 60044 – 2? | | Yes/No |  |
| 25. | Whether percentage voltage (ratio) errors and phase displacement of protective winding conform to the values given in IEC 60044 – 2? | | Yes/No |  |
| **C.** | **Construction**  (Attach photograph of voltage transformer showing all parts and a detail legend with the bid). | |  |  |
| 1. | Material of primary winding. | |  |  |
| 2. | Material of secondary winding. | |  |  |
| 3. | Material of bellows, if applicable. | |  |  |
| 4. | Whether device for indicating position of bellow is provided? | | Yes/No |  |
| 5. | Whether Separate windings for measuring and protection applications are provided? | | Yes/No |  |
| 6. | Material of housing/tank. | |  |  |
| 7. | Color of paint on the interior & exterior surface. | |  |  |
| 8. | Whether all steel & metal parts are hot dip galvanized? | |  | Yes/No |
| 9. | Minimum phase spacing. | |  |  |
| 10. | Minimum clearance. | |  |  |
| 11. | Total height. | |  |  |
| 12. | Wight per pole. | | Kg |  |
| 13. | Weight of oil per pole. | | Kg |  |

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| 14. | **Characteristics of oil** | |  |  |
|  | a. | Viscosity at 40 oC, max. mm2/s. |  |  |
|  | b. | Viscosity at -30 oC, max. mm2/s. |  |  |
|  | c. | Density at 20oC, max.. g/ml. |  |  |
|  | d. | Flash point, oC. |  |  |
|  | e. | Dielectric dissipation factor, tan δ at 90 oC. |  |  |
|  | f. | Pour point, max. oC. |  |  |
|  | g. | Dielectric strength, min. kV. |  |  |
|  | h. | PCB Content. |  |  |
|  | i. | Acidity, max. mg KOH/g. |  |  |
| 14. | Whether nitrogen cushion is provided at the top of the voltage transformer? | |  | Yes/No |
| **D.** | **Insulator** | |  |  |
| **1.** | Manufacturer’s name & address.  (Attach Manufacturer’s catalogue with the bid) | |  |  |
| 2. | Type of Insulator. | |  |  |
| 3. | Type tests (Attach copy of type test reports) | |  |  |
| 4. | **Details of Type Tests if performed.** | | **Date of Test** | **Name of Lab.** |
|  | a. | Ultimate strength of column. |  |  |
|  | b. | Impulse withstand voltage. |  |  |
|  | c. | Power frequency withstand voltage. |  |  |
|  | d. | Radio interference Voltage. |  |  |
| 5. | Diameter of insulator. | | Mm |  |
| 6. | No. of units per column. | | No. |  |
| 7. | Creepage distance (Phase to Earth) | | Mm |  |
| 8. | Phase to phase clearance. | | Mm |  |
| 9. | Max RIV at 1 MHz. | | µV |  |
| 10. | Impulse withstand voltage. | | kV |  |
| 11. | Power frequency withstand test voltage. | |  |  |
|  | a. | Dry 1 minute. | kV |  |
|  | b. | Wet 10 sec. | kV |  |

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| 12. | Ultimate strength of column. | | Kg |  |
| 13. | Withstand Pressure:.. | |  |  |
|  | a. | Cantilever. | N |  |
|  | b. | Tension. | N |  |
|  | c. | Torsion. | N |  |
|  | d. | Compression. | N |  |
|  | e. | Bending. | N |  |
| 14. | Material and colour of insulator. | |  |  |
| 15. | Reference Manufacturing IEC Standard of insulator. | |  |  |
| **E.** | **Steel Support Structure** | |  |  |
| 1. | Manufacturer’s name & address.  (Attach drawing/photograph of the support structure with the bid). | |  |  |
| 2. | Dimensions for steel support structure: | |  |  |
|  | a. | Height. | mm |  |
|  | b. | Breadth. | mm |  |
|  | c. | Width. | mm |  |
|  | d. | Structure fixing foundation details. |  |  |
| 3. | Tensile Strength of Angles/plates. | | Kg/mm2 |  |
| 4. | Tensile Strength of Nuts & Bolts. | | Kg/mm2 |  |
| 5. | Yield Strength of Angles/plates. | | Kg/mm2 |  |
| 6. | Yield Strength of Nuts & Bolts. | | Kg/mm2 |  |
| 7. | Elongation in 200m guage. | | % |  |
| 8. | Weight of Zinc Coating of angles/nuts & bolts. | |  |  |
| 9. | Thickness of zinc coating angles/nuts & bolts. | |  |  |
| 10. | Hardness of nuts & bolts. | | HB |  |
| 11. | Designed soil bearing capacity. | |  |  |
| 12. | Seismic withstand stress/magnitude. (Attach design calculations) | |  |  |
| 13. | Total weight of supporting steel structure with foundation bolts. | | kg |  |

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| **F.** | **Terminal** | |  |  |
| 1. | Manufacturer’s name & address.  (Attach drawing/photograph of the terminal). | |  |  |
| 2. | Material of primary terminal. | |  |  |
| 3. | Size of primary terminal. | |  |  |
| 4. | Current Carrying Capacity of primary terminal. | | A |  |
| 5. | Whether brass cable glands are provided. | |  | Yes/No |
| 6. | Material of secondary terminal. | | kg |  |
| 7. | Static & dynamic withstand load of terminal. | | kg |  |
| 8. | Whether HV terminals are fixed in the metal part at the top of voltage transformer. | |  | Yes/No |
| 9. | Whether two earthing terminals are provided. | |  | Yes/No |
| 10. | Material of earthing terminal. | |  |  |
| **G.** | **Connector** | |  |  |
| 1. | Manufacturer’s name & address.  (Attach drawing/photograph with the bid). | |  |  |
| 2. | Type of connector. | |  |  |
| 3. | Type tests (Attach copy of type test reports). | |  |  |
| 4. | **Details of Type Tests if performed.** | | **Date of Test** | **Name of Lab.** |
|  | a. | Tensile strength & elongation. |  |  |
|  | b. | Brinell hardness. |  |  |
|  | c. | Conductivity. |  |  |
|  | d. | Short circuit withstand. |  |  |
|  | e. | Heat cycle. |  |  |
| 5. | Material of connector (Monometallic or Bimetallic). | |  |  |
| 6. | Material of connector. | |  |  |
| 7. | Material of keeper. | |  |  |
| 8. | Current carrying capacity of connector & keeper. | | A |  |
| 9. | Tensile Strength of connector & keeper. | | Kg/mm2 |  |
| 10. | Hardness of connector. | | HB |  |

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| 11. | Hardness of keeper. | HB |  |
| 12. | Elongation of connector & keeper. | % |  |
| 13. | Electrical conductivity of connector. | % |  |
| 14. | Electrical conductivity of keeper. | % |  |
| 15. | Short Circuit Rating of connector. | kA |  |
| 16. | Short Circuit Rating of keeper. | kA |  |
| 17. | Material of Nuts & Bolts. |  |  |
| 18. | Tensile Strength of Nuts & Bolts. | Kg/mm2 |  |
| 19. | Brinell Hardness of Nuts & Bolts. | HB |  |
| **I.** | **TERMINAL & RATING PLATES** |  |  |
| 1. | Whether the data/ diagram as listed in clause 8.0 is marked/engraved on the terminal & rating plates. | Yes/ No |  |
| 2. | Material of rating plate |  |  |
| 3. | Thickness of rating plate. | mm |  |