SPECIFICATION FOR ELECTRICAL INSTALLATIONS TO BUILDINGS OTHER THAN DWELLINGS HOUSES

REVISIONS		
REV	**DATE**	**APPROVED**
01	**April 2016**	**S.Sewdayal**

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Annexure 1: Statement of Compliance

1.0 SCOPE

1.1 This specification covers the requirements with respect to the electrical installation, including the supply of all material and labour necessary to complete the EL&P installation for buildings.

1.2 This specification also applies to electrical alterations and additions carried out to existing installations.

2.0 REFERENCES

2.1 The following publications (latest edition) are referred to herein:

CODES OF PRACTICE

SANS 10313:	Code of Practice for Protection of Buildings against Lightning.
SANS 10086-1:	The Installation and Maintenance of Electrical Equipment used in Explosive Atmospheres.
SANS 10108:	The Classification of Hazardous Locations and the Selection of Electrical Apparatus for use in such Locations.
SANS 10114-1:	Interior lighting Part 1: Artificial lighting of interiors
SANS 10313	Protection against lightning - Physical damage to structures and life Hazard
SANS 10142-1:	The Wiring of Premises Part 1: Low-voltage installations

The Occupational Health & Safety (OHS) Act No. 85 of 1993

SPECIFICATIONS

SANS 121:	Hot-dip (galvanized) zinc coatings (other than on continuously zinc coated sheet and wire)
SANS 60947-2:	Low-voltage switchgear and control gear Part 2: Circuit breakers
SANS 160:	Electric Room Heaters.
SANS 164-1:	Plug and socket-outlet systems for household and similar purposes for use in South Africa Part 1: Conventional system, 16 A 250 V a.c.
SANS 172:	Low-voltage fuses
SANS 181:	Thermostats for electric storage water heaters
SANS 475:	Interior luminaires for fluorescent lamps
60598-2-1:	Fixed general purpose luminaires
SANS 556-2-1:	Low-voltage switchgear Part 2-1: Earth leakage circuit breakers
SANS 950:	Non-metallic conduit fittings for use in electrical installations
SANS 1041:	Tubular fluorescent lamps for general service
SANS 61386-1:	Conduit systems for cable management Part 1: General requirements
SANS 1085:	Wall outlet boxes for the enclosure of electrical accessories
SANS 1091:	National colour standards for paint
SANS 1274:	Coatings applied by the powder-coating process
SANS 61084-1:	Cable trunking systems and cable ducting systems for electrical installations

SANS 1574	Polyvinyl chloride (PVC)-insulated electric cables and flexible cords
SANS 10064:	The preparation of steel surfaces for coating
SANS 60947-3:	Low-voltage switchgear and control gear Part 3
SANS 60947-4:	Low-voltage switchgear and control gear Part 4- : Contactors and Motor-starters
SANS 60529:	Degrees of protection provided by enclosures (IP Code)
SANS 61558-2-4:	Isolating transformers and safety isolating transformers
SANS 60079-1:	Explosive atmospheres Part 1: Equipment protection by flameproof enclosures d

3.0 SERVICE CONDITIONS

3.1 The cable shall be designed and rated for continuous operation under the following conditions :-

3.1.1 Ambient/Environment Conditions :

3.1.1.1 Altitude : Sea level.

3.1.1.2 Ambient temperature : -5° C to +45° C (daily average +35° C).

3.1.1.3 Relative humidity : As high as 96%

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3.1.1.4 Lightning conditions : Severe, with a maximum lightning ground flash density 11 flashes per km^2 per annum.

3.1.1.5 Exposure conditions : Salt laden, industrial atmosphere as well as hazardous Gases and dust atmosphere.

3.1.1.6 Electrolytic corrosion conditions prevail in all the areas owing to the proximity of direct current traction system and cathodic protection schemes.

4.0 ELECTRICAL INSTALLATION

4.1 The contractor shall carry out the installation in accordance with SANS 10142-1: Code of Practice for the Wiring of Premises and the requirements of this specification.

4.2 Where the local supply authority requirements differ from those specified herein Transnet National Port Authority Electrical Engineer shall be approached for a decision.

4.3 All equipment and material shall comply with the relevant National or International standard specification. Where equipment does not comply, it shall be submitted with the Transnet National Port Authority Electrical Engineer for approval.

4.4 The system of supply will be three phase, 4 wire or single phase 2 wire 50 Hz. alternating current with earthed neutral at a nominal voltage of 400/230 volts. The voltage may vary within the range of ±5 % of the nominal voltage.

4.5 Wiring

4.5.1 All wiring shall be carried out in cable trunking and/or conduit. Only the loop in system of wiring shall be accepted.

4.5.2 Joints in wiring, nor the cutting away of strands to facilitate connections shall be permitted.

4.5.3 Single core cable smaller than 1,5 mm shall not be used. PVC cables shall not be connected directly to the lamp holders for incandescent lamps. Conductors shall terminate in an approved connector in the conduit box directly behind the luminaire, and connection to the lamp holder made by means of adequately rated silicone heat resistant wire.

4.5.4 Colour identification of conductors shall be used.

4.5.5 Flameproof equipment shall comply with SANS 60079-1 or BS 229 for installation in hazardous areas, as defined in SANS 10108.

4.5.6 Equipment in hazardous areas shall be installed in accordance with SANS 10086-1.

4.6 The provision and installation of the supply cable to the building, the termination and the connection thereof to the distribution board main incoming isolating shall be the responsibility of the Contractor, as directed by the Engineer.

4.7 The Contractor shall be responsible for the provision and connection of power supplies to electric urns, stoves, geysers, fry-tops, fans etc. provided by others; unless otherwise stated in the Schedule of Requirements.

4.8 The Contractor shall also provide power supplies to air-conditioning equipment. The connection to air-conditioning equipment will be undertaken by others.

4.9 Cables shall be adequately supported to prevent strain on the terminals.

4.10 Drilling or welding of steelwork for the mounting of electrical equipment will not be permitted unless approved by Transnet's Engineer on site. Equipment shall be fixed to the steelwork by means of approved, purpose made clamp/brackets.

4.11 Lightning protection shall be in accordance with the requirements of the local supply authority and SANS 10313: Code of Practice for Protection against lightning - Physical damage to structures and life hazard

5.0 DISTRIBUTION BOARDS

5.1 Architrave type for flush mounting, and surface type for mounting on indoor walls shall comply with SANS 10142-1.

5.1.1 These distribution boards shall be supplied with a cover plate or open window door and

be suitably painted and finished to harmonise with wall finish.

5.1.2 All switches and associated equipment shall be fully enclosed within the distribution board with only the operating handles protruding through the cover plate or door.

5.2 Cubicle type shall comply with IEC publication 439.

5.3 Distribution boards for outdoor use shall be weatherproof and corrosion resistant.

5.4 A substantial earthing terminal shall be firmly attached to the steel work of the distribution board and connected to the earthing bar.

5.5 Entries suitable for all incoming and outgoing cables shall be provided. Glands for bottom entry cables shall not be less than 600mm above floor level.

5.6 Space for mounting of 20% additional control units shall be allowed on all distribution boards. In addition, 20% spare conduits (20mm diameter) shall be provided between flush distribution boards and the ceiling/roof space in pitched roof buildings (minimum 2 conduits).

5.7 All circuits shall be clearly labelled. Labels shall be of the fabricated type and permanently secured. Embossed tape is not acceptable.

5.8 When called for labelling of moulded case circuit breakers shall be labelled by means of numerals. A legend inserted behind a clear plastic window on the inside of the door shall be provided to detail the various circuits.

6.0 ISOLATING SWITCHES

6.1 Isolating switches for machines shall be lockable in the open position.

6.2 Isolating switches shall comply with SANS 60947-3.

7.0 CIRCUIT BREAKERS

7.1 MOULDED CASE CIRCUIUT BREAKER

Moulded case circuit breakers shall: -

7.1.1 Comply with SANS 60947-2.

7.1.2 Have a breaking capacity as specified.

7.1.3 Adjustable type with electronic trip.

7.1.4 Be suitable for clip-on tray mounting.

7.2 MINIATURE CIRCUIT BREKER

Miniature circuit breakers shall: -

7.2.1 Comply with SANS 60947-2.

7.2.2 Have a breaking capacity as specified.

7.2.3 Different range of tripping characteristics: B Curve, C Curve

7.2.4 Operating voltage up to 400V AC

7.2.5 Be suitable for clip-on tray mounting.

8.0 EARTH LEAKAGE PROTECTION UNITS

8.1 Earth leakage protection units shall: -

8.1.1 Be the integral moulded case type and comply with SANS 556-2-1.

8.1.2 Have a sensitivity of 30 mA.

8.1.3 Be similar in design to moulded case circuit breakers and suitable for clip-on tray mounting.

8.1.4 Have a breaking capacity and current rating as specified.

9.0 FUSE SWITCHES

9.1 Fuse switches shall:

9.1.1 Comply with SANS 60947-3

9.1.2 Be of the double break, horizontal draw out, air insulated type, suitable for flush mounting.

11.1.3 Be of the quick break, dustproof type.

12.0 HIGH RUPTURING CAPACITY FUSE LINKS

12.1 High rupturing capacity fuse links shall:

12.1.1 Comply with SANS 172

12.1.2 Be of the cartridge type with a breaking capacity not less than that shown in the Category of Duty AC 50 table 2 of SANS 172.

12.1.3 Have a class Q1 fusing factor

12.1.4 A spare set of fuse links for each of the different ratings shall be provided and accommodated in the distribution board.

13.0 CONTACTORS

13.1 Contactors shall comply with SANS 60947-4.

14.0 LUMINAIRES FOR INCANDESCENT LAMPS

14.1 Luminaires shall be suitable for accommodating energy saving lamps.

14.2 The insulation of internal wiring shall be heat resistant.

14.3 Bulkhead luminaires shall comply with CKS 199.

14.4 Bowl type luminaires shall have porcelain or acrylic galleries with white opal, high impact acrylic screw-in type bowls.

14.5 Well glass luminaires shall consist of a body of non-corrosive material with a top entry for a 20mm conduit, have a clear glass cover and be completely weatherproof.

15.0 LUMINAIRES FOR FLUORESCENT LAMPS

15.1 Luminaires for fluorescent lamps shall comply with SANS 475.

15.2 Lampholders shall be of the telescopic type.

15.3 The luminaires shall be suitable for 1,2m or 1,5m "rapid start" lamps to SANS 1041, class B, group 2, with rated colour 3. (Warm white).

15.4 Anti-corrosive luminaires shall have a body channel constructed of fibre-glass or non-corrosive material with a moulded acrylic enclosing diffuser.

15.5 A gasket shall be provided between the body channel and the diffuser to ensure a reliable seal.

15.6 The enclosing diffuser shall latch to the body channel with captive-type non-corrosive latches.

15.7 It is essential that full descriptions and photometric data of the luminaires and lamps offered, accompany tenders. This information shall include description and drawings of the various items of equipment as well as full photometric data issued by the South African Bureau of Standards.

16.0 INTERIOR LUMINAIRES FOR HIGH INTENSITY DISCHARGE LAMPS

16.1 Interior luminaires for high intensity discharge lamps shall comply with SANS 475 and be suitable for use in an ambient temperature of 40^{o}C.

16.2 Suitable provision shall be made on the ballast housing for eyes or lugs, for the attachment of safety chains.

16.3 The electronic ignition device for high pressure of sodium and metal halide lamps shall be of the three wire type operating on the superposed pulse principle. The circuitry shall be such that at starting, or on failure of a lamp, high voltage pulses will be confined to the high voltage lead between the igniter and centre contact of the lamp holder. Igniters incorporating a switching element are not acceptable.

16.4 A fully electronic ignition circuit shall be utilized to trigger the pulse transformer.

16.5 The natural frequency of the electronic ignition circuit shall be in the order of 100kHz.

16.6 The lamp ignition voltage shall remain constant within a mains voltage variation of between 200 and 250 volts.

16.7 Tenderers shall guarantee that pulsing of the igniter on a failed lamp will not have a detrimental effect on the life and efficient operation of the control gear, igniter, lamp holders and circuit wiring.

16.8 It is essential that full descriptions and photometric data of the luminaires and lamps offered, accompany tenders. This information shall include description and drawings of the various items of equipment, as well as full photometric data issued by the South African Bureau of Standards.

17.0 ELECTRIC AIR HEATERS

17.1 Electric air heaters shall comply with SANS 160.

17.2 Tubular heaters shall be rated at 260 watt per metre length of tube and have an enclosed entry box containing terminals for incoming line, neutral and earth connections with a suitable entry for a flexible conduit connector.

17.2.1 Tubular heaters shall be mounted with the bottom 200mm above floor level

17.3 Convector Heaters shall:

17.3.1 Be of the natural convection type, of good appearance and suitable for flush or surface mounting.

17.3.2 Have incorporated a manually adjustable control switch, automatic controlling thermostat and indicating neon pilot lighting showing when the heater is on.

17.3.3 Have a mounting box or housing suitable for a 20mm electrical conduit entry.

17.3.4 Be installed with the bottom of the mounting box/housing 200mm above floor level.

17.4 Fan Heaters shall :

17.4.1 Be of the wall mounted type with air flow directional adjustment and locking facilities.

17.4.2 Have a totally enclosed type fan motor fully protected from damp and dust and fitted with

self aligning noiseless bearings.

17.4.3 Have a separate manually adjustable control unit incorporating an automatic controlling thermostat. The control unit shall be housed in a adequately ventilated sheet steelcase. Means of protecting and isolating the heater, shall be provided. The control unit circuit shall be arranged such that during summer months the heater can be switched off and the fan used alone for ventilation.

18.0 ROOM THERMOSTATS

18.1 Room thermostats shall comply with BS 3955 Part 2, section 2F, and be to category A.

18.2 An over-riding switch shall be mounted adjacent to the thermostat for manual control.

19.0 LIGHT SWITCHES

19.1 Light switches shall comply with SANS 60669-1 and be of the rocker type.

19.2 They shall be mounted 1 500 mm above floor level and where possible 200 mm from door frames.

20.0 LIGHT SENSITIVE CONTROL UNITS

20.1 The complete unit shall be of the solid state type and housed in a sealed weatherproof enclosure suitable for mounting in any position.

20.2 The light sensitive cell shall operate in a manner to give an area of detection not less than a hemisphere.

20.3 The unit shall not operate due to light fluctuations of duration less than 5 minutes. They shall incorporate main contacts rated at least to 10 amps and be mounted at a height of not less than 2 400 mm.

20.4 An over-riding switch shall be provided.

21.0 SOCKET OUTLETS

21.1 All 220 volt, 16 amp socket outlets shall comply with SANS 164-1 and be of the 3 round pin shuttered type.

21.2 All 32V, 5A socket outlets for lead lights shall be of the industrial two pin, weatherproof type with a screw cover attached to the socket outlet by a short length of chain.

21.2.1 They shall be mounted on columns/walls 1 500mm above floor level or in recesses provided in inspection pits.

21.3 Welding socket outlets shall be in accordance with IEC publication 309 and be rated for 63A

(unless other rating is indicated on the drawing) and be of the 5 pin, 6 h configuration type.

21.3.1 Welding plugs shall be supplied complete with matching male plugs and be mounted 1 500mm above floor level.

21.3.2 The welding plug circuit shall be protected by an earth leakage device that shall be mounted either in the welding plug housing or in the distribution board feeding the welding plug.

22.0 TRANSFORMERS 220V/32V

22.1 The transformers for 32V socket outlets shall be in accordance with SANS 61558-2-4 and be designed for 220V to 250V primary power supply and have an output voltage of 32V.

23.0 ISOLATING AND SAFETY ISOLATING TRANSFORMERS

23.1 Isolating and safety isolating transformers shall comply with SANS 61558-2-4.

24.0 POWER POINTS

24.1 Power points for hot water cylinders shall be equipped with a 2 or 4 pole isolating switch adjacent to the cylinder except for hot water cylinders mounted below sinks.

24.2 Where contactors are necessary for the operation of hot water cylinders, these shall be installed adjacent to the appliance where practicable and in a suitable enclosure.

24.3 Power points for tubular heaters shall be equipped with a flush mounted 100mm x 100mm conduit box, blanked off with a cover plate accommodating a 15A flush mounted switch. Connection to the heater shall be by means of a PVC covered flexible conduit. The flexible conduit shall have sufficient slack to avoid strain but shall not touch the floor.

24.4 Power points for fan heaters shall be equipped with two recessed interconnected conduit boxes, one for connection to the heater and the other for connection to the control unit 1 500mm above floor level.

24.5 Power points for stoves, fry tops and boiling tables shall be equipped with a 2 or 3 pole isolating switch for the appliance shall be 1 500mm above floor level. The outlet for connection to the appliance shall be 500mm above floor level.

24.6 Power points for air-conditioning units shall terminate in a 100mm x 100mm conduit box mounted adjacent to the unit and equipped with a 2 pole isolating switch.

24.7 Power points for extractor fan units shall terminate in a 100mm x 100mm conduit box mounted adjacent to the unit.

24.8 Where a common thermostat is specified for controlling a number of fans, power points shall be so arranged to allow for circuit wiring between the fans and thermostat.

24.9 Power points for smoke detection and CO_2 equipment shall terminate in a 100mm x 100mm

conduit box equipped with a 30A, 2 pole isolating switch, lockable in the "on" position, mounted 1500mm above floor level, with connecting facilities to the equipment.

24.10 Power points for air conditioning units shall terminate in a 100mm x 100mm conduit box mounted adjacent to the unit and equipped with a 2 pole isolating switch, with connecting facilities for the unit.

24.11 Power points for machinery shall terminate in a connection box suitable for mounting a 2 or 3 pole isolating switch, with connecting facilities to the machine.

24.12 Power points for lighting shall terminate in a circular conduit box fitted with an unswitched 5A, 3 pin socket outlet.

25.0 CONDUIT AND ASSOCIATED FITTINGS

25.1 Conduit systems for cable management shall comply with SANS 61386-1.

25.2 Non-metallic conduit and fittings shall comply with SANS 950. Non- metallic conduit shall not be cast into concrete.

25.3 Wall outlet boxes shall comply with SANS 1085.

25.4 In areas within 50 km of the coast only galvanised or non-metallic conduit shall be used. Where conduit is exposed to the weather elements only galvanised conduit shall be used or UV T routed P.V.C. pipe.

25.5 Threads of metallic conduit and associated fittings shall be effectively protected against rust by non-corrosive paint where they are exposed to moisture or weather elements.

25.6 Wall outlet boxes shall be positioned with the major dimension vertical and not more than 15 mm below the finished wall surface. Cover plates shall fit plumb and flush with wall surfaces.

25.7 Conduits are to be concealed and chased into plastered brick walls or cast into concrete work as building work proceeds. Where conduit cannot be concealed these shall be installed neatly on the surface as approved by the Engineer.

25.8 Conduits are to be concealed and chased into plastered brickwalls or cast into concrete work as the building work proceeds.

25.9 Chasing of finished walls or concrete work will not be allowed. Under no circumstances will chases be permitted through structural members of the building.

25.10 Chasing of face brick walls will not be permitted. Conduits and outlet boxes shall be built into walls.

26.0 CABLES AND GLANDS

26.1 Polyvinyl-chloride cables shall comply with SANS 1574. Armoured cables shall be of the earth

continuity conductor type.

26.2 Cable glands shall be of the compression type, (brass or bronze) and be suitable for termination of earth continuity conductor type cables. Glands shall be supplied with neoprene shroud.

27.0 BUSBAR TRUNKING

27.1 Busbar trunking shall comply with SANS 60439-2.

28.0 CABLE TRAYS

28.1 Cable trays shall be protected against corrosion and be adequately supported so that when fully loaded the deflection does not exceed 10mm. They shall be wide enough to accommodate the power cables in a single layer.

29.0 EARTHING AND BONDING

29.1 The complete electrical installation shall be earthed in accordance with SANS 10142-1: Code of Practice for the Wiring of Premises.

29.2 Earth electrodes shall consist of an exterior copper layer molecularly bonded to a high strength steel core. The copper shall have a minimum thickness of 0.25mm.

29.3 Only approved non-corrosive substances may be used to reduce earth resistivity. The earth resistance as measured with an earth resistance tester shall not exceed 5 ohm.

29.4 Copper tape used for bonding and earthing of waste pipes shall have a minimum cross sectional area of 12mm^2, and when run along walls shall be fixed by means of non-ferrous screws in plastic plugs at intervals of 300 maximum.

30.0 PAINTING

30.1 All surfaces of distribution boards shall be light orange to SANS 1091 colour No. B26 unless otherwise stated in the Schedule of Requirements attached to this specification.

30.2 All surfaces shall be cleaned according to the appropriate method described in SANS 10064 for the particular surface to be cleaned, the contamination to be removed and the primer to be applied.

30.3 Components that will be powder coated shall be cleaned and prepared in accordance with the requirements of SANS 10064. Powder coating shall comply with the requirements of SANS 1274; Coatings applied by the powder-coating process.

30.4 All specified coatings shall be applied according to the relevant specification and the manufacturer's instructions shall be followed. Coatings shall not be applied in conditions which may be detrimental to the effectiveness of the coating, or the appearance of the painted surface.

30.5 When examined visually the finished product shall have a uniform appearance as far as gloss is

concerned and shall show no sign of damage. Damaged areas shall be repaired coat for coat to obtain the desired finish.

31.0 TESTS

31.1 Insulation, continuity and earthing tests in accordance with SANS 10142-1 shall be carried out to the satisfaction and in the presence of the Engineer or authorised deputy on completion of the work.

31.2 An installation Certificate of Compliance for the electrical installation issued by an accredited person as required by the Occupational Health and Safety Act,1993 (Act 85 of 1993) shall be provided.

31.3 The Contractor shall provide the necessary approved instruments.

31.4 Transnet National Port Authority reserves the right to use its own instruments should it be considered necessary.

WITNESSES

1. …….. ……
TENDERER

2. ……. …….
DATE

Transnet National Port Authority
Engineering

ANNEXURE 1

STATEMENT OF COMPLIANCE
(TO BE COMPLETED BY TENDERER)

This tender complies with specification TPD: 001-EL&P SPEC in all respects.

SIGNATURE : _____ DATE : _____

This tender complies generally with specification TPD: 001-EL&P SPEC, but differs from it on the following points.

_____

_____

_____

_____

_____

_____

SIGNATURE : _____ DATE : _____

Transnet National Ports Authority