



ABU DHABI SEWERAGE SERVICES COMPANY (ADSSC)

GENERAL SPECIFICATION FOR ELECTRICAL WORKS

DIVISION 16 ELECTRICAL

SECTION 16100 CONTROL, PROTECTION AND MEASUREMENT

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DOCUMENT CONTROL SHEET

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1 GENERAL

All items described within this section shall comply with the provisions of Section 15001: General M&E Requirements.

2 RELAYS

- a) All auxiliary relays shall mainly comply with BS EN 116000 and BS EN 116205/6/7.
- b) Where similar relays have different operating voltages and/or different contact configurations, they shall be of non-interchangeable voltage at nominal operating temperature and shall not 'drop-out' at greater than 60% of the nominal coil voltage.
- c) Relays shall be fully encapsulated and be of the plug-in type, with terminals protected to a minimum of IP2X.
- d) Plug-in relays shall be fitted with transparent dust-proof covers. External connections shall be by screw clamp terminals that are easily accessible with the relay in position.
- e) Relays shall include provision for manual operation.
- f) The pin configuration of the relay shall be printed on the casing and on the bases in order to ensure correct pin alignment.
- g) Relays shall be suitable for operation on a nominal 110V ac/dc, 24V ac/dc or other voltage as specified or deemed necessary for the safe operation of the devices connected using auxiliary relays. Preference shall be given to relay coils operating at low voltage. 240V ac relay coils shall not be used.
- h) Relays shall be suitable for operation at plus 10% and minus 20% of their nominal rated voltage.
- i) The contacts configuration shall be either normally opened/normally closed or changeover contact combinations.
- j) The contact material used in the relay for general logic design shall be Silver Cadmium Oxide (AgCdO). Specific applications requiring extra low switching current shall have GOLD Flash contacts for minimal voltage drop across the contacts.
- k) It is not permitted to use mixed voltages on the different contacts of a relay. If necessary, additional relays shall be used to separate the voltages.
- l) Relays Coil shall be vacuum impregnated to ensure satisfactorily operation for the Abu Dhabi climatic conditions as specified.

- m) Relays shall be mounted on DIN Rail.
- n) Relays shall be secured to their bases by retaining bar or clip to prevent malfunction due to the relay being loosened in its base.
- o) Care shall be taken to ensure that relay contacts and associated wiring are suitably fused protected.
- p) All type of relays shall have a means of visual indication, e.g. light emitting diode (LED) or neon bulb, mounted within their clear covers connected directly across the relay coil to indicate when the relay is energised. These indicators shall be easily seen when the relay compartment door is opened.
- q) A permanent means of identification shall be affixed to both relay and base in line with the circuit diagram reference.
- r) Where remote supply voltages are used, a warning label engraved in English and Arabic shall be fitted, clearly identifying the source of supply.
- s) The relay shall be designed for minimum 1 Million mechanical operation and 200,000+ electrical operations at rated load.

3 TIMERS

- a) Timers shall be plug-in or surface-mounting types; solid state microprocessor based employing CMOS IC technology.
- b) Timers shall be suitable for operation on a nominal 110V ac, 24V ac/dc or other voltage as specified or deemed necessary for the safe operation. Preference shall be given to timers operating at low voltage. 240V ac timers shall not be used.
- c) Timers shall have linearly calibrated scales, in units of time, each scale division being a maximum of 5% of full scale. Repeat accuracy shall be within 0.5% of full scale.
- d) Timers shall be provided with “energised” and “timed out” indicators.
- e) Plug-in timers shall be fitted with transparent dust-proof covers. External connections shall be by screw clamp terminals that are easily accessible with the timer in position.
- f) Timers shall be secured to their bases by retaining bar or clip to prevent malfunction due to the relay being loosened in its base.
- g) The pin configuration shall be printed on the casing of the timer and on its associated bases in order to ensure correct pin alignment.

- h) Timer shall be provided with a 10A rated output relay with DPDT contacts.
- i) Unless specified otherwise, timers shall be provided for circuits that require 'delay on' operate, 'delay on' release, and star-delta starting of a 3-phase induction motor.
- j) Multifunction timing relays, programmable where specified, shall be provided to the satisfaction of ADSSC.
- k) The use of pneumatic timers, motor driven timers and other special timers shall be avoided unless specifically mentioned in the particular requirements and the same shall be subjected to the review and approval by ADSSC.

4 HOUR RUN METER

- a) There shall be two counters provided for each motor.
- b) One counter shall be non-resettable 'hours run' meter, rotating disc type for measuring total operating period (accumulative) of a motor. The minimum size shall be 48×48mm. The counting capacity shall be 99,999.99 hours. The colour of the decimal digits shall be red while the colour of other digits shall be white.
- c) The second counter shall be provided for counting TOTAL (accumulative) number of start of a motor. This shall be of non-resettable, electronic type with permanent memory retention arrangement and LCD display to indicate the number of start of a motor.

5 CONTROL POWER TRANSFORMER

- a) The control power transformer shall be double-wound by using the screen between the windings; designed and manufactured to BS EN 60742 (IEC 61558), centre-tapped and earthed via a removable bolted earth link, minimum capacity 100VA/50Hz, 415/240/110V and/or 240/24V as per the requirement of the application.
- b) The control power transformer shall be selected based on the application requirements feeding mix-up of low and high inrush inductive control and measuring devices and resistive devices (e.g. motorised valves, solenoid valves, contactors, timers, PLC, pilot devices, instruments, controllers, indicators and sensors etc.).
- c) The control transformer shall have the following features:
 - i. Vacuum impregnated windings.
 - ii. Low-inrush current torch-proof termination.
 - iii. Easy access to fixing holes.
 - iv. Legible and easily accessible rating label/plate.

6 INSTRUMENTS

- a) All indicating instruments, e.g. Ammeters, Voltmeters, kW Meter, Frequency Meter, Power Factor Meter etc. wherever specified, shall be of 240° scale, flush mounted and of the same appearance throughout.
- b) They shall comply with BS 89 (EN 60051/IEC 60051) and built to industrial grade accuracy not exceeding 0.5% for all instruments except kWh meter, which shall be as per ADWEA regulations. They shall be sealed against ingress of moisture and dirt and shall be hermetically sealed or tropicalised.
- c) Instruments shall have an external zero adjustment and have black bezels. They shall be positioned at easily readable height not exceeding 2,000mm above finished floor level.
- d) Meters shall be fitted with an adjustable RED pointer indicating the normal circuit rating of the associated plant, equipment or drive.
- e) Instruments shall have a square front appearance, dimensions of 96 x 96mm for measuring the parameters of a plant or equipment's total connected load. Dimension 72x72mm size meters are permitted for individual loads.
- f) Ammeters used to measure current in the motor circuit shall have suppressed scale (minimum 5 times the full load current of the motor) to indicate the maximum starting current. Ammeters shall be selected such that the ampere reading under normal running load is approximately 70 to 80% of their rated scale.
- g) All meters shall have factory-calibrated scale to match the connected load. It is not permitted to use any label whereby the operator needs to recalculate the actual measured parameter by computing the value from the label.
- h) Motors rated at full load current 10A and below shall be provided with direct reading type Ammeters and those exceeding 10A shall be connected via Current Transformers (CTs).
- i) Kilowatt-hour meters, together with associated CTs, shall be arranged to register 3-phase 4-wire unbalanced loads. The kWh meter shall be provided in accordance with the requirement of ADWEA.

7 CURRENT TRANSFORMERS (CTs)

- a) CTs shall comply with BS EN 60044-3 (IEC 60044-3) and shall be suitably rated and designed to carry out appropriate function (e.g. metering or protection) as specified in the particular requirements.

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- b) The secondary current of current transformer shall be 5A unless specified otherwise. 1A CTs where necessary, shall be subjected to the review and approval by ADSSC.
- c) CTs used in metering circuits shall be to Class 1.0 or better. CTs for protection circuits shall be to Class X.
- d) CTs shall be of cast resin type.
- e) The minimum Short Time Current Rating shall be 3 seconds.
- f) Identification labels giving type, ratios, accuracy, limit factor, rating, output and serial numbers shall be fitted. Duplicate rating labels are to be fitted on the exterior of the mounting chambers suitably located to enable reading without removal of any cover.
- g) CTs shall be bar primary type or ring type as appropriate to the application. The Contractor to clearly identify in his submittal the type of CT used for a particular application. This shall be subjected to the review and approval by ADSSC.
- h) One secondary terminal of each current transformer shall be earthed through a removable link at the switchgear.
- i) Secondary wiring of the current transformer shall be terminated on shorting type terminal block. The supplier of equipment (FBA) shall ensure shorting of CT secondary wiring through the terminals prior to the shipment of the equipments.

8 VOLTAGE TRANSFORMERS

- a) Voltage transformers used in conjunction with instrumentation where specified shall be of the isolatable type with a 3-phase 110V secondary.
- b) The transformers shall be epoxy resin and comply with BS EN 60044-2 (IEC 60044-2).
- c) The primary and secondary windings shall be protected by HRC fuses.
- d) The connections between the fuses and the primary conductors shall be adequately rated to withstand the short circuit rating of the Switchgear.
- e) In the case of HV, automatically operating shutters shall be provided to conceal the HV orifices when the transformer is withdrawn. A padlock with non-interchangeable key shall be provided for the shutter.

9 PROTECTIVE DEVICES

Application-specific protective devices, where provided, shall generally comply with BS EN 60255-6 (IEC 60255-6). The Contractor shall submit

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detailed engineering calculations and co-ordination studies for the protective devices so proposed for ADSSC review and approval prior to the commencement of any work undertaken.

10 EARTH LEAKAGE RELAY (ELR)

- a) An Earth Leakage protection system shall comprise of two components:
 - i. Core Balanced Current Transformer (CBCT) Earth Leakage Relay (ELR).
 - ii. The CBCT may be designed in ring or rectangular shape to suit mounting on conductors/cables or busbars as appropriate.
- b) The information from the CBCT shall be first registered in the amplifier circuit and continuously monitored. Whenever the leakage exceeds the preset value, a relay is operated to trip the main circuit breaker.
- c) The ELR shall have the following facilities:
 - i. It shall conform to BS EN 60947-2.
 - ii. Be of the adjustable type suitable for mounting on a compartment door.
 - iii. A residual operating current range: 0.03 to 2A.
 - iv. A time delay of 0 to 1 second.
 - v. Immunity from nuisance tripping.
 - vi. Protection against direct and indirect contact.
 - vii. Provide continuous monitoring of the leakage current.
 - viii. Be capable of operating under all unbalanced phase conditions.
 - ix. Alarm contact with fail-safe operation.
 - x. LED Status indications.

END OF SECTION