



ABU DHABI SEWERAGE SERVICES COMPANY (ADSSC)

GENERAL SPECIFICATION FOR ELECTRICAL WORKS

DIVISION 16 ELECTRICAL

SECTION 16050 CIRCUIT BREAKERS

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1 GENERAL

- a) The Contractor shall comply with the provisions of Section 15001: General M&E Requirements.
- b) Each low voltage Circuit Breaker (CB) shall be suitable for controlling loads as indicated and shall conform to IEC 60947-2 Utilisation Category B or other approved equivalent standard for 415V 3-phase 50Hz 4-wire operation.
- c) All low voltage circuit breakers shall be housed in MCCs/Control Boards/Cubicles, which comply with the requirements of Section 16020: Factory Built Assembly (FBA).
- d) Unless specified otherwise, each incoming CB shall be sized as follows:
 - i). 800A and above shall be a 3- or 4-pole (as applicable) drawout electrically operated motor-driven Air Circuit Breaker (ACB).
 - ii). Above 160A but below 800A shall be a 3- or 4-pole (as applicable) drawout, electrically operated motor-driven Moulded Case Circuit Breaker (MCCB).
 - iii). Up to and including 160A shall be a 3- or 4-pole (as applicable) Plug-in type manually-operated Moulded Case Circuit Breaker (MCCB).
 - iv). MCCB rated up to and including 125A 3-pole with Neutral link when used as a means of kWh metering cut-out for ADDC shall be manually-operated fixed type.
- e) Unless specified otherwise, each outgoing CB shall be sized as follows:
 - i) Above 800A shall be a 3-pole drawout electrically-operated motor-driven ACB.
 - ii) Above 250A, but less than or equal to 800A, shall be a 3-pole drawout, manually-operated MCCB.
 - iii) Up to and including 250A shall be a 3-pole Plug-in type manually-operated MCCB.
- f) 3-pole circuit breakers shall be provided with a separate Neutral link, where necessary.
- g) All low voltage ACB/MCCBs shall be rated for continuous duty at 415V 3-phase 50Hz with minimum short circuit capacity 50KA for 1 second.

2 LOW VOLTAGE ACB

- a) ACBs shall be provided with electrical and mechanical ON/OFF/TRIP indications.
- b) Electrically-operated ACBs shall be provided with a manually-operated

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handle for charging the spring mechanism allowing the breaker to operate manually in the event of a failure of the motor mechanism.

- c) The ACB shall be provided with built-in Overcurrent, Short Circuit and Earth Fault protection having the following characteristics:
- i). Adjustable long time delay current setting between 50–200% with variable tripping time characteristics.
 - ii). Adjustable short time delay current setting 200–800% with variable tripping time characteristics.
 - iii). Instantaneous tripping for heavier over current applications adjustable from 400–1,600% of the base current.
 - iv). Adjustable earth fault trip current setting 20–80% with variable tripping time characteristics.

- d) The ACB shall provide three positions:

- i). Service position – for opening and closing main and auxiliary contacts.
- ii). Test position – for opening main contacts but closing auxiliary contacts.
- iii). Isolated position – for opening all main and auxiliary contacts.

An indicator shall clearly show these positions and a mechanism to allow locking of the ACB in any position.

- e) The ACB shall be provided with interlocks to ensure that:

- i). It cannot be plugged in or isolated when it is closed.
- ii). It cannot be closed until it is fully plugged in or completely isolated.
- iii). It cannot be closed in the 'Service' position without completing the auxiliary circuits between the fixed and moving positions.
- iv). Only one incoming supply can be energised at any one time where more than one supply is available.
- v). Mechanical interlocking shall be provided to prevent withdrawing or inserting of the ACB when it is in ON position. Any attempt to do so shall automatically trip the ACB.

- f) The withdrawable part of the ACB shall be effectively connected to Earth through scraping contacts that shall make before and break after the main and auxiliary contacts.

- g) The moving contacts, comprising of main and arcing contacts, shall be of the spring loaded self-aligning type. They shall be so arranged that arcing contacts make before and break after the main contacts.

- h) Individual shutters for busbar and circuit spouts shall be provided to automatically operate as the truck is racked in and out. When closed the shutters shall effectively prevent any contact with either the busbar or the circuit connections and shall seal the spouts against the ingress of

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dust. The shutters shall to be coloured and painted in bold characters with "BUSBARS (red) or "CIRCUIT" (yellow) as appropriate in Arabic and English. Provision shall be made to lock each shutter in the closed position.

- i) A purpose-designed, separate earthing device shall be provided to earth either the cable box or the busbar side of the ACB. Single function earthing shall be arranged so that it shall only be possible to earth non-current carrying conductors.
- j) The ACB shall include the following as a minimum:
 - i). 8NO/8NC auxiliary contacts.
 - ii). Arc chutes.
 - iii). Folding extension rail.
 - iv). Charging handle.
 - v). Open and Close push buttons.
 - vi). Trip indicator.
 - vii). Spring charge motor.
 - viii). Spring charge indicator.
 - ix). Breaker position indicator mechanically and electrically.
 - x). Microprocessor-based protection and management unit that provides the following control and monitoring features:
 - Overcurrent protection.
 - Short circuit protection.
 - Earth fault protection.
 - Neutral protection.
 - Thermal memory.
 - Alarm logging.
 - Field selectable Manual or Auto reset.
 - Microprocessor malfunction watchdog.
 - Programmable input/outputs.
 - Load monitoring.
 - Operation counter.
 - Serial communication by employing Modbus protocol.
 - xi). Carriage/Lifting Truck if an ACB exceeded 25kg in weight (One carriage only for each site/project regardless of number of breakers provided).
 - xii). Shunt trip and under-voltage release.
- k) The ACB shall include facility to test the 'Trip Circuit Healthy' mechanism.
- l) ACBs shall be designed and constructed such that inspection, maintenance and replacement of the main fixed and moving contacts shall be easily possible on site. Manufacturer's detailed instructions

shall be incorporated in the maintenance manuals. ACBs requiring their complete return to the manufacturers for service shall not be acceptable.

- m) When used with transformer protection relays, the ACB shall be provided with an intertrip relay to trip the associated upstream HV circuit breaker on operation of the transformer protection device.
- n) The ACB shall trip when the associated upstream HV circuit breaker trips.
- o) For each ACB, test certificates shall be submitted from the Association of Short-circuit Testing Authorities (A.S.T.A.) or Keuring van Electrotechnische Materialen, Arnhem (K.E.M.A).

3 LOW VOLTAGE MCCB

- a) An MCCB shall be provided with electrical and mechanical ON/OFF/TRIP indication when used as an incomer and be certified to at least the same fault level (Icu) as that of the busbar systems. MCCBs shall have the following minimum features:
 - i). Mechanical indication of the circuit breaker when opened, closed and tripped.
 - ii). Quick break and quick make trip-free switching mechanisms so as not to withhold the contacts closed against short circuits and abnormal currents.
 - iii). Facility for padlocking without the use of loose components.
 - iv). At least one unused volt-free changeover auxiliary contact, wired down to outgoing terminals, for remote indication.
 - v). Adjustable Magnetic and Thermal inverse time delay protective device to protect against sustained overloads and instantaneous tripping under heavy overloads and short circuits. An additional facility shall be provided to prevent unauthorised adjustment of thermal and magnetic settings.
 - vi). Shunt trip and/or under voltage release, as applicable.
- b) Each MCCB shall be housed in a separate compartment with the operating handle door interlocked when used as an incomer, feeder or starter, so that access can only be gained to the compartment with the MCCB in the OFF position. Padlocking shall be provided in the OFF position only. When the MCCB is used for control transformers, distribution or ICA compartments, the handle shall be internally mounted with appropriate shrouding and warning labels.
- c) Each MCCB shall be complete with 2 N/O and 2 N/C spare auxiliary contacts (10A, 240V rating) in addition to those required for the Contract.
- d) Each MCCB used as an incomer or feeder shall have facilities for electrical as well as mechanical interlock.

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- e) Each incoming MCCB shall be provided with electrical and mechanical interlocking scheme to ensure that only one incoming supply can be energised at any one time where more than one supply is available.

4 MCB

- a) Each MCB shall be suitable for the type of load it feeds. It shall comply with IEC 60898 and shall include the following minimum features:
- i). Magnetic and thermal trip elements.
 - ii). Trip-free mechanisms.
- b) The minimum short circuit rating of the MCB shall be 10KA, unless shown otherwise on the relevant single line diagrams.

5 EARTH LEAKAGE CIRCUIT BREAKERS (ELCB OR RCCB)

- a) Earth Leakage Circuit Breakers (ELCBs) shall have tripping characteristics appropriate to the application and provide discrimination with other series devices. ELCB/RCCB shall comply with IEC 61008-1.
- b) Current-operated ELCBs shall provide accidental protection by interrupting dangerous contact with the voltage that may be present in the faulty electrical equipment and/or wiring as a result of frame faults, weaker insulation resistance or misuse.
- c) The ELCB shall also provide a high degree of protection against earth leakage, fires and electric shock.
- d) The ELCB protecting socket outlet shall have a rated residual operating current of 30mA with an operating time not exceeding 40msec. All other areas protected by ELCB shall have operating current as indicated on the relevant drawings. The ELCB shall isolate all live conductors.
- e) Switching and isolation devices incorporating RCDs shall be selected to provide current and time discrimination with upstream and downstream protective devices.

6 RESIDUAL CURRENT BREAKER WITH OVERCURRENT PROTECTION (RCBO)

- a) Each RCBO shall comply with IEC 61009.
- b) RCBO units shall be provided for final circuits supplying socket outlets, outdoor lighting, heating circuits and other small loads.
- c) The units shall have trip sensitivity of 30mA or as indicated on the relevant drawings.

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7 SOURCE TESTS

- a) Provide testing and analysis covered under Section 15001: General M&E Requirements.
- b) All circuit breakers shall be subject to the following witness tests to BS EN 60947 or other approved equivalent standard for voltages up to and including 1,000 Volts.
 - i). Routine tests including HV pressure test, millivolt drop tests and mechanical tests.
 - ii). Operation of dc closing coil and satisfactory closing of the circuit breaker with the voltage on the coil between 85% and 110% of its rated voltage.
 - iii). Satisfactory shunt opening and shunt closing of the circuit breaker with the trip coil energised between 50% and 110% of its rated voltage.
 - iv). Interchangeability of identically equipped withdrawable circuit breakers and checking of all mechanical and electrical interlocks.
 - v). Current injection tests as described under Section 16020: Factory Built Assembly (FBA).
 - vi). Type Test Certificates giving records of performance for identical circuit breakers shall provided.

END OF SECTION

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