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ARAB ENGINEERING BAR

28 SMALL ENCLOSURES

28.1 GENERAL

28.1.1 Scope

- 1 This Part specifies the requirements for small enclosures.
- 2 Related Parts and Sections are as follows:

This Section

Part 2 FBA
Part 3 Protective Devices
Part 6 Cables and small wiring
Part 7 Conduits
Part 8 Trunking
Part 9 Cable Trays
Part 10 Accessories and General Power

28.1.2 Description

- 1 The use of small enclosures, cabinets and junction boxes shall be limited to enclosing terminal blocks and low voltage (not exceeding 415 Volts) electrical field devices e.g. transmitters, sensors, switches, sockets, local starters and control stations, etc. excluding main motor control and switchgear.

28.1.3 References

- 1 The following Standards are referred to in this Part:
 - BS 476 Fire tests on building materials and structures
 - BS 476-7 Fire tests on building materials and structures - Method of test to determine the classification of the surface spread of flame of products
 - BS 476-8 Fire Tests on Building Materials and Structures Part 8: Test Methods and Criteria for the Fire Resistance of Elements of Building Construction; (BS 476-20 Fire tests on building materials and structures - Method for determination of the fire resistance of elements of construction (general principles))
 - BS 4800 Schedule of paint colours for building purposes; (BS 4800F: BS 4800 Colour matching fan)
 - BS 6220 Junction Boxes (EN 60670-22)
 - BS 7671, Requirements for Electrical Installations
 - ENV 12038 Durability of wood and wood-based products - Wood-based panels - Method of test for determining the resistance against wood-destroying basidiomycetes; (EN 113-3 Durability of wood and wood-based products - Test method against wood destroying basidiomycetes - Part 3: Assessment of durability of wood-based panels)

EN 60947-4-1Title Low-voltage switchgear and controlgear - Part 4-1: Contactors and motor-starters - Electromechanical contactors and motor-starters; (IEC 60947-4-1 Low-voltage switchgear and controlgear - Part 4-1: Contactors and motor-starters - Electromechanical contactors and motor-starters)

EN 60947-7-1Low-voltage switchgear and controlgear - Part 7-1: Ancillary equipment - Terminal blocks for copper conductors

IEC 947-7-1Low-voltage switchgear and controlgear - Part 7-1: Ancillary equipment - Terminal blocks for copper conductors; (IEC 60947-7-1 Low-voltage switchgear and controlgear - Part 7-1: Ancillary equipment - Terminal blocks for copper conductors)

IEE, UK., EN 60947-4-1

NEMA 250

NEMA ICS 4

NFPA 70 -National Electrical Code, U.S.A

.....or other approved equivalent standards as applicable.

28.1.4 Submissions

- 1 Submissions shall be in accordance with Part 1 of this Section and Part 7 of Section 1.
- 2 Shop Drawings submission shall include dimensional drawings of the battery and battery charger, including sections and elevations, showing the following:
 - (a) sizes and positions of components
 - (b) positions and method of fixing cable and boxes
 - (c) location of terminal boards
 - (d) other pertinent data.
 - (e) Component part list
 - (f) Single line diagram
 - (g) Three line diagram
 - (h) Wiring diagram
 - (i) Spare parts list
- 3 Submission of project data shall be as follows:
 - (a) full specifications of the enclosure and the components of the equipment with relevant sheets of manufacturer's catalogues
 - (b) confirmation that the equipment complies with the relevant specifications.
 - (c) Previous approval in similar applications

28.2 PRODUCTS

28.2.1 General

- 1 The specification shall be in accordance with latest edition of local and International regulations e.g QGEWC (KAHRAMAA).

- 2 The product selected and proposed shall include manufacturer's Instructions that Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements.
- 3 The Contractor shall select the product only from manufacturer's specializing in manufacturing products specified in this Part with minimum five years documented experience of the products being satisfactorily in use in a similar service and climatic conditions.
- 4 The Contractor shall ensure proper co-ordination with related civil and other project associated activities prior to the selection of the equipment.
- 5 The Contractor shall clearly show locations and fixing arrangements on the drawings.
- 6 IP ratings are based on short laboratory tests and are not an indication of an enclosure's suitability for use outdoors or in a harsh environment. All such enclosures need considerable interpretation for each installation.
- 7 Any enclosure installed in the wet well of a pumping station or in any area where the change of flooding exists shall be rated for IP68 classification.
- 8 Any enclosure installed the wet well of a pumping station shall be rated for Zone 2 hazardous area classification.

28.2.2 Hinged Cover Enclosures for use Indoors

- 1 Construction: Galvanized steel with minimum sheet steel thickness of 2 mm with panel fronts of thickness 2.0 mm minimum.
- 2 Covers: Lift-off hinge held closed by lockable T type handles. Doors shall close on to neoprene or soft rubber sealing strips held in place mechanically.
- 3 Provide interior metal panel for mounting terminal blocks and electrical components; finish with white enamel.
- 4 Enclosure Finish: Green to BS 4800, shade 14E53.
- 5 Enclosure Protection: Dust and vermin proof. Environmental protection to IP 54 or as applicable depending on the application.

28.2.3 Cabinets and Junction Boxes for use Indoors

- 1 Boxes: Galvanized steel with minimum sheet steel thickness of 2 mm with panel fronts of thickness 2.0 mm minimum.
- 2 Box Size: To suit equipment requirements.
- 3 Provide interior metal panels for mounting terminal blocks and electrical components; finish with white enamel.
- 4 Fronts: Lift-off hinge held closed by lockable T type handles. Doors shall close on to neoprene or soft rubber sealing strips held in place mechanically.

- 5 Junction boxes enclosing small quantity of terminals with bolted cover shall however be permitted to be used as per the approval of the Engineer.
- 6 Glandplates shall be provided to suit cable, conduit and circuiting arrangements.
- 7 Provide metal barriers to form separate compartments wiring of different systems and voltages.
- 8 Provide accessory feet, pedestal or pillar for free-standing equipment.
- 9 Enclosure Finish: Green to BS 4800, shade 14E53.
- 10 Enclosure Protection: Dust and vermin proof. Environmental protection to IP 54 or as applicable depending on the application.

28.2.4 Terminal Blocks

- 1 Terminal Blocks: IEC 947-7-1 or EN 60947-7-1: Terminal blocks for copper conductors.
- 2 Power Terminals: Unit construction type with closed back and tubular pressure screw connectors, rated 600 volts.
- 3 Signal and Control Terminals: Modular construction type, suitable for channel mounting, with tubular pressure screw connectors, rated 600 volts.
- 4 Provide earth bus terminal block, with each connector bonded to the enclosure.
- 5 Special terminals e.g. disconnect type, diode type, bridging type, fuse type etc. according to the applications requirements or as directed by the Engineer shall be provided.
- 6 All terminal assemblies shall be provided with dividers as necessary and end plates. Where included in the manufacturers' inventory, locking wire shall be installed on every terminal assembly.

28.2.5 Weatherproof Cabinets for use Outdoors

- 1 Weatherproof cabinets shall be provided for all electrical, control, instrumentation, distribution, etc. equipment which is to be used externally.
- 2 Outdoor equipment shall be weatherproof and designed to prevent the collection of water at any point. Metal to metal joints will not be permitted and all external bolts or screws shall be provided with blind tapped holes where a through hole would permit the ingress of moisture. The insides of outdoor cubicles shall be coated with an approved anti-condensation finish.
- 3 Confirmation must be provided from the manufacturer of any equipment intended for use outdoor that the equipment is suitable for use outdoors in the local climatic conditions, in situations where minor accidental damage, e.g. chipping, is likely to occur.
- 4 All kiosks and cubicles shall be fitted with door operated internal lights and shall be ventilated.

- 5 All instrumentation and control cubicles, kiosks etc. designed for use outside shall be manufactured having walls of double skinned, resin bonded fibreglass, with a totally encapsulated infill of rigid weather and "boil" proof plywood to ENV 12038 between the two skins.
- 6 The roof section shall have a totally encapsulated infill of end grain balsa instead of plywood. The end grain balsa shall have a minimum thickness of 18mm.
- 7 They shall be fully wind, dust and water tight and suitable for the prevailing climatic conditions and be of robust vandal proof construction.
- 8 The cabinets shall have a single door or two or more hinged non-overlapping doors fitted with a double locking bar, with a waterproof lever handle and cylindrical lock. Doors shall have an all round channel recessed gasket of non-fatigue, oil and age resistant material. Hinges shall be strong, smooth action and non-corrodable which allow the door to be easily removed. Doors shall be fitted with a suitable fixing bar to hold in the open position.
- 9 Box section steel shall be encapsulated into door edges and door frames.
- 10 All door catches and locks shall latch onto steel reinforced surfaces. The door sill shall be protected by a non-corroding alloy material.
- 11 Door mounted meters and transparent windows shall be of wired glass, which shall be protected from harmful direct sunshine by orientation or other approved means.
- 12 The cabinet shall be stiffened and/or reinforced when required for additional rigidity.
- 13 The cabinet shall have an easily removable rear mounting plate on moulded spacers.
- 14 All internal equipment shall be mounted on supports built into the fiberglass structure. Fixing bolts through the skin will not be accepted.
- 15 If required by the internal components, encapsulated thermal insulation shall be included.
- 16 The laminate material shall have flame retardant characteristics in compliance with BS 476 Part 7 Class 2, and shall retain "stability, integrity and insulation" for 30 min. when tested in accordance with BS 476 Part 8. An indicative fire test report shall be provided with the tender.
- 17 Colour impregnated gel coats backed by coloured resin shall be used to ensure maintenance free and "colour fast" finishes.
- 18 The cabinet shall be light grey in colour. The finish shall be colour fast and maintenance free.
- 19 The cabinet shall be constructed to provide environmental protection to IP 55.
- 20 The cabinet shall have a suitable shade canopy.
- 21 Ventilation via louvres with efficient sand traps and vermin screens will be permitted.
- 22 The cabinet shall be floor mounted suitable for bolting down to a concrete base.
- 23 The locking arrangement shall be suitable for the Master Lock & Key System used by the Employer.

28.2.6 Small outdoor Enclosures for Pushbutton Stations, Local Isolators, Local Starter or Control Gear etc.

- 1 All push button stations for use outdoors shall be of cast alloy, galvanised iron or stainless steel, heavy duty construction, specifically made for outdoor use and certified by the manufacturer as weatherproof.
- 2 Stop push buttons shall be of the auto-latch turn-to-release type. Push buttons shall not be prone to U.V. degradation.
- 3 Clearly visible legend plates to indicate the motor controlled shall be fitted at each push button or control station.
- 4 Isolator enclosures shall be of similar construction, lockable in the off position and fitted with auxiliary contacts for alarm purposes.
- 5 A robust factory manufactured and galvanised steel or stainless steel floor standing support shall be supplied and fixed for mounting the enclosure at a convenient height. These shall be pipe mounted with cabling running up inside the pipe, to protect the cables from mechanical damage and sun or fabricated from substantial angle iron and channel. Enclosures shall not be attached to handrailing. Under no circumstances shall enclosures be mounted on channel type supports of the unistrut type. Unistrut will not be accepted as any part of a welded support.
- 6 Where enclosures are installed in direct sunlight sunshades of an approved design shall be provided.
- 7 Hinged doors shall have a rain trap all round the opening and enclosures shall be fitted with a separate weather protection canopy.
- 8 Under no circumstances will painted sheet steel enclosures or enclosures with knock-outs for conduit or glandplates be acceptable for use outdoors unless they are mounted inside a heavy duty GRP enclosure and weather canopy.

28.3 INSTALLATION

28.3.1 General

- 1 Install in accordance with NECA "Standard of Installation" and other standards as directed by the Engineer.
- 2 Remove dirt and debris from enclosure
- 3 Install enclosures and boxes plumb. Anchor securely to wall and structural supports at each corner under the provisions of Section "supporting Devices".

28.4 QUALITY CONTROL AND TEST PROCEDURES

28.4.1 General

- 1 The manufacturer shall provide proof of a stringent Quality Control (QC) plan or Inspection Test Plan (ITP). In particular the main equipment manufacturing stages sanctioned by appropriate tests such as: incoming components inspection, discrete sub-assembly tests and complete functional checks on the final product. Final inspection and calibration operations shall be documented in a report drawn up by the supplier's Quality Inspection department.
- 2 The integrated functional test shall be conducted at manufacturer's works to ensure satisfactorily functioning of the equipment.
- 3 The Assembly shall not leave the manufacturer's works until the works test sheets have been duly approved and stamped by the Engineer and written permission is obtained for their dispatch to site.

28.5 ENVIRONMENT

28.5.1 General

- 1 Environmental conditions shall be in accordance with Section 1 Part 1 unless specified herein.
- 2 Minimum ambient temperature shall be 0°C.
- 3 Maximum relative humidity shall be 95%.

END OF PART