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9 CABLE TRAYS

9.1 GENERAL

9.1.1 General Reference

1 The work of this section is integral with the whole of the Project Documentation and is not intended to be interpreted outside that context.

2 Co-ordinate the work with all other services affecting the work of this section.

3 Related Parts and Sections are as follows:

This Section

Part 1	General Provisions for Electrical Installations
Part 6	Cables and Small Wiring
Part 7	Conduits and Conduit Boxes

9.1.2 References

1 The following standards are referred to in this Part:

ASTM A123/A123M ...Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

BS 729.....Hot dip galvanized coating on iron and steel articles (ISO 1461)

BS 7671.....Requirements for Electrical Installations. IET Wiring Regulations

NFPA 70.....National Electrical Code

9.1.3 Description

1 Provide all labour, materials, equipment, services and accessories necessary to furnish and install the work of this Section, complete and functional, as indicated in the Project Documentation and as specified herein.

9.1.4 Quality Assurance

1 Reference standards as detailed under Part 1 and this Part Clause 9.1.4.

9.1.5 Submissions

1 Reference Part 1

9.1.6 Delivery, Storage and Handling

1 Deliver, store and handle materials and products in a manner to prevent damage.

2 Reference Part 1

9.1.7 Co-ordination

1 The work of this Section shall be completely co-ordinated with the work of other services.

9.2 PRODUCTS

9.2.1 General

1 The cable tray system shall be of one manufacturer and shall include factory-made trays, tray fittings, connectors and necessary accessories and supports to form a complete cable support system.

2 The cable tray system shall include the following factory-made tray elements:

(a) straight cable trays and ladders

(b) fittings as horizontal and vertical bends of various angles, crosses, tees, wyes, reducers, vertical riser elements

(c) connectors

(d) all necessary fixing accessories.

3 Manufacturer's standard accessories shall be used and site fabrication shall not be permitted.

4 Horizontal run of cables laid on cable tray and exposed to direct sunlight shall be provided with covering at higher level to allow for ventilation. Cable tray shall be raised 15 cm from finished floor level.

5 Cable trays shall confirm to requirements as specified in BS 7671, NFPA 70 - National Electrical Code, U.S.A or other equivalent standard as applicable.

6 Cable trays specification and installation shall be in accordance with QGEWC regulations and IEE latest edition as applicable.

7 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.

8 The contractor shall select the product only from manufacturer's specializing in manufacturing products specified in this Section, with a minimum five years documented experience of the products being satisfactorily in use in a similar service and climatic conditions.

9 The contractor shall ensure proper co-ordination with related civil activities prior to the selection of the equipment.

10 The contractor shall clearly show locations of trays, service fittings, junction boxes, and branch circuiting arrangements on the drawings.

9.2.2 Materials

1 The whole of the tray work, trays, fittings, supports shall be of mild steel hot dipped galvanized after manufacture to BS 729. The thickness of the protective sheath on any element shall not be less than 55 microns.

2 Cable trays shall be constructed from mild steel hot dip galvanized and of minimum thickness of 1.5 mm.

3 Insert elements, bolts, screws, pins, etc., shall be mild steel cadmium plated.

4 Tray work shall have oval perforations. Ladder type trays shall be used for vertical runs as approved by the Engineer.

5 All trays (straight and fittings) shall be welded construction and be a heavy duty returned flanged, perforated type, unless specified otherwise. The minimum thickness of heavy duty returned flanged cable trays shall be 1.5 mm.

6 Tray components shall be accurately rolled or formed to close tolerances and all edges rounded. Flanges shall have full round smooth edges.

7 Ladder racks shall be of similar construction. The rungs shall be spaced at maximum 300 mm. The system shall allow for installing additional rungs and for replacement of rungs.

8 For all trays, flanges shall be a minimum of 50 mm deep, unless otherwise specified.

9 Cable tray width and radius of curved sections shall be selected to suit the number of cables as shown on drawings and to the approval of the Engineer.

10 Cable trays and accessories installed in hazardous and extremely corrosive environments shall be heavy duty GRP or 316 S31 grade stainless steel.

11 Ladder Type Cable Tray

(a) definition: Two longitudinal side rails connected by individual cross members (rungs).

(b) description: NEMA VE 1, specified Class or other approved standard, ladder type tray.

(c) material: Steel or aluminium as specified.

(d) finish: ASTM A123 or other approved standard, hot dipped galvanised after fabrication for steel trays. Painted with specified colour epoxy or PVC coated as specified. The material shall be self extinguishing and non-inflammable and shall be unaffected by sunlight or water. It shall be suitable for continuous ambient temperature of 65° C.

(e) inside Width: 150, 300, 450, 600, 750 or 900 mm as specified or indicated.

(f) inside Depth: 75, 100, 125, or 150 mm as specified or indicated.

(g) straight Section Rung Spacing: 150, 225, 300 or 450 mm as specified or indicated.

(h) inside Radius of Fittings: 300, 600 or 900 mm as specified or indicated.

(i) provide manufacturer's standard clamps, hangers, brackets, splice plates, reducer plates, blind ends, barrier strips, connectors, and grounding straps.

(j) covers: Flanged or Non-flanged as specified, solid or ventilated and flush or raised cover as specified.

(k) bond trays carrying LV cables to earth with 16 Sq. mm. PVC insulated copper single core cable, 25x3 mm copper tape if carrying HV cables.

12 Trough Type cable Tray

(a) definition: Two longitudinal side rails connected by closely-spaced rungs or ventilated bottoms.

(b) description: NEMA VE 1, specified Class or other approved standard, trough type tray.

(c) material: Steel, aluminium or heavy duty unplasticised PVC as specified.

(d) finish: ASTM A123 or other approved standard, hot dipped galvanised after fabrication for steel trays. Painted with specified colour epoxy or PVC coated as specified. The material shall be self extinguishing and non-inflammable and shall be unaffected by sunlight or water. It shall be suitable for continuous ambient temperature of 65 degrees C.

(e) inside Width: 150, 300, 450, 600, 750 or 900 mm as specified or indicated.

(f) inside Depth: 75, 100, 125, or 150 mm as specified or indicated.

(g) inside Radius of Fittings: 300, 600 or 900 mm as specified or indicated.

(h) provide manufacturer's standard clamps, hangers, brackets, splice plates, reducer plates, blind ends, barrier strips, connectors, and earthing straps.

(i) covers: Flanged or Non-flanged as specified, solid or ventilated and flush or raised cover as specified.

13 Solid Bottom Type Cable Tray

(a) definition: Two longitudinal side rails connected by corrugated or reinforced solid bottom.

(b) description: NEMA VE 1, specified Class or other approved standard, solid bottom cable tray.

(c) material: Steel, aluminium or heavy duty unplasticised PVC as specified.

(d) finish: ASTM A123 or other approved standard, hot dipped galvanised after fabrication for steel trays. Painted with specified colour epoxy or PVC coated as specified. The material shall be self extinguishing and non-inflammable and shall be unaffected by sunlight or water. It shall be suitable for continuous ambient temperature of 65 degrees C.

(e) inside Width: 150, 300, 450, 600, 750 or 900 mm as specified or indicated.

(f) inside Depth: 75, 100, 125, or 150 mm as specified or indicated.

(g) inside Radius of Fittings: 300, 600 or 900 mm as specified or indicated.

(h) provide manufacturer's standard clamps, hangers, brackets, splice plates, reducer plates, blind ends, barrier strips, connectors, and earthing straps.

(i) covers: Flanged or Non-flanged as specified, solid or ventilated and flush or raised cover as specified.

14 Channel Type Cable Tray

(a) definition: Single piece formed into channel. Bottom may be solid or with ventilation openings.

(b) description: NEMA VE 1, specified Class or other approved standard, solid bottom or ventilated bottom type cable tray as specified.

(c) material: Steel, aluminum or heavy duty unplasticised PVC as specified.

(d) finish: ASTM A123 or other approved standard, hot dipped galvanised after fabrication for steel trays. Painted with specified colour epoxy or PVC coated as specified. The material shall be self extinguishing and non-inflammable and shall be unaffected by sunlight or water. It shall be suitable for continuous ambient temperature of 65 degrees C.

(e) inside Width: 75 or 100 mm as specified or indicated.

(f) outside Depth: As specified or indicated.

(g) inside Radius of Fittings: 300, 600 or 900 mm as specified or indicated.

(h) provide manufacturer's standard clamps, hangers, brackets, splice plates, reducer plates, blind ends, barrier strips, connectors, and earthing straps.

(i) covers: Flanged, solid or ventilated cover as specified.

15 Fiberglass Ladder Type Cable Tray

(a) description: NEMA FG 1, specified Class or other approved standard, ladder type tray.

(b) material: Fiberglass.

(c) inside Width: 150, 300, 450, 600, 750 or 900 mm as specified or indicated.

(d) inside Depth: 75, 100, 125, or 150 mm as specified or indicated.

(e) straight Section Rung Spacing: 150, 225, 300 or 450 mm as specified or indicated.

(f) inside Radius of Fittings: 300, 600 or 900 mm as specified or indicated.

(g) provide manufacturer's standard clamps, hangers, brackets, splice plates, reducer plates, blind ends, barrier strips, and connectors.

(h) covers: Flanged or Non-flanged as specified, solid or ventilated and flush or raised cover as specified.

16 Fiberglass Trough Type Cable Tray

(a) description: NEMA FG 1, specified Class or other approved standard, trough type tray.

(b) material: Fiberglass.

(c) inside Width: 150, 300, 450, 600, 750 or 900 mm as specified or indicated.

(d) inside Depth: 75, 100, 125 or 150 mm as specified or indicated.

(e) inside Radius of Fittings: 300, 600 or 900 mm as specified or indicated.

(f) provide manufacturer's standard clamps, hangers, brackets, splice plates, reducer plates, blind ends, barrier strips, connectors, and earthing straps.

(g) covers: Flanged or Non-flanged as specified, solid or ventilated and flush or raised cover as specified.

17 Fibreglass Solid Bottom Type Cable Tray

(a) description: NEMA FG 1, specified Class or other approved standard, solid bottom cable tray.

(b) material: Fiberglass.

(c) inside Width: 150, 300, 450, 600, 750 or 900 mm as specified or indicated.

(d) inside Depth: 75, 100, 125 or 150 mm as specified or indicated.

(e) inside Radius of Fittings: 300, 600 or 900 mm as specified or indicated.

(f) provide manufacturer's standard clamps, hangers, brackets, splice plates, reducer plates, blind ends, barrier strips and connectors.

(g) covers: Flanged or Non-flanged as specified, solid or ventilated and flush or raised cover as specified.

18 Fibreglass Channel Type Cable Tray

(a) description: NEMA FG 1, specified Class or other approved standard, solid bottom or ventilated as specified, channel type cable tray.

(b) material: Fiberglass.

(c) inside Width: 75 or 100 mm as specified or indicated.

(d) outside Depth: As specified or indicated.

(e) inside Radius of Fittings: 300, 600 or 900 mm as specified or indicated.

(f) provide manufacturer's standard clamps, hangers, brackets, splice plates, reducer plates, blind ends, barrier strips, and connectors.

(g) covers: Flanged, solid or ventilated cover as specified.

19 Warning Signs

(a) engraved nameplates shall be provided and installed along the route of the cable tray: 13-mm black letters on yellow laminated plastic nameplate, engraved with the following wording:- “WARNING! DO NOT USE CABLE TRAY AS WALKWAY, LADDER, OR SUPPORT. USE ONLY AS MECHANICAL SUPPORT FOR CABLES AND TUBING!”

9.3 INSTALLATION

9.3.1 Installation

1 Drilling, machining or cutting shall not be carried out after application of protective coat, unless previously agreed by the Engineer. If cutting or drilling is necessary, edges shall be cleaned up and painted with zinc based paint before erection.

2 Installation of vertical runs of tray along the line of vertical expansion joints in structure of the facility shall not be allowed.

3 Cables shall be fixed to the trays by means of PVC covered saddles or straps secured with brass or cadmium plated bolts, nuts and washers.

4 20 % spare capacity shall be maintained once all cables have been installed on trays. Double banking of cables shall not be permitted. space between adjacent cables shall be not less than the radius of the bigger cable.

5 Trays shall not be smaller than the minimum size stated on the Drawings or specified later and shall be so sized; if not specified, the Contractor shall calculate the size of the tray and submit to the Engineer for approval. The Contractor shall check the minimum size as specified is large enough for his requirements and provide 20% spare capacity for future use.

6 Install metallic cable tray in accordance with NEMA VE 1 or other approved standard and local regulations as approved by the Engineer.

7 Install fibreglass cable tray in accordance with NEMA FG 1 or other approved standard and local regulations as approved by the Engineer.

8 Support trays in conjunction with supporting devices as described under Section "Supporting Devices". Provide supports at each connection point, at the end of each run, and at other points to maintain spacing between supports of 1200 mm maximum.

9 Use expansion connectors where required.

10 Provide firestopping under provisions of relevant Section to sustain ratings when passing cable tray through fire-rated elements.

11 Ground and bond cable tray under provisions of the Earthing and Bonding Part of QCS.

(a) provide continuity between tray components.

(b) use anti-oxidant compound to prepare aluminium contact surfaces before assembly.

(c) provide specified cross section copper equipment grounding conductor through entire length of tray; bond to each component.

(d) connections to tray may be made using mechanical or exothermic connectors.

12 Where specified, install warning signs at 1500 mm centres along cable tray, located to be visible.

13 Where specified, install warning signs at 1500 mm centres along cable tray, located to be visible.

14 Plastic tie-wraps of any description shall not be used for fixing cables to cable tray.

15 Saddle and cleat cables in position as they are installed along the route. Cables should be neatly dressed and crossing of cables should be avoided by good detailed design of cable routing.

16 All cable tray changes in direction or level shall be made via sets and adequately sized angles to provide a support to the cables.

17 Single core cables of the same circuit shall be laid and mounted in purpose made trefoil cleats.

9.3.2 Erection

1 Cable trays arranged one above the other shall have spacing in relation to their width not exceeding a ratio of 1:2 with a minimum distance of 150 mm.

2 Supports

Install fixings and supports:

(a) at 2 meter centres or as specified in project docutmentation

(b) 150 mm from bends, tees, intersections and risers

(c) as close as practicable to joints

(d) each side of expansion joints.

3 Supports shall be selected from the following types, to suit the site conditions:

(a) M12 steel threaded drop rods fixed to ceilings complete with GI channels or brackets

(b) wall support brackets

(c) cantilever arms

(d) steel channels.

4 The cable trays shall be fixed in accordance with site conditions and manufacturer's recommendations.

5 Join cable tray and accessories with hardware per manufacturer's recommendations.

6 Avoid mid-span joints.

7 The Contractor shall submit, as required, all calculations relating to tray work and tray supports demonstrating acceptable mechanical stresses and sag.

8 Cable trays installed on roofs shall be supported using GI brackets or concrete blocks. Removable cable tray cover shall be fitted.

9 Access shall be available at all times to remove or replace cables with a minimum of 400 mm between trays and physical obstructions, A/C ductwork etc.

9.3.3 Earthing

1 Cable trays and accessories shall be electrically and mechanically continuous throughout their length.

2 The entire cable tray system shall be bonded and 12 mm x 2.5 mm tinned copper links shall be bolted across each joint in the system by means of bronze nut and bolts, complete with flat and spring washers.

3 All cable trays shall be provided with earth continuity copper tape along the whole route of cable trays which shall be bonded to the main earthing system of the facility. The earth continuity copper tape shall be fixed on cable tray by means of PVC covered saddles or by other means approved by the Engineer.

END OF PART