**Specification – BASORTRAV FE HDG Steel Ladder Cable Tray system – Three Part Specification**

**DIVISION 26**

**SECTION 26 05 36 - CABLE TRAYS FOR ELECTRICAL SYSTEMS (Ladder Cable Tray)**

*\*\*\* This Section 26 05 36 includes metal cable trays of types and sizes included in NEMA VE 1.*

\*\*\*Throughout this document you will find designated ‘Notes to specifier’ in green to better serve your needs. If you have any questions or comments, please contact your local Basor Electric sales representative

**PART 1 – GENERAL**

* 1. RELATED DOCUMENTS
		1. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specifications Sections, apply to this Section.
	2. SUMMARY
		1. Section Includes Ladder cable tray systems manufactured from hot dip galvanized steel.
	3. RELATED SECTIONS
		1. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
		2. Section 26 05 29 - Hangers and Supports for Electrical Systems
		3. Section 27 05 36. - “Cable Trays for Communications Systems” for cable trays and accessories service communications systems.
		4. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables.
		5. Section 26 05 00 – Common Work Results for Electrical.
		6. Section 48 00 00 – Electrical Power Generation.
		7. Section 27 11 23 – Communications Cable Management and Ladder Rack.
	4. REFERENCES

A. American National Standards Institute (ANSI) / National Fire Protection Association (NFPA)

* + - 1. ANSI/NFPA70 – National Electrical Code (NEC).
		1. National Electrical Manufacturers Association (NEMA):
			1. NEMA VE 1 - Metal Cable Tray Systems.
			2. NEMA VE 2 - Cable Tray Installation Guidelines
		2. International Electrotechnical Commission (IEC):
			1. IEC 61537 – Cable Tray Systems and Cable Ladder Systems for Cable Management.
		3. Telecommunications Industry Association (TIA):
			1. TIA 569-A (1998) – Commercial Building Standard for Telecommunications Pathways and Spaces.
		4. Underwriters Laboratories (UL)
		5. ASTM International (ASTM):
			1. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
		6. European standards (EN):
			1. EN ISO 1461 - Hot dip galvanized coatings on fabricated iron and steel articles -- Specifications and test methods.
		7. German Institute for Standardization (DIN) Standards:
			1. DIN 4102-12: Fire behavior of building materials and building components – Part 12: Circuit integrity maintenance of electrical cable systems – requirements and testing. Edition 2000-02-01
	1. ACTION SUBMITALS
		1. Product Data for Each type of product.
			1. Include data indicating dimensions for each type of cable tray indicated; a Manufacturer’s data sheet on each product to be used (including dimensions, material, UL Classification).
			2. Preparation instructions and recommendations.
			3. Storage and handling requirements and recommendations.
			4. Illustrative installation methods.
		2. Shop Drawings: For each type of cable tray indicated.
			1. Show fabrication and installation details of cable ladder, including plans, elevations and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, connectors, expansion -joint assemblies, straight lengths, and fittings.
			2. Verify loading capacities for supports.
	2. INFORMATIONAL SUBMITTALS
		1. Coordination Drawings: Floor plans and sections, draw to scale on which the following items are shown and coordinated with each other, using input from installers of the items involved.
			1. Include scaled cable ladder layout and relationships between components and adjacent structural, electrical, and mechanical elements.
			2. Vertical and horizontal offsets and transitions.
			3. Clearances for access above and to the side of cable ladder.
			4. Vertical elevation of cable trays above the floor or below bottom of ceiling structure.
			5. Include scaled cable ladder layout and relationships between components and adjacent structural and mechanical elements. Field verification of all dimensions, routing, elevation changes, etc. are required.
		2. Seismic Qualifications Certificates: For cable ladder, accessories, and components from the manufacturer.
			1. Basis for Certification: Indicated whether the product load carrying capabilities certification are based upon actual test of assembled components or on calculations.
			2. Dimensioned outline drawings of equipment unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
			3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
		3. Certification:
			1. Submit training procedure for certifying cable ladder installers.
	3. QUALITY ASSURANCE
		1. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum 5 years documented experience.
			1. Manufacturer shall be ISO 9001 compliant.
			2. Manufacturer shall be ISO 14001 compliant.
		2. NEMA Compliance: Manufacturer to comply with NEMA Standards Publication Number VE1, "Cable Tray Systems".
		3. UL Compliance: Manufacturer to provide products that are UL-classified and labeled.
		4. NEC Compliance: Contractor to comply with NEC, as applicable to construction and installation of cable tray and cable channel systems (Article 392 NEC).
		5. Installer Qualifications: Certified by the manufacturer.
			1. Certified Installer: Cable tray installers shall have successfully completed manufacturers Certified Installer training program.
	4. DELIVERY, STORAGE and HANDLING
		1. Avoid breaking and scratching of finish. Damaged products shall not be installed. Store cable trays and accessories in original packaging in a location that is free from construction traffic and an environment that will damage the packaging materials.
		2. Store products in original unopened packaging until ready for installation.
1. **- PRODUCTS**
	1. MANUFACTURER
		1. Manufacturer shall be Basor Electric, which US office is located at 609 South Breese, Millstadt, Illinois 62260; Toll Free Telephone: 844-393-3985; Telephone: 618-476-6300; Fax:618-476-6301; E-Mail: customerservice@basor.com; Web address: [www.basor.com](http://www.basor.com) or [www.basor.us](http://www.basor.us)
		2. Substitutions
			1. Substitutions shall not be permitted.
	2. LADDER CABLE TRAY SYSTEM
		1. General: Except as otherwise indicated, provide metal ladder cable trays, of types, classes and sizes indicated; with splice plates, bolts, nuts, and washers for connecting units. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards.
			1. Product: Basortrav FE Ladder Cable Tray, manufactured and supplied by Basor Electric.
			2. Ladder Cable Tray System providing continuous cable ventilation and heat dissipation. Systems include, straight sections, radial bends, tees, crossovers, supports, covers, connectors, mounting brackets, supports, dividers and installation joints and accessories. With splice plates, bolts, nuts, and washers for connecting units. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards
			3. Ladder providing self-assembly system, only Bolt sets needed for the set-up, and no union joint plates needed.
			4. UL classified and NEMA rated
		2. Materials and Finish: Material and finish specifications for cable ladder are as follows:
			1. Carbon Steel with Hot Dip Galvanized after fabrication acc. to ISO 146 or ASTM 123. All covers and splice plates must also be hot-dip galvanized after fabrication; mill galvanized covers are not acceptable for hot-dipped galvanized ladder cable tray. All hot dip galvanized after fabrication steel ladder cable trays must receive inspection and removal of all icicles and excess zinc. Coating thickness must be a minimum value of 2.17 mils (55 microns).
	3. TYPE OF TRAY SYSTEM
		1. Ladder type trays shall consist of two longitudinal members (side rails) with transverse members (rungs) swaged to the side rails.

\*\*\* NOTE TO SPECIFIER: Delete rung spacing options not required:

* + 1. Rungs shall be spaced [9] [10] [12] inches on center. No portion of the rungs shall protrude below the bottom plane of the side rails. Each rung must be capable of supporting the maximum cable load, with a safety factor of 1.5 and a 200-pound concentrated load when tested in accordance with NEMA VE-1, section 5.4.

\*\*\* NOTE TO SPECIFIER: Delete NEMA Load/Span-Ladder depth options not required:

* + 1. Ladder Cable Tray shall be capable of carrying the uniformly distributed load and corresponding foot support span, with a safety factor of 1.5 when supported as a simple span and tested per NEMA VE1 Section 5.2. Ladder models shall be:
			1. NEMA Load / Span Rating: 12C-16A:
				1. Ladder depth 4” Basortrav FE 100x1,5mm
				2. Ladder depth 5” Basortrav FE 120x1,5mm
			2. NEMA Load / Span Rating: 12C-16B
				1. Ladder depth 3” Basortrav FE 75x2mm
				2. Ladder depth 4” Basortrav FE 100x2mm
				3. Ladder depth 6” Basortrav FE 150x1,5mm
			3. NEMA Load / Span Rating: 16C-20B
				1. Ladder depth 5” Basortrav FE 120x2mm
				2. Ladder depth 6” Basortrav FE 150x2mm

\*\*\* NOTE TO SPECIFIER: Delete ladder width options not required:

* + 1. Ladder width shall be [4”(100mm)] [6”(150mm)] [8”(200mm)] [12”(300mm)] [16”(400mm)] [20”(500mm)] [24”(600mm)], unless otherwise shown on drawings.

\*\*\* NOTE TO SPECIFIER: Delete ladder length options not required:

* + 1. Ladder straight section length shall be [10ft (3,000mm)] [12ft (3,660mm)] [20ft (6,000mm)], unless otherwise shown on drawings.

\*\*\* NOTE TO SPECIFIER: Delete ladder fittings radius options not required:

* + 1. All fittings must have a minimum radius of [12”(300mm)] [24”(600mm)] [36”(900mm)]
	1. EXISTING PRODUCTS (general requirements for Cable tray)
	2. MATERIAL (performance requirements. Ladder Cable Tray)
		1. Load Span Criteria
			1. The Load Span to be per the manufacturer’s recommendations based upon the cable type, cable size, cable quantity planned for the installation.
	3. MANUFACTURED UNITS
		1. Units shall be in pieces.
	4. EQUIPMENT
		1. Proper Material handling equipment shall be used on site to prevent personal injury or damage to materials.
	5. FABRICATION
		1. Field fabrication or alterations of ladder cable tray fittings shall not be permitted.
1. **– EXECUTION**
	1. INSTALLERS
		1. On installations of greater than 500 feet (approximately 152 meters) in total length, installers must be certified and trained by the manufacturer or manufacturer’s representative.
		2. Install as a complete system, including all necessary fasteners, splice plates, supports, divider strips, elbows, Tees, reducers, crosses, vertical splice plates, variable angle splice plates, hinged splice plates and covers.
	2. EXAMINATION
		1. Examine materials to be installed, comparing them to the manufacturer’s specifications and spec sheets (drawings). Do not proceed with installation until materials are confirmed to be within the prescribed condition.
		2. Examine materials to be installed for cleanliness and hidden damage resulting from poor material handling practice.
	3. LADDER CABLE TRAY INSTALLATION
		1. Install ladder cable trays according to the manufacturer’s installation directions.
		2. Install ladder cable trays as a complete system, including fasteners, hold-down clips, support systems, barrier strips, adjustable horizontal and vertical splice plates, elbows, reducers, tees, crosses, cable dropouts, adapters and covers.
		3. Install ladder cable trays so that the ladder is accessible for cable installation and all splices are accessible for inspection and adjustment.
		4. Remove any burrs or sharp edges from ladder cable trays that result from field fabrication.
		5. Fasten ladder cable tray supports to building structure and install seismic restraints as applicable.
		6. Design fasteners and supports to carry ladder cable tray and the cables.
		7. Place supports so that spans do not exceed maximum spans on loading schedules and provide clearances shown on drawings or per manufacture’s recommendations.
		8. Construct supports from appurtenances furnished by the cable tray manufacturer. Arrange supports in trapeze, wall-bracket form or directly upon the floor or machinery as required by the application.
		9. Support Ladder Cable Tray assembly to prevent twisting from eccentric loading.
		10. Locate and install supports according to the installation directions provided by the manufacturer.
		11. Make connections to equipment and flanged fittings fastened to ladder cable trays to equipment. Support ladder cable trays independently of fittings. Do not transfer the weight of the ladder cable trays to equipment enclosures.
		12. Make changes in direction and elevation using the manufacturer’s recommended fittings.
		13. Seal penetrations through fire and smoke barriers in accordance with requirements in NFPA 70, National Electrical Code, Section 300.21. If ladder
		14. Ladder cable trays are sized for futures cables, specify provisions for penetrations with sleeves through fire-rated partitions or use “repairable” firestop sealing material.
		15. Install capped metals sleeves for future cables through firestop-sealed ladder cable tray penetrations of fire and smoke barriers.
		16. Install ladder cable trays with enough workspace to permit access for installing cables.
		17. Install barriers to separate cables of different systems, such as power, communications, and data processing; or different insulation levels such as 600V, 5,000V and 15,000V.
		18. Install permanent covers, if used, after installing cable. For outdoor applications or for where access to the contents of the ladder cable tray is to be limited to qualified individuals, install cover retention hardware that will result in the need for a tool to remove the cover.
		19. Install warning signs in visible locations on or near ladder cable trays after cable installation with the legend “Warning! Not to be used as a Walkway, Ladder or Support for Ladders or Personnel.”
	4. CABLE INSTALLATION
		1. Install cables only when each ladder cable tray run has been completed and inspected.
		2. Fasten cables on horizontal runs with environment appropriate cable ties according to the methods demonstrated in NEMA VE2. Tighten cable ties only enough to secure the cable, without indenting the cable jacket. Install cable ties with a tool that includes an automatic pressure-limiting device.
		3. Fasten cables on vertical runs to ladder cable trays every 18 inches (450mm).
		4. Fasten and support cables that pass from one ladder cable tray to another or drop from ladder cable trays to equipment enclosures. Fasten cables to the ladder cable tray at the point of exit and support cables independent of the enclosure. The cable length between ladder cable trays or between ladder cable tray and enclosure shall be no more than 72 inches (1,800mm).
		5. In existing construction, remove inactive or dead cables from the ladder cable trays before active cables are installed.
	5. CONNECTIONS
		1. Connect raceways to ladder cable trays according to requirements in NFPA 70, National Electric Code.
	6. FIELD QUALITY CONTROL
		1. Perform the following tests and inspections [**with the assistance of factory-authorized service representatives]**:
			1. After installing ladder cable trays and after the electrical circuitry has been energized, survey for compliance with requirements.
			2. Visually inspect cable insulations for damage. Correct any sharp corners, protuberances that appear in the ladder cable tray, vibrations and thermal expansion and contraction conditions, which may cause or have caused damage.
			3. Verify that the number, size and voltage of cables in ladder cable trays are installed as permitted by NFPA 70. Verify that communications or data-processing circuits are separated from power circuits by barriers or are installed in separate cable trays.
			4. Verify that there are no intruding items such as pipes, hangers or other equipment in the ladder cable tray.
			5. Remove dust deposits, industrial process materials, trash or any description and any blockage of ladder tray ventilation.
			6. Visually inspect each ladder cable tray joint for mechanical continuity.
			7. Check for missing, incorrect or damaged bolts, bolt heads or nuts. When found, replace with specified hardware.
	7. PROTECTION
		1. Install temporary protection for cables in open ladder trays to safeguard exposed cables against falling objects or debris during construction. Temporary protection for cables and ladder cable tray can be constructed of wood or metal materials and shall remain in place until the risk of damage no longer exists.