MIDDLE EAST™
enduro

An Industrial Systems Group Partner

ISG
مجموعة الأنظمة الصناعية
Industrial Systems Group

GRP Solutions for Cable Management Systems

- Cable Tray
- Cable Ladder
- Instrument Stands
- Strut & Mechanical

www.endurocomposites.com

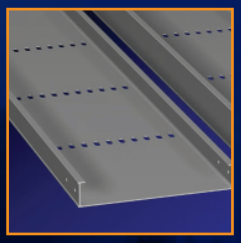
Welcome to Enduro Middle East

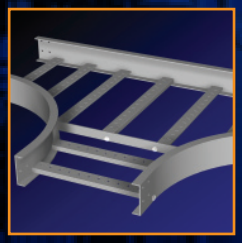
Enduro Middle East is an established licensing agreement formed in 2011 between Enduro Composites, Inc. (USA) and Industrial Systems Group (KSA), a subsidiary of Al Abdulkarim Holding (AKH).

The manufacturing facility is strategically located in Second Industrial City, Dammam, KSA and opened its doors in early 2013.

This catalog provides all of the cable tray options available locally through Enduro Middle East. Additional items can be manufactured and shipped from the Enduro headquarters in Houston, TX, USA. For full catalog, please contact a customer service representative at +966-13-8128630 ext. 5208 or visit our website at www.endurocomposites.com.

Thank you for your interest in Enduro Middle East Cable Management Systems and we look forward to working with you.





Over 35 Years Experience

Enduro is the world leader in the manufacture and development of fiberglass cable tray and other GRP systems.

Quality & Consistency

With a world–class quality testing laboratory, Enduro ensures consistent and reliable product performance through comprehensive programs of quality control.

Single Source Responsibility

Because we have been providing GRP cable management solutions for over three decades, our product offering is one of the broadest in the industry. Combined with our other manufacturing, engineering and design capabilities, this enables us to offer application–specific solutions to just about any design problem. And, since we are vertically integrated, we can deliver these solutions on time and on budget, at the quality level our customers expect.

Engineering & Design Assistance

Enduro's experienced technical staff can provide engineering and design assistance for your project. If you have a unique design problem, chances are good we have encountered something similar before.

Specification Assistance

The specification phase of a project is the most important to ensure the success of a composite cable management solution. With our broad history of installations in a wide variety of challenging environments, we can help you specify the best resin system and the right structural properties to ensure long life and low cost of ownership.

AutoCAD, PDMS

We can assist you in the design process with AutoCAD details. In addition, Enduro's cable tray offering is available in PDMS. Contact us today for more information.

Customer Service & Sales Support

Our Customer Service desk is available to assist with questions, product selection or quotes. Please call us today at +966.13.8128630 ext. 5208 or email sales@endurocomposites.com.

Our Broad Experience

- Offshore Platforms
- Subsea Applications
- Floating Offshore Systems FPSOs & Other Vessels
- Refineries
- Liquified Natural Gas (LNG)
- Chemical Plants
- Petrochemical Complex
- Fertilizer, Potash Plants
- Pulp & Paper
- Copper Refineries
- Aluminum Refineries
- Zinc Refineries
- Metal Plating Facilities
- Desalination Plants
- Salt Processing
- Grain Refining
- Food Processing
- Water & Wastewater Treatment
- Electronics Etching/Clean Rooms
- Tunnels, Bridges, Causeways
- Non–Conductive Applications

Quick Find Index

Ladder Cable Tray

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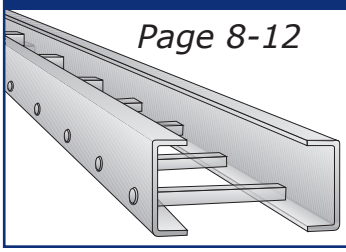

Ladder Cable Tray Fittings

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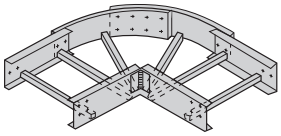

Ladder Cable Tray Splice Plates

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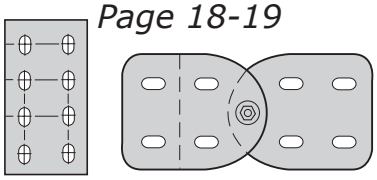

Ladder Cable Tray Accessories

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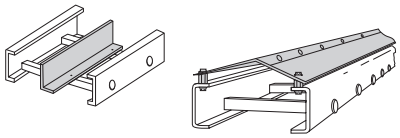

Channel-Type Instrumentation Tray

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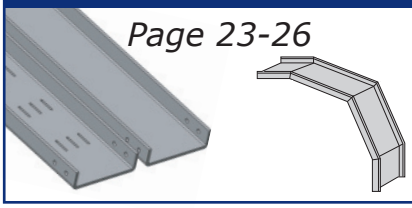

Flanged-Type Instrumentation Tray

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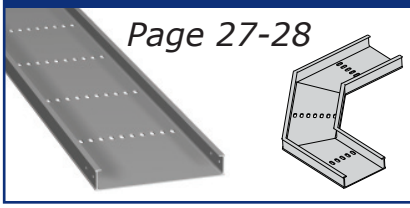

Support Systems & Strut

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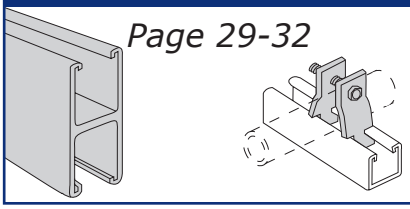

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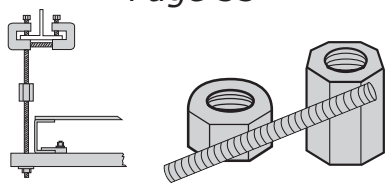

Instrument & Push Button Stands

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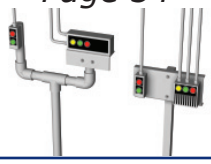

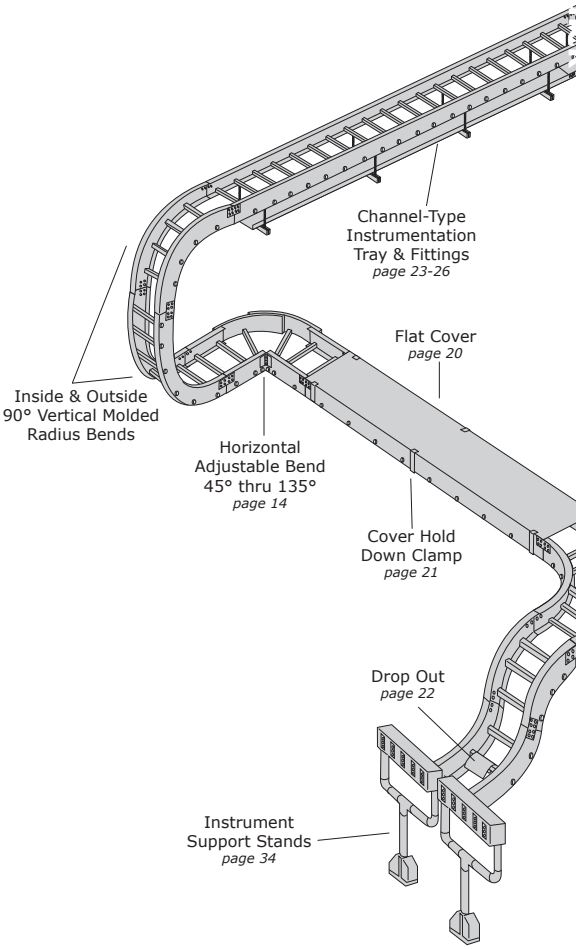

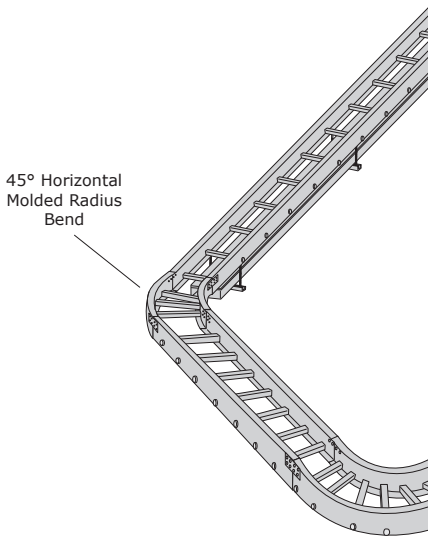

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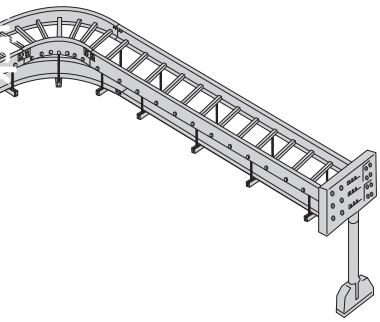

Push Button
Support Stand
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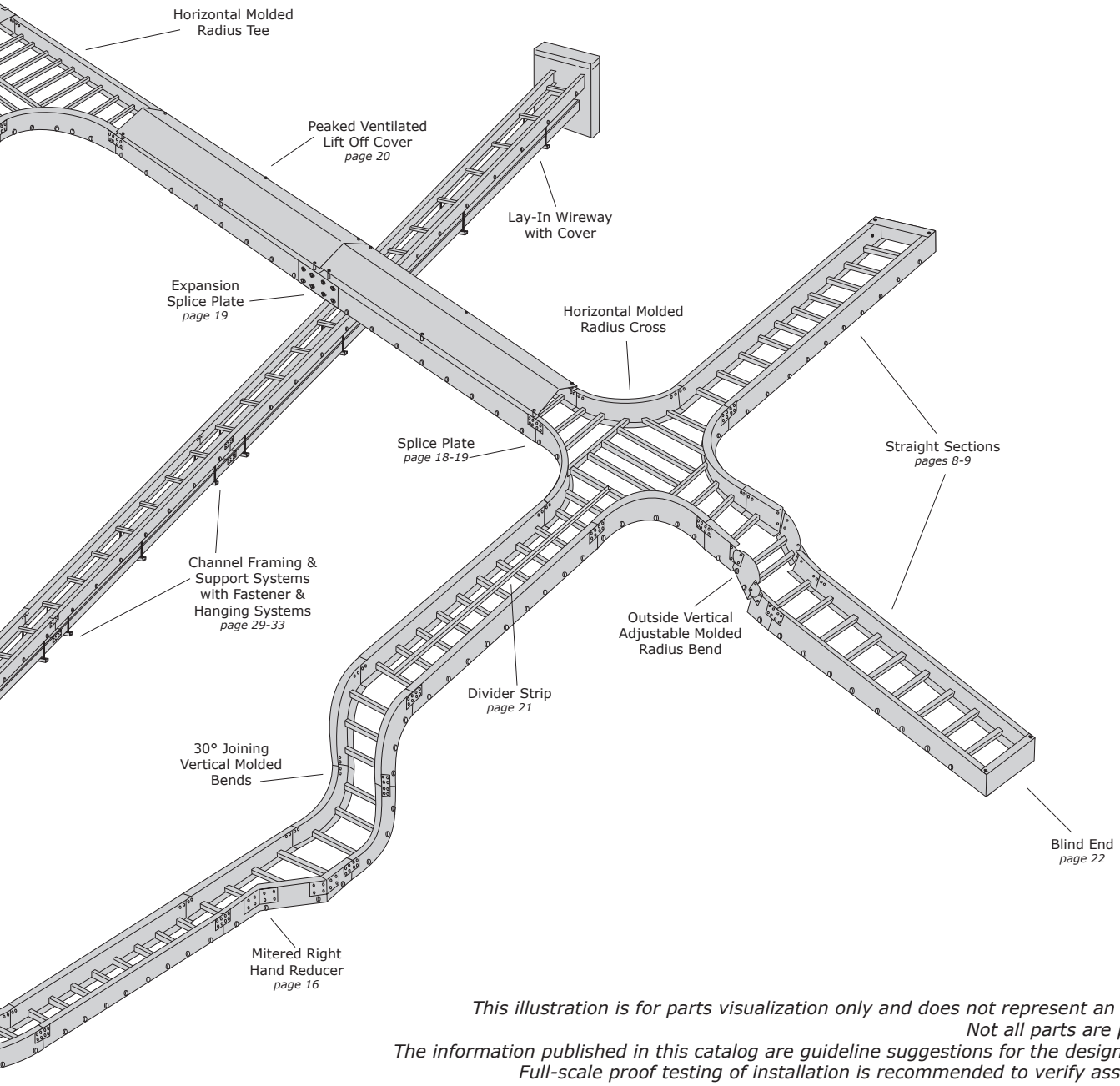


This illustration is for parts visualization only and does not represent an actual layout.
Not all parts are pictured here.
The information published in this catalog are guideline suggestions for the design professional.
Full-scale proof testing of installation is recommended to verify assembly at site.

GRP Technical Data

Typical Properties of Structural GRP

Longitudinal Direction

Mechanical (coupon)	FR-P	FR-VE
Ultimate Tensile Strength, PSI (ASTM D638)	30,000	35,000
Ultimate Compressive Strength, PSI (ASTM D695)	30,000	35,000
Ultimate Flexural Strength, PSI (ASTM D790)	30,000	35,000
Tensile Modulus, PSI x 10^6	2.5	3.0
Compressive Modulus, PSI x 10^6	2.5	2.5
Flexural Modulus, PSI x 10^6	1.6	2.0
Ultimate Shear Strength, PSI	5,500	7,000
Ultimate Bearing Stress, PSI	30,000	35,000
Izod Impact Strength, Ft.-Lbs. per inch of notch (ASTM D256) (sample thickness ⅛" except ¼" for rod)	25	30

Transverse Direction

Mechanical (coupon)	FR-P	FR-VE
Ultimate Tensile Strength, PSI	7,000	10,000
Ultimate Compressive Strength, PSI	15,000	20,000
Ultimate Flexural Strength, PSI	10,000	14,000
Tensile Modulus, PSI x 10^6	0.8	1.0
Compressive Modulus, PSI x 10^6	1.0	1.2
Flexural Modulus, PSI x 10^6	0.8	1.0
Ultimate Shear Strength, PSI	5,500	6,000
Ultimate Bearing Stress, PSI	30,000	35,000
Izod Impact Strength, Ft.-Lbs. per inch of notch (ASTM D256)	4	5
Barcol Hardness (ASTM D2583-75	50	50

Electrical

Mechanical (coupon)	FR-P	FR-VE
Electric Strength, short term in oil, ⅛", vpm (ASTM D149)*	200	200
Electric Strength, short term in oil, KV per inch	35	35
Dielectric Constant, 60 Hz.(ASTM D150)*	5.6	5.2
Dissipation Factor, 60 Hz. (ASTM D150)*	0.03	0.03
Arc Resistance, seconds (ASTM D495)**	120	120

Full Section in Bending

Mechanical (coupon)	FR-P	FR-VE
Modulus of Elasticity, PSI x 10^6	2.5	3.0
Tensile Strength, PSI	20,000	25,000
Compressive Strength, PSI	20,000	25,000

Thermal

Mechanical (coupon)	FR-P	FR-VE
Thermal Coefficient of Expansion Inches/Inch/°F (ASTM D696)**	5 x 10^{-6}	5 x 10^{-6}
Thermal Conductivity, BTU per Sq. Ft./Ht./°F/In. (ASTM C-177-76)	4	4
Specific Heat, BTU/Lb./°F	0.28	0.28

Fire Retardant Properties

Mechanical (coupon)	FR-P	FR-VE
Flame Resistance, ign/burn, seconds (FTMS 406-2023)	75/75	75/75
Intermittent Flame Test, rating (HLT-15)	100	100
Flammability Test	average time of burning 5 seconds, average extent of burning 15mm (ASTM D635)	
Surface Burning Characteristics, maximum (ASTM E84)	25	25

Other

Mechanical (coupon)	FR-P	FR-VE
Density, Lbs./In.^{3} (ASTM D792)	0.065	0.065
Specific Gravity (ASTM D792)	1.80	1.80
Water Absorption, Max. % by weight (24 hour immersion) (ASTM D570)	.50	.50

Note: 1 PSI = 6.894 K Pa; 1 Ft.-Lb./In. = 5.443 kg-m/m; * Specimen tested perpendicular to laminate face ** Indicates reported value measured in logitudinal direction; Depending on the specific glass content and resin, the strength and stiffness properties may be significantly higher. Contact us for specific values on Halogen-Free Low Smoke Plus resin properties.

Concentric Static Load (if required)

A concentrated static load is not included in the table on page 9. Some user applications may require that a given concentrated static load be imposed over and above the working load. Such concentrated static load represents a static weight applied between the side rail at midspan. When so specified, the concentrated static load may be converted to an equivalent load (W_e) in pounds per linear foot (kg/m) using the formula to the below right and added to the static weight of cable in the tray. This combined load may be used to select a suitable load/span designation (table on page 9).

If the combined load exceeds the working load shown, please contact us. This data was obtained from the NEMA and NEC Standards Publications and other sources to assist in the proper selection of the most appropriate cable tray type offered by Enduro.

$$W_e = \frac{2 \times (\text{Concentrated Static Load})}{\text{span length (ft or m)}}$$

Thermal Contraction & Expansion

The table to the right compares the thermal contraction and expansion based on various temperature differentials for fiberglass, steel and aluminum cable trays. The values shown represent the length of cable tray that will produce a ⅝" movement between expansion connectors for the indicated temperature differential. Fiberglass has the least movement. Enduro has expansion connectors to provide for total movement of ⅝".

Fiberglass vs Steel vs Aluminum

Temp. Differential	Fiberglass Ft. (m)	Steel Ft. (m)	Aluminum Ft. (m)
25°F (14°C)	417 (126)	320 (97)	162 (49)
50°F (28°C)	208 (63)	160 (48)	81 (25)
75°F (42°C)	138 (42)	106 (32)	54 (16)
100°F (56°C)	104 (32)	80 (24)	40 (12)
125°F (69°C)	83 (25)	63 (19)	32 (10)
150°F (83°C)	69 (21)	53 (16)	26 (8)
175°F (97°C)	59 (17)	45 (13)	23 (6)

Effect of Temperature - GRP

Strength properties of reinforced plastics are reduced when continuously exposed to elevated temperatures. Working loads shall be reduced when based on the table to the right. Percentages shown are approximate. If unusual temperature conditions exist, please contact us for consultation. Below freezing temperatures do not adversely affect the load rating capability of the tray. Fiberglass does not become brittle at below freezing temperatures. Careful review should be made of applications involving service temperatures over 200°F.

Temp.	Polyester Strength %	Vinyl Ester Strength %
75°F (24°C)	100%	100%
100°F (38°C)	90%	100%
125°F (52°C)	78%	100%
150°F (66°C)	68%	90%
175°F (79°C)	60%	90%
200°F (93°C)	52%	75%

The test values in the chart below were obtained from tests conducted by Enduro's vinyl ester resin supplier. The values shown, although obtained from an actual coupon test, are intended for illustrative purposes only, and not for use in design calculations. The values for polyester are slightly lower.

Test Temp. °F (°C)	-100° (-73°)	-50° (-46°)	0° (-18°)	50° (10°)	77° (25°)	100° (38°)	150° (66°)	200° (93°)	250° (121°)	300° (149°)
Flex. St., PSI, ASTM D790	101,500	86,400	79,500	72,300	68,100	66,300	58,700	27,400	13,200	9,200
Flex. Mod., PSI x 10^6, ASTM D790	3.36	3.32	3.42	3.38	3.24	3.29	3.07	1.98	0.98	0.83
Tensile St., PSI, ASTM D638	84,100	70,400	63,900	58,000	56,100	54,600	49,900	41,800	29,600	22,000

Corrosion Resistance of Resin Systems

Enduro offers a variety of resin systems which are listed in more detail on page 9. The two resin systems most often used are isophthalic polyester fire-retardant (FR-P) and vinyl ester fire-retardant (FR-VE). Polyester is more widely used and sufficient for most applications while vinyl ester is recommended where strong acids (such as hydrochloric acid), strong alkalies (such as caustic soda), organic solvents and organic conditions exist. An abbreviated guide is provided below to assist in the selection of the proper standard resin system for individual application.

Polyester and vinyl ester resin systems are available in conductive formulation. Contact us for corrosion resistance information for halogen-free and halogen-free low smoke plus resins.

All composite materials have an ultra-violet light inhibiting chemical additive and has a maximum flame spread of 25 or less, per ASTM E-84 (Class 1 flame spread). All pultruded products have complete synthetic veil coverage (outer surfacing fabric) to provide maximum chemical and UV protection.

Chemicals	75°F (24°C)	160F° (71°C)	Chemicals	75°F (24°C)	160°F (71°C)
Acetic Acid 5%	FR-P	FR-P	Magnesium Chloride	FR-P	FR-P
Acetic Acid 25%	FR-P	FR-VE-210° (*)	Methyl Alcohol 10%	FR-P	FR-VE-150° (*)
Aluminum Potassium Sulfate 5%	FR-P	FR-P	Naphtha	FR-P	FR-P
Ammonium Hydroxide 10%	FR-P	FR-VE-150°	Nitric Acid 5%	FR-P	FR-P
Ammonium Nitrate	FR-P	FR-P	Nitric Acid 20%	FR-VE	FR-VE-120° (*)
Benzenesulfonic Acid 5%	FR-P	FR-P	Phosphoric Acid 10%	FR-P	FR-P
Calcium Chloride	FR-P	FR-P	Phosphoric Acid 30%	FR-P	FR-P
Carbon Tetrachloride	FR-VE	FR-VE-100° (*)	Phosphoric Acid 85%	FR-P	FR-P
Chlorine Dioxide 15%	FR-P	FR-VE-150° (*)	Sodium Bicarbonate 10%	FR-P	FR-P
Chromic Acid 5%	FR-P	FR-VE-150° (*call)	Sodium Bisulfate	FR-P	FR-P
Copper Sulfate	FR-P	FR-P	Sodium Carbonate	FR-P	FR-VE
Diesel Fuel No. 1	FR-P	FR-P	Sodium Chloride	FR-P	FR-P
Diesel Fuel No. 2	FR-P	FR-P	Sodium Hydroxide 1-50%	FR-VE	FR-VE-120° (*)
Ethylene Glycol	FR-P	FR-P	Sodium Hypochlorite 5%	FR-P	FR-VE-120° (*)
Fatty Acids 100%	FR-P	FR-P	Sodium Nitrate	FR-P	FR-P
Ferrous Sulfate	FR-P	FR-P	Sodium Silicate	FR-P	FR-VE-210° (*)
Fluosilicic Acid 0-20%	FR-VE	FR-VE (call)	Sodium Sulfate	FR-P	FR-P
Hydrochloric Acid 1%	FR-P	FR-P	Sulfuric Acid 0-30%	FR-P	FR-P
Hydrochloric Acid 15%	FR-P	FR-VE-180° (*)	Sulfuric Acid 30-50%	FR-VE	FR-VE
Hydrochloric Acid 37%	FR-P	FR-VE-150° (*)	Sulfuric Acid 50-70%	FR-VE	FR-VE-180° (*)
Hydrogen Sulfide	FR-P-140°	FR-VE-210°	Trisodium Phosphate 25%	FR-P	FR-VE-210° (*)
Kerosene	FR-P	FR-P	Trisodium Phosphate - All	FR-VE	FR-VE-210° (*)
			Water, Distilled	FR-P	FR-P

FR = Fire-Retardant; P = Polyester Resin; VE = Vinyl Ester Resin; (*) = Not recommended to exceed this temperature; call = Call for recommendations

Information contained in this chart is based on data from raw material suppliers and collected from several years of actual industrial applications. Temperaturers are not the minimum nor the maximum (except where specifically stated) but represent standard test conditions. The products may be suitable at higher temperatures, but individual test data should be required to establish such suitability. The recommendations or suggestions contained in this chart are made without guarantee or representation as to results. We suggest that you evaluate these recommendations and suggestions in your own laboratory or by actual field trial prior to use.

Ladder Cable Tray Selection Guide

Imperial Straight Section Part Numbers

TYPE - (W) - (RS) - (L)

Example: **EHL6 - 06 - 06 - 20** Supplied with Standard Rung

System No.	Side Rail Height	Width	Rung Spacing*	Length	Rung
See Ladder Cable Tray Selection Guide Below	4=4″ 6=6″	06=6″ 09=9″ 12=12″ 18=18″ 24=24″ 30=30″ 36=36″	06=6″ 09=9″ 12=12″ 18=18.5″	10=10 Ft. 20=20 Ft.	MR=Marine Rung SR=Strut Rung (For additional rung options, add requested type affix) EX. EHL6-06-06-20-MR

Metric Straight Section Part Numbers

TYPE - (W) - (RS) - (L)

Example: **EHL6 - 150 - 150 - 6M** Supplied with Standard Rung

System No.	Side Rail Height	Width	Rung Spacing*	Length	Rung
See Ladder Cable Tray Selection Guide Below	4=4″ 6=6″	150=150mm 225=225mm 300=300mm 450=450mm 600=600mm 750=750mm 900=900mm	150=150mm 235=229mm 300=300mm 470=470mm	3M=3m 6M=6m	MR=Marine Rung SR=Strut Rung (For additional rung options, add requested type affix) EX. EHL6-06-06-20-MR

Rung Spacing (RS) dimensions are nominal. Width (W) represents inside dimensions.

Solid bottom available upon request. Rung connections are made with a mechanical and chemical lock. See specification page 12, item 5.1.2 for details. Please contact us for any other custom modifications. 18.5″ (470mm) rung spacing not available for 30″ (750mm) and 36″ (900mm) widths.

Ladder Cable Tray Selection Guide

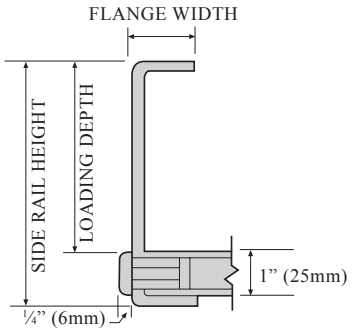
Standard Resin Catalog No. (polyester resin)	**Optional Resin Catalog No.** (Δ) = insert code; see bottom of pg.	Side Rail Height In. (mm)*	Loading Depth In. (mm)	Flange Width In. (mm)	Min. Channel Thickness In. (mm)	NEMA Class FG-1	Safety Factor	UL Listing**
EHL4	EH(Δ)4	4″ (100)	2¾″ (70)	1⅛″ (28)	¼″ (6.4)	12A	1.5	Class A
ETL6	ET(Δ)6	6″ (150)	4 13/16″ (122)	1⅝″ (41)	5/32″ (4.0)	18A	1.5	-
EHL6	EH(Δ)6	6″ (150)	4¾″ (121)	1⅝″ (41)	¼″ (6.4)	20B 20C	2.0 1.5	Class C
EHZ6	EHZ(Δ)6	6″ (150)	4 11/16″ (119)	2″ (51)	5/16″ (8.0)	20C	1.5	-

*mm value is nominal; **Please contact us for details regarding UL listing(s) of various products and their respective specifications as defined under the listing(s).
(Δ) = Insert one of the following letters for resin designation: V = Vinyl Ester; RTX = Anti-Static

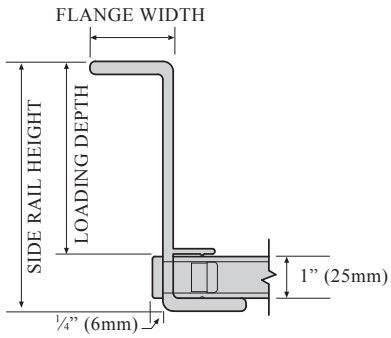
NEMA classes in this table are for polyester and vinyl ester resin systems only.

System Diagrams

EHL4, ETL6, EHL6



EHZ6



Resin Systems

Below is an overview of the common resin systems we offer. When choosing a resin type for your application, we highly recommend consulting with us regarding the application to be sure the proper resin is specified. Considerations include corrosion environment, temperature, fire resistance, smoke and smoke toxicity requirements and conductivity / resistivity requirements. Regarding the corrosion environment, certain chemical concentrations and temperatures will dictate whether a polyester or epoxy vinyl ester system is preferred for optimum durability.

Isophthalic Polyester

This industrial-grade polyester resin system offers very good weathering performance (resistance to UV) and corrosion resistance. This system is especially suitable for seawater environments.

Vinyl Ester

This resin system also delivers good weathering performance, but is superior to a polyester with respect to corrosion resistance and high heat environments. Epoxy vinyl ester resins provide greater toughness and considerably higher strength at elevated temperatures. They also provide superior resistance to chemical attack in corrosive chemical service.

Anti-Static

Enduro's resin technologies are available with Anti-Static properties to meet surface resistivity requirements. Please specify your Anti-Static requirement. For other Anti-Static requirements, please contact Enduro Middle East.

	Tray Weight Lbs/Ft. (kg/m) 2 side rails, 12" rung spacing	Working (Allowable) Load Lbs./Ft. (kg/m)						
		8' (2.4m)	10' (3m)	12' (3.7m)	14' (4.3m)	16' (4.9m)	18' (5.5m)	20' (6.1m)
	3.0 (4.5)	113 (167)	72 (107)	50 (74)				
	2.9 (4.3)	253 (377)	162 (241)	113 (167)	83 (123)	63 (94)	50 (74)	
	4.5 (6.7)				204 (304)	156 (233)	123 (184)	100 (149)
	4.8 (7.1)				204 (304)	156 (233)	123 (184)	100 (149)

For more tray weight values, please contact us. For CSA class, please contact us. Values in Working (Allowable) Load are applicable to all resin systems, where possible. Enduro Middle East, Manufacture material does not contain any halogen or halogen compounds. Moreover, it's free from amine and its derivatives.

Installation Guide - Ladder Cable Tray

Installation

The installation of Enduro Cable Tray should be made in compliance with the standards set forth by the National Electric Code and NEMA Publications VE-2 (current issue). Enduro supplies made to order, pre-fabricated cable ladder tray and fittings as specified by the purchaser.

Always observe common safety practices when assembling tray and fittings in the field. Assemble in well-ventilated areas as dust from field cuts can accumulate. This presents no serious health hazard but can cause skin irritation and, if allowed to accumulate with grease and other machining lubricants, can become abrasive. Personnel should wear safety goggles, dust mask, coveralls or a shop coat when sawing, machining and/or sanding. Caution should also be noted when cutting as dust from carbon fiber is also electrically conductive and additional considerations apply.

Avoid generating excessive heat in any machining operation, as heat softens the bonding resin in the fiberglass, resulting in a ragged rather than a clean-cut edge.

Avoid excessive pressure when sawing, drilling, routing, etc. Use carbide-tipped drill bits and saw blades for extended tool life.

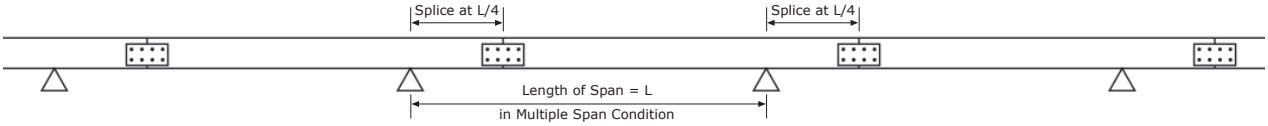
The use of lubricant during machining is not recommended.

To avoid chipping of material at cut edges, secure cable tray and fittings properly during field cut operations. We recommend the use of Enduro sealant (pg. 25) for sealing surfaces and cut edges after field cuts are made.

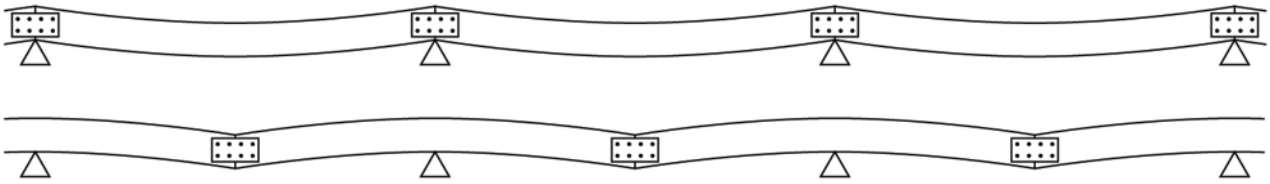
When using adhesives, be sure to prepare the surface properly before applying. Follow label instructions carefully. A combination of mechanical fasteners and adhesives make the strongest most reliable connections.

Support Location Guidelines*

Correct



Incorrect



*These guidelines apply when using standard splice plates.

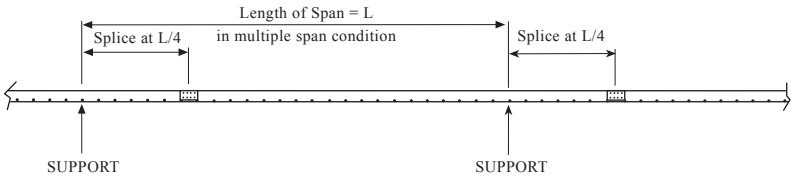
Warning! Not to be used as a walkway, ladder or support for personnel. To be used only as a mechanical support for cables and tubing.

WARNING! CABLE TRAYS ARE NOT DESIGNED FOR USE AS WALKWAYS

Reference NEMA VE-2 (current issue)
In as much as fiberglass cable tray is designed as a support for power or control cables, or both; it is not intended or designed to be a walkway for personnel. The user is urged to display appropriate warning cautioning against the use of this support as a walkway.

Straight Sections

Supports must be located so that connector (splice joints) between horizontal runs fall between the support point and the quarter point of the span.



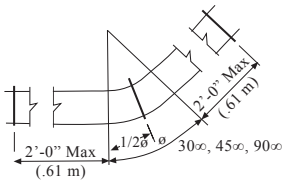
Standard engineering practice requires that the splice joints be located where they will resist little or no bending moment. This allows the cable tray system to act as a continuous member with spans working in conjunction with one another to resist loading. When a cable tray system is installed with the splice joints located directly over the support, the previous continuous span condition is changed to one of a number of simple spans. These spans act independently of each other and excessive stress will occur at substantially less loading.

Vertical straight lengths should be supported at intervals dictated by the building structure not exceeding 24 Ft. on centers.

A support should be located 2 Ft. on each side of an expansion connection.

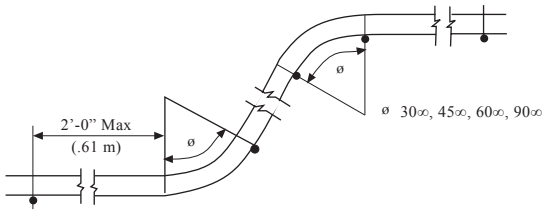
Horizontal Fitting Supports

Supports should should be placed within 2 Ft. (.61m) of each fitting extremity, and as follows: 90 degree supports at the 45 degree point of the arc, 45 degree supports at the 22.5 degree point of the arc (except for the 12" radii), 30 degree supports at the 15 degree point of the arc (except for the 12" radii).



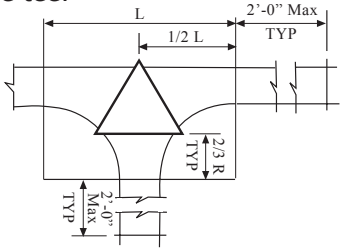
Vertical Fitting Supports

Vertical fittings at the top runs should be supported at each end. Fittings at the bottom of runs should be supported at the top of the fitting, and within 2 Ft. (.61m) of the lower extremity of the fitting.



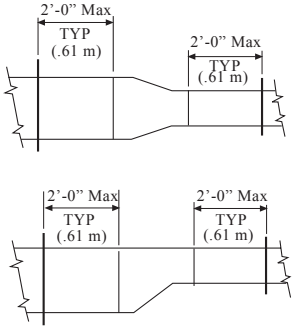
Horizontal Tee Supports

Supports should be placed within 2 Ft. (.61m) of each of the three openings connected to other cable tray items for 12" (305mm) radius. On all other radii, at least one support should also be placed under each side rail of the tee.



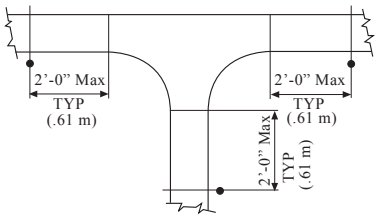
Reducer Fitting Supports

Straight reducer and right/left hand reducer fittings should be supported within 2 Ft. (.61m) of each fitting extremity.



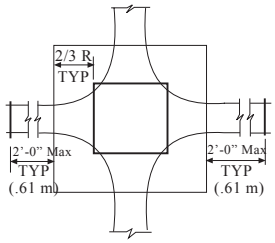
Vertical Tee Supports

Vertical tee fittings should be supported within 2 Ft. (.61m) of each fitting extremity.



Horizontal Cross Supports

Supports should be placed within 2 Ft. (.61m) of the four openings connected to other cable tray items for the 12" (305mm) radius. On all other radii, at least one support should also be placed under each side rail of the cross.



Specification - Ladder Cable Tray

1.0 Scope

1.1 The cable tray system shall conform to the material and fabrication requirements as per this specification.

2.0 Standards

2.1 The cable tray system shall conform to applicable sections of:

- 2.1.1 NEMA Standard FG-1 (latest edition)
- 2.1.2 National Electric Code (NEC)
- 2.1.3 ASTM E-84 (Class 1 Rating)
- 2.1.4 UL (Underwriters Laboratories, Inc.) Standards for Non-Metallic Cable Trays.
- 2.1.5 CSA INTERNATIONAL (National Standard of Canada) CAN/CSA-C22.2 No. 126 Cable Tray Systems

3.0 General

3.1 Tray Requirements

- 3.1.1 Tray widths 6" (152mm), 9" (229mm), 12"(305mm), 18" (457mm), 24" (610mm), 30" (762mm), and 36" (914mm)
- 3.1.2 Lengths (as required): 10 ft, 20 ft, 3m, and 6m
- 3.1.3 Rung spacing (as required): 6" (152mm), 9.25" (235mm), 12" (305mm), and 18.5" (470mm). Dimensions are nominal. Rung Type (as required): Standard Rung, Marine Rung or Strut Rung
- 3.1.4 Radius of fittings (as required): 12" (305mm), 24" (610mm), and 36" (914mm)
- 3.1.5 Resin Systems (as required): Isophthalic Polyester, Vinyl Ester, Halogen-Free Polyester, Anti-static Polyester

3.2 Loading Requirements

- 3.2.1 There shall be three working load classifications of fiberglass cable tray based on 20 Ft. (6m) support span:

Class	Working Load	FOS
A	50 Lbs./Lineal Ft.	1.5
B	75 Lbs./Lineal Ft.	1.5
C	100 Lbs./Lineal Ft.	1.5

- 3.2.2 Span support criteria shall be as specified (Reference the following table)

Support Span (Ft.)	Working Load in Lbs./Lineal Ft. Class A	Class B	Class C
30	-	-	100
20	50	75	100
18	62	92	123
16	78	117	156
14	102	150	200
12	139	208	-
10	200	-	-

• Independent test reports in conformance to NEMA FG-1 are required.

- 3.2.3 Nominal loading depth (as required): 3" (76mm), 5" (127mm)

4.0 Materials

4.1 The glass fiber to resin content shall be maintained between 45 to 55 percent by weight in all pultruded components except flat sheet which shall be 35 to 45 percent; and, 25 to 45 percent by weight in all molded components.

4.2 All composite material shall have an ultraviolet light inhibiting chemical additive to resist UV degradation.

4.3 All composite material shall be fire retardant and have a flame spread rating of 25 or less (Class 1 Rating) when tested in accordance with ASTM E-84.

4.4 All pultruded products shall have a complete surfacing veil to provide maximum chemical and UV protection.

5.0 Construction

5.1 Straight section tray shall be fiberglass reinforced meeting all the requirements herein described.

- 5.1.1 The side rail members must turn in.
- 5.1.2 All rung to side member connections shall have both a mechanical and a chemical (adhesive) lock. The tray shall be assembled by the use of a locking pin made of fiberglass reinforced thermoplastic. The locking pin shall be inserted under pressure with a high strength, chemical resistant adhesive.
- 5.1.3 All bonded connections must be sanded to maximize adhesion and structural integrity.
- 5.1.4 The tray interior shall be clear of all projections or sharp objects.
- 5.1.5 All straight section lengths shall be pre-drilled to accept connector plates.
- 5.1.6 All cut ends and drilled holes (factory and field) shall be resin coated.

5.2 Fittings are to be pre-fabricated and shall meet all the requirements herein described.

- 5.2.1 All fittings shall have a nominal 9.25" rung spacing.
- 5.2.2 All fittings shall be pre-drilled to accept connector plates.
- 5.2.3 All fittings shall be designed and installed so as to have the same load carrying capacity as the straight sections.
- 5.2.4 Rung to side member connections shall have both a mechanical and/or chemical (adhesive) lock. Fittings shall be assembled by use of a locking pin made of fiberglass reinforced thermoplastic and/or a stainless steel rivet. The locking pin shall be inserted under pressure with a high strength chemical resistant adhesive.

• All radius 90° and 45° horizontal and vertical bends, all tees and crosses for tray types using 6" (152mm), and most 4" (101mm) and 8" (202mm).

5.3 Connector Plates and Fasteners:

- 5.3.1 Connector plates shall be fiberglass and designed with sufficient strength so they may be installed between 0.2 and 0.3 of the length of the span from the support without derating the load carrying capacity of the tray.
- 5.3.2 Connector plates for conductive tray shall be stainless steel.
- 5.3.3 Fasteners for connector plates shall be 3/8" (9.5mm) diameter Type 316 Stainless Steel, Monel, Silicon, Bronze, or GRP studs & hex nuts as required.

5.4 Accessories

- 5.4.1 The manufacturer shall be capable of providing all necessary parts (i.e. clamps, support assemblies, etc.) for the installation of a complete fiberglass tray system.

6.0 Acceptable Manufacturer

6.1 The fiberglass ladder-type cable tray system shall be manufactured - pultrusion, compression molded, resin transfer molded and/or fabricated by Enduro Composites, Inc., of Houston, Texas USA and/or Enduro Middle East of Dammam, KSA.

Ladder Cable Tray - Mitered Fittings

Pre-assembled mitered fittings are available for all tray types. Fittings are assembled using 316 SS fasteners unless specified otherwise. When connecting to straight sections, expansion splice plates are recommended. Rung connections are made with a mechanical and/or chemical lock (see specification, pg. 12, item 5.2.4).

Imperial Mitered Fittings Part Numbers

TYPE - (Δ)(H) - (A) - (W) - (R)

Example: **EHB - HL6 - 90 - 24 - 24**

Type of Fitting	Tray Type/Resin (Δ)	Side Rail Height (H)	Angle	Width (W)	Radius (R)
EHB = Horizontal Bend	See Selection Table to the Right	4 = 4″	30 = 30°	06 = 6″	12 = 12″
EIV = Vertical Inside		6 = 6″	45 = 45°	09 = 9″	24 = 24″
EOV = Vertical Outside			60 = 60°	12 = 12″	36 = 36″
EHT = Horizontal Tee			90 = 90°	18 = 18″	
EHC = Horizontal Cross				24 = 24″	
EVT = Vertical Tee				30 = 30″	
ER = Right Reducer				36 = 36″	
EL = Left Reducer					
ESR = Straight Reducer					
EHBD = Horiz. Direct Bend					

Tray Type/Resin Selection Table

Resin	Tray Type (see page 8)		
	ETL6	EHL4 EHL6	EHZ6
Polyester	TL	HL	MZ
Vinyl Ester	TV	HV	HVZ
Anti-Static	TRTX	HRTX	HRTXZ

Look at left column to select resin, then look at top row to select tray type. Then, insert corresponding letters into fitting part number.

See page 9 for definition of Anti-Static resin.

For vertical tee specify "up" or "down" at end of part code. Covers = EC *before* catalog number; example EC-EHB-MC6-90-24-24. Fasteners for covers are separate order item, see page 43. Strut Rung = SR *after* part number; example EHB-MC6-90-24-24-SR. Marine Rung = MR *after* part number; example EHB-MC6-90-24-24-MR

Metric Mitered Fittings Part Numbers

TYPE - (Δ)(H) - (A) - (W) - (R)

Example: **EHB - HL6 - 90 - 600 - 600**

Type of Fitting	Tray Type/Resin (Δ)	Side Rail Height* (H)	Angle	Width (W)	Radius (R)
EHB = Horizontal Bend	See Selection Table to the Upper Right	4 = 100mm	30 = 30°	150 = 150mm	300 = 300mm
EIV = Vertical Inside		6 = 150mm	45 = 45°	225 = 225mm	600 = 600mm
EOV = Vertical Outside			60 = 60°	300 = 300mm	900 = 900mm
EHT = Horizontal Tee			90 = 90°	450 = 450mm	
EHC = Horizontal Cross				600 = 600mm	
EVT = Vertical Tee				750 = 750mm	
ER = Right Reducer				900 = 900mm	
EL = Left Reducer					
ESR = Straight Reducer					
EHBD = Horiz. Direct Bend					

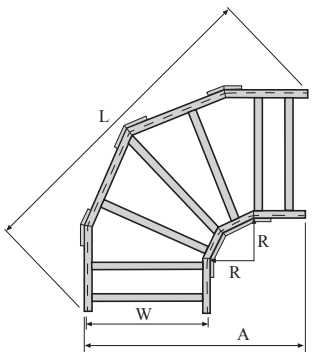
* (mm) value is nominal. For vertical tee specify "up" or "down" at end of part code. Covers = EC *before* part number; example EC-EHB-MC6-90-600-600. Fasteners for covers are separate order item, see page 43. Strut Rung = SR *after* part number; example EHB-MC6-90-600-600-SR. Marine Rung = MR *after* part number; example EHB-MC6-90-600-600-MR

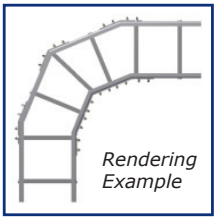
90° Horizontal Bend

Part No. Key*
EHB-(Δ)(H)-90-(W)-(R)

Dimension Inches (mm)

	12" (305) Radius		24" (610) Radius		36" (914) Radius	
Width	A	L	A	L	A	L
6 (152)	33⅝ (854)	47½ (1207)	45⅝ (1159)	64½ (1638)	57⅝ (1464)	81½ (2070)
9 (229)	36⅝ (930)	51¾ (1314)	48⅝ (1235)	68¾ (1746)	60⅝ (1540)	85¾ (2178)
12 (305)	39⅝ (1006)	56 (1422)	51⅝ (1311)	73 (1854)	63⅝ (1616)	90 (2286)
18 (457)	45⅝ (1159)	64½ (1638)	57⅝ (1464)	81½ (2070)	69⅝ (1768)	98½ (2502)
24 (610)	51⅝ (1311)	73 (1854)	63⅝ (1616)	90 (2286)	75⅝ (1921)	107 (2718)
30 (762)	57⅝ (1464)	81½ (2070)	69⅝ (1768)	98½ (2502)	81⅝ (2073)	115⅜ (2931)
36 (914)	63⅝ (1616)	90 (2286)	75⅝ (1921)	107 (2718)	87⅝ (2226)	123⅞ (3146)





NOTE: mm values are nominal; * In Part No. Key, parentheses ( ) = insert corresponding option code; Δ = Resin; H = Side Rail Height; R = Radius; W = Width of the *inside* distance from tray wall to tray wall; ** Contact us for availability of 3" (76mm)

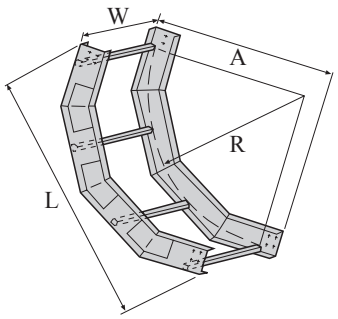
Mitered Fittings - Ladder Cable Tray

90° Vertical Inside Bend

Part No. Key*

EIV-(Δ)(H)-90-(W)-(R)

Dim. Inches (mm)	12" Radius		24" Radius		36" Radius	
	Depth		Depth		Depth	
	4"	6"	4"	6"	4"	6"
A	20⅞ (530)	20⅞ (530)	32⅞ (835)	32⅞ (835)	44⅝ (1133)	44⅝ (1133)
L	29½ (749)	29½ (749)	46½ (1181)	46½ (1181)	63⁵⁄₁₆ (1608)	63⁵⁄₁₆ (1608)

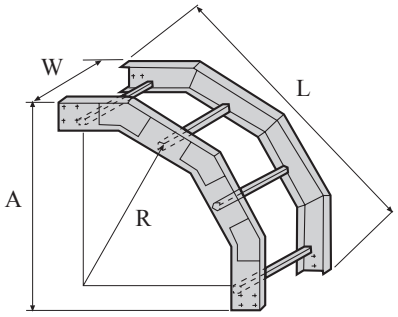


90° Vertical Outside Bend

Part No. Key*

EOV-(Δ)(H)-90-(W)-(R)

Dim. Inches (mm)	12" Radius		24" Radius		36" Radius	
	Depth		Depth		Depth	
	4"	6"	4"	6"	4"	6"
A	19⅞ (505)	21⅞ (555)	31⅞ (810)	33⅞ (860)	43⅞ (1114)	45⅞ (1165)
L	28⅛ (714)	30¹⁵⁄₁₆ (786)	45¹⁄₁₆ (1145)	47¹⁵⁄₁₆ (1218)	62¹⁄₁₆ (1576)	64⅞ (1648)

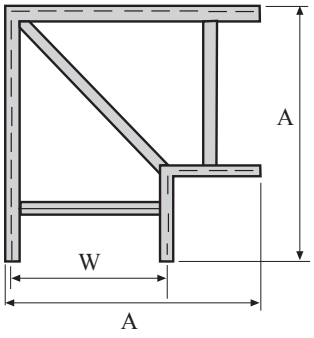


90° Horizontal Direct Bend

Part No. Key*

EHBD-(Δ)(H)-90-(W)

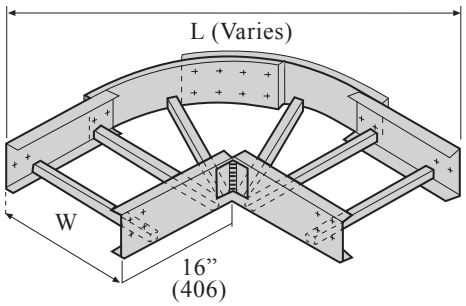
Dimensions Inches (mm)	
W	A
6 (152)	13 (330)
9 (229)	16 (406)
12 (305)	19 (483)
18 (457)	25 (635)
24 (610)	31 (787)
30 (762)	37 (940)
36 (914)	43 (1092)



Horizontal Adjustable Bend 45°-135°

Part No. Key*

EHAB-(Δ)(H)-(W)



NOTE: mm values are nominal; * In Part No. Key, parentheses ( ) = insert corresponding option code; Δ = Resin; H = Side Rail Height; R = Radius; W = Width of the *inside* distance from tray wall to tray wall

Ladder Cable Tray - Mitered Fittings

30°, 45°, 60° Horizontal Direct Bend

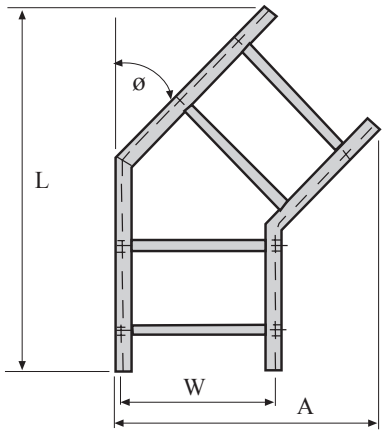
Part No. Key*

EHBD-(Δ)(H)-30/45/60-(W)

The 60° fitting is fabricated with the horizontal adjustable splice plates.

Dimension Inches (mm)

	30° Angle (ø)		45° Angle (ø)		60° Angle (ø)	
Width	A	L	A	L	A	L
6 (152)	14 1/16 (357)	31 1/2 (800)	17 (432)	30 (762)	19 3/16 (487)	27 9/16 (700)
9 (229)	17 1/16 (433)	33 (838)	20 (508)	32 1/16 (814)	22 3/16 (564)	30 3/16 (767)
12 (305)	20 1/16 (510)	34 1/2 (876)	23 (584)	34 1/4 (870)	25 3/16 (640)	32 3/4 (832)
18 (457)	26 9/16 (675)	39 5/16 (999)	29 3/4 (756)	40 3/16 (1021)	32 (813)	39 7/16 (1002)
24 (610)	32 9/16 (827)	42 5/16 (1075)	36 3/4 (933)	44 7/16 (1129)	38 (965)	44 5/8 (1133)
30 (762)	38 9/16 (979)	45 5/16 (1151)	41 3/4 (1060)	48 11/16 (1237)	44 (1118)	49 7/8 (1267)
36 (914)	44 9/16 (1132)	48 5/16 (1227)	47 3/4 (1213)	52 15/16 (1345)	50 (1270)	55 1/16 (1399)



45° Horizontal Bend

Part No. Key*

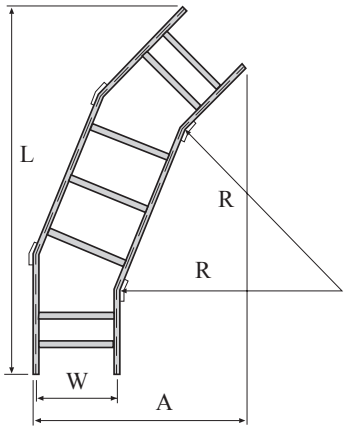
EHB-(Δ)(H)-45-(W)-(R)

Please contact us for other 30°/60° radius mitered fittings.

Joining 45° Horizontal Bend
X = 2A - .707 (W + .5)
Y = 2L - .707 (W + .5)

Dimension Inches (mm)

	12" (305) Radius		24" (610) Radius		36" (914) Radius	
Width	A	L	A	L	A	L
6 (152)	20 11/16 (525)	38 7/8 (987)	24 1/4 (616)	47 3/8 (1203)	27 3/4 (705)	55 7/8 (1419)
9 (229)	23 11/16 (602)	41 (1041)	27 1/4 (692)	49 1/2 (1257)	30 3/4 (781)	58 (1473)
12 (305)	26 11/16 (678)	43 1/8 (1095)	30 1/4 (768)	51 5/8 (1311)	33 3/4 (857)	60 1/8 (1527)
18 (457)	32 11/16 (830)	47 3/8 (1203)	36 1/4 (921)	55 7/8 (1419)	39 3/4 (1010)	64 3/8 (1635)
24 (610)	38 11/16 (983)	51 5/8 (1311)	42 1/4 (1073)	60 1/8 (1527)	45 3/4 (1162)	68 5/8 (1743)
30 (762)	44 11/16 (1135)	55 7/8 (1419)	48 1/4 (1226)	64 3/8 (1635)	51 3/4 (1314)	72 13/16 (1846)
36 (914)	50 11/16 (1287)	60 1/8 (1527)	54 1/4 (1378)	68 5/8 (1743)	57 3/4 (1467)	77 1/16 (1957)



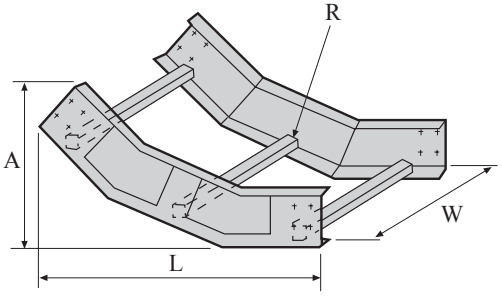
30°/45° Vertical Inside Bend

Part No. Key*

EIV-(Δ)(H)-30 or 45-(W)-(R)

All dimensions are to the nearest 1/4"

Dim. Inches (mm)		12" Radius Depth 4"	12" Radius Depth 6"	24" Radius Depth 4"	24" Radius Depth 6"	36" Radius Depth 4"	36" Radius Depth 6"
30°	A	9 (229)	10 (254)	10 (254)	12 (305)	12 (305)	14 (356)
	L	18 (457)	18 (457)	24 (610)	24 (610)	30 (762)	30 (762)
45°	A	11 1/16 (281)	12 1/2 (318)	14 9/16 (370)	16 (406)	18 1/8 (470)	19 1/2 (495)
	L	19 7/8 (505)	19 7/8 (505)	28 3/8 (721)	28 3/8 (721)	36 7/8 (937)	36 7/8 (937)



NOTE: mm values are nominal; * In Part No. Key, parentheses ( ) = insert corresponding option code; Δ = Resin;
H = Side Rail Height; R = Radius; W = Width of the *inside* distance from tray wall to tray wall

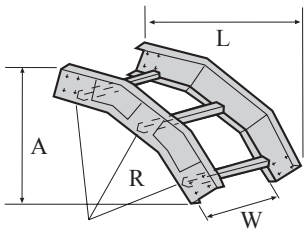
Mitered Fittings - Ladder Cable Tray

30°/45° Vertical Outside Bend

Part No. Key*

EOV-(Δ)(H)-30 or 45-(W)-(R)

All dimensions are to the nearest 1/4"

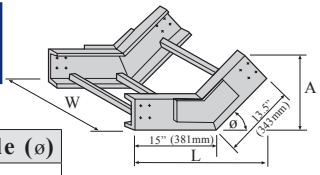


Dim. Inches (mm)		12" Radius		24" Radius		36" Radius	
		Depth		Depth		Depth	
		4"	6"	4"	6"	4"	6"
30°	A	8 (203)	10 (254)	10 (254)	12 (305)	12 (305)	14 (356)
	L	17 (432)	18 (457)	23 (584)	24 (610)	29 (737)	30 (762)
45°	A	10¾ (273)	12¾ (324)	14⅝ (364)	16⅝ (414)	17¹³⁄₁₆ (452)	19¹³⁄₁₆ (503)
	L	19³⁄₁₆ (487)	20⅝ (522)	27¹¹⁄₁₆ (703)	29¹⁄₁₆ (738)	36⅛ (918)	37⅝ (954)

30°/45° Vertical Inside Direct Bend

Part No. Key*

EIVD-(Δ)(H)-30 or 45-(W)

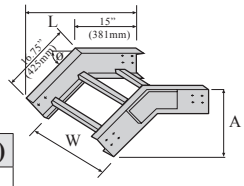


Dim. Inches (mm)	30° Angle (ø)		45° Angle (ø)	
	Depth		Depth	
	4"	6"	4"	6"
A	10³⁄₁₆ (259)	11¹⁵⁄₁₆ (303)	12⅜ (314)	13¹³⁄₁₆ (351)
L	26¹¹⁄₁₆ (678)	26¹¹⁄₁₆ (678)	24⅝ (624)	24⅝ (624)

30°/45° Vertical Outside Direct Bend

Part No. Key*

EOVD-(Δ)(H)-30 or 45-(W)

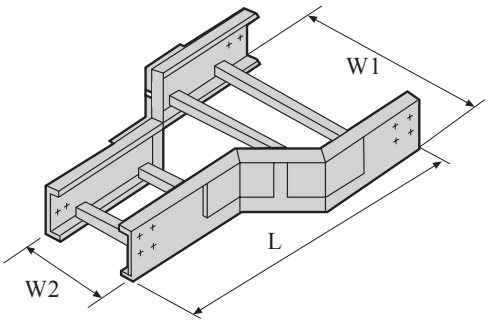


Dim. Inches (mm)	30° Angle (ø)		45° Angle (ø)	
	Depth		Depth	
	4"	6"	4"	6"
A	11¹³⁄₁₆ (300)	13⅜ (344)	14¹¹⁄₁₆ (357)	16⅛ (408)
L	29½ (749)	29½ (749)	26⅞ (683)	26⅞ (683)

Straight Reducer

Part No. Key*

ESR-(Δ)(H)-(W1)x(W2)



W2 Inches (mm)	W1 Inches (mm)					
	36 (914)	30 (762)	24 (610)	18 (457)	12 (305)	9 (229)
6 (152)	43½ (1105)	40½ (1029)	37½ (953)	34½ (876)	26¾ (679)	26⅜ (670)
9 (229)	42 (1067)	39 (991)	36 (914)	33 (838)	26⅜ (670)	—
12 (305)	40½ (1029)	37½ (953)	36 (914)	26¾ (679)	—	—
18 (457)	37½ (953)	35¾ (908)	26¾ (679)	—	—	—
24 (610)	35¾ (908)	26¾ (679)	—	—	—	—
30 (762)	26¾ (679)	—	—	—	—	—
	Dimension "L" Inches (mm)					

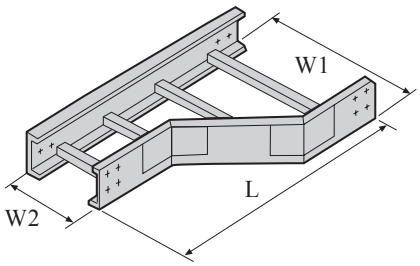
Right or Left Hand Reducer

Part No. Key*

RIGHT: ER-(Δ)(H)-(W1)x(W2)

LEFT: EL-(Δ)(H)-(W1)x(W2)

Right hand reducer is shown



W2 Inches (mm)	W1 Inches (mm)					
	36 (914)	30 (762)	24 (610)	18 (457)	12 (305)	9 (229)
6 (152)	55½ (1410)	46¼ (1175)	46¼ (1175)	37 (940)	37 (940)	27¾ (705)
9 (229)	46¼ (1175)	46¼ (1175)	37 (940)	37 (940)	27¾ (705)	—
12 (305)	46¼ (1175)	37 (940)	37 (940)	27¾ (705)	—	—
18 (457)	37 (940)	37 (940)	27¾ (705)	—	—	—
24 (610)	37 (940)	27¾ (705)	—	—	—	—
30 (762)	27¾ (705)	—	—	—	—	—
	Dimension "L" Inches (mm)					

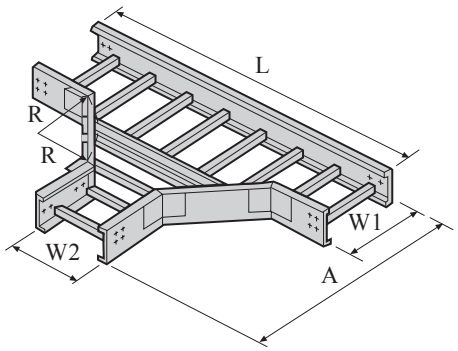
NOTE: mm values are nominal; * In Part No. Key, parentheses ( ) = insert corresponding option code; Δ = Resin; H = Side Rail Height; R = Radius; W = Width of the *inside* distance from tray wall to tray wall

Ladder Cable Tray - Mitered Fittings

Horizontal Tee

Part No. Key*

EHT-(Δ)(H)-(W1)-(W2)-(R)



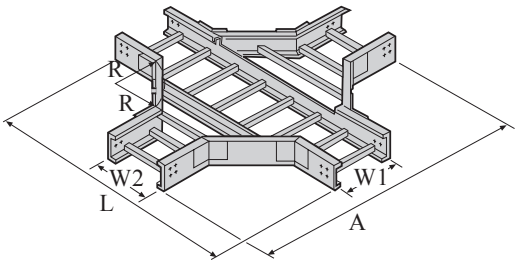
Dimension Inches (mm)

	12" (305) Radius		24" (610) Radius		36" (914) Radius	
Width	A	L	A	L	A	L
6 (152)	30⅝ (780)	55½ (1410)	42⅝ (1080)	74 (1880)	54⅝ (1390)	101¾ (2580)
9 (229)	33⅝ (850)	55½ (1410)	45⅝ (1160)	83¼ (2110)	57⅝ (1460)	101¾ (2580)
12 (305)	36⅝ (930)	55½ (1410)	48⅝ (1240)	83¼ (2110)	60⅝ (1540)	111 (2820)
18 (457)	42⅝ (1080)	64¾ (1640)	54⅝ (1390)	92½ (2350)	66⅝ (1690)	111 (2820)
24 (610)	48⅝ (1240)	74 (1880)	60⅝ (1540)	92½ (2350)	72⅝ (1840)	120¼ (3050)
30 (762)	54⅝ (1390)	74 (1880)	66⅝ (1690)	101¾ (2580)	78⅝ (2000)	129½ (3290)
36 (914)	60⅝ (1540)	83¼ (2110)	72⅝ (1840)	111 (2820)	84⅝ (2150)	129½ (3290)

Horizontal Cross

Part No. Key*

EHC-(Δ)(H)-(W1)-(W2)-(R)



Dimension Inches (mm)

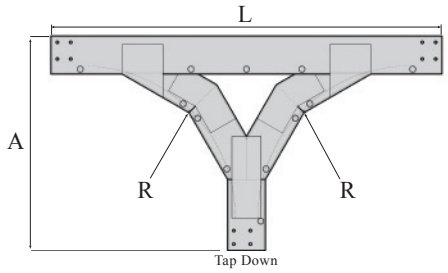
	12" (305) Radius		24" (610) Radius		36" (914) Radius	
Width	A	L	A	L	A	L
6 (152)	54¾ (1390)	55½ (1410)	78¾ (2000)	74 (1880)	102¾ (2610)	101¾ (2580)
9 (229)	57¾ (1470)	55½ (1410)	81¾ (2080)	83¼ (2110)	105¾ (2690)	101¾ (2580)
12 (305)	60¾ (1540)	55½ (1410)	84¾ (2150)	83¼ (2110)	108¾ (2760)	111 (2820)
18 (457)	66¾ (1700)	64¾ (1640)	90¾ (2310)	92½ (2350)	114¾ (2910)	111 (2820)
24 (610)	72¾ (1850)	74 (1880)	96¾ (2460)	92½ (2350)	120¾ (3070)	120¼ (3050)
30 (762)	78¾ (2000)	74 (1880)	102¾ (2610)	101¾ (2580)	126¾ (3220)	129½ (3290)
36 (914)	84¾ (2150)	83¼ (2110)	108¾ (2760)	111 (2820)	132¾ (3370)	129½ (3290)

Vertical Tee

Part No. Key*

EVT-(Δ)(H)-90-(W)-(R)

Specify "up" or "down" at the end of the part number. For tap up, dimensions different than tap down, contact us for dimensions.

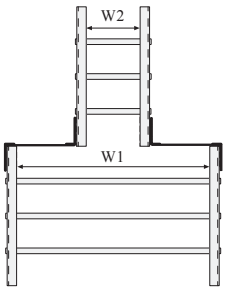


	Dimensions Inches (mm)	
Radius	A	L
24 (610)	33⅞ (860)	61¾ (1568)
36 (914)	45⅞ (1165)	85¾ (2178)

Straight Reducer Splice Plate

Part No. Key*

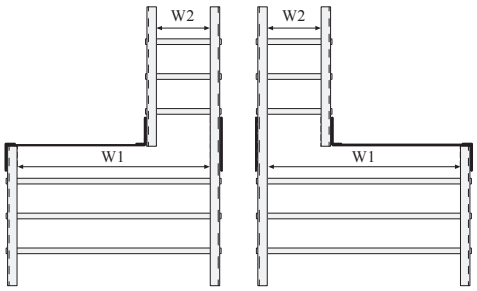
ESR-SP(D)-(W1)x(W2)



Right/Left Reducer Splice Plates

Part No. Key*

ER/EL-SP(D)-(W1)x(W2)



D = depth of tray in inches (mm); W1 = Width of Tray 1; W2 = Width of Tray 2; Reducer splice plates sold as kits to transition from one straight tray to another. Kit includes splice plates and hardware. Ladder tray images above are for illustration purposes only to show how the splice plates mate to varying widths of tray.

NOTE: mm values are nominal; *In Part No. Key, parentheses ( ) = insert corresponding option code; Δ = Resin;
H = Side Rail Height; R = Radius; W = Width of the *inside* distance from tray wall to tray wall

Splice Plates - Ladder Cable Tray

Enduro offers a full line of fiberglass splice plates designed to provide a structural transition between straight sections and fittings. Enduro splice plates and hardware are sold separately and are not provided as standard with straight sections or fittings due to the many hardware options. All plates have 7/16" pre-drilled bolt holes.

NEMA FG-1

Please refer to NEMA FG-1 regarding proper tray installation as it pertains to support and splice plate locations for straight sections and fittings. Refer to page 11 for recommended support locations. NEMA

Ladder Cable Tray Splice Plate Part Numbers

TYPE - (H)(Δ) - (D)

Example: **ESP - 6C - 180**

Type	Side Rail Height	Material	Degree
ESP = Straight	4 = 4" (100mm)*	C = Polyester	180 = Straight, Expansion
EEP = Expansion	6 = 6" (150mm)*	V = Vinyl Ester	90 = 90°
EVS = Vertical		SS = Stainless Steel	45 = 45°
EHS = Horizontal		RTX = Anti-Static**	30 = 30°
			22.5 = 22.5°
			HA = Horiz. Adjustable†
			VA = Vert. Adjustable†

* (mm) value is nominal. ** See page 9 for definition of Anti-Static resin. † For Horiz. and Vert. Adjustable part number use "ESP" for Type, example: ESP-6C-HA. Expansion plates have 1" slotted holes allowing 5/8" total contraction and expansion. Refer to thermal contraction table on page 6 for maximum spacing between expansion joints. Side rail height 4" requires 4 bolt sets per plate. Side rail height of 6" requires 8 bolt sets per plate.

Splice Plate and Hardware Options

Tray Resin	Splice Plate Material			Hardware Material Sets
	Polyester	Vinyl Ester	316 Stainless Steel	316 Stainless Steel
Polyester	Standard	Optional	Optional	Standard
Vinyl Ester		Standard	Optional	Standard
Anti-Static		Optional	Standard	Standard

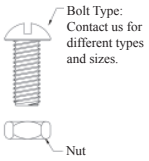
Hardware

Type	Set Includes	Size	For Use With Tray Types	Part No.
316 Stainless Steel Bolt Set	Bolt, nut	3/8"-16 x 1"	For S.S. splice plates (except 10" Channel)	505166SS
316 Stainless Steel Bolt Set	Bolt, nut	3/8"-16 x 1¼"	All tray types (except 10" Channel)	505167SS*
316 Stainless Steel Bolt Set	Bolt, nut	3/8"-16 x 1½"	For use with VA splice place	505168SS
Monel Bolt Set	Bolt, nut	3/8"-16 x 1¼"	All tray types (except 10" Channel)	606167M
GRP Studs & Nuts	Stud and 2 nuts	3/8"-16 x 2"	ELL3, ELL4, ETL6, EHZ6	707166F
GRP Studs & Nuts	Stud and 2 nuts	3/8"-16 x 2½"	EHL6, EHL8, EHV6	707167F
Silicon Bronze Bolt Set	Bolt, nut	3/8"-16 x 1¼"	All tray types (except 10" Channel)	808167SB

* Standard hardware set; NOTE: For monel and silicon bronze, please contact us for lead times. Also available in additional sizes. For 10" channel, please contact us for hardware; It is recommended that expansion splice plates and 1½" long assembly fasteners be used when connecting mitered fittings to molded fittings or straight lengths.

Fastener Torque - Metric: Class 5.8

Size	N-m
M10 x 1.5	26-33
M12 x 1.78	45-58



Typical Dimensions for GRP Splice Plates

Typical Dimensions Inches (mm)

Channel Depth Inches (mm)	A	B	C
4 (102)	2 (51)	1 (25)	-0-
6 (152)	4⅝ (117)	1 (25)	2⅝ (67)

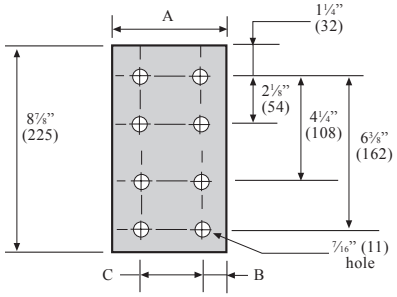
Typical Dimensions for Stainless Splice Plates

Typical Dimensions Inches (mm)

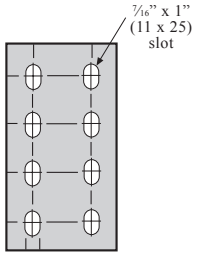
Channel Depth Inches (mm)	A	B	C
4 (102)	1¼ (32)	⅝ (16)	-0-
6 (152)	4⅛ (105)	¾ (19)	2⅝ (67)

Ladder Cable Tray - Splice Plates

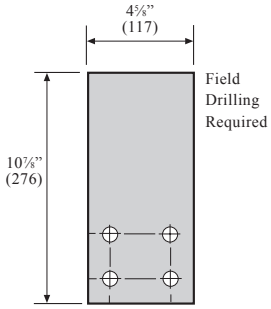
Straight Section



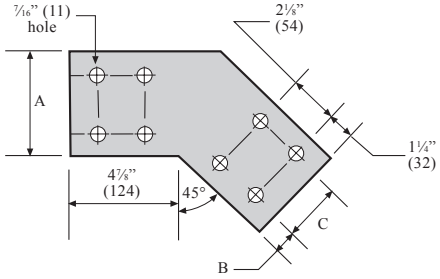
Expansion



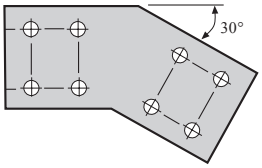
90° Vertical



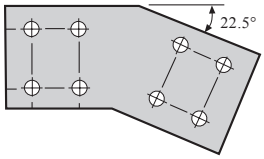
45° Vertical



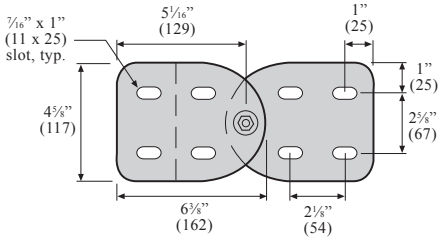
30° Vertical



22.5° Vertical

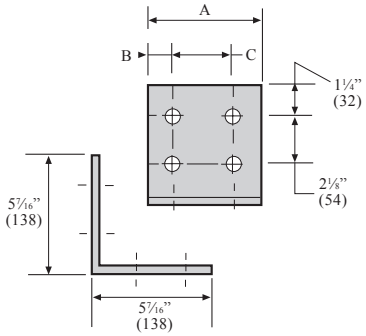


Adjustable Vertical

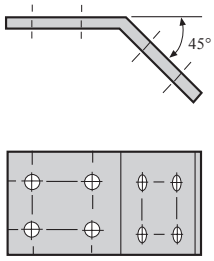


For adjustable vertical plate hardware, use catalog number 505168SS. For travel dimensions, contact us.

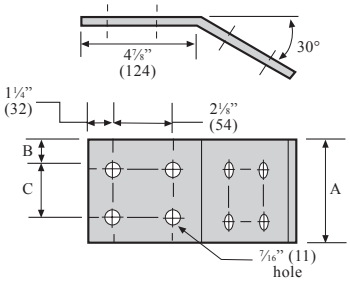
90° Horizontal



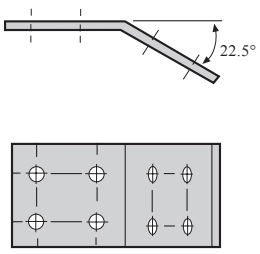
45° Horizontal



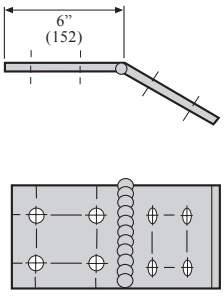
30° Horizontal



22.5° Horizontal



Adjustable Horizontal



Accessories - Ladder Cable Tray

Enduro offers a full line of accessories for our electrical products including cable tray covers, divider strips, drop outs, blind ends, adapters, hold-down clips, marine rungs, strut rungs, swivel clamps and a wide variety of stainless steel or GRP cable tray fasteners appropriate for any application.

Resin Designation

(Δ) = Insert one of the following letters for resin designations when required.

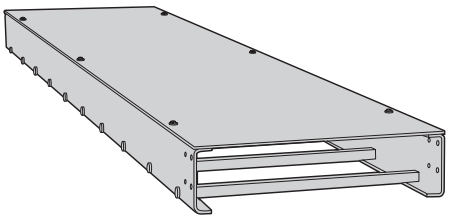
P = Polyester (Example: EPC-CL-12-P)
V = Vinyl Ester (Example: EPC-CL-12-V)
RTX = Anti-Static (Example: EPC-CL-12-RTX)

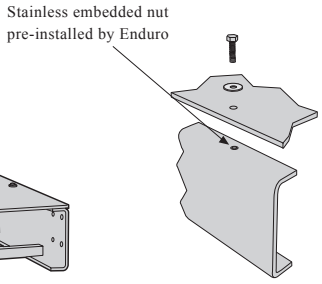
See page 9 for definition of Anti-Static resin.

Cable tray covers are recommended for those areas where the cable needs protection from falling objects, adverse weather conditions, etc. Available in 10ft. (3m) sections in both flat and peaked design. In addition to cover, solid bottom is also available. See page 21 for cover accessories.

Clampless Flat Cover

Part No. Key*
EPC-CL-(W)-(Δ)





Easiest & Lowest Installation Cost

Eliminates the need for Cover Hold Down Clamp for a quicker and easier field installation.

Recommended to be purchased with a cable tray straight section matching the clampless flat cover section.

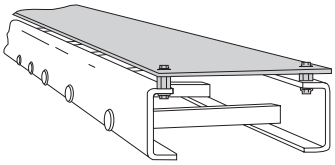
A total of three pairs of stainless embedded nuts are pre-installed to the cable tray channels by Enduro. Contact us for metal types available on embedded nuts. ¼" diameter stainless fasteners and flat washers are also included and shipped separately.

Contact us regarding fittings availability on this type of cover system.

Available tray widths (inches): 6, 9, 12, 18, 24, 30, 36

Flat Cover

Part No. Key*
"C" Tray: E(Δ)C-(W)
"Z" Tray: EZC-(W)



Installation Methods for Flat Cover: Thermoplastic Drive Rivets (part no. R-25) are the most economical method, but do require field drilling.

It is recommended rivets be installed on 24" centers along both side rails.

Cover Hold Down Clamps and Enduro Stand Offs allow cover to be removed for easy access to cables - see next page.

It is recommended to use seven pair at 1'6" on center per 10 Ft. length of cover.

Add ventilation height 2" for Flat Cover.

Flat covers can be ventilated or non-ventilated. Diagram shown is ventilated. Flat cover thickness is 3mm and maximum length is 3M or 10 ft.

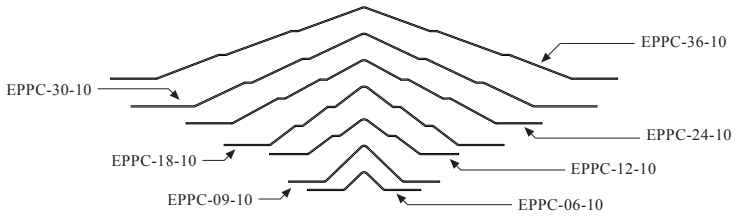
Tray Width Inches (mm)	"C" Tray Type	Wt./LF	"Z" Tray Type	Wt./LF
6 (152)	EPC-06	0.57	EZC-06	0.95
9 (229)	EPC-09	0.86	EZC-09	1.24
12 (305)	EPC-12	1.14	EZC-12	1.52
18 (457)	EPC-18	1.71	EZC-18	2.09
24 (610)	EPC-24	2.28	EZC-24	2.66
30 (762)	EPC-30	2.85	EZC-30	3.23
36 (914)	EPC-36	3.42	NA	NA

To order Flat Cover for ladder cable tray fittings, add "EC" before fitting part number.
Example: EC-EHB-MC6-90-24-24

Peaked Cover

Part No. Key*
EPPC-(W)-(L)

Contact us for Z-Tray covers. Installation Methods for Peaked Cover: Use three pair of Enduro Stand Offs - Peaked for each 10 ft. length of tray. Peaked cover is not available for fittings. Contact us for information on 22.5°, 30° and 45° peaked covers. Add ventilation height 1¾" for peaked cover. Peaked covers can be ventilated or non-ventilated.



"C" Tray Type	Dimensions In. (mm) W	H	Wt./LF
EPPC-06-10	13 (330.2)	1.375 (34.93)	1.05
EPPC-09-10	13.25 (336.55)	3 (76.2)	1.05
EPPC-12-10	19 (482.6)	2.75 (69.85)	1.57
EPPC-18-10	25 (635)	4.625 (117.48)	3.14
EPPC-24-10	28.25 (717.55)	5 (127)	3.14
EPPC-30-10	37 (939.8)	5.75 (146.05)	3.14
EPPC-36-10	40.25 (1022.35)	5.6875 (144.46)	3.14

* In Part No. Key, parentheses ( ) = insert corresponding option code; Δ = Insert resin designation, see gray box at top;
W = Width of the *inside* distance from tray wall to tray wall; L = Length

Ladder Cable Tray - Accessories

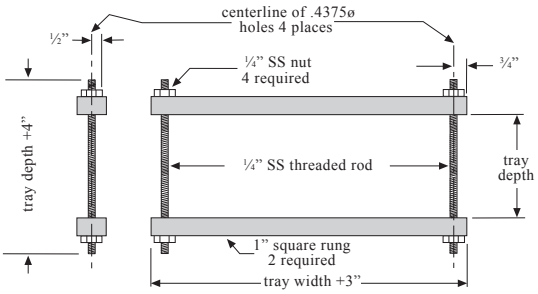
Complete Cover Hold Down

Part No. Key*
CCHD-(H)(Δ) x (W)

Recommended Usage: To secure cover to tray in an outdoor application.

Best suited for a high wind situation.

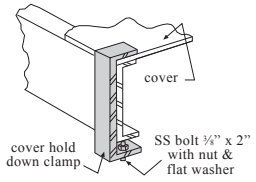
Available in stainless steel, contact us for dimensions.



Cover Hold Down Clamp

Part No. Key*
ECHD-(H)(Δ)

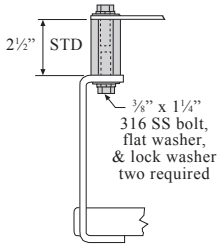
Not available for EHZ6 tray



Stand Off

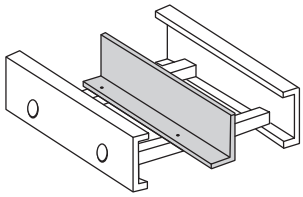
Part No.
ESO

Vinyl Ester resin is the standard.
Includes mounting hardware



Divider Strip

Part No. Key*
Loose: EDS-(Δ)-1
Installed: EDS-(Δ)-2



Divider strips are supplied in ten foot lengths.

Unless indicated otherwise, dividers are intended for field installation. Please indicate installation position if required.

For easier installation, dividers can be furnished with factory-drilled notching with additional cost.

Divider strips are available for fittings, please contact us for part numbers.

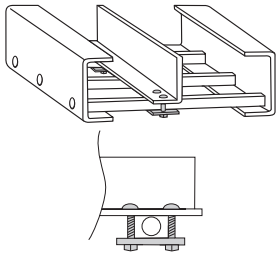
For securing riveted divider to tray we use 3/16" SS rivets. We also have available thermoplastic drive rivets (pg 22) which require field drilling.

Adjustable Clamp for Divider Strip

Part No. Key*
For ⌈ Side Rail: ADC-1(Δ)
For ⌊ Side Rail: ADC-2(Δ)

This part number is only for the adjustable clamp, does not include divider strip.

⌊ side rail only available in 3" (76), 4" (102), 6" (152) and 8" (203)

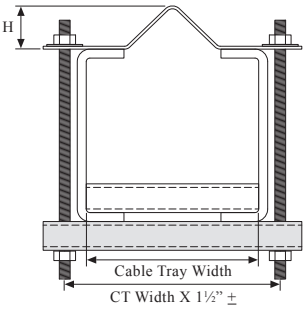


Complete Peaked Hold Down

Part No.
PCHD-(H)(Δ) x (W)

This is designed for high wind applications.

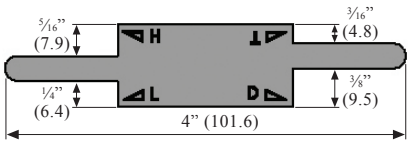
For ventilated peaked cover requirements, options are available. Please contact us regarding your specifications.

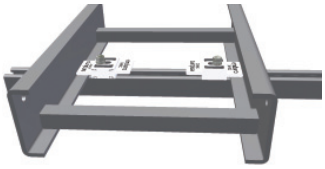


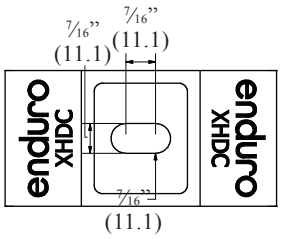
Hold Down Clamp & Expansion Guide

Enduro's XHDC serves as both a Hold Down Clip and Expansion Guide for all ***horizontal*** installations of Enduro ladder tray types. This new design eliminates the need for ordering or tracking multiple products for securing ladder tray to structural supports. Installation: To determine the appropriate orientation for installation, rotate the XHDC to the corresponding letter indicator (etched into side profile) as shown in the table below. Each row shows which letter indicator to use for each series, for use as either Hold Down Clip, or Expansion Guide. See example below.

Part No. XHDC		Tray Type
Hold Down Clamp	Expansion Guide	
L	H	EHL4
T	L	ETL6
L	H	EHL6
H	D	EHZ6







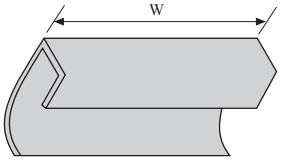
* In Part No. Key, parentheses ( ) = insert corresponding option code; Δ = Insert resin designation, see gray box on page 20;
H = Side Rail Height; W = Width of the *inside* distance from tray wall to tray wall

Accessories

Accessories - Ladder Cable Tray

Drop Out

Part No. Key*
For ⌊ Side Rail: EDO-1-(W)
For ⌊ Side Rail: EDO-2-(W)
For 10” ⌊ Side Rail: EDO-3-(W)



Actual width of Drop Out is less than width of tray to allow for placement inside channel flange. R-25 drive rivets (left) are a separate order item.

For Vinyl Ester, add “VE” to the end of part number. For Halogen-Free Low Smoke Plus resin add “Y” to part number.

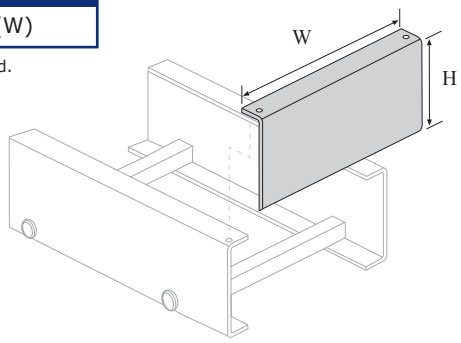
Drop Out installation for less than 12” width: Drill two ¼” holes 1” from each end. Insert R-25 rivet into each opening.

Drop Out installation for more than 12” width: Drill three ¼” holes 1” from each end and in the middle. Insert R-25 rivet into each opening. LIMITED STOCK AVAILABLE.

Blind End

Part No. Key*
EBE-(H)(Δ)-(W)

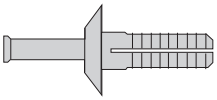
316 SS fasteners included.



Nylon Thermoplastic Drive Rivet

Part No. Key*
R-25-(Δ)

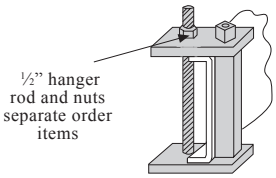
For securing cover material and divider strip. Pigmented to match resin type.



Vertical Tray Hanger Support

Part No. Key*
VH-(H)(Δ)

Not available for EHZ6.



Standard Field Install Rung

Part No. Key*
EFIR-(W)-(PE or VE)

Rung is standard 1” x 1” rung.

PE = Polyester; VE = Vinyl Ester; Example for a 6” wide rung, polyester resin: EFIR-06-PE

Hardware included.

Strut Field Install Rung

Part No. Key*
EFSR-(W)-(PE or VE)

PE = Polyester; VE = Vinyl Ester; Example for a 6” wide rung, polyester resin: EFSR-06-PE

SemKit Adhesive

Part No.
SEMKIT

Fiberglass to fiberglass adhesive for custom fabrication or repair. Meets NTSA and UPS requirements for sea and ground transportation.

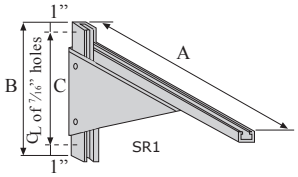
Field Cutting Sealant

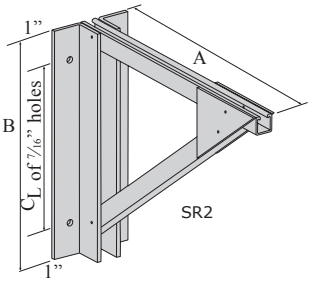
Part No.
Quart Can: ES-Q / Gallon Can: ES-G

Seals exposed fibers after any field cuts. Restores gloss and luster to weathered fiberglass. Seals exposed FRP/GRP threads after installation of fiberglass threaded rod and hex nuts. For polyester and vinyl ester resin products. Clear color. Meets NSTA and UPS requirements for sea and ground transportation.

Cable Tray Support Racks

Part No. Key*	Dimension In. (nominal) A	B	C	Allowable Load Lbs.
SR1-6(Δ)	10”	12”	10”	1,600
SR1-9(Δ)	13”	12”	10”	1,100
SR1-12(Δ)	16”	12”	10”	850
SR1-18(Δ)	22”	12”	10”	725
SR1-24(Δ)	28”	12”	10”	480
SR2-12(Δ)	14”	12”	6”	800
SR2-18(Δ)	20”	16”	10”	775
SR2-24(Δ)	26”	21”	15”	750
SR2-30(Δ)	32”	21”	15”	750
SR2-36(Δ)	38”	21”	15”	750

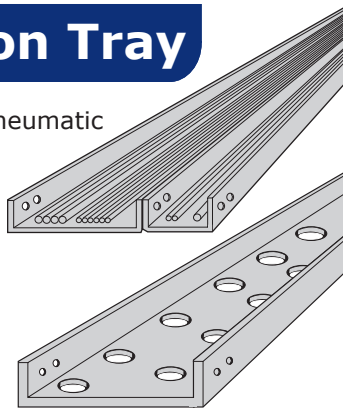




Dimensions are norminal. Allowable load is based on a total load, uniformly distributed over the length of the rack. Safety factor = 2.0

* In Part No. Key, parentheses ( ) = insert corresponding option code; Δ = Insert resin designation, see gray box on page 20; H = Side Rail Height; W = Width of the *inside* distance from tray wall to tray wall

Channel-Type Instrumentation Tray



Enduro channel-type instrumentation tray is designed for light loads of individual wiring and pneumatic tubing. Our channel-type tray is available with solid or ventilated bottom.

All straight sections and pre-assembled fittings are pre-drilled to accept flange splice plates. All splice plates and hardware are separate order items.

Enduro's ventilated channel-type tray features 1 7/16" (36.5125) x 1/4" (6.35) +/- size slots to allow for cooling and cable strapping.

All (mm) dimensions are nominal.

Channel-Type Instrumentation Tray Part Numbers

EI(B) - (Δ) - (W) x (L)

Example: **EIS - PE - 200 x 20**

Type	Resin (Δ)	Width (W)	Length (L)
EIS = Solid Bottom	PE = Polyester	200 = 2"**	10 = 10'
EIP = Slotted Bottom	VE = Vinyl Ester	300 = 3"**	20 = 20'
EIPH = Perforated Hole-Type Bottom	RTX = Anti-Static*	400 = 4"	3M = 3m
		400D = 4"**	6M = 6m
		600 = 6"	
		600D = 6"**	

* See page 9 for definition of Anti-Static resin. ** Longer lead time. Contact us for details.

Technical Data - Channel-Type Instrumentation Tray

Part No. Key*	Channel Size Width x Depth	Lbs./Ft.	Channel Thickness	Span Ft. (m)	Max Loading Lbs./Ft. (N/m)	Max Deflection In. (mm)
EI(B)-(Δ)-200 x (L)	2" x 1" (51 x 25)	0.60	3/16" (4.76)	5 (1.5)	4.0 (5.4)	0.5 (12.7)
EI(B)-(Δ)-300 x (L)	3" x 1" (76 x 28)	0.75	3/16" (4.76)	5 (1.5) 8 (2.4)	3.9 (5.3) 1.0 (1.35)	0.5 (12.7) 0.8 (20.3)
EI(B)-(Δ)-400 x (L)	4" x 1 1/8" (102 x 28)	1.05	1/4" (6.35)	8 (2.4) 10 (3.0)	2.8 (3.8) 1.5 (2.03)	0.8 (20.3) 1.0 (25.4)
EI(B)-(Δ)-600 x (L)	6" x 1 5/8" (152 x 41)	2.10	1/4" (6.35)	10 (3.0)	2.8 (3.8)	1.0 (25.4)

Loads are based on limiting the deflection to a value equal to 1/120 of the span.

For ventilated tray, max loading reduced by 10%.

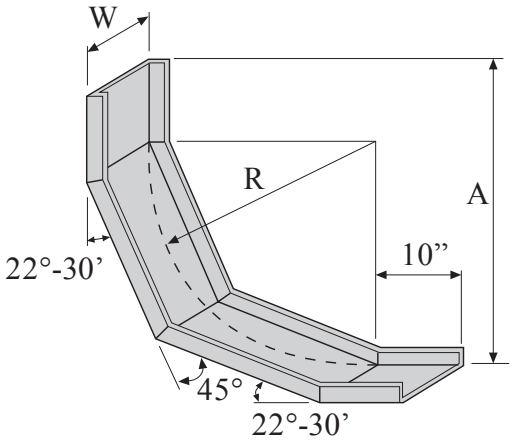
NOTE: mm values are nominal; * In Part No. Key, parentheses ( ) = insert corresponding option code; B = Bottom (solid, slot or holes); Δ = Resin; R = Radius; (L) = Length; W = Width of the *inside* distance from tray wall to tray wall

Fittings & Accessories - Channel-Type Inst. Tray

90° Vertical Inside Mitered

Part No. Key*	A
EI(B)-(Δ)-90IV-(R)-(W)	22¼" (565)
EI(B)-(Δ)-90IV-(R)-(W)	34¼" (820)

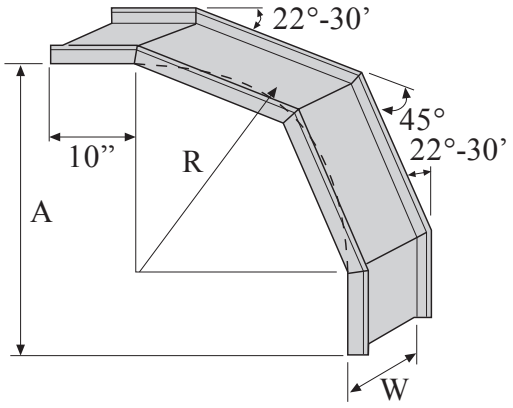
R = Radius which can be 12" (305) or 24" (610);
W = Width which can be 2", 3", 4", 6", 8" or 10"



90° Vertical Outside Mitered

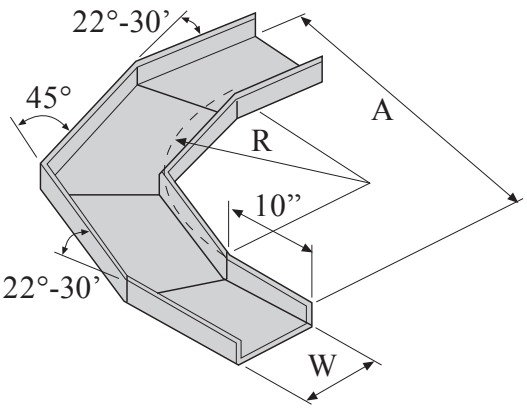
Part No. Key*	A
EI(B)-(Δ)-90OV-(R)-(W)	22" (559)
EI(B)-(Δ)-90OV-(R)-(W)	34" (864)

R = Radius which can be 12" (305) or 24" (610);
W = Width which can be 2", 3", 4", 6", 8" or 10"



90° Horizontal Bend

	Part No. Key*	A
12" (305) Radius	EI(B)-(Δ)-90HB-12-200	24" (610)
	EI(B)-(Δ)-90HB-12-300	25" (635)
	EI(B)-(Δ)-90HB-12-400	26" (660)
	EI(B)-(Δ)-90HB-12-600	28" (711)
24" (610) Radius	EI(B)-(Δ)-90HB-24-200	36" (914)
	EI(B)-(Δ)-90HB-24-300	37" (940)
	EI(B)-(Δ)-90HB-24-400	38" (965)
	EI(B)-(Δ)-90HB-24-600	40" (1016)



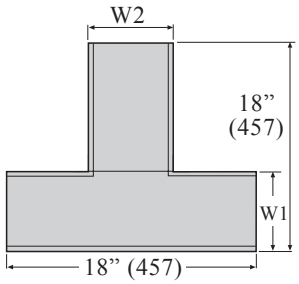
NOTE: mm values are nominal; * In Part No. Key, parentheses ( ) = insert corresponding option code; B = Bottom (solid, slot or holes);
Δ = Resin; R = Radius; (L) = Length; W = Width of the *inside* distance from tray wall to tray wall

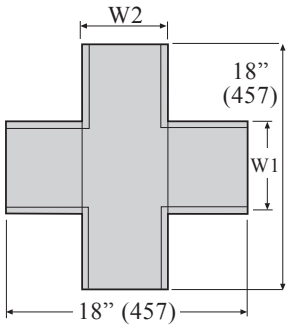
Channel-Type Inst. Tray - Fittings & Accessories

Horizontal Tee & Horizontal Cross

Tee Part No. Key*	Cross Part No. Key*	W1	W2
EI(B)-(Δ)-HT-200**	EI(B)-(Δ)-HC-200**	2” (51)	2” (51)
EI(B)-(Δ)-HT-300**	EI(B)-(Δ)-HC-300**	3” (76)	3” (76)
EI(B)-(Δ)-HT-400	EI(B)-(Δ)-HC-400	4” (102)	4” (102)
EI(B)-(Δ)-HT-600	EI(B)-(Δ)-HC-600	6” (154)	6” (154)

** Longer lead times. Contact us for details.





Channel Tray Cover

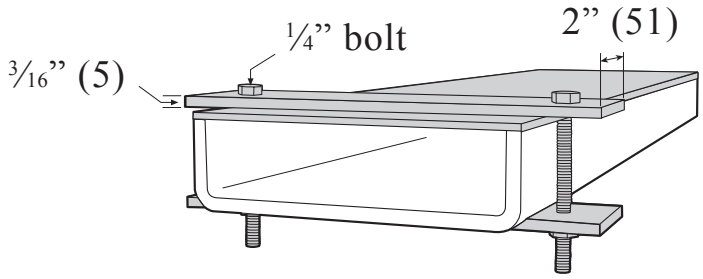
Part No. Key*
E(Δ)C-(W)

Hardware and clamp not included.

Channel Cover Clamp

Part No. Key*
CCC-(W)-(Δ)

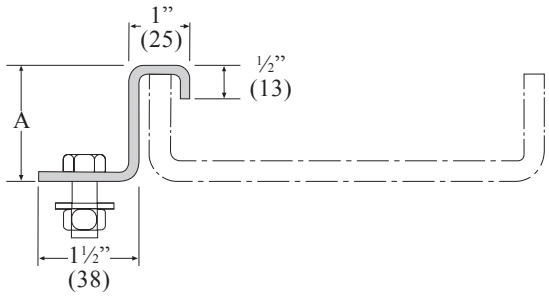
316 SS hardware included.



Channel Hold Down Clip

Part No.	W	A
IHDC-3**	3” (76)	1⅛” (28)
IHDC-4	4” (102)	1¼” (33)
IHDC-4D**	4” (102)	2⅛” (54)
IHDC-6	6” (154)	1¾” (44)
IHDC-6D**	6” (154)	2⅛” (54)

10 Ga. 316 SS; ** Longer lead times. Contact us for details.



NOTE: mm values are nominal; * In Part No. Key, parentheses ( ) = insert corresponding option code; B = Bottom (solid, slot or holes);
Δ = Resin; R = Radius; (L) = Length; W = Width of the *inside* distance from tray wall to tray wall

Splice Plates - Channel-Type Inst. Tray

Channel-Type Splice Plate Part Numbers

Example: **EISP - 90V - 600**

Degree
180 = Straight
90 = 90°
45 = 45°
30 = 30°
22.5 = 22.5°

Direction
V = Vertical
H = Horizontal
(for straight, leave direction space in product number blank, example: EISP-180-600)

Channel Size
400 = 4" (100mm)*
600 = 6" (150mm)*

These part numbers are for Polyester resin. For other channel sizes, contact us.

* (mm) values are nominal

Splice plates and hardware are sold individually and are not provided with straight sections or fittings.

For expansion insert "X" between "EISP" and Degree, example: EISP-X-180-400.

For Vinyl Ester Resin, add "VE"
Example: EISP-VE-90V-600

For Stainless Steel, add "316SS"
Example: EISP-90V-600-316SS

See page 18 for splice plate and hardware options.

Dimensions

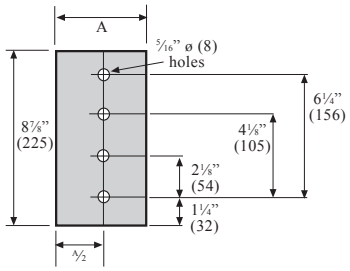
Channel Depth Inches (mm)	A Inches (mm)	B Inches (mm)
4" (102)	1" (25)	¼" (6.35)
6" (152)	1¼" (32)	⅝" (15.875)

Hardware

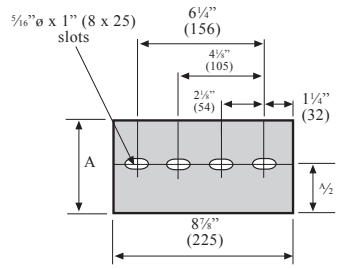
Part No.	
505138SS (Pan Head)	¼" - 20 x ¾"
505139SS	¼" - 20 x ¾"
505141SS	¼" - 20 x 1"

Parts No. 505138 & 505139 for use with S.S. splice plates. Part No. 505141SS all channel tray except 10". Contact us for bolt sets for 10" channel. Also available in silicon bronze & monel. Contact us for pricing and availability.

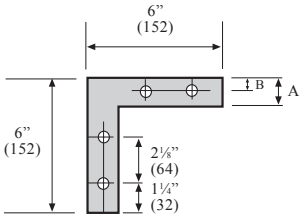
Straight Section



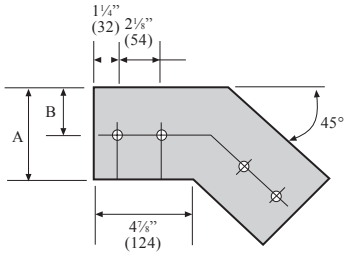
Expansion



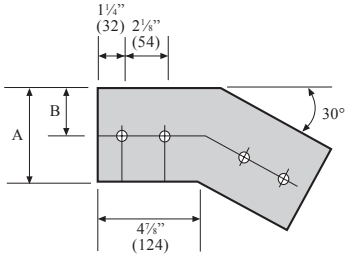
90° Vertical



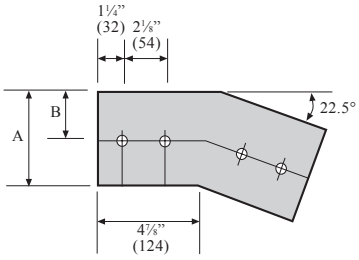
45° Vertical



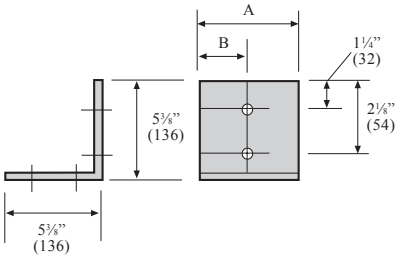
30° Vertical



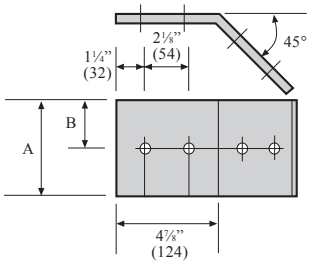
22.5° Vertical



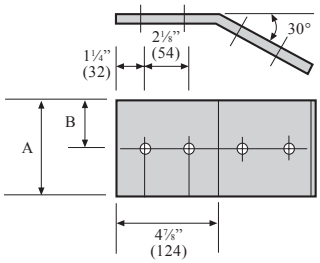
90° Horizontal



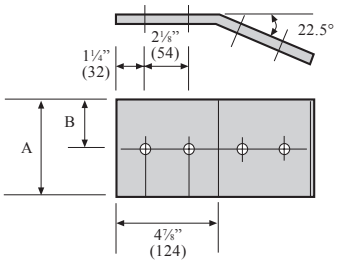
45° Horizontal



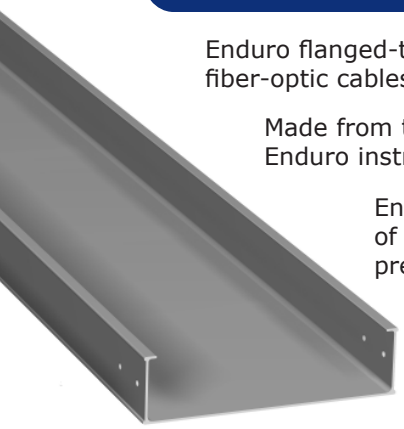
30° Horizontal



22.5° Horizontal



Flanged-Type Instrumentation Tray



Enduro flanged-type instrumentation tray is ideal for low-voltage or communications cables, including fiber-optic cables, or to support hydraulic or pneumatic tubing.

Made from the same high-strength, corrosion-resistant pultruded materials as our ladder-type tray, Enduro instrumentation tray is tough and made to stand up to the most demanding environments.

Enduro flanged tray comes in multiple options, including different resin systems, your choice of solid or perforated bottom, and with or without snap-on covers. Perforated cable trays are pre-slotted for ventilation or easy attachment of cables.

Our flanged-type instrumentation tray has a side rail height of 80mm, measuring from the outside of the top to the outside of the bottom. Enduro flanged-type tray widths come in 150mm and 300mm, measuring inside to inside of the flanges. Lengths are 3m. In addition, our offering includes a full complement of fittings, support systems and accessories.

Flanged-Type Straight Section Part Numbers

(Δ) - IT(B) - (H) - CT - (W) - (L)

Example: **EP - ITS - 80 - CT - 100 - 3M**

Resin (Δ)
EP = Polyester
EV = Vinyl Ester
RTX = Anti-Static*

Bottom (B)
ITS = Solid Bottom
ITP = Perforated Bottom Slotted Type**
ITH = Perforated Bottom Hole Type

Side Rail Height (H)
50 = 50mm (1.97″)
80 = 80mm (3.15″)

Width (W)
100 = 100mm (3.94″)
150 = 150mm (5.91″)
200 = 200mm (7.87″)
300 = 300mm (11.82″)

Length (L)
3M = 3m (118.1″)

*See page 9 for definition of Anti-Static. **Slot size: 1 7/16″ (25.40mm) x 3/16″ (4.76mm) +/-

Maximum Loading

Part No. Key*	Span Ft. (m)	Max Loading Lbs./Ft. (N/m)
(Δ)-IT(B)-50-CT-100-3M	5 (1.5) 10 (3.0) 15 (4.5)	30.9 (41.9) 3.8 (5.2) 1.1 (1.5)
(Δ)-IT(B)-50-CT-150-3M	5 (1.5) 10 (3.0) 15 (4.5)	35.6 (48.3) 4.4 (6.0) 1.3 (1.8)
(Δ)-IT(B)-50-CT-200-3M	5 (1.5) 10 (3.0) 15 (4.5)	contact us
(Δ)-IT(B)-50-CT-300-3M	5 (1.5) 10 (3.0) 15 (4.5)	42.4 (57.5) 5.2 (7.1) 1.5 (2.0)
(Δ)-IT(B)-80-CT-100-3M	5 (1.5) 10 (3.0) 15 (4.5)	94.4 (128.0) 11.8 (16.0) 3.5 (4.7)
(Δ)-IT(B)-80-CT-150-3M	5 (1.5) 10 (3.0) 15 (4.5)	108.4 (147.0) 13.5 (18.3) 4.0 (5.4)
(Δ)-IT(B)-80-CT-200-3M	5 (1.5) 10 (3.0) 15 (4.5)	117.7 (159.6) 14.7 (19.9) 4.3 (6.5)
(Δ)-IT(B)-80-CT-300-3M	5 (1.5) 10 (3.0) 15 (4.5)	130.8 (177.3) 16.4 (22.2) 4.8 (6.5)

Load (Lbs/Ft) are based on deflection equal to L/D = 200.

Straight Splice Plates

Part No.	Material
ESS-IT-80-SSP	Stainless Steel
EL-IT-80-SSP	Polyester
EV-IT-80-SSP	Vinyl Ester
ERTX-IT-80-SSP	Anti-Static

Reducer Splice Plates

Part No. Key*	Material
ESS-IT-(H)-(W1)-(W2)-RSP	Stainless Steel

Please specify Width 1 and Width 2 when ordering.

Straight Cover

Part No. Key*
(Δ)-IT-(W)-CTC-(L)

Example: EL-IT-150-CTC-3M
Covers only available in 3m lengths.

NOTE: mm values are nominal; * In Part No. Key, parentheses ( ) = insert corresponding option code;
Δ = Resin; B = Bottom; H = Side Rail Height; W = Width of the *inside* distance from tray wall to tray wall

Fittings - Flanged-Type Inst. Tray

Flanged-Type Fittings Part Numbers

(Δ) - IT(B) - (H) - TYPE - (W) - (A) - (L)

Example: **EL - ITS - 80 - HB - 100 - 90 - 300**

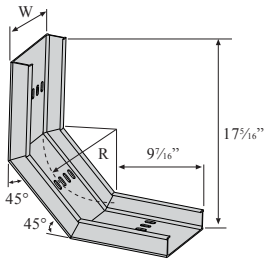
Resin (Δ)	Bottom (B)	Side Rail Height (H)	Type	Width (W)	Angle
EL=Polyester	ITS=Solid Bottom	50=50mm (1.97″)	HB=Horizontal Bend	100 = 100mm (3.94″)	90=90°
EV=Vinyl Ester	ITP=Perforated Bottom Slotted Type**	80=80mm (3.15″)	IV=Inside Vertical	150=150mm (5.91″)	45=45°
RTX=Anti-Static*	ITH=Perforated Bottom Hole Type		OV=Outside Vertical	200 = 200mm (7.87″)	
			HT=Horizontal Tee	300=300mm (11.82″)	
			HC=Horizontal Cross		

*See page 9 for definition of Anti-Static resin. **Slot size: 1 7/16″ (36.5125) x ¼″ (6.35) +/-
Note: More fittings and fitting covers available, please contact us.

90° Vertical Inside Mitered

Part No. Key*
(Δ)-(B)-80-IV-(W)-90-300

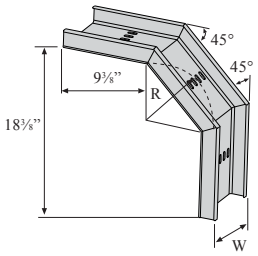
Radius = 11.8″ (300mm)



90° Vertical Outside Mitered

Part No. Key*
(Δ)-(B)-80-OV-(W)-90-300

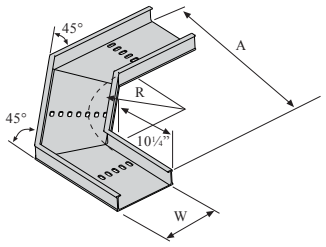
Radius = 11.8″ (300mm)



90° Horizontal Mitered

Part No. Key*	A
(Δ)-(B)-50-HB-100-90-300 (Δ)-(B)-80-HB-100-90-300	21 3/8″ (543)
(Δ)-(B)-50-HB-150-90-300 (Δ)-(B)-80-HB-150-90-300	23 5/16″ (593)
(Δ)-(B)-50-HB-200-90-300 (Δ)-(B)-80-HB-200-90-300	25 5/16″ (643)
(Δ)-(B)-50-HB-300-90-300 (Δ)-(B)-80-HB-300-90-300	29 1/4″ (743)

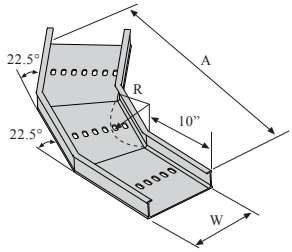
Radius = 11.8″ (300mm)



45° Horizontal Mitered

Part No. Key*	A
(Δ)-(B)-50-HB-100-45-300 (Δ)-(B)-80-HB-100-45-300	28 1/2″ (723)
(Δ)-(B)-50-HB-150-45-300 (Δ)-(B)-80-HB-150-45-300	29 7/8″ (758)
(Δ)-(B)-50-HB-200-45-300 (Δ)-(B)-80-HB-200-45-300	31 1/4″ (794)
(Δ)-(B)-50-HB-300-45-300 (Δ)-(B)-80-HB-300-45-300	34 1/16″ (865)

Radius = 11.8″ (300mm)

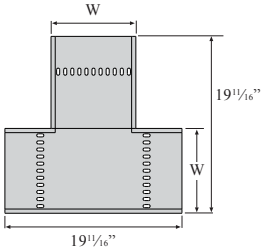


Horizontal Fitting Cover

Part No. Key*
(Δ)-IT-(W)-CTC-(90 or 45)-300

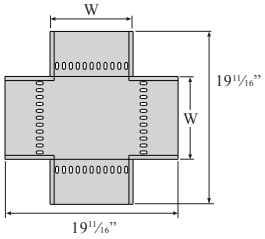
Horizontal Tee

Part No. Key*
(Δ)-(B)-(H)-(W)-HT



Horizontal Cross

Part No. Key*
(Δ)-(B)-(H)-(W)-HC

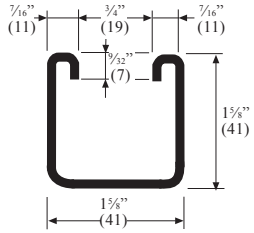


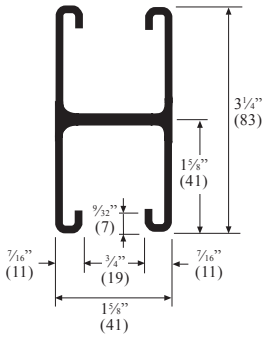
Note: More fittings and fitting covers available, please contact us. * In Part No. Key, parentheses ( ) = insert corresponding option code;
Δ = Resin; B = Bottom; H = Side Rail Height; W = Width of the *inside* distance from tray wall to tray wall

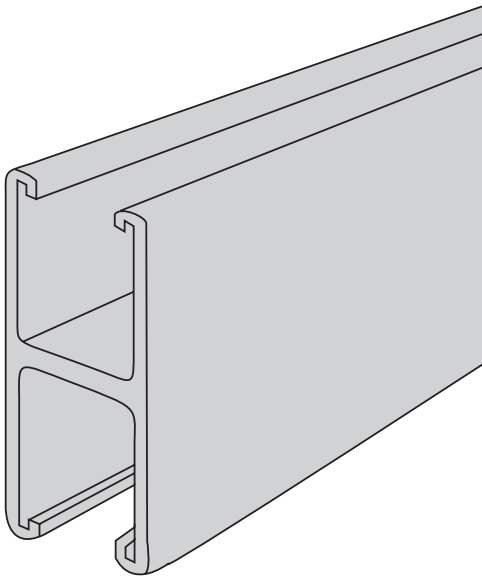
Channel Framing (Solid & Punched)

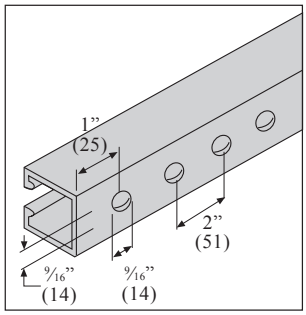
Part No.	Lbs/Ft.
Polyester: EC-158	0.68
Vinyl Ester: EC-VE-158	

Part No.	Lbs/Ft.
Polyester: EC-158D	1.36
Vinyl Ester: EC-VE-158D	









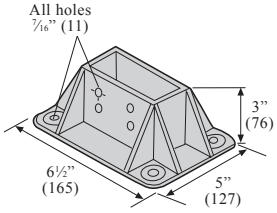
For punched channel framing add "H" to the end of the part number; example: EC-10H. Punched not available for double channel. Punched holes are 9/16" holes on 2" centers. Replaces drilled strut.

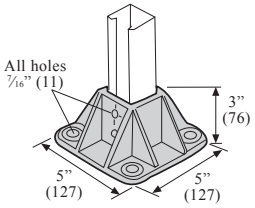
For use in tray support systems, electrical conduit and tray rungs for tying down cable. Available in 10 ft and 20 ft lengths. See below for loading, and see page 38 for specification information.

Post Base

Part No.
Polyester: PBD-PE
Polyurethane: PBD-PU

Part No.
Polyester: PBS-PE
Polyurethane: PBS-PU

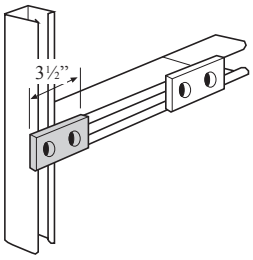




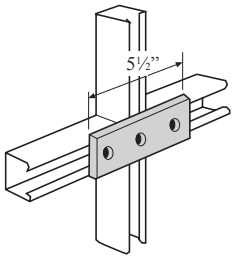
Support Systems & Strut

Connector Plates

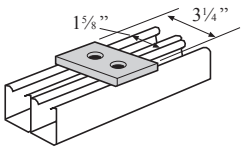
Based on individual applications, changes may be required on dimension and thickness of material. Please contact us. Holes are drilled to accept ⅜" and ½" bolts.
For Vinyl Ester Connector Plates, insert the letters "VE" as indicated in this example:
Polyester = CP-100; Vinyl Ester = CP-VE-100



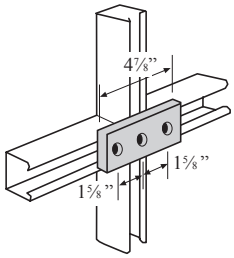
Part No.
CP-100



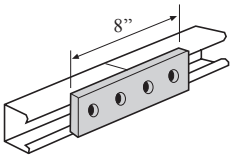
Part No.
CP-101



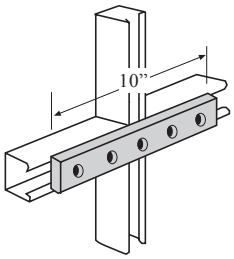
Part No.
CP-102



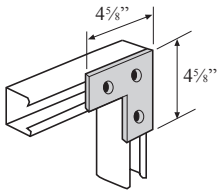
Part No.
CP-103



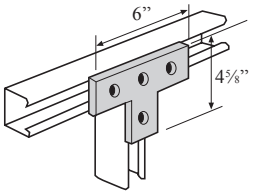
Part No.
CP-104



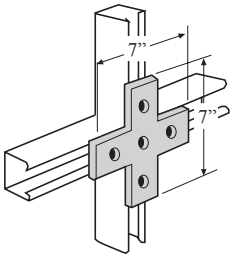
Part No.
CP-105



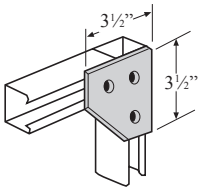
Part No.
CP-109



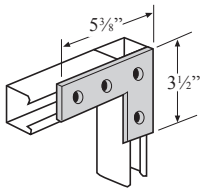
Part No.
CP-110



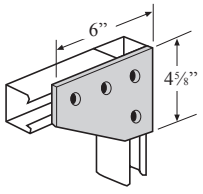
Part No.
CP-111



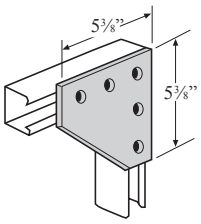
Part No.
CP-112



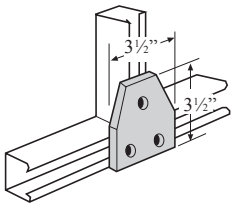
Part No.
CP-113



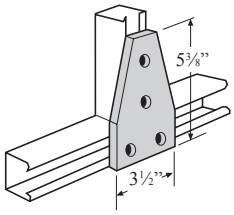
Part No.
CP-114



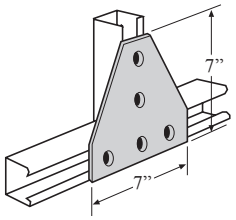
Part No.
CP-115



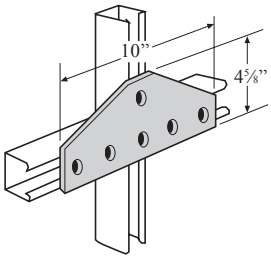
Part No.
CP-116



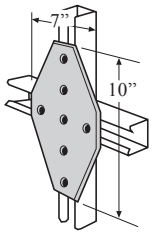
Part No.
CP-117



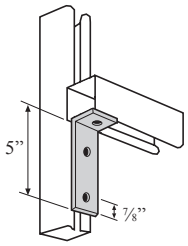
Part No.
CP-118



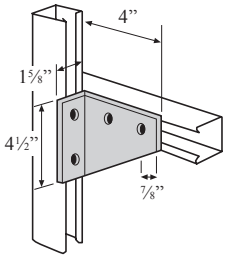
Part No.
CP-119



Part No.
CP-120

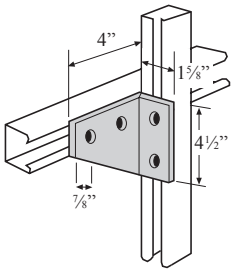


Part No.
CP-205



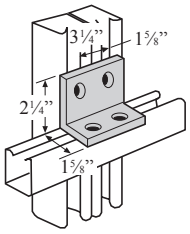
SEE NOTE AT BOTTOM

Part No.
CP-209



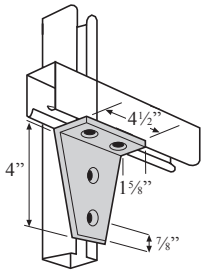
SEE NOTE AT BOTTOM

Part No.
CP-210



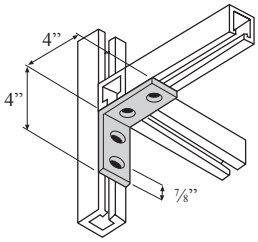
SEE NOTE AT BOTTOM

Part No.
CP-211



SEE NOTE AT BOTTOM

Part No.
CP-226



SEE NOTE AT BOTTOM

Part No.
CP-405

NOTE: These composite angle components will not support tensile loads or forces.

Support Systems & Strut

Non-Metallic Universal Pipe Clamp

Conduit Outside Diameter Inches
(for reference only)

Part No.	Pipe Size Inches	Wt./ 100 Sets* Lbs.	PVC Schedule 40 & 80	PVC Coated Steel	Rigid Steel	Fiberglass (GRP)
PC-1609N	½	9.0	0.840	0.920	0.840	-
PC-1610N	¾	10.0	1.050	1.130	1.050	0.890
PC-1611N	1	10.5	1.315	1.395	1.315	1.195
PC-1612N	1¼	11.0	1.660	1.740	1.660	1.507
PC-1613N	1½	13.0	1.900	1.980	1.900	1.757
PC-1614N	2	14.0	2.375	2.455	2.375	2.132
PC-1615N	2½	18.0	2.875	2.955	2.875	2.650
PC-1616N	3	20.0	3.500	3.580	3.500	3.132
PC-1617N	3½	23.0	4.000	4.080	4.000	3.632
PC-1618N	4	25.0	4.500	4.580	4.500	4.132

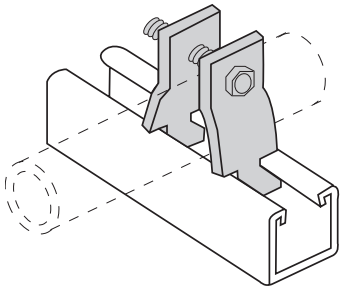
* Includes nylon bolt

For rigid, PVC coated steel, PVC Schedule 40 & 80 and fiberglass conduit.

Made from a toughened grade of glass reinforced polycarbonate resin. Standard fasteners are nylon slotted hex bolt and nut. Recommended for horizontal use as shown. For vertical placement please contact us.

Packaged 10 sets per bag.

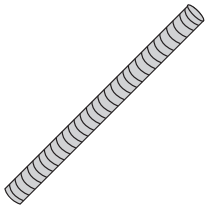
If stainless steel fasteners are preferred, indicate by adding the letter "S" after the catalog number (Example: PC-1609S).



GRP Threaded Rod

Part No.	Size	Weight
TR-GRP-038	⅜"-16	0.07 Lbs/Ft
TR-GRP-050	½"-13	0.12 Lbs/Ft
TR-GRP-0625	⅝"-11	0.18 Lbs/Ft
TR-GRP-075	¾"-10	0.28 Lbs/Ft
TR-GRP-100	1"-8	0.50 Lbs/Ft

Vinyl Ester resin is the standard. Available in 8 ft. lengths.

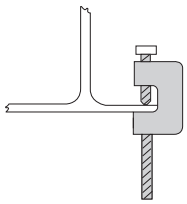


Beam Clamps

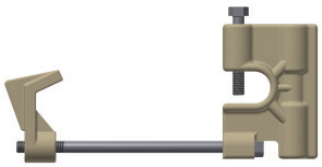
Part No.	Description
BCS-3/8	Single for ⅜" GRP Threaded Rod
BCS-1/2	Single for ½" GRP Threaded Rod
BCD-3/8	Double for ⅜" GRP Threaded Rod
BCD-1/2	Double for ½" GRP Threaded Rod

Max Load Rating = 600 lb
Ultimate Load = 1,800 lb
Recommended safety factor = 3
SS set screws included with clamps.

Single



Double



Typical Properties - GRP Threaded Rod

Properties	⅜-16 UNC	½-13 UNC	⅝-11 UNC	¾-10 UNC	1-8 UNC
Thread shear strength using GRP hex nut in tensile - Lbs.	1,250	2,200	3,100	4,500	6,500
Transverse shear on threaded rod - double shear (load Lb.) (ASTM-B565)	3,000	5,000	7,500	12,000	22,000
Transverse shear on threaded rod - single shear (load Lb.)	1,600	2,600	3,800	6,200	15,000
Compressive strength longitudinal, PSI (ASTM-D695)	54,000	54,000	54,000	54,000	65,000
Flexural strength, PSI (ASTM-D790)	55,000	55,000	55,000	55,000	60,000
Flexural modulus, PSI x 10^6 (ASTM-D790)	2.0	2.0	2.0	2.50	2.75
Torque strength using fiberglass nut lubricated with SAE 10W30 motor oil, Ft.-Lbs.	8	18	35	50	110
Dielectric strength, KV/In. (ASTM-D149)	35	35	35	35	35
Water absorption 24 hour immersion - threaded, % (ASTM-D570)	1	1	1	1	1
Coefficient of thermal expansion - longitudinal In./In./°F	5 x 10^{-6}	5 x 10^{-6}	5 x 10^{-6}	5 x 10^{-6}	5 x 10^{-6}
Max recommended operation temp - based on 50% retention of ultimate thread shear strength °F (°C)	200°(93°)	200°(93°)	200°(93°)	200°(93°)	200°(93°)
Stud weight, Lb./Ft.	0.07	0.12	0.18	0.28	0.50
Flammability	Self-extinguishing on all				

Note: 1 Ft.-Lb. = .138 kg-M; 1 Lb = .4536 kg; 1 PSI = 6.984 K Pa; Test results are for studs with single GRP hex nuts only, stainless steel nuts will result in reduced values. Proper safety factors should be applied to testing. All values are based on laboratory test results.

Fastener & Hanging Systems - Installation Guide

The Enduro fastener system is a vinyl ester resin and fiberglass composite with unique characteristics which make it ideal for many applications where high strength, non-metallic fasters are required.

Size	Thread Shear (single nut)	Maximum Installation Torque	Socket Size
3/8" - 16 UNC	1,250 Lbs.	4 Ft.-Lbs.	15/16"
1/2" - 13 UNC	2,200 Lbs.	8 Ft.-Lbs.	15/16"
5/8" - 11 UNC	3,100 Lbs.	16 Ft.-Lbs.	15/16"
3/4" - 10 UNC	4,500 Lbs.	24 Ft.-Lbs.	15/16"
1" - 10 UNC	6,500 Lbs.	50 Ft.-Lbs.	2"

For Access After Installation

If the assembly will require occasional removal of the nuts, the rod should be lightly coated with a dry lubricant, silicon spray, or a light oil prior to assembly.

For Permanent Installation

If the assembly is designed to be a permanent installation, the nuts and studs should be bonded with an epoxy adhesive.

Apply a light coating of adhesive to the stud and nut threads, then quickly secure the assembly before adhesive has time to set, otherwise the mil thickness of the adhesive will make it impossible to thread. Next, apply a thick coat of adhesive to the exposed stud and nut surfaces. This provides a locking mechanism which eliminates the need for extra torque and lock washers.

For Hanging System Installation

The optimum method of installation for a hanger system is to finger tighten the assembly and then only tighten the nuts one-half turn to secure any jam nut assemblies. Follow the permanent installation procedure whenever possible. This results in minimum torque and allows maximum thread shear.

To insure maximum resistance to chemical attack once the assembly is completed, the exposed stud thread and nut surfaces should be coated with Enduro's Field Cutting Sealant (Part No. ES-Q or ES-G; see pg. 25).

Metal & GRP Installation

When utilizing metal fasteners, connectors, or nuts, consideration must be given to reduced strengths. Enduro rod and nuts are designed with maximum thread engagement and extra nut thickness. Metal products have less thread engagement. When installation requires metal components, special tests may be necessary to define ultimate strengths of the fastener systems.

For Beam Clamp Installation

Maximum installation torque of 10 foot-pounds is recommended to secure set screw.

Site Conditions

Vibration and dynamic loading conditions on the Enduro fastener assembly should be eliminated or minimized. If this is not possible, additional safety factors should be used in designed the fastener system.

Tools Required

The oversize hex nut design of the Enduro nut requires a larger than normal socket wrench, but either a six point or twelve point socket will work.
Important - do not exceed the torque values listed in the table above.

Caution

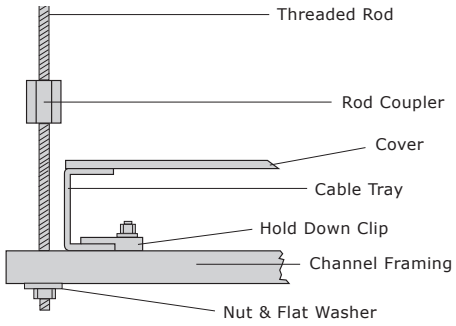
Do not over torque the Enduro nut and rod. The thread shear and torque values are NOT mutually exclusive, they are additive

Example

1/2" - 13 has a thread shear of 2,200 Lbs. and an ultimate torque strength of 18 ft-lbs. If you use the maximum installation torque of 8 ft-lbs, the amount of thread shear remaining is reduced to 1,225 lbs.

Specifying engineers should apply this information at the design stage, applying the proper safety factors to ensure a secure installation.

Typical Hanging Support System



Instrument & Pushbutton Stands

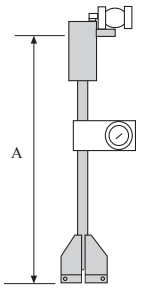
Enduro's universal instrument support system offers many of the same features and benefits as our cable tray, strut and wireway systems. Enduro instrument and pushbutton stands are built to any configuration required, including, single or double post, large mounting panel (switch rack/station) type designs, and any mounting requirements needed. For all configurations, please specify dimensions in inches.

Enduro Instrument & Pushbutton Stand Benefits:

- Costs less than stainless steel systems & competitive with most metallic systems
- Faster assembly time than metallic systems due to easy cut, fit, and adhesive design
- Lighter weight with corrosion resistance comparable to stainless steel and galvanized stand designs
- Compatible with metallic post bases and metallic support structures
- Easily built on site allowing for design freedom and increasing response time
- Constructed from 2" Schedule 80 gray vinyl ester base for superior corrosion resistance
- 2" SteelFree™ U-Bolt (shown below) may be used to attach instruments and/or gauges to the supports

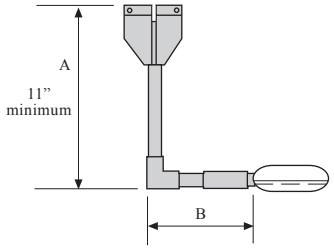
Floor Mount Single

Part No. Key*
DISR170B1 x (A)



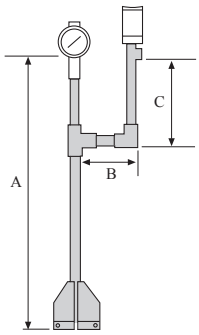
Column or Wall Mount

Part No. Key*
DISR175B48 x (A) x (B)



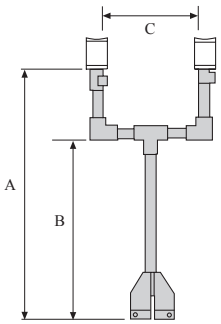
Floor Mount, Multiple Instrument

Part No. Key*
DISR172B x (A) x (B) x (C)



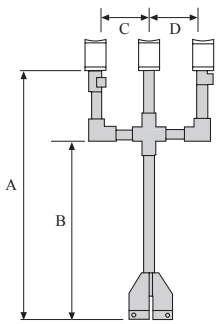
Floor Mount Double

Part No. Key*
DISR171B x (A) x (B) x (C)



Floor Mount Triple

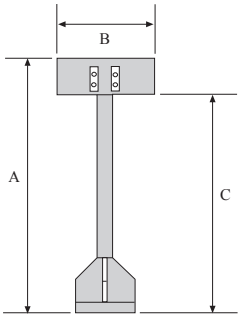
Part No. Key*
DISR173T x (A) x (B) x (C) x (D)



Pushbutton Station

Part No. Key*
DPS x (A) x (B) x (C)

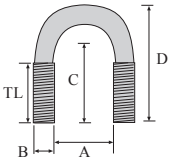
Made of pultruded fiberglass reinforced vinyl ester 2" square tube with an 8" square vinyl ester base at 6 1/2" high. Please specify dimensions in inches.



U-Bolts

Part No.	Pipe Nom. Dia.	A	B	C	D	TL	Max Rec. Loading Lbs.	Max Rec. Torque In.-Lbs.
EU050	½"	0.93	0.375	1.56	2.41	1.25	75	20
EU070	¾"	1.12	0.375	1.66	2.60	1.25	75	20
EU100	1"	1.37	0.375	1.78	2.85	1.25	75	20
EU125	1¼"	1.68	0.375	1.94	3.16	1.25	75	20
EU150	1½"	2.00	0.375	2.10	3.47	1.25	75	20
EU200	2"	2.43	0.500	2.46	4.18	1.50	150	40
EU250	2½"	2.93	0.500	2.71	4.68	1.50	150	40
EU300	3"	3.56	0.500	3.03	5.31	1.50	150	40
EU350	3½"	4.06	0.500	3.28	5.81	1.50	150	40
EU400	4	4.56	0.500	3.53	6.31	1.50	150	40

Made from glass reinforced polyurethane resin, u-bolts are the ideal choice for mounting enclosures, instrumentation, conduit, and piping on your Enduro instrument and pushbutton support systems.
Excellent as an alternative when replacing corroded steel u-bolts.
Recommended for operating temperatures up to 150 °F.
Four nuts included with each u-bolt.



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