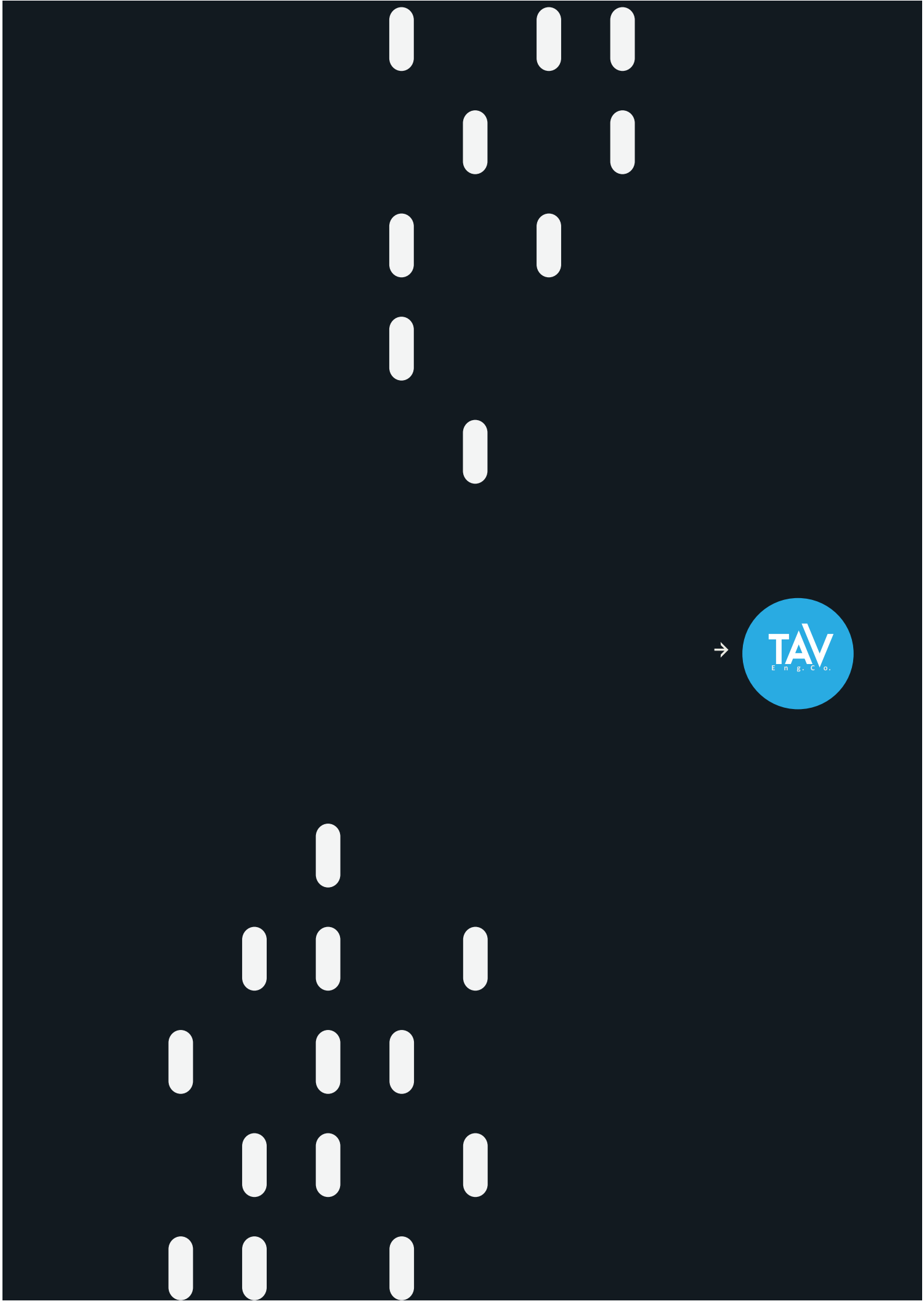
...Cable Way System


TAV
Eng.Co.

→ ...**The Bests** Choose The Best.

...**Cable Way** System

Introduction

: **TAV Eng. Co.** was established in 2001 with the purpose of supplying & Producing some of the electrical & instrumental materials.

... For achieving to these goals, constant promotion of products' quality, presentation of engineering, consulting & designing services, according to all the project experts' & designers' viewpoints and also with considering International terms & standards, confirmed in authorized scientific associations and different industries, has been always the title page of our managers.

We started our activity in a Tehran central office in 200m^2 area with 9 expert and specialized personnel, equipped with all technical and engineering soft & hardware facilities, presenting engineering services to produce all kinds of panels (Switchboards), cable carrying systems (cable trays, cable ladders & accessories), instrument junction boxes, earthing & lightning materials.

In order to manufacturing our products, we also, established our workshop in Khoramdasht industrial city with 1000m^2 area with 18 specialized personnel, equipped with all kinds of production machineries, laboratorial test, QC equipments with the help of our experienced experts.

Considering all above conditions, TAV has been successful to satisfy the customers' needs. Now, lots of prosperous achievements in our projects, had made our managers believe that the only way to attain presentation of a high quality products, confirmed by up-to-dated standards, being a self-producer, is to take advantage of developed countries' producing methods & using them in our country.

TAV, has been also succeeded in getting Certificate of Quality from SGS (ISO 9001), and now is planning to gain the other valid (safety, managing) certificates. Following our firm relation with lots of well-known manufacturers such as Rittal (Germany), Scame (Italy), now we have been joined with CE-TEK Co. enabling us to supply some products explosion proof panel under their licence.

TAV also, extends its company with its new plant in Eshtehard industrial city with 2000m^2 producing area & 500m^2 laboratory & office area equipped by modern machineries with the latest technology.

These series of catalogue try to get you acquainted with TAV Eng. Co. potential abilities in supplying electrical panels, electrical & instrumental Junction Boxes (Industrial type, Ex. Type), cable carrying systems for power & control cables & earthing equipments.

Content

→ TAV **Departments**

- Design & Sales Engineering Department
- Production Department
- Quality Control (QC) Department
- Packing Department
- After Sales Services Department
- R&D Department
- Commercial Department

... **TAV** & Departments

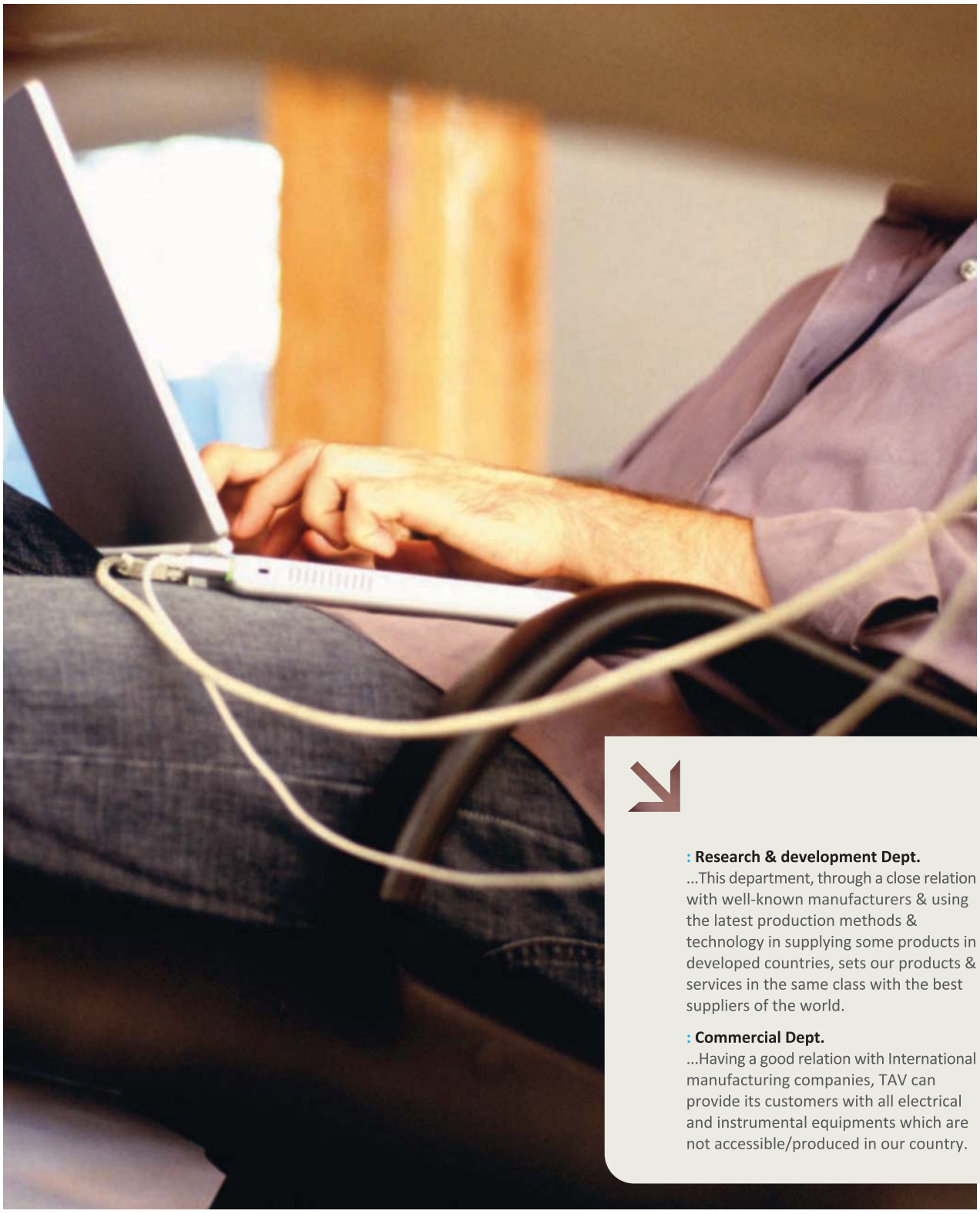
: Design & Sales Engineering Dept.
...TAV makes it possible to design your recommendations in various ranges, concerning all necessities & requirements of projects with the help of all kinds of hard & soft wares and also great knowledge of our experienced specialists. Besides, this department is responsible for having relation with our customers, getting their point of view in different projects, and preparing the work shop drawings.

: Production Dept.
...With the help of modern machineries, the latest technologies, professional specialists, and recommendations designed by our sales engineering Dept. (which is confirmed by the clients) are produced & ready to be tested by QC Dept.

: Quality Control (QC) Dept.
...This department, based on technical-engineering ability & permanent inspections of all production process according to confirmed standards & customers' viewpoints, with all necessary tests during and after the process of producing, is a good warranty for our clients.

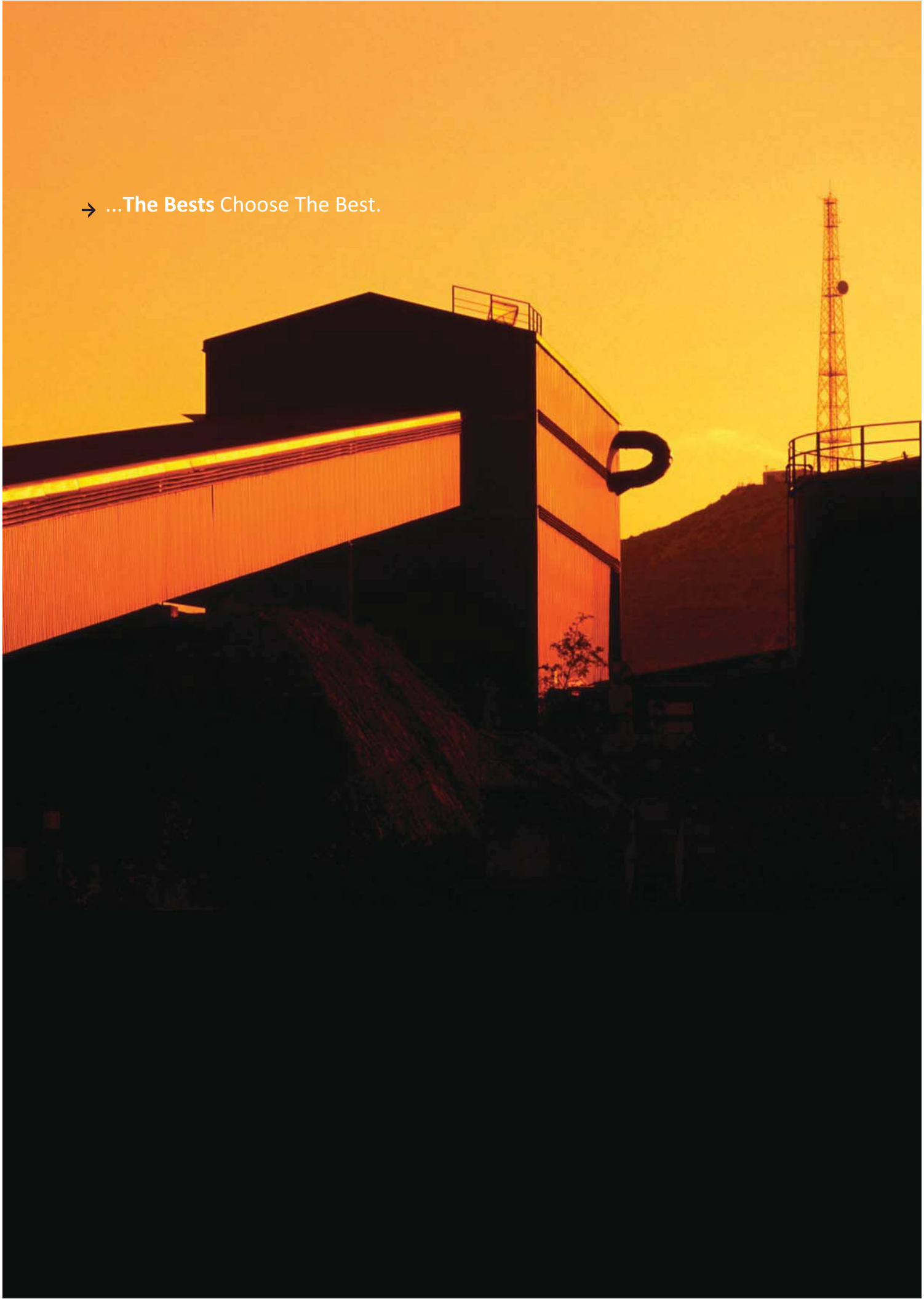
: Packing Dept.
...Our products are being packed in wooden resistant pallets, considering all conditions & terms of loading, un loading & transporting with the best quality and finally ready to be shipped in a shapely packages.

: After Sales Services Dept. (A.S.S.)
...Our after sales services, such as supplying spare parts, repairing or replacing the damaged items during and after the guarantee, is a confident warranty for your recommendations



: Research & development Dept.
...This department, through a close relation with well-known manufacturers & using the latest production methods & technology in supplying some products in developed countries, sets our products & services in the same class with the best suppliers of the world.

: Commercial Dept.
...Having a good relation with International manufacturing companies, TAV can provide its customers with all electrical and instrumental equipments which are not accessible/produced in our country.


→ ...**The Bests** Choose The Best.

: General Information

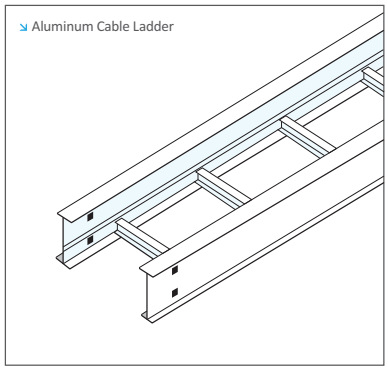
... Preface

: In this catalogue, full range of TAV products for cable trays, cable ladders & supporting system according to the needs of different projects are gathered.
The main reason of high quality products is the usage of experts' knowledge with the help of modern machinery.
Taking all environmental factors into account such as; loading, influence of wind, corrosion & etc, in the process of producing cause the useful life increased & the expense decreased during the operation.
High flexibility during the production process according to the needs & recommendations of clients by taking all the conditions & limitations of the project into account in ***shorter time*** is another positive parameter of this company in cable way engineering department.

... Material

Standards Available - Material

Material	Material Specification	Advantages
Aluminum	6063-T6 (Side rails, Rungs and Splice Plates) 5052-H32 (Trough Bottoms, Covers and Accessories)	▫ Corrosion Resistance ▫ Easy Field Fabrication & Installation ▫ Excellent Strength to Weight Ratio ▫ Excellent Grounding Conductor
Steel	ASTM A1011 SS Gr. 33 ASTM A1008 Gr. 33 Type 2 ASTM A653 SS Gr. 33 G90 (Pre-Galvanized)	▫ Electric Shielding ▫ Finish Options ▫ Low Thermal Expansion ▫ Limited Deflection
Stainless Steel	AISI Type 304 or AISI Type 316 ASTM A240	▫ Superior Corrosion Resistance ▫ Withstands High Temperatures


Aluminum Cable Ladder

: Aluminum

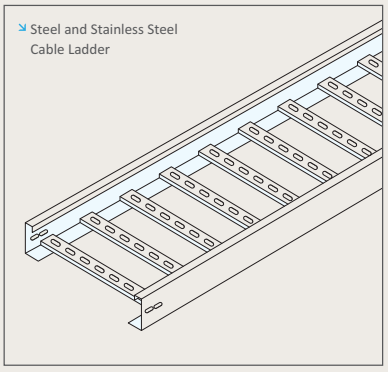
Aluminum cable trays are fabricated from structural grade "copper free"(marine grade) aluminum extrusions.
Aluminum's excellent corrosion resistance is due to its ability to form an aluminum oxide film that when scratched or cut reforms the original protective film.
Aluminum has excellent resistance to "weathering" in most outdoor applications.
Aluminum cable tray has excellent corrosion resistance in many chemical environments. Typically, aluminum cable trays can perform indefinitely, with little or on degradation over time, making it ideal for many chemical and marine environments. The resistance to chemicals, indoor and outdoor, can best be determined by tests conducted by the user with exposure to the specific conditions for which it is intended.

: Stainless Steel

Stainless Steel cable trays are fabricated from continuous roll-formed non-magnetic stainless steel.
Several important conditions could make the use of stainless steel imperative. These include long term maintenance costs, corrosion resistance, appearance and locations where product contamination is undesirables.
Stainless steel exhibits stable structural properties such as yield strength and high creep strength at elevated temperatures.
TAV's stainless steel cable trays are welded using stainless steel welding wire to ensure each weldment exhibits the same corrosion resistant characteristic as the base metal.

: Sheet Steel

Steel cable trays are fabricated from continuous roll-formed structural quality steel.
By roll-forming steel; the mechanical properties are increased allowing the use of a lighter gauge steel to carry the required load.
This reduces the dead weight that must be carried by the supports and the installers.
Using structural quality steel, TAV assures that the material will meet the minimum yield and tensile strengths of applicable ASTM standards.
All cable tray side rails, rungs and splice plates are numbered for material traceability.
The corrosion resistance of steel varies widely with coating and alloy.

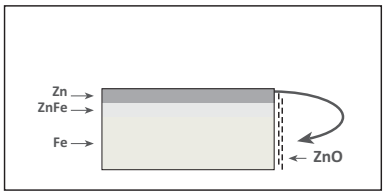

Steel and Stainless Steel Cable Ladder

... Finish

: Zinc Coatings

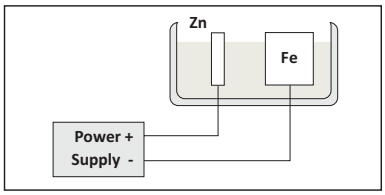
Zinc protects steel in tow ways. First it protects the steel as a coating and second as a sacrificial anode to repair bare areas such as cut edges, scratches and gouges. The corrosion protection of zinc is directly related to its thickness and the environment. It includes the following terms;

↘ Galvanizing also protects cut and drilled edges



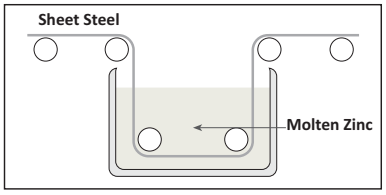
a. Electro galvanized Zinc

Electro galvanized Zinc (also known as zinc or electroplated) is the process by which a coating of zinc is deposited on the steel by electrolysis from a bath of zinc salts. When exposed to air and moisture, zinc forms a tough, adherent, protective film consisting of a mixture of zinc oxides, hydroxides, and carbonates. This film is in itself a barrier coating which slows subsequent corrosive attack on the zinc. This coating is usually recommended for indoor use and dry areas, as it provides ninety-six hours protection in salt spray testing per ASTM B117.



b. Pre-Galvanized Zinc

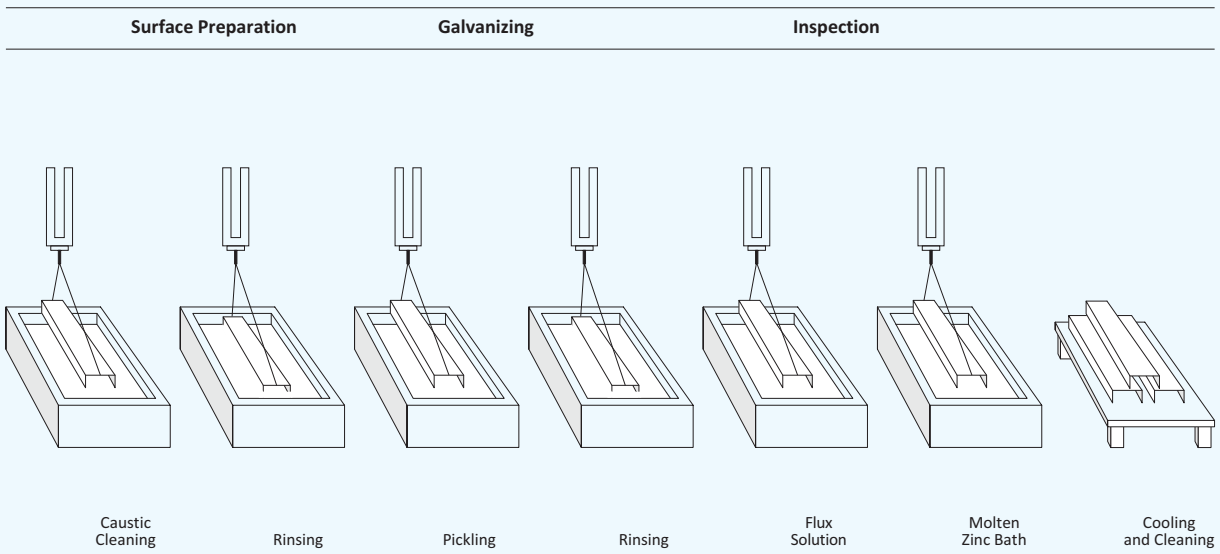
(Mill galvanized, hot dip mill galvanized or continuous hot dip galvanized)
Pre-galvanized steel is produced by coating coils of sheet steel with zinc by continuously rolling the material through molten zinc at the mills. This is also known as mill galvanized or hot dip mill galvanized. Theses coils are then slit to size and fabricated by roll forming, shearing, punching, or forming to produce TAV pre-galvanized cable tray and ladder products. The G90 specification calls for a coating of .90 ounces of zinc per square foot of steel (0.274 kg/m²).
This results in a coating of 0.45 ounces per square foot on each side of the sheet. During fabrication, cut edges and welded areas are not normally zinc coated; however, the zinc near the uncoated metal becomes a sacrificial anode to protect the bare areas after a short period of time.



Standards Available - Finish

Finish	Specification	Recommended Use
Electyogalvanized Zinc	ASTM B633 (For Cable Tray & Ladder Hardware and Accessories, Alum. and Pre-Galv).	▫ Dry Areas ▫ Indoor
Pre-Galvanized Zinc	ASTM A-653 SS Gr. 33 G90 (Pre-Galvanized) (Steel Cable Tray & Ladder And Fittings).	▫ Dry Areas ▫ Indoor
Hot Dip Galvanized Zinc After Fabrication	ASTM A123 (Steel Cable Tray & Ladder And Fittings).	▫ Outdoor ▫ Indoor

c. **Hot Dip Galvanized After fabrication**
(Hot dip galvanized or batch hot dip galvanized)



Hot Dip Galvanized after Fabrication cable tray and ladder products are fabricated from steel and then completely immersed in a bath of molten zinc. A metallic bond occurs resulting in a zinc coats all surfaces, including edges and welds.
Another advantage of this method is coating thickness. Cable trays hot dip galvanized after fabrication have a minimum thickness of 1.50 ounces persquare foot (0.4 kg/m²) each side, or atotal 3.0 ounces per square foot of steel (0.8 kg/m²), according to ASTM A123.
The zinc thickness is controlled by the amount of time each part is immersed in the molten zinc bath as well as the speed at which it is removed. The term 'double dipping' refers to parts too large to fit into the galvanizing kettle and, therefore, must be dipped one end at a time. It does not refer to extra coating thickness.
The layer of zinc which bonds to steel provides a dual protection against corrosion. It protects first as anoverall barrier coating. If this coating happens to be scratched or gouged, zinc's secondary defenses is called upon to protect the steel by galvanic action.
Hot dip galvanized after fabrication is recommended for prolonged outdoor exposure and will protect steel for many years in most outdoor environments and in many aggressive industrial environments.

... Corrosion

All metal surfaces are affected by corrosion. Depending on the physical properties of the metal and the environment to which it is exposed, chemical or electromechanical corrosion may occur.

a. Atmospheric Corrosion
Atmospheric corrosion occurs when when metal is exposed to air-borne liquid, solids or gases. Some sources of atmospheric corrosion are moisture, salt, dirt and sulphuric acid. This form of corrosion is typically worse outdoors, especially near marine environments.

b. Chemical Corrosion
chemical corrosion takes place when metal comes in direct contact with a corrosive solution. Some factors which affect the severity of chemical corrosion include: chemical concentration level, duration of contact, frequency of washing, and operating temperature.

c. Storage Corrosion
Wet storage stain (white rust) is caused by the entrapment of moisture between surfaces of closely packed and poorly ventilated material for an extended period. Wet storage stain is usually superficial, having no affect on the properties of the metal.
Light staining normally disappears with weathering. Medium to heavy build up should be removed, in order to allow the formation of normal protective film. Proper handling and storage will help to assure stain-free material. If product arrives wet, it should be unpacked and dried before storage. Dry material should be stored in a well ventilated 'low moisture' environment to avoid condensation formation. Outdoor storage is undesirable, and should be avoided whenever possible.

d. Galvanic Corrosion
Galvanic corrosion occurs when two or more dissimilar metals are in contact in the presence of an electrolyte (i.e. moisture). An electrolytic cell is created and the metals form an anode or a cathode depending on their relative position on the Galvanic Series Table. The anodic material will be the one to corrode. Whether a material is anodic depends on the relative position of the other material.

↘ Galvanic Series In Sea Water

Anodic End

More Anodic ↑

- Magnesium
- Magnesium Alloys
- Zinc
- Beryllium
- Aluminum - Zinc Alloys (7000 series)
- **Aluminum - Magnesium Alloys (5000 series)**
- Aluminum (1000 series)
- Aluminum - Magnesium Alloys (3000 series)
- **Aluminum - Magnesium - Silicon Alloys (6000 series)**
- Cadmium
- Aluminum - Copper Alloys (2000 series)
- Cast Iron, Wrought Iron, Mild Steel
- Austenitic Nickel Cast Iron
- Type 410 Stainless Steel (active)
- **Type 316 Stainless Steel (active)**
- **Type 304 Stainless Steel (active)**
- Naval Brass, Yellow Brass, Red Brass
- Tin
- Copper
- Lead-Tin Solders
- Admiralty Brass, Aluminum Brass
- Manganese Bronze
- Silicon Bronze
- Tin Bronze
- Type 410 Stainless Steel (passive)
- Nickel-Silver
- Copper Nickel Alloys
- Lead
- Nickel - Aluminum Bronze
- Silver Solder
- Nickel 200
- Silver
- Type 316 Stainless Steel (Passive)
- Type 304 Stainless Steel (Passive)
- Incoloy 825
- Hastelloy B
- Titanium
- Hastelloy C
- Platinum
- Graphite

Cathodic End

... Thermal Contraction and Expansion

: It is important that thermal contraction and expansion be considered when installing cable tray systems.
The length of the straight cable tray runs and the temperature differential govern the number of expansion splice plates required .

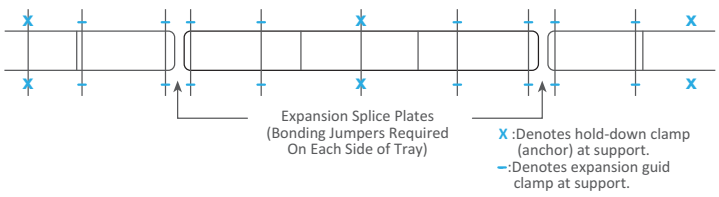
Maximum Spacing Between Expansion Joints For 1" (2.5 cm) Movement

Temperature Differential		Aluminum		Steel		Stainless Steel	
°F	°C	Feet	Meter	Feet	Meter	Feet	Meter
25	13.9	260	79.2	512	156	347	105.7
50	27.8	130	39.6	256	78	174	53
75	41.7	87	26.5	171	52.1	116	35.4
100	55.6	65	19.8	128	39	87	26.5
125	69.4	52	15.8	102	31.1	69	21
150	83.3	43	13.1	85	25.9	58	17.7
175	97.2	37	11.3	73	22.2	50	15.2

Note: every pair of expansion splice plates requires two bonding jumpers for grounding continuity.

: The cable tray should be anchored at the support nearest to its midpoint between the expansion splice plates secured by expansion guides at all other support locations.

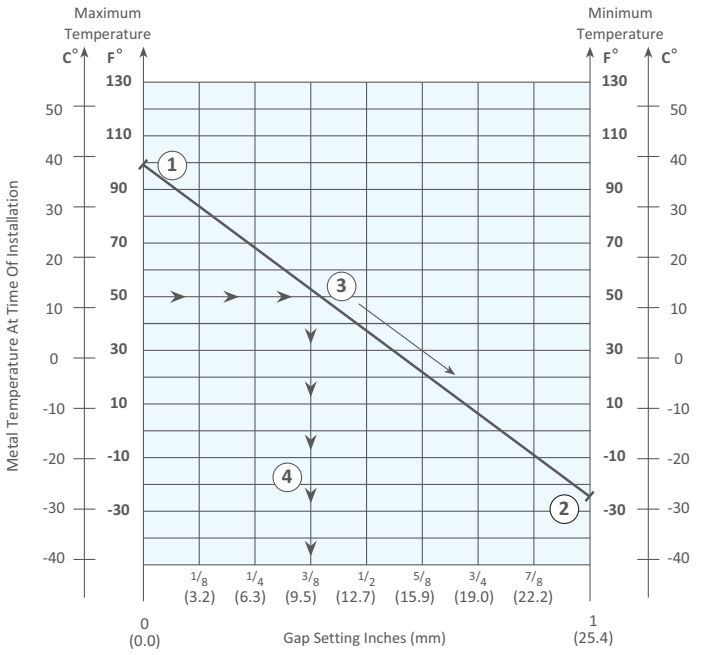
Typical Cable Tray Installation

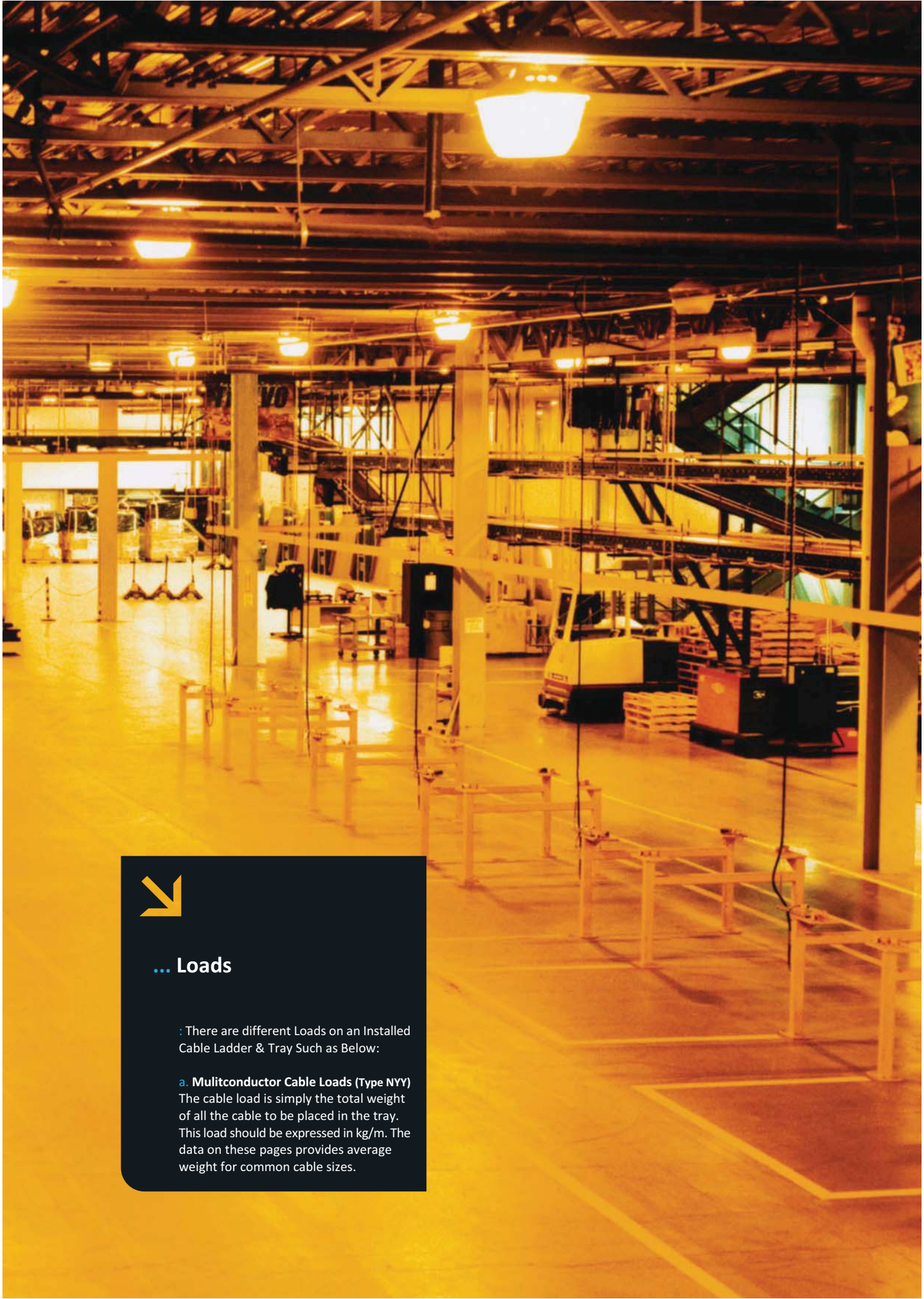


: The cable tray should be permitted longitudinal movement in both directions form that fixed point.
When used, covers should be overlapped at expansion splices.

: Accurate gap settings at the time of installation are necessary for the proper operation of the expansion splice plates. The following procedure should assist the installer in determining the correct gap.

1. Plot the highest expected metal temperature on the maximum temperature line.
2. Plot the lowest expected metal temperature on the minimum temperature line.
3. Draw a line between the maximum and minimum points.
4. Plot the metal temperature at the time of installation to determine the gap setting.





... Loads

: There are different Loads on an Installed Cable Ladder & Tray Such as Below:

a. **Mulitconductor Cable Loads (Type NYY)** The cable load is simply the total weight of all the cable to be placed in the tray. This load should be expressed in kg/m. The data on these pages provides average weight for common cable sizes.

Low & Medium Voltage Copper Conductors	Type NYY			Inside Height: 40 mm		Inside Height: 60 mm		Inside Height: 80 mm		Inside Height: 100 mm	
Cable Cross-Section 4x...mm	Cable Outside Ø appr.mm	Cable Weight appr.kg/m	Smallest Allowable Radius mm	Number of Cable appr.	Total Cable Weight appr.kg/m	Number of Cable appr.	Total Cable Weight appr.kg/m	Number of Cable appr.	Total Cable Weight appr.kg/m	Number of Cable appr.	Total Cable Weight appr.kg/m
Width: 100mm											
4 x											
1.5	12.5	0.23	150	17	3.91	32	7.36	41	9.43	52	11.96
2.5	14	0.3	170	12	3.6	21	6.3	34	10.2	45	13.5
4	15.5	0.41	190	8	3.28	18	7.38	30	12.3	33	13.53
6	16.5	0.52	200	8	4.16	16	8.32	24	12.48	31	16.12
10	18.5	0.72	230	7	5.04	11	7.92	20	14.4	27	19.44
16	22	1.1	270	6	6.6	9	9.9	13	14.3	17	18.7
25	27.5	1.65	330			7	11.55	10	16.5	10	16.5
35	31	2.15	380			5	10.75	8	17.2	7	15.05
50	36	3.1	440			4	12.4	6	18.6	4	12.4
70	41	4.1	500			4	16.4	5	20.5	3	12.3
95	47	5.5	570			4	22	4	22	3	16.5
120	51	6.7	620					3	20.1	2	13.4
150	57	8.3	690					3	24.9	1	8.3
185	63	10.2	760					3	30.6	1	10.2
240	71	13	860					3	39	1	13
Width: 200mm											
4 x											
1.5	12.5	0.23	150	34	7.82	64	14.72	82	18.86	104	23.92
2.5	14	0.3	170	24	7.2	42	12.6	68	20.4	90	27
4	15.5	0.41	190	16	6.56	36	14.76	60	24.6	66	27.06
6	16.5	0.52	200	16	8.32	32	16.64	48	24.96	62	32.24
10	18.5	0.72	230	14	10.08	22	15.84	40	28.8	54	38.88
16	22	1.1	270	12	13.2	18	19.8	26	238.6	34	37.4
25	27.5	1.65	330			14	23.1	20	33	20	33
35	31	2.15	380			10	21.5	16	34.4	14	30.1
50	36	3.1	440			8	24.8	12	37.2	8	24.8
70	41	4.1	500			8	32.8	10	41	6	24.6
95	47	5.5	570			8	44	8	44	6	33
120	51	6.7	620					6	40.2	4	26.8
150	57	8.3	690					6	49.8	2	26.6
185	63	10.2	760					6	61.2	2	20.4
240	71	13	860					6	78	2	26
Width: 300mm											
4 x											
1.5	12.5	0.23	150	51	11.73	96	22.8	123	28.29	156	35.88
2.5	14	0.3	170	36	10.8	63	18.9	102	30.6	135	40.5
4	15.5	0.41	190	24	9.84	54	22.14	90	36.9	99	40.59
6	16.5	0.52	200	24	12.48	48	24.96	72	37.44	93	48.36
10	18.5	0.72	230	21	15.12	33	23.76	60	43.2	81	58.32
16	22	1.1	270	18	19.8	27	29.7	39	42.9	51	56.1
25	27.5	1.65	330			21	34.65	30	49.5	30	49.5
35	31	2.15	380			15	32.25	24	51.6	21	45.15
50	36	3.1	440			12	37.2	18	55.8	12	37.2
70	41	4.1	500			12	49.2	15	61.5	9	36.9
95	47	5.5	570			12	66	12	66	9	49.5
120	51	6.7	620					9	60.3	6	40.2
150	57	8.3	690					9	74.7	3	24.9
185	63	10.2	760					9	91.8	3	30.6
240	71	13	860					9	117	3	39

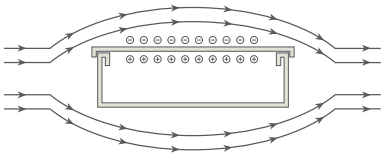
Low & Medium Voltage Copper Conductors		Type NYY			Inside Height: 40 mm		Inside Height: 60 mm		Inside Height: 80 mm		Inside Height: 100 mm	
Cable Cross-Section 4x...mm	Cable Outside Ø appr.mm	Cable Weight appr.kg/m	Smallest Allowable Radius mm	Number of Cable appr.	Total Cable Weight appr.kg/m	Number of Cable appr.	Total Cable Weight appr.kg/m	Number of Cable appr.	Total Cable Weight appr.kg/m	Number of Cable appr.	Total Cable Weight appr.kg/m
Width: 400mm											
4 x											
1.5	12.5	0.23	150	68	15.64	128	29.44	164	37.72	208	47.84
2.5	14	0.3	170	48	14.4	84	25.2	136	40.8	180	54
4	15.5	0.41	190	32	13.12	72	29.52	120	49.2	132	54.12
6	16.5	0.52	200	32	16.64	64	33.28	96	49.92	124	64.48
10	18.5	0.72	230	28	20.16	44	31.68	80	57.6	108	77.76
16	22	1.1	270	24	26.4	36	39.6	52	57.2	68	74.8
25	27.5	1.65	330			28	46.2	40	66	40	66
35	31	2.15	380			20	43	32	68.8	28	60.2
50	36	3.1	440			16	49.6	24	74.4	16	49.6
70	41	4.1	500			16	65.6	20	82	12	49.2
95	47	5.5	570			16	88	16	88	12	66
120	51	6.7	620					12	80.4	8	53.6
150	57	8.3	690					12	99.6	4	33.2
185	63	10.2	760					12	122.4	4	40.8
240	71	13	860					12	156	4	52
Width: 500mm											
4 x											
1.5	12.5	0.23	150	85	19.55	160	36.8	205	47.15	260	59.8
2.5	14	0.3	170	60	18	105	31.5	170	51	225	67.5
4	15.5	0.41	190	40	16.4	90	36.9	150	61.5	165	67.65
6	16.5	0.52	200	40	20.8	80	41.6	120	62.4	155	80.6
10	18.5	0.72	230	35	25.2	55	39.6	100	72	135	97.2
16	22	1.1	270	30	33	45	49.5	65	71.5	85	93.5
25	27.5	1.65	330			35	57.75	50	82.5	50	82.5
35	31	2.15	380			25	53.75	40	86	35	75.25
50	36	3.1	440			20	63	30	93	20	62
70	41	4.1	500			20	82	25	102.5	15	61.5
95	47	5.5	570			20	110	20	110	15	82.5
120	51	6.7	620					15	100.5	10	67
150	57	8.3	690					15	124.5	5	41.5
185	63	10.2	760					15	153	5	51
240	71	13	860					15	195	5	65
Width: 600mm											
4 x											
1.5	12.5	0.23	150	102	23.46	192	44.16	246	56.58	312	71.76
2.5	14	0.3	170	72	21.6	126	37.8	204	61.2	270	81
4	15.5	0.41	190	48	19.68	108	44.28	180	73.8	198	81.18
6	16.5	0.52	200	48	24.96	96	49.92	144	74.88	186	96.72
10	18.5	0.72	230	42	30.24	66	47.52	120	86.4	162	116.64
16	22	1.1	270	36	39.6	54	59.4	78	85.8	102	112.2
25	27.5	1.65	330			42	69.3	60	99	60	99
35	31	2.15	380			30	64.5	48	103.2	42	90.3
50	36	3.1	440			24	74.4	36	111.6	24	74.4
70	41	4.1	500			24	98.4	30	123	18	73.8
95	47	5.5	570			24	132	24	120.6	18	99
120	51	6.7	620					18	149.4	12	80.4
150	57	8.3	690					18	183.6	6	49.8
185	63	10.2	760					18	234	6	61.2
240	71	13	860					18		6	78

b. Environmental Loads

b 1. **Wind Loads**

Wind loads need to be dertermined for all outdoor cable tray installations. the most severe loading to be cable considered is impact pressure normal to the cable tray side rails.

: When covers are installed on outdoor cable trays, another factor to be considered is the aerodynamic effect which can produce a tray. Wind moving across a covered tray creates a positive perssure inside the tray and a negetive pressure above the cover.This presure difference can lift the cover off the tray.



TAV recommends the use of heavy duty wraparound cover clamps when covered trays are installed in an area where strong winds occur.

Special Notice

Covers on wind cable tray and/or cable tray installed at elevations high off the ground may require additional heavy duty clamps or thicker cover material.

b 2. **Ice Loads**

Glaze ice is the most commonly seen form of ice build-up. It is the result of rain or drizzle freezing on impact with an exposed object. Generally, only the top surface (or the cover) and the windward side of a cable tray system is significantly to be added due to ice should be calculated. The maximum design load to be added due to ice. should be calculated as follows:

$$Li=(\frac{W \times Ti}{144})x\ Di \text{ where;}$$

Li= Ice Load (lbs/Linear foot)
W= Cable Tray Width (inches)
Ti= Maximum Ice Thickness (inches)
Di= Ice Density = 57 lbs/ft^3
the maximum ice thickness wall vary depending on location.A thickness of $1/_2$" can be used as a conservative standard.

b 3. **Snow Load**

Snow is measured by density and thickness. The density of snow varies almost as much as its thickness.
The additional design load from snowfall should be determined using the building codes witch apply for each Installation.

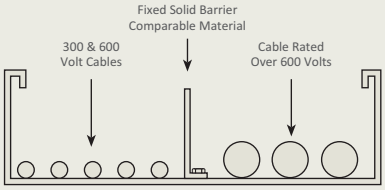
b 4. **Concentrated loads**

A concentrated static load represents a static weight applied at a single point between the side rails.
Tap boxes, conduit attachments and long cable drops are just some of the many types of concentrated loads.

WARNING! NOT TO BE USED AS A WALKWAY, LADDER OR SUPPORT FOR PERSONNEL. TO BE USED ONLY AS A MECHANICAL SUPPORT FOR CABLE WAY.

... Additional Consideration

: Barrier Requirements
Barrier strips are used to separate cable systems, such as when cable above and below 600 volts per NEC 392.6(F) are in the same cable tray. The barriers should be made of the same material type as the cable tray.



: Future Expansion Requirements
One of the many features of cable tray is the ease of adding cables to an existing system. Future expansion should always be considered when selecting a cable tray, and allowance should be made for additional fill area and load capacity.
A minimum of 30% expansion allowance is recommended.

: Space limitations
Any obstacles which could interfere with a cable tray installation should be considered when selecting a cable tray width and height. Adequate clearances should be allowed for installation of supports and for cable accessibility.

... Installition Consideration

: Weight
The weight of an aluminum cable tray is approximately half that of a comparable steel tray. Some factors to consider include: shipping cost, material, handling, poroject weight restrictions and the stregth of support members.

: Electrical Grounding Capacity
The National Electrical Code, Article 392.7 allows cable tray to be used as an equipment grounding conductor.
nema 392.7

: Field Modifications
Aluminum cable tray is easier to cut and drill than steel cable tray since it is a "softer" material.Similary, galvanized steel cable tray is easier to cut and drill than stainless steel cable tray.

: Installation Recommendation
Shorter cable tray lengths are typically easier to maneuver on the job site during installation. More people may be needed to manipulate longer cable tray sections, while shorter sections might be handled by one person.
Although longer cable tray lengths are more difficult to maneuver, they can reduce installation time due to the fact that there are fewer splice connections. This trade-off should be evaluated for each set of job sits restrictions.

Metal Area Requirements for Cable Tray & Ladder Used as Equipment Grounding Conductors

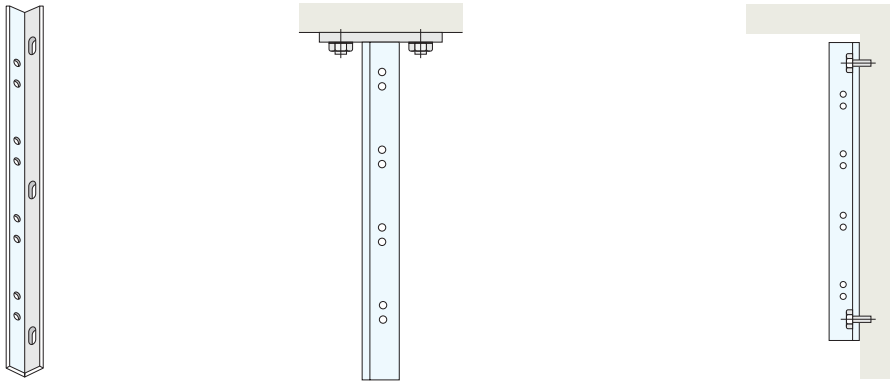
Maximum Fuse Ampere Rating Circuit Breaker Ampere Trip Setting, or Circuit Breaker Protective Relay Ampere Trip Setting for Ground Fault Protection of any Cable Circuit in the Cable Tray & Ladder System.	Minumum Cross-Sectional Area of Metal* in Square Inches	
	Steel Cable Tray & Ladders	Aluminum Cable Tray & Ladders
60	0.20	0.20
100	0.40	0.20
200	0.70	0.40
400	1.00	0.40
600	1.50**	0.60
1000	-	1.00
1200	-	1.50
1600	-	2.00**
2000	-	

:For Sl units: one square inch=645 square millimeters.
* Total cross-sectional area of both side rails for ladder or cable trays.
**Steel cable trays shall not be used as equipment grounding conductors for circuits with ground-fault protection above 600 amperes.
Aluminum cable trays shall not be used as equipment grounding conductors circuits with ground-fault protection above 2000 amperes.
:For larger ampere rating, an additional grounding conductor must be used.

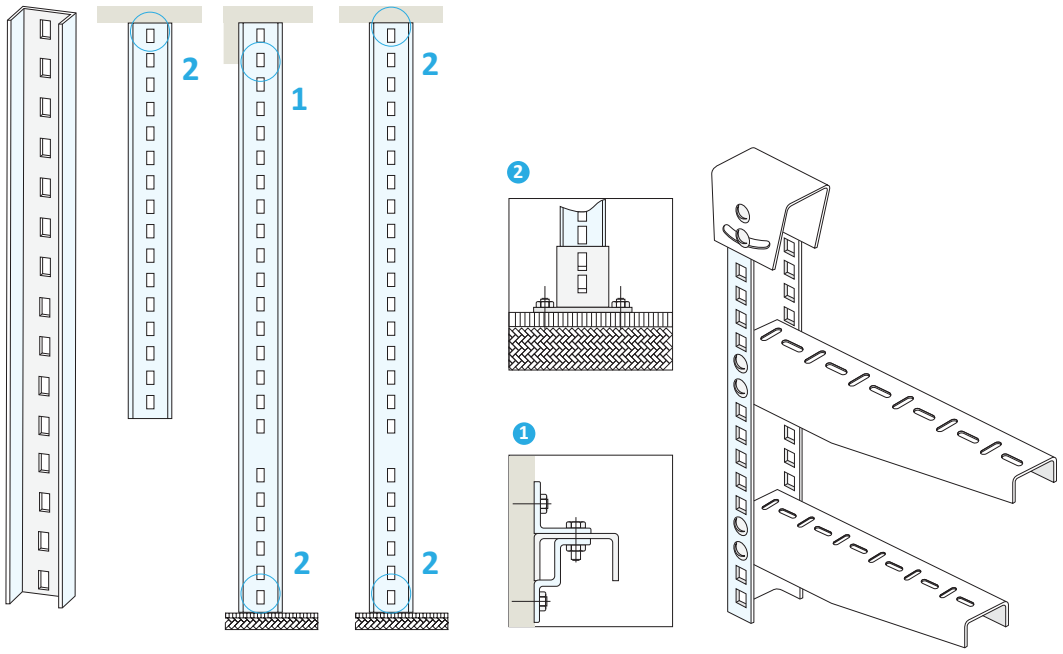
→ ...**The Bests** Choose The Best.

... Support System

: Support System



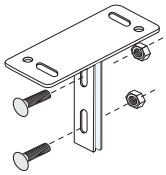
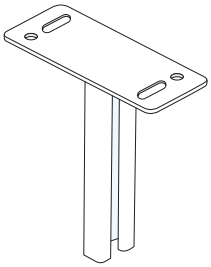
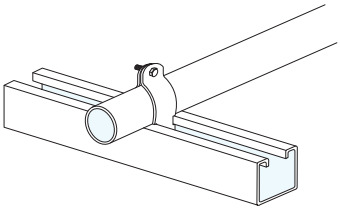
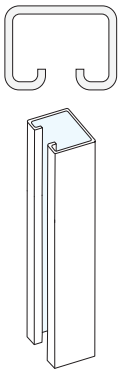
L - Type Support

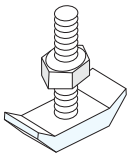
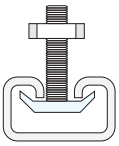
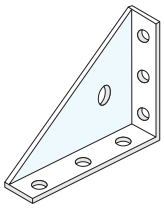
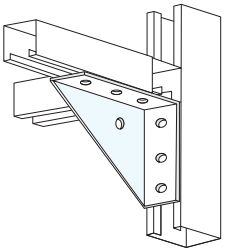


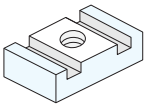
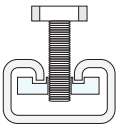
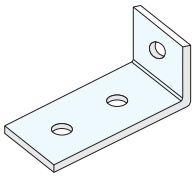
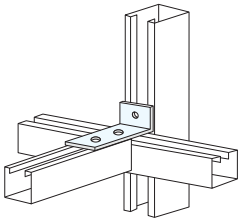
U - Type Support

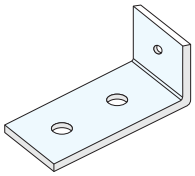
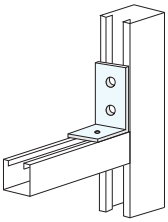
: Support System

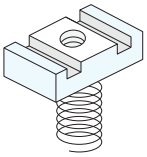
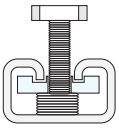
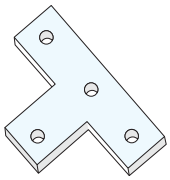
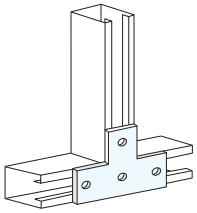
C Type Support & Bracket

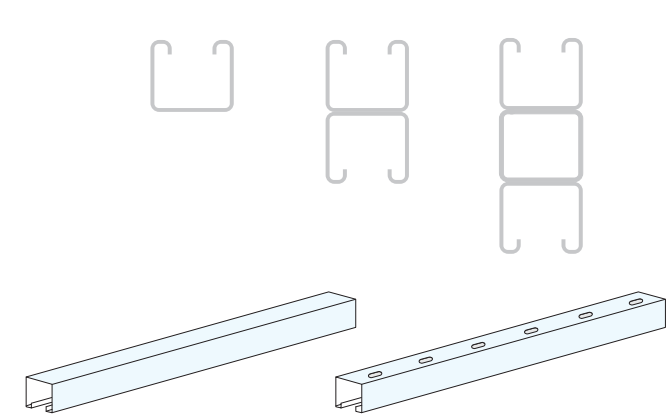





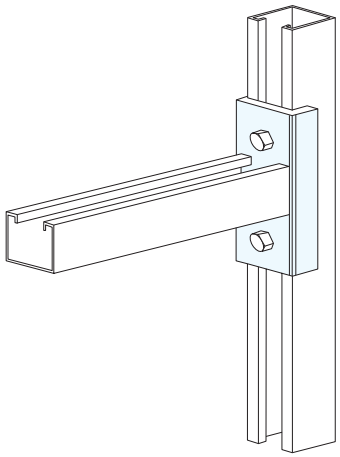





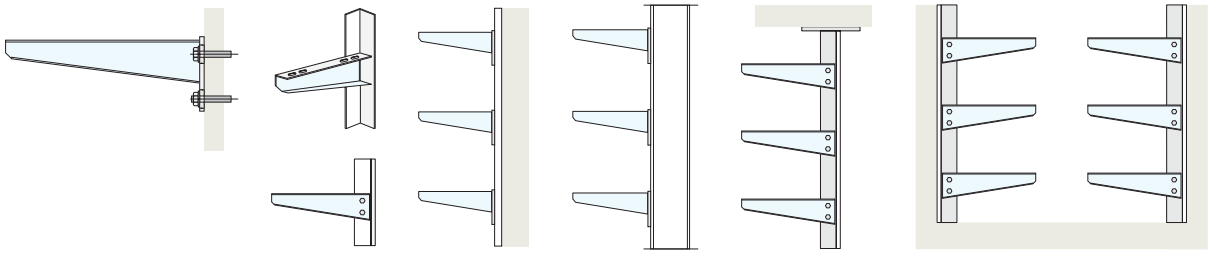



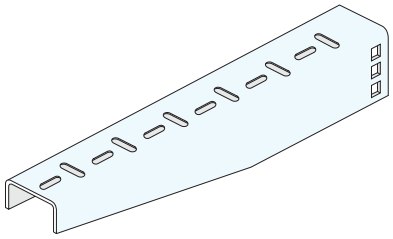


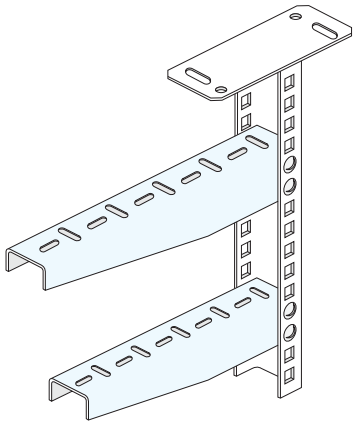


C Type Support & Bracket



L Type Bracket





U Type Bracket

Metric Conversion Chart

To Convert From	To	Multiply By
Angle		
degree	radian (rad)	0.0174532
radian (rad)	degree	57.295780
Area		
$foot^2$	square meter (m^2)	0.09290304
$inch^2$	square meter (m^2)	0.0064546×10^{-2}
circular mil	square meter (m^2)	$0.00005067075 \times 10^{-5}$
sq. centimeter (cm^2)	square inch (in^2)	0.15500030
square meter (m^2)	$foot^2$	10.763910
square meter (m^2)	$inch^2$	1550.0030
square meter (m^2)	circular mil	1973523000.0
Temperature		
degree Fahrenheit	degree Celsius	$t^{\circ C} = (t^{\circ F} - 32) / 1.8$
degree Celsius	degree Fahrenheit	$t^{\circ F} = 1.8t^{\circ C} + 32$
Force		
pounds - force (lbf)	newtons (N)	4.4482220
Length		
foot (ft)	meter (m)	0.30480
inch (in)	meter (m)	0.02540
mil	meter (m)	0.002540×10^{-5}
inch	micrometer (um)	25400.0
milimeters	inch (in)	0.039370
meter (m)	foot (ft)	3.280840
meter (m)	inch (in)	39.370080
meter (m)	mil	39370.0080
micrometer (um)	inch	$0.039370080 \times 10^{-3}$
Volume		
$foot^3$	cubic meter (cm^3)	0.028316850
$inch^3$	cubic meter (cm^3)	$0.16387060 \times 10^{-3}$
cubic centimeter (cm^3)	cubic inch (in^3)	0.061023740
cubic meter (cm^3)	$foot^3$	35.314660
cubic meter (cm^3)	$inch^3$	61023.760
gallon (U.S. liquid)	cubic centimeter (cm^3)	0.0037854120
Section		
section modulus S (in^3)	S (m^3)	$0.16387060 \times 10^{-3}$
moment of inertial (in^4)	I(m^4)	$0.00041623140 \times 10^{-3}$
modulus of elasticty E (psi)	E (Pa)	6894.7570
section modulus S (m^3)	S (in^3)	61023.740
moment of inertial (m^4)	I (in^4)	2402510.0
modulus of elasticty E (Pa)	E (psi)	0.1453770×10^{-2}

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