

	GOLGOHAR STEEL PROJECT	
	Technical Specification For Cable Tray, Ladder, Conduit & Accessories Bulk Material	
REV: 00	Barsoo Document No.:157DEDG1540101-00 Client Document No : S-SM01-D-BOP-WWTP-S PC-EL-001	Page 1 of 35

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00	ISSUED FOR APPROVAL	M.KHAVARI	F.NIKNAM	A.MONFARED	1405/02/08
Rev.	DESCRIPTION	REVISED BY	CHECKED BY	APPROVED	APP DATE

 شرکت توسعه آهن و فولاد گل گهر G.I.S.D.Co.	GOLGOHAR STEEL PROJECT	 برسو
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1.0 GENERAL

1.1 SCOPE

This specification is prepared to cover the project Cable Trays & Ladders that located in the Project.

1.2 DOCUMENT PRIORITY

In case of conflict between documents, the order of precedence shall be:

- This Specification.
- Drawings and other technical documents.
- I.E.C. standards.
- Other standard and codes when I.E.C. publications have not yet been issued.

1.3 CONDITION OF OPERATION

All of the Electrical Equipment & Systems will be suitable for 24 hours, 7 days/week, and 365 days/year operation.

Site Conditions

1.4 Plant Location

The Site is located at Gol-E-Gohar Iron Ore Complex, situated in Sirjan, Province of Kerman in southern part of Islamic Republic of IRAN, approximately 285 km southwest of Kerman city and 335 km north of Bandar Abbas port, in a semi-desertic high plateau terrain, 1750 m above sea level, and flanked by mountains over 2500 m high trending northwest to southwest.

1.5 Meteorological

Ambient Temperature

Max. Temperature:	+40 deg. C (Recorded)
	+50 deg. C (Design)
Min. temperature:	-12 deg. C (Recorded)
	-10 deg. C (Design)
Average temperature:	+15.9 deg. C (Design)
Wet bulb design temperature (summer):	+25 deg C
Relative Humidity:	Max. 70%

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Wind Velocity

According to National Iranian Code (6th revision):

Basic speed data: 130 Km/h

Basic pressure data: 0.845 KN/m²

Correction factor:

0 - 10 m: 2

10 - 20 m: 2.2

20 - 100 m: 2.4

Rainfall

Yearly 120 mm (average)

Monthly rainfall 260mm (Max)

Barometric Pressure

820 milliards

Geological Conditions

This data is belongs to the existing palletizing plant location. For the engineering the contractor shall be study geotechnical conditions for the essential location according to the project plan.

Altitude: About 1,750 m above mean sea level

Soil bearing: approx. 20t/m²

Ground water level: approx. 60 m below ground level

Earthquake Load

Equipment in plant will be dimensioned including a safety calculation against earthquake according to the "Iranian Code for Seismic Resistant Design of Buildings

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– Publication No. S253-2nd edition, autumn 1999” (“Iranian Regulations 2800”) and “Minimum

Design Loads for Building and Structures” (Iranian Regulations 519).

- Design base acceleration: 0.3·g
- Classification of Buildings: Group 2
- Soil classification: soil type III-b

1.6 Conditions of Operation

All of the Electrical Equipment & Systems will be suitable for 24 hours, 7 days/week, 365 days/year operation.

2.0 STANDARDS AND CODES

IEC 61537 Cable management - Cable tray systems and cable ladder systems

ISO 1461 Hot Dip Galvanized Coatings on Fabricated Iron and Steel Articles

In case of any conflicts among the above-mentioned referenced documents and this specification, the more stringent requirement shall govern.

1.0. CABLE TRAYS DESCRIPTION

1.1. Features

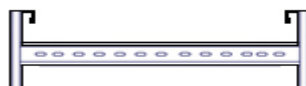
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Ladder type cable trays shall consist of two side channels to which rungs shall be fastened by continuous welding; spacing between rungs shall be <300 mm.

Sharp edges and burrs capable of damaging cables shall be positively avoided.

Ladder type cable trays are applied only for Electrical.

To protected cables, for each side number of cable tray's inside edge shall be 3 (totally 6). (as following figure)



1.2. Ladder type cable trays

Available inside depth shall be not less than 85 mm. Widths shall be either 300 or 600mm (inside available clear space). The side channel size of cable trays shall be 100x25x25 mm. Rung channel size for cable trays shall be 35x15x15mm, fully welded to side channels. Thickness of rungs shall be same as side channels.

Perforated trough type cable trays (for Instrumentation) – Available inside depth shall not be less than 100mm for 400 & 600 mm wide trays. The same shall not be less than 50mm for 200 mm and 300 mm wide trays. The side channel for cable trays shall be 100X12X12 mm for 600 mm and 400 mm trays and 50x12x12 mm for 300 and 200 mm trays.

Widths shall be 100/200/300/400/500/600 mm (inside available clear space).

Depth of connecting splice plates shall be suitable for ladder or perforated type cable trays height.

Metal cable trays shall be assembled by means of continuous welding or bolting. Riveting and spot welding are not allowed. In any case, welding and punching shall be carried out before galvanizing.

Horizontal and vertical elbows shall be continuous (without angles).

MV cables, LV cables and control cables shall be placed on separated cable trays/ladders by considering MV cables placed on lowest level and control cables placed on upper trays/ladders.

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The cable tray (Ladder type) side channels shall be fabricated with minimum 2mm thickness.

The cable tray (Perforated type) thickness shall be minimum 2mm.

The cable tray covers shall be minimum 1.5 mm thick

1.3. Material of Construction

Ladder type cable trays shall be made from hot deep galvanized.

Perforated type cable trays for Instrumentation shall also be made from hot deep galvanized steel.

1.4. Finishing

Finishing for the hot deep galvanized steel trays - Hot deep galvanizing shall be done after fabrication; for carbon steel having thickness ≥ 2 mm, the minimum galvanizing thickness shall be 85 micron of Zinc coating.

1.5. Sizing

Cable trays shall be designed to support the loads specified in Inquiry. Anyway, in lack of other instructions, a mass of 200 N per linear meter and per 200 mm tray width shall be considered.

The maximum deflection of tray span shall be within 1/200 of the span.

Working load is intended as useful carrying capacity, in addition to the tray its own load. Contribution of rungs to withstanding it is deemed negligible.

In addition to the working (static) load (due to cables), concentrated live load equal to 900 N (equivalent to a man weight) shall be considered, in whichever location respect to supports, without the tray being permanently deformed.

Cable tray system shall be able to withstand the required loads, with a safety factor ≥ 1.5 .

2.0. CABLE TRAYS ARRANGEMENT

2.1. General

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Trays arrangement shall allow an easy laying and removal of cables.

2.2. Clearances

Vertical and Horizontal clearances between cable trays shall be ensured as per the requirements.

A side clearance of 600 mm at least is required for accessibility; if clearance on one side is less than the required one, cable tray shall be considered as not accessible on this side.

2.3. Supports

The maximum distance between brackets shall be considered 1.5 m.

2.4. Covers

Cable trays may be provided in outdoor areas on topmost layer of the trays, where cables are likely to be exposed to direct sunlight and mechanical damage is likely to occur during maintenance activities.

The covers shall be arranged so as not to confine the heat generated by radiation from the cables.

Mounting of covers on cable trays shall be carried out by spacers, for cable ventilation reasons.

2.5. Fittings

Manufacturer shall supply, together with straight sections of cable trays, the following fittings:

- brackets and structural elements, horizontal and vertical elbows, reducers, tees, crosses, rigid connectors, expansion connectors, adjustable connectors, spacers;
- hardware as screws, nuts, washers;
- Accessories as conduit adapters, partitions, fasteners, slopes.

Quantity shall be stated in Material requisition; in case of lack of quantity in Material requisition about hardware, quantity to be supplied shall be enough for a proper assembling, with a reasonable quantity overestimation.

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3.0. DRAWINGS AND DOCUMENTATION

General Documentation requirements

Manufacturer shall supply documentation with complete information about:

- Type of material;
- Type of finishing (in particular galvanizing);
- Mass of tray in kg per meter;
- Maximum overall dimensions,
- Basic solutions (standard span; allowed working load) with specification
- About consequent deflection values;
- Assembling instructions with illustrations.
- List of applicable type test certificates
- Test report of FAT

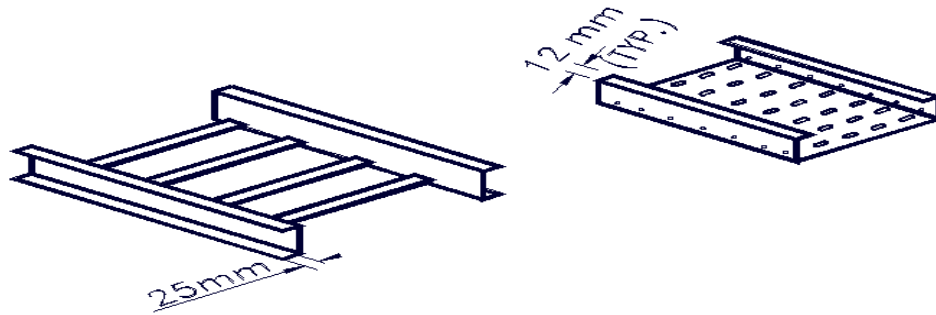
All documents shall show the relevant purchase order number, item and manufacturers references.

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4.0. Types of Cable Trays & Accessories

4.1. Cable Tray Element

Cable Tray Straight Element



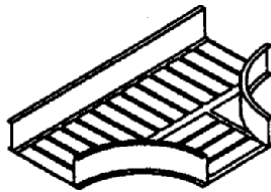
Length of Cable Tray :3000 mm Standard Length

WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	STP10	STL10
200 mm	STP20	STL20
300 mm	STP30	STL30
400 mm	STP40	STL40
500 mm	STP50	STL50
600 mm	STP60	STL60
700 mm	STP70	STL70

a)

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Cable Tray tee Element

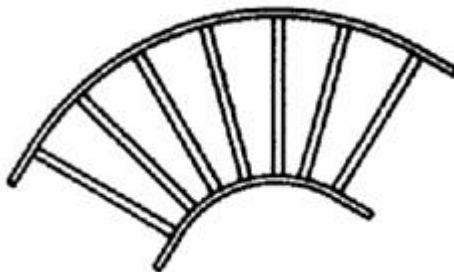


Working Depth : minimum 100 mm inside for perforated and 85 mm for ladder type

Radius (RAD): 600mm

WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	TEP10	TEL10
200 mm	TEP20	TEL20
300 mm	TEP30	TEL30
400 mm	TEP40	TEL40
500 mm	TEP50	TEL50
600 mm	TEP60	TEL60
700 mm	TEP70	TEL70

Cable Tray horizontal 90° bend Element



Working Depth : minimum 100 mm inside for perforated and 85 mm for ladder type.

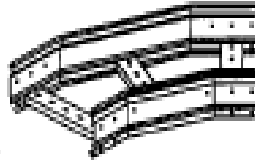
Radius (RAD) : 600mm

WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	HBP10	HBL10
200 mm	HBP20	HBL20
300 mm	HBP30	HBL30
400 mm	HBP40	HBL40
500 mm	HBP50	HBL50
600 mm	HBP60	HBL60

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700 mm	HBP70	HBL70
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Cable Tray horizontal 45° bend Element



Working Depth : minimum 100 mm inside for perforated and 85 mm for ladder type.

Radius (RAD): 600mm

WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	HBP10(45)	HBL10(45)
200 mm	HBP20(45)	HBL20(45)
300 mm	HBP30(45)	HBL30(45)
400 mm	HBP40(45)	HBL40(45)
500 mm	HBP50(45)	HBL50(45)
600 mm	HBP60(45)	HBL60(45)
700 mm	HBP70(45)	HBL70(45)

Note: Cable tray horizontal 90 bend element can be similar to point 8.1.4

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Cable Tray internal vertical 90° bend Element



Working Depth : minimum 100 mm inside for perforated and 85 mm for ladder type

Radius (RAD): 600mm

WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	VBP10(I)	VL10(I)
200 mm	VBP20(I)	VL20(I)
300 mm	VBP30(I)	VL30(I)
400 mm	VBP40(I)	VL40(I)
500 mm	VBP50(I)	VL50(I)
600 mm	VBP60(I)	VL60(I)
700 mm	VBP70(I)	VL70(I)

Cable Tray external vertical 90° bend Element



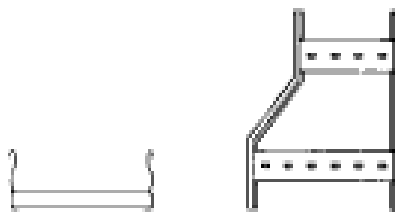
Working Depth : minimum 100 mm inside for perforated and 85 mm for ladder type

Radius (RAD) : 600mm

WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	VBP10(E)	VL10(E)
200 mm	VBP20(E)	VL20(E)
300 mm	VBP30(E)	VL30(E)
400 mm	VBP40(E)	VL40(E)
500 mm	VBP50(E)	VL50(E)
600 mm	VBP60(E)	VL60(E)
700 mm	VBP70(E)	VL70(E)

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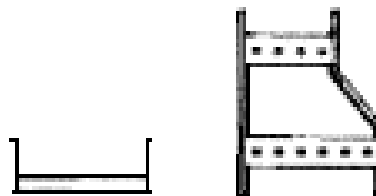
Cable Tray right reduction Element



WIDTH1 to WIDTH2	ITEM(Perforated type)	ITEM(Ladder type)
600mm-500 mm	RRP(60-50)	RRL(60-50)
600mm-400 mm	RRP(60-40)	RRL(60-40)
600mm-300 mm	RRP(60-30)	RRL(60-30)
600mm-200 mm	RRP(60-20)	RRL(60-20)
600mm-100 mm	RRP(60-10)	RRL(60-10)
500mm-400 mm	RRP(50-40)	RRL(50-40)
500mm-300 mm	RRP(50-30)	RRL(50-30)
500mm-200 mm	RRP(50-20)	RRL(50-20)
500mm-100 mm	RRP(50-10)	RRL(50-10)
400mm-300 mm	RRP(40-30)	RRL(40-30)
400mm-200 mm	RRP(40-20)	RRL(40-20)
400mm-100 mm	RRP(40-10)	RRL(40-10)
300mm-200 mm	RRP(30-20)	RRL(30-20)
300mm-100 mm	RRP(30-10)	RRL(30-10)
200mm-100 mm	RRP(20-10)	RRL(20-10)
Height of cable tray	100 mm	100 mm

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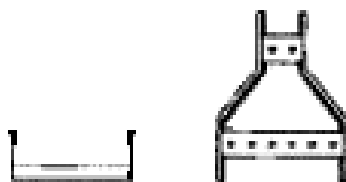
Cable Tray LEFT reduction Element



WIDTH1 to WIDTH2	ITEM(Perforated type)	ITEM(Ladder type)
600mm-500 mm	LRP(60-50)	LRL(60-50)
600mm-400 mm	LRP(60-40)	LRL(60-40)
600mm-300 mm	LRP(60-30)	LRL(60-30)
600mm-200 mm	LRP(60-20)	LRL(60-20)
600mm-100 mm	LRP(60-10)	LRL(60-10)
500mm-400 mm	LRP(50-40)	LRL(50-40)
500mm-300 mm	LRP(50-30)	LRL(50-30)
500mm-200 mm	LRP(50-20)	LRL(50-20)
500mm-100 mm	LRP(50-10)	LRL(50-10)
400mm-300 mm	LRP(40-30)	LRL(40-30)
400mm-200 mm	LRP(40-20)	LRL(40-20)
400mm-100 mm	LRP(40-10)	LRL(40-10)
300mm-200 mm	LRP(30-20)	LRL(30-20)
300mm-100 mm	LRP(30-10)	LRL(30-10)
200mm-100 mm	LRP(20-10)	LRL(20-10)
Height of cable tray	100 mm	100 mm

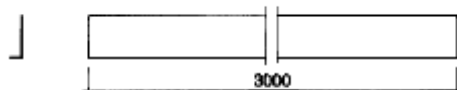
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Cable Tray CENTRAL reduction Element



WIDTH1 to WIDTH2	ITEM(Perforated type)	ITEM(Ladder type)
600mm-500 mm	CRP(60-50)	CRL(60-50)
600mm-400 mm	CRP(60-40)	CRL(60-40)
600mm-300 mm	CRP(60-30)	CRL(60-30)
600mm-200 mm	CRP(60-20)	CRL(60-20)
600mm-100 mm	CRP(60-10)	CRL(60-10)
500mm-400 mm	CRP(50-40)	CRL(50-40)
500mm-300 mm	CRP(50-30)	CRL(50-30)
500mm-200 mm	CRP(50-20)	CRL(50-20)
500mm-100 mm	CRP(50-10)	CRL(50-10)
400mm-300 mm	CRP(40-30)	CRL(40-30)
400mm-200 mm	CRP(40-20)	CRL(40-20)
400mm-100 mm	CRP(40-10)	CRL(40-10)
300mm-200 mm	CRP(30-20)	CRL(30-20)
300mm-100 mm	CRP(30-10)	CRL(30-10)
200mm-100 mm	CRP(20-10)	CRL(20-10)
Height of cable tray	100 mm	100 mm

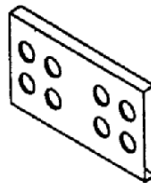
Separators (Dividers)



Separators (Dividers)	Ladder Type: SPL Perforated Type: SPP
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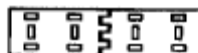
	GOLGOHAR STEEL PROJECT Technical Specification For Cable Tray, Ladder, Conduit & Accessories Bulk Material	
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1.1. Finishing	1.2. Hot deep galvanizing after fabrication, galvanizing thickness shall be 57 micron (average) of zinc coating
1.3. Height	1.4. Suitable for cable tray height border 100 mm
1.5. Accessories	1.6. Stainless Steel Hardware with Bolts, nuts and washer used for fixing plate to ladder



Normal Joint For Ladder / perforated Type Cable Trays	Ladder / perforated Type: NJ
1.7. Finishing	1.8. Hot deep galvanizing after fabrication, galvanizing thickness shall be 57 micron (average) of zinc coating
1.9. Length	1.10. 200 mm
1.11. Height	1.12. Suitable for cable tray height
1.13. Accessories	1.14. Stainless Steel Hardware with Bolts, nuts and washer used for fixing plate to ladder

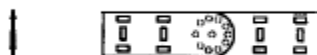
Horizontal Hinged Splice Plate



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Horizontal Hinged Splice Plate	Ladder Type: HHSL Perforated Type: HHSP
1.15. Finishing	1.16. Hot deep galvanizing after fabrication, galvanizing thickness shall be 57 micron (average) of zinc coating
1.17. Length	1.18. 250 mm
1.19. Height	1.20. Suitable for cable tray height border 100 mm
1.21. Accessories	1.22. Stainless Steel Hardware with Bolts, nuts and washer used for fixing plate to ladder

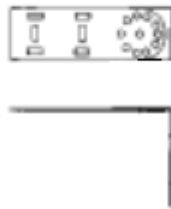
Vertical Hinged Splice Plate



Vertical Hinged Splice Plate	Ladder Type: VHSL Perforated Type: VHSP
1.23. Finishing	1.24. Hot deep galvanizing after fabrication, galvanizing thickness shall be 57 micron (average) of zinc coating
1.25. Length	1.26. 270 mm
1.27. Height	1.28. Suitable for cable tray height border 100 mm
1.29. Accessories	1.30. Stainless Steel Hardware with Bolts, nuts and washer used for fixing plate to ladder

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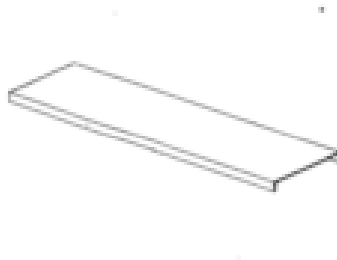
Lateral Connection Joint



Lateral Connection Joint	Ladder Type: LCJL
1.31. Finishing	1.32. Hot deep galvanizing after fabrication, galvanizing thickness shall be 57 micron (average) of zinc coating
1.33. Length	1.34. 170 + 100 mm
1.35. Height	1.36. Suitable for cable tray height
1.37. Accessories	1.38. Stainless Steel Hardware with Bolts, nuts and washer used for fixing plate to ladder

4.2. Cable Trays Cover And Accessories

Cable Tray Straight Element Cover



Length of each unit cover	1500 mm standard length
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WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	CSTP10	CSTL10

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200 mm	CSTP20	CSTL20
300 mm	CSTP30	CSTL30
400 mm	CSTP40	CSTL40
500 mm	CSTP50	CSTL50
600 mm	CSTP60	CSTL60
700 mm	CSTP70	CSTL70

Cable Tray External Vertical 90° Bend Element Cover

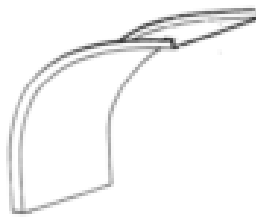


Minimum Bending Radius	600 mm (minimum bending radius of the cable tray)
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WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	CVBP10(E)	CVPL10(E)
200 mm	CVPP20(E)	CVPL20(E)
300 mm	CVPP30(E)	CVPL30(E)
400 mm	CVPP40(E)	CVPL40(E)
500 mm	CVPP50(E)	CVPL50(E)
600 mm	CVPP60(E)	CVPL60(E)
700 mm	CVPP70(E)	CVPL70(E)

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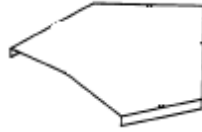
Cable Tray Internal Vertical 90° Bend Element Cover



Minimum Bending Radius	600 mm (minimum bending radius of the cable tray)	
WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	CVBP10(I)	CVPL10(I)
200 mm	CVPP20(I)	CVPL20(I)
300 mm	CVPP30(I)	CVPL30(I)
400 mm	CVPP40(I)	CVPL40(I)
500 mm	CVPP50(I)	CVPL50(I)
600 mm	CVPP60(I)	CVPL60(I)
700 mm	CVPP70(I)	CVPL70(I)

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Cable Tray Horizontal 45° Bend Element Cover



Minimum Bending Radius	600 mm (minimum bending radius of the cable tray)
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WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	CHBP10(45)	CHPL10(45)
200 mm	CHPP20(45)	CHPL20(45)
300 mm	CHPP30(45)	CHPL30(45)
400 mm	CHPP40(45)	CHPL40(45)
500 mm	CHPP50(45)	CHPL50(45)
600 mm	CHPP60(45)	CHPL60(45)
700 mm	CHPP70(45)	CHPL70(45)

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Cable Tray Horizontal 90° Bend Element Cover

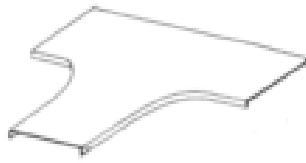


Minimum Bending Radius	600 mm (minimum bending radius of the cable tray)
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WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	CHBP10(90)	CHPL10(90)
200 mm	CHPP20(90)	CHPL20(90)
300 mm	CHPP30(90)	CHPL30(90)
400 mm	CHPP40(90)	CHPL40(90)
500 mm	CHPP50(90)	CHPL50(90)
600 mm	CHPP60(90)	CHPL60(90)
700 mm	CHPP 70(90)	CHPL70(90)

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Cable Tray Tee Element Cover



Minimum Bending Radius	600 mm (minimum bending radius of the cable tray)
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WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	CTEEP10	CTEEL10
200 mm	CTEEP20	CTEEL20
300 mm	CTEEP30	CTEEL30
400 mm	CTEEP40	CTEEL40
500 mm	CTEEP50	CTEEL50
600 mm	CTEEP60	CTEEL60
700 mm	CTEEP70	CTEEL70

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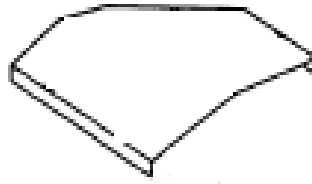
Cable Tray Right Reduction Element Cover



WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	CRR10	CRRL10
200 mm	CRRP20	CRRL20
300 mm	CRRP30	CRRL30
400 mm	CRRP40	CRRL40
500 mm	CRRP50	CRRL50
600 mm	CRRP60	CRRL60
700 mm	CRRP70	CRRL70

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Cable Tray Left Reduction Element Cover



WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	CLR10	CLRL10
200 mm	CLRP20	CLRL20
300 mm	CLRP30	CLRL30
400 mm	CLRP40	CLRL40
500 mm	CLRP50	CLRL50
600 mm	CLRP60	CLRL60
700 mm	CLRP 70	CLRL70

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Cable Tray Central Reduction Element Cover



WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	CCR10	CCRL10
200 mm	CCRP20	CCRL20
300 mm	CCRP30	CCRL30
400 mm	CCRP40	CCRL40
500 mm	CCRP50	CCRL50
600 mm	CCRP60	CCRL60
700 mm	CCRP 70	CCRL70

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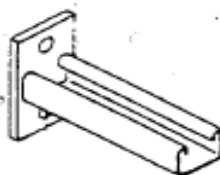
4.3. Cable Trays Accessories

Cover Fixing Clamp



Cover Fixing Clamp	Ladder /Perforated Type: SC
Finishing	Electroplated zinc galvanized
Accessories	Head bolts, Nut & Washer included

Horizontal Support



Horizontal Support	Type:
Finishing	Hot deep galvanizing after fabrication, galvanizing thickness shall be 85 micron(average) of zinc coating
Length	Suitable for 300mm/400mm/600 wide cable tray and cable ducts
Height	

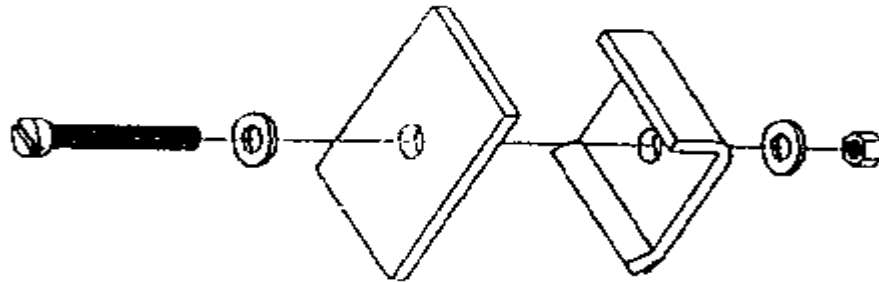
Bolt Fixing To Support (Beam)



Bolt Fixing To support (Beam)	Type:
Finishing	Hot deep galvanizing after fabrication, galvanizing.
Accessories	Nut, plane washer and spring washer

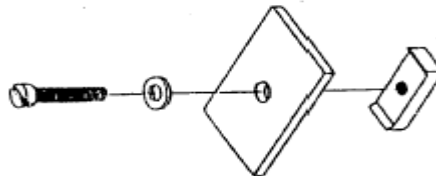
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Bolt Fixing Cable Tray To Structure (Rack)



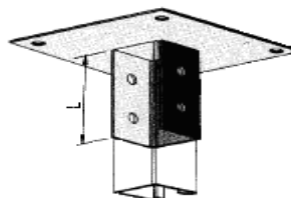
Bolt Fixing Cable Tray To Structure (Rack)	Type:
Material of Construction	Carbon Steel
Finishing	Hot deep galvanizing after fabrication, galvanizing.
Accessories	Double plate, head bolts, nut and washer included

Bolt Fixing Cable Tray To Brackets



Bolt Fixing Cable Tray To Brackets	Type:
Finishing	Hot deep galvanizing after fabrication, galvanizing.
Accessories	Head bolts & nut included

Ceiling Or Floor Fastening Plate (Simple Type)

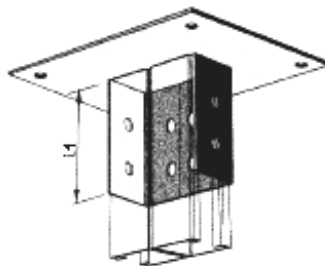


Ceiling Or Floor Fastening Plate	Type:
Finishing	Hot deep galvanizing after fabrication, galvanizing thickness shall be 85 micron(average) of zinc coating
Dimension	Suitable for single channel
Base plate	Base plate with welded "U" Steel plate
Accessories	Stainless Steel Hardware with Channel nut screw, washers and bolts and expansion bolts for support fixing
Height	L = 100mm

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Ceiling Or Floor Fastening Plate (Double Type)



Ceiling Or Floor Fastening Plate (Double Type)	Type:
Finishing	Hot deep galvanizing after fabrication, galvanizing thickness shall be 85 micron(average) of zinc coating
Dimension	Suitable for double channel
Base plate	Base plate with welded "U" Steel plate
Accessories	Stainless Steel Hardware with Channel nut screw, washers and bolts and expansion bolts for support fixing
Height	L1 = 200mm

4.4. U Channel

Thickness: min. 2.5mm

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A (mm)	B (mm)	C (mm)	H (mm)
45	12	21	41

