

 BHARAT HEAVY ELECTRICALS LIMITED TRANSMISSION BUSINESS HVDC ENGINEERING & SYSTEMS									
	DOCUMENT No.	TB-406-316-TS-019			Rev. No.	00	Prepared	Checked	Approved
	TYPE OF DOC.	TECHNICAL SPECIFICATION				SIGN			
	TITLE					NAME	MSP/MM	SKS	AG
	CABLE TRENCH MATERIAL					DATE	03.06.20	03.06.20	29.04.20
						GROU	HVDC	W.O. No	88009
	CUSTOMER	UTTAR PRADESH TRANSMISSION CORPORATION LTD (UPPTCL)							
	PROJECT	400/220/132 kV GIS SUBSTATION AT SHAMLI, U.P. 400/220/132 kV GIS SUBSTATION AT RASARA BALLIA, U.P.							
	NOA NO.	1311/ESD-8/126/III/400 kV SHAMLI dtd 14.11.2018							
	Station	Shamli, Uttar Pradesh & Rasara Ballia, Uttar Pradesh							
	CONTENTS								
	Section	Description						No. of Sheets	
	1	Scope, Bill of Quantity, Specific Technical Requirement, Qualifying Requirement						4+12	
	2	Equipment Specification						4	
	3	Project Details and General Technical Requirements						16	
4	Guaranteed Technical Particulars						1		
5	Checklist						2		
	Rev No.	Date	Altered	Checked	Approved	REVISION DETAILS			
	Distribution				To	TBEM	TBMM	TBQM	Vendor
					Copies	1	1	1	4

	Project:	400/220/132 kV GIS Substation at Shamli, U.P. & Rasara Ballia (UP)
	Customer:	Uttar Pradesh Transmission Corporation Ltd (UPPTCL)
	Contractor:	Bharat Heavy Electricals Limited
	Document No.	TB-406-316-TS-04, Rev.00
	Technical Specification:	CABLE TRAY & ACCESSORIES

SECTION-1

Scope, Bill of Quantity, Specific Technical Requirements & Qualifying Requirement

1.1 Scope

This technical specification covers the requirements of design, manufacture, testing at works, packing and dispatch to site of cable trench material complete with all accessories as listed below.

No deviation from the requirements specified in various clauses of this specification shall be allowed.

The equipment is required for the following project:

Name of the customer : **UTTAR PRADESH POWER TRANSMISSION LIMITED**
Name of the project : **400/220/132kV GIS SUBSTATION AT SHAMLI, UP**
400/220/132kV GIS SUBSTATION AT RASARA BALLIA, UP
Site : **Shamli, Uttar Pradesh**

The fitment and equipments offered shall be of approved make of UPPTCL or its subsequent approval from UPPTCL shall be bidder's responsibility with no commercial implications to BHEL. If any of the make offered by the bidder is not acceptable to M/s UPPTCL, the bidder has to supply alternate UPPTCL approved make, meeting the specification, with no commercial implications to BHEL.

Refer section-3 of this document for project details and general specification.

In case of any conflict among the various sections of this specification, the order of precedence shall be section 1, section 2 & the section 3.

1.2 Bill of Quantities

SN	Item Description	Qty (Nos.)		Remarks
		Shamli	Ballia	
1.	Galvanized- LADDER TYPE 2MM THK CABLE TRAY 2.5 M LONG, 600MM WIDE, 100 MM HIGH, HAVING SLOTTED RUNG SPACING OF 250 MM, ALONG WITH 2 NOS. SIDE PLATE AND 16 NOS. M8 BOLTS WITH NUTS AND WASHERS FOR COUPLING TWO TRAYS.	915	915	As per Annexure 1 of section 1.



Project:	400/220/132 kV GIS Substation at Shamli, U.P. & Rasara Ballia (UP)
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Technical Specification:	CABLE TRAY & ACCESSORIES

SN	Item Description	Qty (Nos.)		Remarks
		Shamli	Ballia	
2.	Galvanized- LADDER TYPE TRAY 2MM THK 90° HORIZONTAL ELBOW 600MM WIDE, 100 MM HIGH, HAVING SLOTTED RUNG SPACING OF 250 MM	300	300	As per Annexure 1 of section 1.
3.	Galvanized- LADDER TYPE TRAY 2MM THK 90° VERTICAL ELBOW 600MM WIDE, 100 MM HIGH, HAVING SLOTTED RUNG SPACING OF 250 MM	50	50	As per Annexure 1 of section 1.
4.	Galvanized- PERFORATED TYPE 2MM THK CABLE TRAY 2.5 M LONG, 150MM WIDE, 100 MM HIGH, as per enclosed drawing, ALONG WITH 2 NOS. SIDE PLATE AND 16 NOS. M8 BOLTS WITH NUTS AND WASHERS FOR COUPLING TWO TRAYS.	50	30	As per Annexure 1 of section 1.
5.	Galvanized- Cable tray cover 1.7mm THK suitable for 600mm wide ladder type cable tray as per enclosed drawing	20	20	As per Annexure 1 of section 1.
6.	Galvanised Iron -TRAY COVER (1.7mm THK sheet) FOR 150MM WIDE TRAY along with bolts & accessories for fixing on tray	50	30	As per Annexure 1 of section 1.

Note:

1. The quantity for individual items may vary up to any extent, however total quantity may vary $\pm$ 30% during contract execution stage.
2. All items mentioned above shall be as per enclosed specification drawings attached.
3. Minor fabrication detail changes which do not affect the material/dimensional aspect of the equipment, shall be subject to BHEL's/Owner's approval without any commercial implication.
4. 2% Extra Hardware shall be supplied along with all the applicable items in the BOQ.

1.3 Specific Technical Requirements

Refer section 2.

1.4 Type Tests

- 1.4.1** The cable trench material to be supplied shall be of type tested design. During detail engineering, the bidder shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last five years from the date of techno-commercial bid opening i.e 07-Sept-2018. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.

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1.4.2 However if the bidder is not able to submit report of the type test(s) conducted within last five years from the date of techno-commercial bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the bidder shall conduct all such tests under this contract at no additional cost to the BHEL either at third party lab or in presence of client/owners representative and submit the reports for approval

1.4.3 All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.

1.4.4 The type test reports once approved for any projects shall be treated as reference. For subsequent projects of UPPTCL, an endorsement sheet will be furnished by the manufacturer confirming similarity and “No design Change”. Minor changes if any shall be highlighted on the endorsement sheet.

1.4.5 Details of testing shall be as per Section II of this specification.

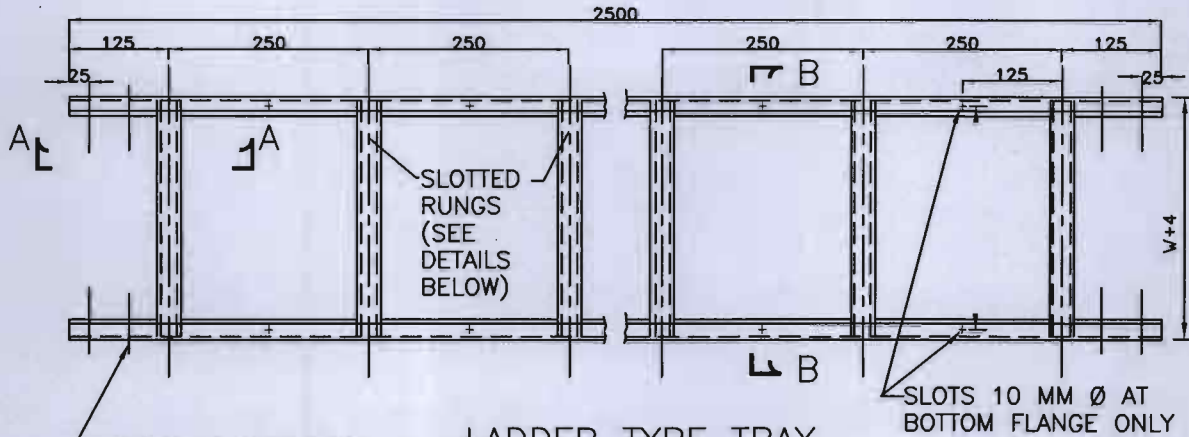
1.5 Quality Plan

Bidder to follow valid UPPTCL approved quality plan at contract stage. In case the bidder does not have UPPTCL approved QP, bidder has to incorporate all comments by BHEL/UPPTCL during approval.

1.6 Deviations

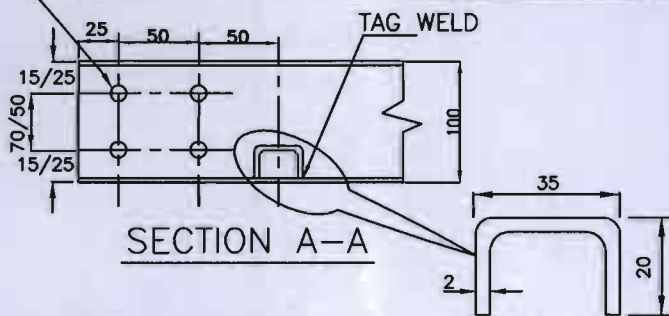
The bidder shall list all the deviation from the specification separately. Offers without specific deviation will be deemed to be totally in compliance with the specification and NO DEVIATION on any account will be entertained at a later date.

ANNEXURE-1

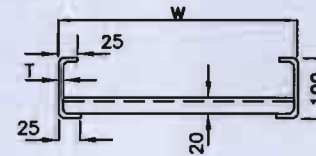


4 HOLES 10mm DIA.

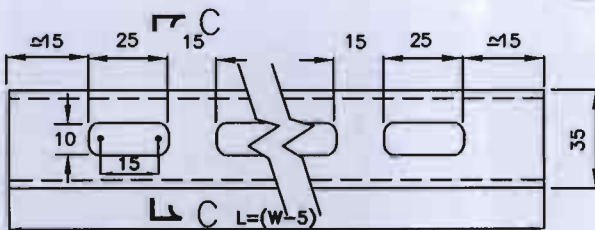
LADDER TYPE TRAY



SECTION A-A

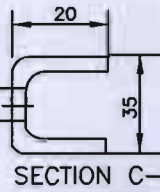


SECTION B-B

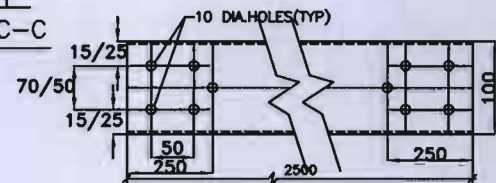


SLOTTED RUNGS

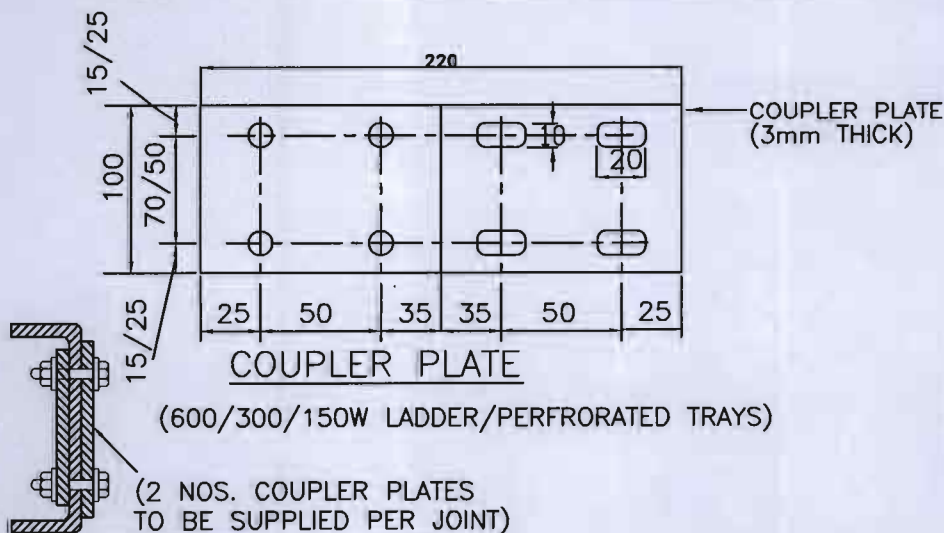
(TO SUIT TRAY WIDTH)



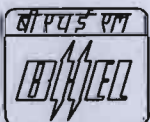
SECTION C-C



SIDE RUNNER



8 NUMBERS BOLTS
8mm DIA 20mm LONG
WITH NUTS AND
WASHERS ARE TO BE
SUPPLIED WITH EACH
COUPLER PLATE



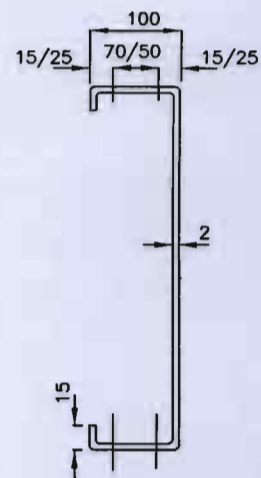
TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES

DRAWING NO.

PE-DG-999-507-E007

SH 2 OF 13

REV 00



600/450/300/150 TRAYS

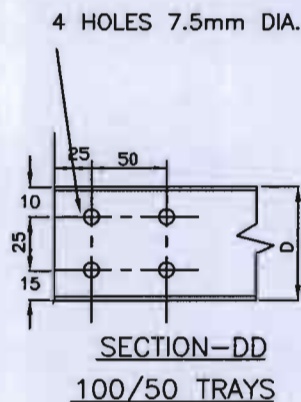
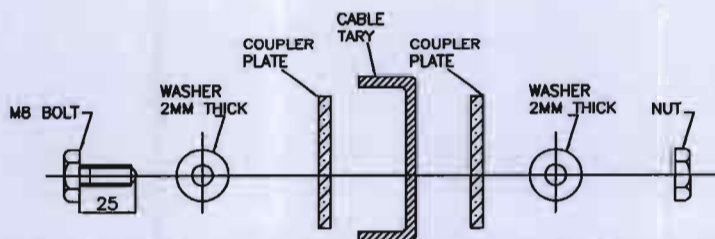


Diagram of a C-channel section with dimensions: total width 50, flange width 10, web width 25, and lip width 15. A shear force T is applied to the web.

SECTION-CC
(100/50 TRAYS)

PERFORATED TYPE TRAY



SEQUENCE OF M8 BOLT, WASHER, NUT, COUPLER PLATE & CABLE TRAY
FOR TYPICAL CABLE TRAY JOINT

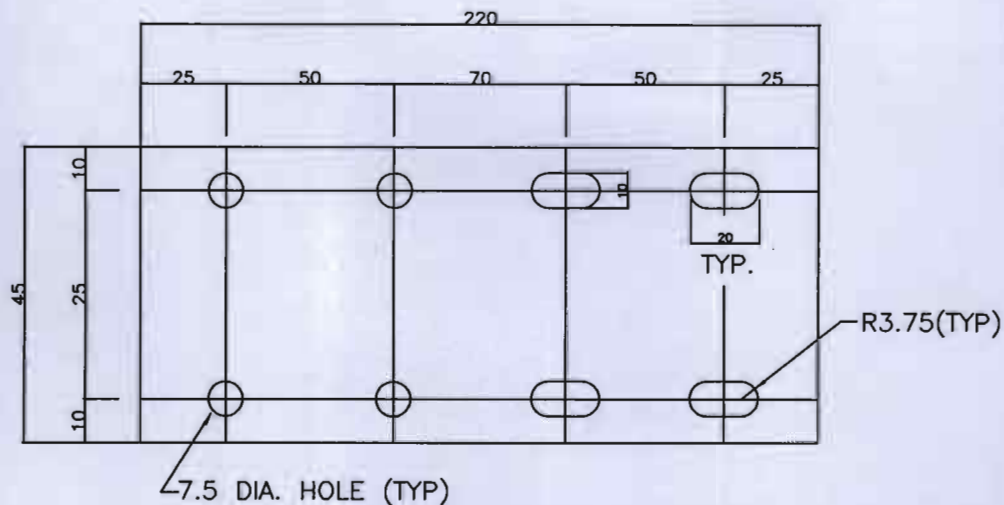
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DRAWING NO.

PE-DG-999-507-E007

SH 3 OF 13

REV 00



**SIDE COUPLER PLATE FOR
PERFORATED TYPE TRAYS
(100/50W TRAYS)**

QTY. REQUIRED/TRAY SECTION : 4 NOS.

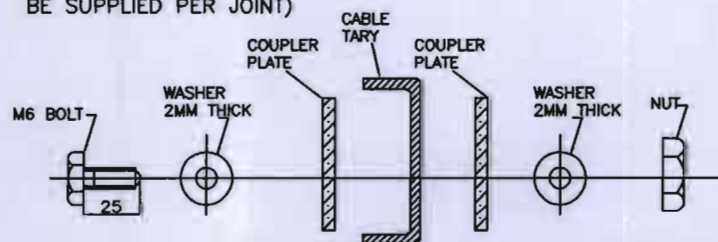


(2 NOS. COUPLER PLATES
OF 3 MM THICKNESS TO
BE SUPPLIED PER JOINT)



QTY. REQD/TRAY SECTION

- A) 16 NOS. M6 BOLTS
- B) 16 NOS. NUTS
- C) 32 NOS. WASHERS



SEQUENCE OF M6 BOLT, WASHER, NUT, COUPLER PLATE & CABLE TRAY
FOR TYPICAL CABLE TRAY JOINT

SEE GENERAL NOTES IN SHEET 13.



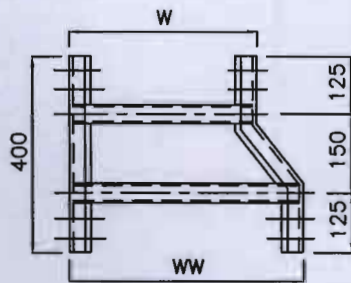
**TYPICAL DETAILS OF
CABLE TRAYS AND ACCESSORIES**

DRAWING NO.

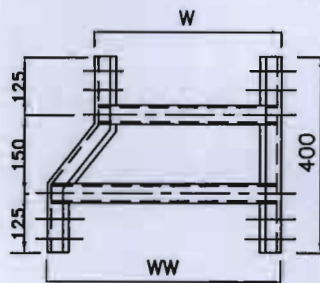
PE-DG-999-507-E007

SH 4 OF 13

REV 00



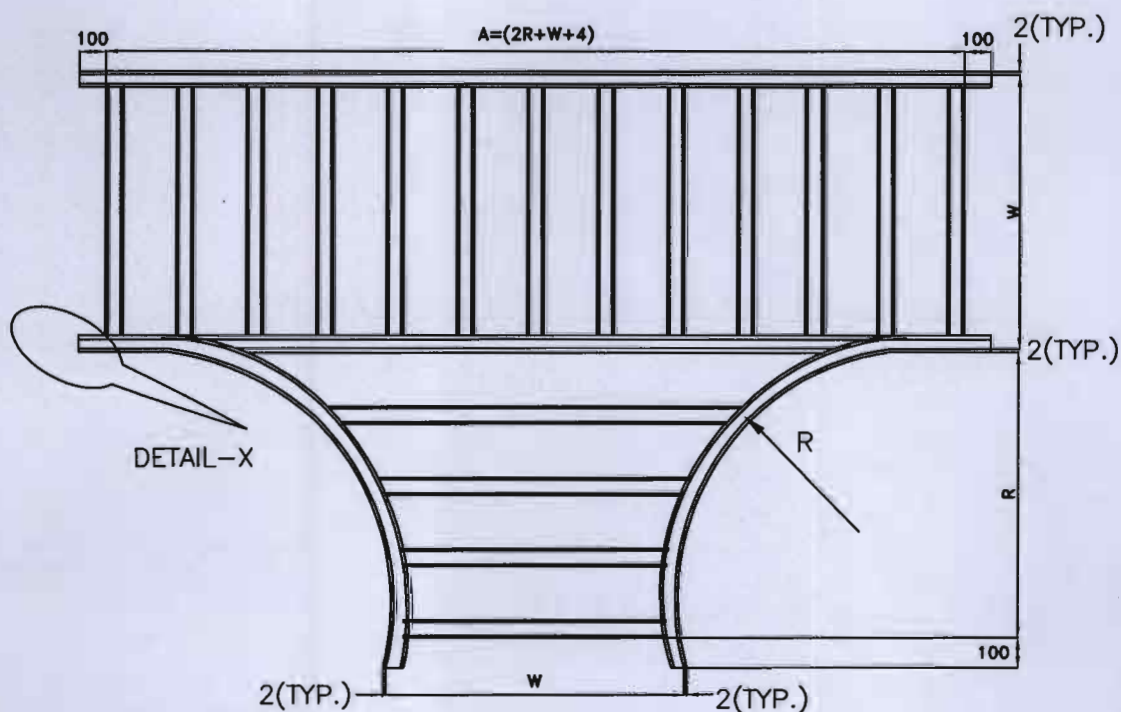
LEFT HAND REDUCER



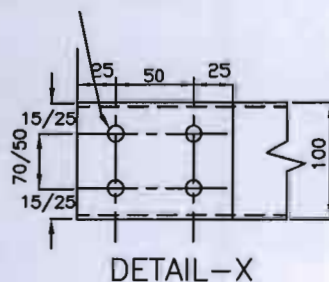
RIGHT HAND REDUCER

WW	W	DEPTH
600	300	100
600	150	100
300	150	100

LADDER TYPE



10mm DIA. HOLES



DETAIL-X

WIDTH W	BENDING RADIUS R	DEPTH	A		
			W		
			150	300	600
150, 300 & 600	600	100	1354	1504	1804

SEE GENERAL NOTES IN SHEET 13.

LADDER TYPE



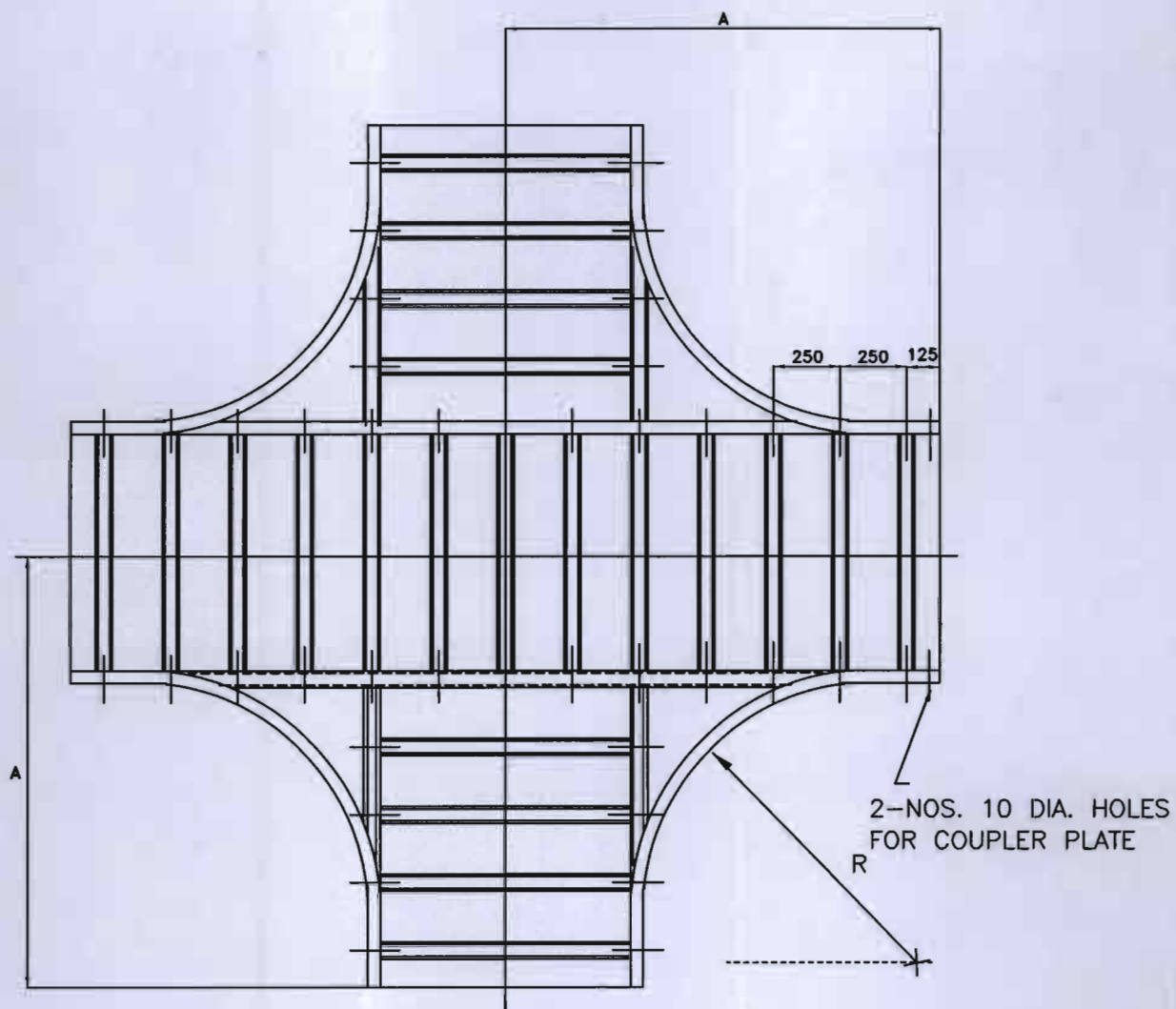
TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES

DRAWING NO.

PE-DG-999-507-E007

SH 5 OF 13

REV 00



HORIZONTAL CROSS-PLAN

WIDTH W	BENDING RADIUS R	$A=R+W/2+100$
600	600	1000
300	600	850

SEE GENERAL NOTES IN SHEET 13.



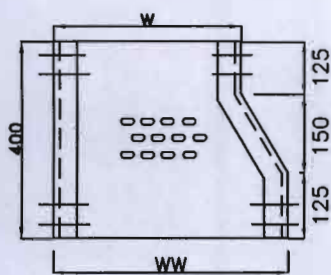
**TYPICAL DETAILS OF
CABLE TRAYS AND ACCESSORIES**

DRAWING NO.

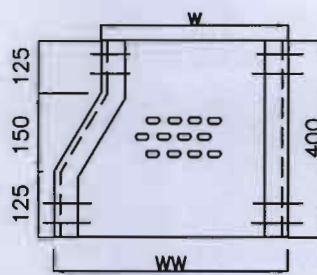
PE-DG-999-507-E007

SH 6 OF 13

REV 00



LEFT HAND REDUCER



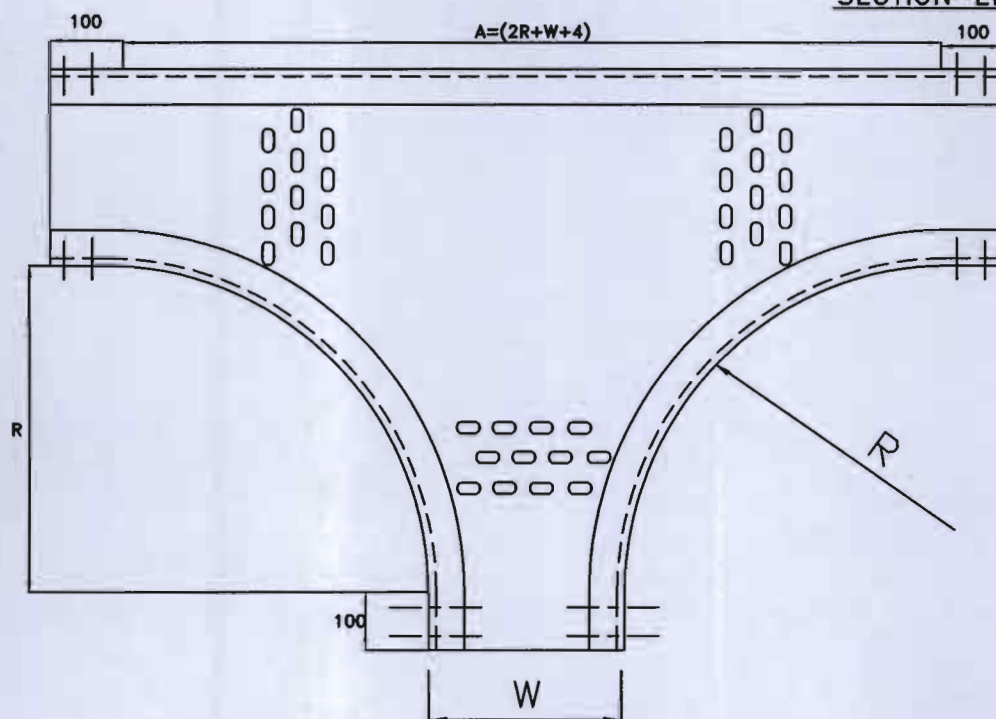
RIGHT HAND REDUCER

PERFORATED TYPE

WW	W	DEPTH
600	300	100
600	150	100
300	150	100



SECTION-EE



TEE

WIDTH W	BENDING RADIUS R	DEPTH	A		
			W		
			150	300	600
150, 300 & 600	600	100	1354	1504	1804

SEE GENERAL NOTES IN SHEET 13.

PERFORATED TYPE



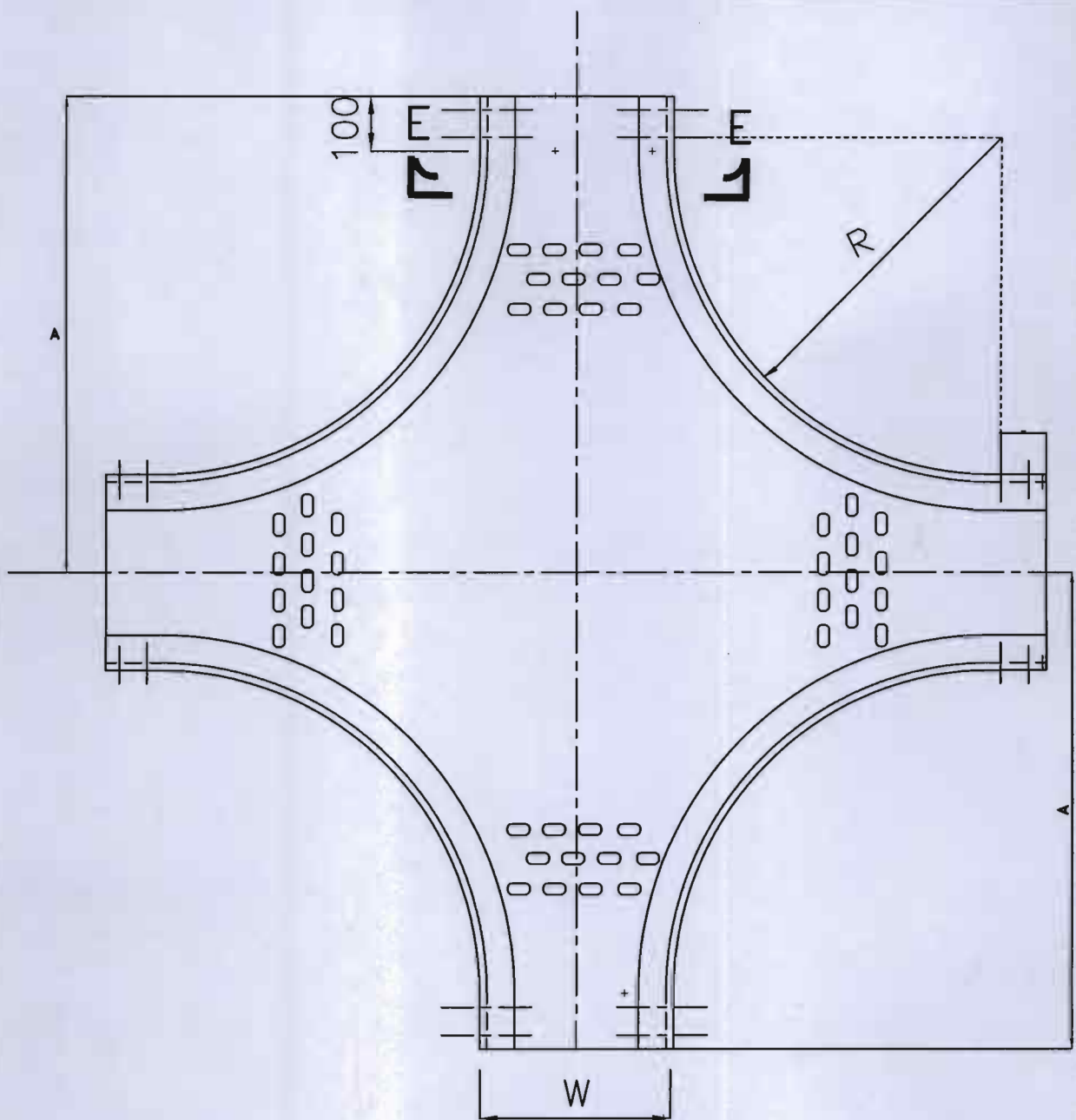
TYPICAL DETAILS OF
CABLE TRAYS AND ACCESSORIES

DRAWING NO.

PE-DG-999-507-E007

SH 7 OF 13

REV 00



CROSS

WIDTH W	BENDING RADIUS R	$A=R+W/2+100$
600	600	1000
300	600	850

SEE GENERAL NOTES IN SHEET 13.



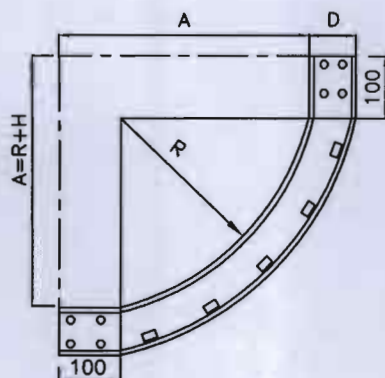
TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES

DRAWING NO.

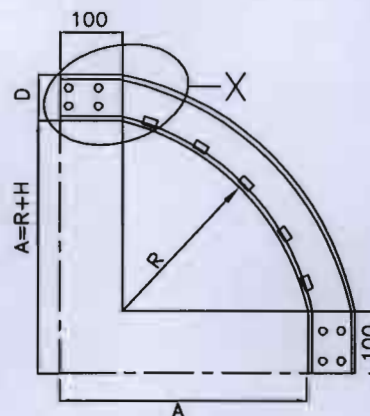
PE-DG-999-507-E007

SH 8 OF 13

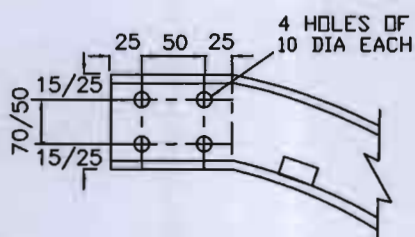
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INSIDE TYPE



OUTSIDE TYPE

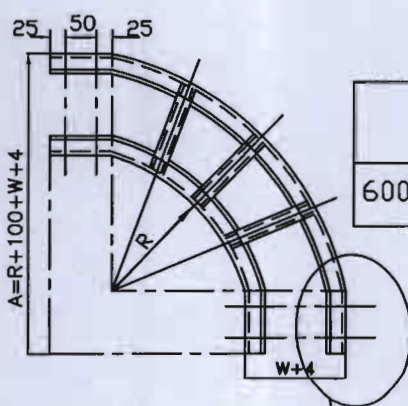


ENLARGED VIEW OF "X"

VERTICAL ELBOW 90 DEG UP/DOWN

INSIDE WIDTH W	BENDING RADIUS R	DEPTH	A
600, 300 & 150	600	100	700

90° VERTICAL BEND - LADDER TYPE



LADDER TYPE

X (AS ABOVE)

HORIZONTAL ELBOW 90 DEG

INSIDE WIDTH W	BENDING RADIUS R	DEPTH	A		
			W		
600, 300 & 150	600	100	150	300	600
			854	1004	1304

90° HORIZONTAL BEND - LADDER TYPE

SEE GENERAL NOTES IN SHEET 13.



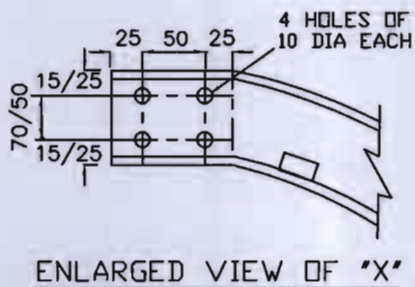
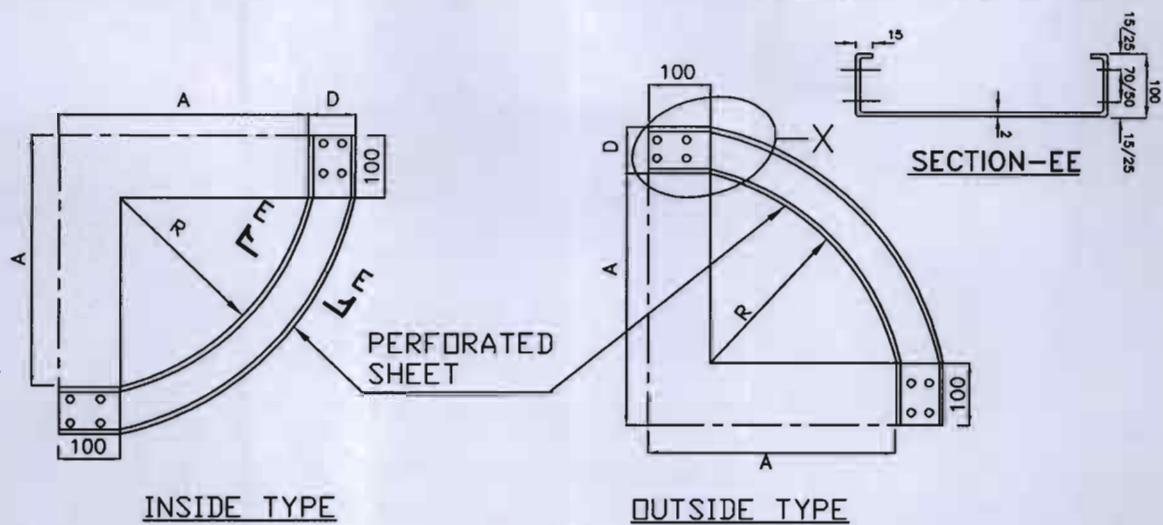
TYPICAL DETAILS OF
CABLE TRAYS AND ACCESSORIES

DRAWING NO.

PE-DG-999-507-E007

SH 9 OF 13

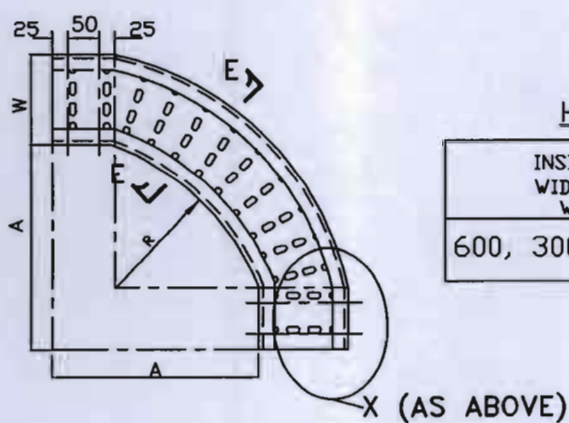
REV 00



90° VERTICAL BEND - PERFORATED TYPE

VERTICAL ELBOW 90 DEG UP/DOWN

INSIDE WIDTH W	BENDING RADIUS R	DEPTH	A
600, 300 & 150	600	100	700



90° HORIZONTAL BEND - PERFORATED TYPE

SEE GENERAL NOTES IN SHEET 13.

HORIZONTAL ELBOW 90 DEG

INSIDE WIDTH W	BENDING RADIUS R	DEPTH	A		
			150	300	600
600, 300 & 150	600	100	854	1004	1304



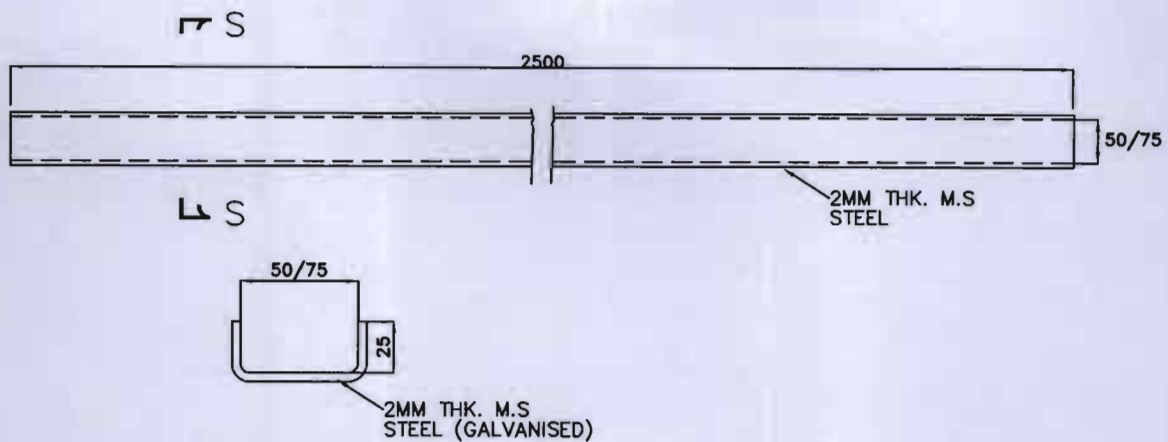
TYPICAL DETAILS OF
CABLE TRAYS AND ACCESSORIES

DRAWING NO.

PE-DG-999-507-E007

SH 10 OF 13

REV 00



SECTION S-S

CABLE TROUGHS

SEE GENERAL NOTES IN SHEET 13.

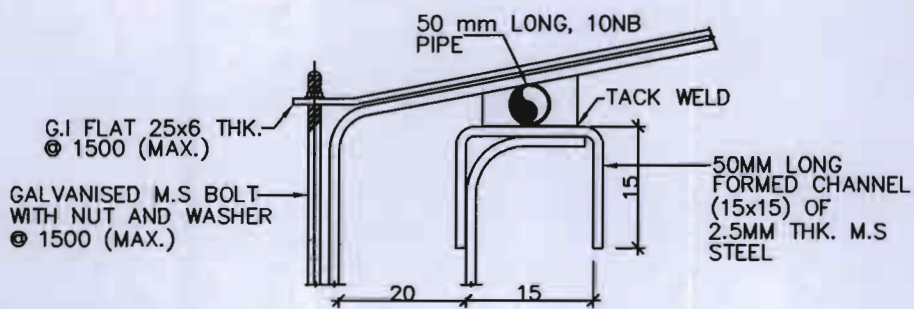
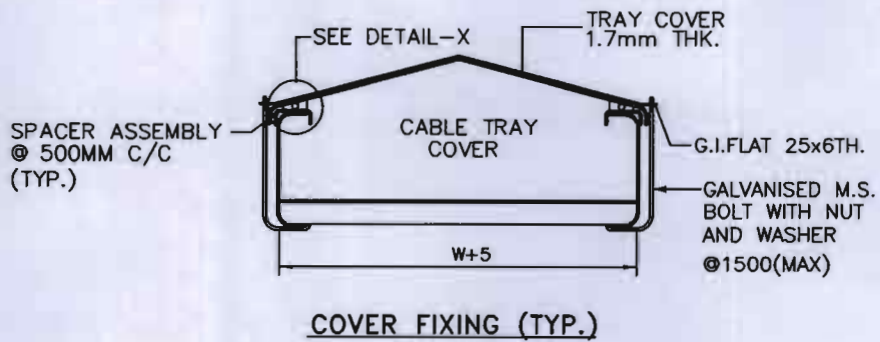


TYPICAL DETAILS OF
CABLE TRAY AND ACCESSORIES

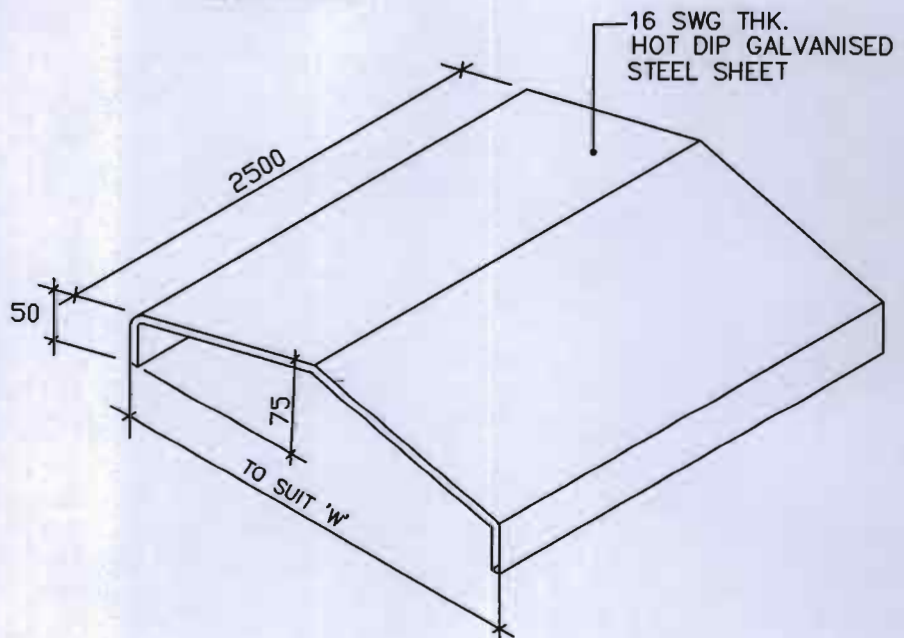
BHEL DRAWING NO.
PE-DG-999-507-E007

SH 11 OF 13

REV 00



DETAIL-X



CABLE TRAY COVER

SEE GENERAL NOTES IN SHEET 13.



TYPICAL DETAILS OF
CABLE TRAYS AND ACCESSORIES

DRAWING NO.

PE-DG-999-507-E005

SH 12 OF 13

REV 00

NOTES:-

1. THE CABLE TRAYS AND ACCESSORIES SHALL BE MADE OF 2mm HOT ROLLED M.S.SHEET CONFIRMING TO IS:1079. ALL THE COUPLER PLATE SHALL BE OF 3 MM THICK.
2. THE CABLE TRAYS AND ACCESSORIES SHALL BE HOT DIP GALVANISED AS PER IS 2629.
3. FOR LADDER TYPE CABLE TRAYS AND ACCESSORIES, ALL RUNGS SHALL BE SLOTTED.
4. PERFORATED TRAYS SHALL BE FABRICATED OUT OF A SINGLE M.S. SHEET.
5. THE DIMENSIONS OF ALL BENDS, TEES, CROSSES, ETC. FOR PERFORATED CABLE TRAYS SHALL BE THE SAME AS FOR LADDER TYPE TRAY FITTINGS.
6. SIDE CHANNELS OF PERFORATED TRAY ACCESSORIES SHALL BE WELDED WITH THE PERFORATED SHEET AT INTERVALS OF 100mm.
7. LENGTH OF WELDING SHALL NOT BE LESS THAN 25mm. WELDING SHALL BE AS PER IS 9595.
8. PREFERABLY SINGLE MS PERFORATED SHEET SHALL BE USED AS BASE OF ALL PERFORATED TYPE TRAY ACCESSORIES. HOWEVER, IF USE OF PIECES OF PERFORATED SHEET IS UNAVOIDABLE FOR BASE, PIECES SHALL BE WELDED WITH EACH OTHER IN LINE WITH THE ABOVE.
9. ALL TRAY CORNERS SHALL BE FREE OF SHARP EDGES & SMOOTH.
10. THE DEPTH, WIDTH AND LENGTH OF TRAYS AND ACCESSORIES SHALL BE WITHIN A TOLERANCE AS PER RELEVANT IS
11. TO FACILITATE ASSEMBLY, ALL ACCESSORIES AT ENDS SHALL HAVE 100mm STRAIGHT PORTION.
12. ALL NUTS, BOLTS, WASHERS ETC., SHALL BE HOT DIP GALVANISED AS PER IS 1367 FOR SIZES ABOVE 12MM AND ELECTROPLATED/ELECTROGALVANISED FOR SIZES UPTO 12MM.
13. ALL DIMENSIONS ARE IN mm UNLESS NOTED OTHERWISE.
14. TRAY ACCESSORIES SHOWN IN THIS DRAWING SHALL BE FACTORY FABRICATED FOR USE AT SITE AS PER APPROVED LAYOUT DRAWINGS. FOR SPECIFIC SITE REQUIREMENTS (E.G. IRREGULAR ANGLE BENDS SUCH AS 30°/60° BENDS, ETC) AS PER SITE LAYOUT CONDITIONS, TRAY ACCESSORIES SHALL BE FABRICATED AT SITE FROM THE STRAIGHT LENGTH OF RESPECTIVE SIZES AS REQUIRED. GALVANISATION DAMAGED DURING CUTTING/WELDING OPERATIONS SHALL BE BRUSHED AND RED LEAD PRIMER, OIL PRIMER AND ALUMINIUM PAINT SHALL BE APPLIED BEFORE INSTALLATION OF THE ACCESSORIES.
15. WIDTH OF CABLE TRAYS PROPOSED TO BE USED FOR PROJECT ARE AS UNDER :
LADDER TYPE CABLE TRAY (MM) : 600,300 & 150.
PERFORATED TYPE CABLE TRAY (MM) : 600,300,150,100 & 50.
16. 600MM WIDE CABLE TRAY SHALL BE SUITABLE FOR WEIGHT OF 100KG/M INCLUDING LIVE LOAD OF RUNNING LENGTH OF CABLE TRAY.
17. MAKE OF ALL ITEMS SHALL BE AS PER BHEL/CUSTOMER APPROVAL.
18. CABLE TROUGHS OR 50/100MM WIDE PERFORATED TYPE SHALL BE USED FOR LOCAL CABLING/BRANCHING OUT FEW CABLES FROM MAIN ROUTE.



TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES

DRAWING NO.

PE-DG-999-507-E007

SH 13 OF 13

REV 00



Project:	400/220/132 kV GIS Substation at Shamli, U.P. & Rasara Ballia (UP)
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Contractor:	Bharat Heavy Electricals Limited
Document No.	TB-406-316-TS-04, Rev.00
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SECTION-2

STANDARD SPECIFICATION

2.1 GENERAL

This section covers the general technical requirements of Cable Trench Material. In case of any discrepancies between the requirements mentioned in this section and those specified in other sections of this specification, the latter shall prevail and shall be treated as binding requirements.

2.1.1 TECHNICAL PARAMETERS

A. Cable Trays

Material of cable trays	:	MS
Whether Galvanised or Painted	:	Galvanised
Width (mm)	:	As per BOQ
Mass of Zinc coating	:	<u>610 g/sqm.</u>
Thickness of sheet metal for trays	:	<u>2 mm</u>
Whether perforated or ladder type	:	Ladder Type
Length of Single Cable Tray Piece	:	2.5 m
Accessories	:	Coupler plates & associated Hardware
Reference Drawing	:	As per Annexure 1 and drawing references in BOQ.

Notes:

1. Cable trench material and fittings shall be supplied as per the technical particulars and reference drawings as specified in this specification.
2. All finished galvanized MS structural members for cable tray supports shall be free from sharp edges, corners, burs and unevenness.
3. Necessary fasteners shall be provided with each cable trench material (as applicable) as specified in enclosed drawings.
4. All welded joints in cable trench material shall be smooth enough to provide a good appearance and shall not cause any injury to working personnel. All welding work shall be done by skilled personnel.
5. Coupler plates shall be provided for connecting tray ends to other straight trays, horizontal elbows, vertical elbows, tees, reducers etc. The number of coupler plates, washers, nuts and bolts to be supplied shall be as per the specification and drawings.
6. Cable trays shall be complete with all necessary hot dip galvanized sheet steel accessories such as coupler plates and associated nuts, bolts, washers, hangers, clamps etc.

	Project:	400/220/132 kV GIS Substation at Shamli, U.P. & Rasara Ballia (UP)
	Customer:	Uttar Pradesh Transmission Corporation Ltd (UPPTCL)
	Contractor:	Bharat Heavy Electricals Limited
	Document No.	TB-406-316-TS-04, Rev.00
	Technical Specification:	CABLE TRAY & ACCESSORIES

7. All fittings like horizontal/vertical elbow, reducer, horizontal tee etc., should be pre-fabricated. Each fitting shall be provided with two no. hot dip galvanized side coupler plates and associated bolts, nuts and washers on each side.
8. Necessary fasteners shall be provided along with each length of cable tray as specified drawings enclosed.
9. The width of tray covers, if applicable, shall be suitable for width of trays. Suitable bolting arrangement shall be supplied for attaching the cover to the cable trays, elbows, reducers, tees etc. as per drawings enclosed.

2.2 APPLICABLE STANDARDS

The Cable Trench Material shall conform to latest revision of the following Indian Standards:

Steel for general structural purpose : IS:2062-1999

Hot Rolled Carbon Steel Sheets and Strips specification : IS:1079

Mechanical Testing of Metals - Tensile Testing : IS:1068

Dimensions for steel plates, sheets strips and flats for general engineering purpose : IS:1730

Method of Tensile Testing of sheet steel and strip of thickness 0.5 to 3 mm : IS:1608

General technical delivery requirements for steel and steel products : IS:8910

Method of chemical analysis of pig iron, cast iron and plain carbon and low alloy steel , Part-1 : IS:228

Method for testing uniformity of coating on Zinc coated articles : IS:2633-1986

Recommended practice for hot dip galvanising on iron & steel : IS:2629-1985

Hot dip Zinc coating on structural steel and other allied products : IS:4759-1984

	Project:	400/220/132 kV GIS Substation at Shamli, U.P. & Rasara Ballia (UP)
	Customer:	Uttar Pradesh Transmission Corporation Ltd (UPPTCL)
	Contractor:	Bharat Heavy Electricals Limited
	Document No.	TB-406-316-TS-04, Rev.00
	Technical Specification:	CABLE TRAY & ACCESSORIES

Method for determination of mass of zinc coating on zinc coated iron and steel articles : IS:6745-1972

Rolled steel beams, channel and angles : IS:808-1989

Rolling and Cutting tolerances for rolled steel products : IS:1852-1985

Recommended practice for red oxide And zinc chromate on iron & steel : IS:2074-1992

2.3 TECHNICAL REQUIREMENTS

- 2.3.1 The material (Mild Steel) used for the supply shall be in sound condition and of recent manufacture, free from defects, loose mill scale, slag, pitting, rust, etc.
- 2.3.3 Galvanising of the rack assembly shall be done. The min. thickness of zinc at any spot shall not be less than 85 microns. Coating shall be adherent, smooth and reasonably bright, continuous and free from such imperfection as flux, ash, bare and black spot, pimples, lumpiness, rust stains, bulky white deposits and blisters and zinc chromate/red oxide shall conform to IS : 2074-1992.
- 2.3.4 The trays and rack assemblies shall not have sharp edges cuts, abrasions etc. and the zinc coating shall be adherent, smooth and reasonably bright, continuous and free from such imperfections as flux, ash, bare and black spot, pimples, lumpiness, rust stains.
- 2.3.5 All drilling, cutting, bending etc. of fabricated steel work shall be carried out before galvanising.
- 2.3.6 All angles shall be cut with shearing machine / power hack-saw, cutting with gas welding is not permitted.
- 2.3.7 Bolts and nuts shall be of steel with hexagonal head by approved supplier. All bolts shall be galvanised including threaded portions. The threaded portions of all bolts shall be cleared of smear by spinning / brushing. All the washers and nuts shall also be galvanised but threading of nuts shall be oiled/greased.
- 2.3.8 The bidder shall indicate in his offer, the final weight of the rack after punching and galvanising.

2.4 TESTS

In addition to tests requirement as mentioned in enclosed NTPC specification, following test details shall also be noted:

	Project:	400/220/132 kV GIS Substation at Shamli, U.P. & Rasara Ballia (UP)
	Customer:	Uttar Pradesh Transmission Corporation Ltd (UPPTCL)
	Contractor:	Bharat Heavy Electricals Limited
	Document No.	TB-406-316-TS-04, Rev.00
	Technical Specification:	CABLE TRAY & ACCESSORIES

1. Dimensional and visual examination - As per BHEL approved drawing.
2. Mass of Galvanisation - IS: 6745: 1972
3. Test for galvanising (Acceptance Test)
The test shall be done as per approved standards
4. Uniformity of zinc coating - IS: 2633: 1986
5. Mass of zinc coating – IS: 6745:1972
6. Chemical composition test -As per IS:2062-1999.
7. Tensile - As per IS:2062-1999.
8. Bending test -As per IS:2062-1999.
9. Deflection Test

	Project:	400/220/132 kV GIS Substation at Shamli, U.P. & Rasara Ballia (UP)
	Customer:	Uttar Pradesh Transmission Corporation Ltd (UPPTCL)
	Contractor:	Bharat Heavy Electricals Limited
	Document No.	TB-406-316-TS-04, Rev.00
	Technical Specification:	CABLE TRAY & ACCESSORIES

SECTION-3

Refer document

General Technical Requirements

	Project:	400/220/132 kV GIS Substation at Shamli, U.P. & Rasara Ballia (UP)
	Customer:	Uttar Pradesh Transmission Corporation Ltd (UPPTCL)
	Contractor:	Bharat Heavy Electricals Limited
	Document No.	TB-406-316-TS-04, Rev.00
	Technical Specification:	CABLE TRAY & ACCESSORIES

SECTION-3

PROJECT DETAILS & GENERAL SPECIFICATION

SITE INFORMATION SHAMLI:

	Particular	Details
a)	Owner	UPPTCL
b)	Customer	UPPTCL
c)	Project Title	400/220/132 kV GIS at Shamli, UP
d)	Location	Uttar Pradesh
e)	Transport Facilities	Nearest rail head - Shamli
SITE CONDITIONS		
a)	Max. ambient air temp.	50°C
b)	Min. ambient air temp.	0°C
c)	Max. design ambient emp.	50°C
d)	Design reference temp.	50°C
e)	Average Humidity	Max. 100%
f)	Special corrosion conditions	No
g)	Solar Radiation	
h)	Atmospheric UV radiation	High
i)	Altitude above sea level	Less than 1000meter
j)	Pollution Severity	High Pollution level
k)	Seismic Zone	As per the seismic zone defined in the relevant BIS / IEC-62271-300 but not less than 0.3g horizontal
WIND DATA		
	Wind load	195kg/sqm
	Average No. of thunderstorm days per annum	As per IS

SITE INFORMATION RASARA BALLIA:

	Particular	Details
f)	Owner	UPPTCL
g)	Customer	UPPTCL
h)	Project Title	400/220/132 kV GIS at Rasra, Ballia
i)	Location	Uttar Pradesh
j)	Transport Facilities	Nearest rail head - Ballia
SITE CONDITIONS		
l)	Max. ambient air temp.	50°C
m)	Min. ambient air temp.	0°C
n)	Max. design ambient emp.	50°C
o)	Design reference temp.	50°C
p)	Average Humidity	Max. 100%
q)	Special corrosion conditions	No
r)	Solar Radiation	

	Project:	400/220/132 kV GIS Substation at Shamli, U.P. & Rasara Ballia (UP)
	Customer:	Uttar Pradesh Transmission Corporation Ltd (UPPTCL)
	Contractor:	Bharat Heavy Electricals Limited
	Document No.	TB-406-316-TS-04, Rev.00
	Technical Specification:	CABLE TRAY & ACCESSORIES

s)	Atmospheric UV radiation	High
t)	Altitude above sea level	Less than 1000meter
u)	Pollution Severity	High Pollution level
v)	Seismic Zone	As per the seismic zone defined in the relevant BIS / IEC-62271-300 but not less than 0.3g horizontal
WIND DATA		
	Wind load	195kg/sqm
	Average No. of thunderstorm days per annum	As per IS

1. GENERAL

This Chapter covers Technical Requirements and requirements of auxiliary items.

- 1.1** Equipments furnished shall be complete in every respect with all mountings, fittings, fixtures and standard accessories specified &/or normally provided with such equipment and/ or needed for erection, completion and safe operation of the equipment as required by applicable codes though they may not have been specifically detailed in the Technical Specifications.

Materials and components not specifically stated in the specification but which are necessary for commissioning and satisfactory operation of the substation unless specifically excluded shall be deemed to be included in the scope of the specification and shall be supplied without any extra cost All similar standard components/ parts of similar standard equipment provided, shall be inter-changeable with one another.

- 1.2** The Bidder shall supply type tested (including special test as per technical specification) equipments and materials. The test reports/details shall be furnished by the Bidder in the bid.

In the event of any discrepancy in the test reports i.e. any test report not acceptable due to any design/manufacturing changes or due to non-compliance with the requirement stipulated in the Technical Specification and/or IEC/ IS, same, shall be carried out without any additional cost implication to the Purchaser. The Purchaser reserves the right to get any or all type tests conducted/ repeated.

The reports for all type tests and additional type tests as per technical specification furnished by the Bidder shall be of the tests conducted within last 05(five) years prior to the date of bid opening. The type tests conducted should have either been conducted in accredited laboratory (accredited based on ISO/ IEC Guide 25/ 17025 or EN 45001 by the national accreditation body of the country where laboratory is located) or witnessed by UPPTCL or representative authorized by UPPTCL or Utility or representative of accredited test lab or reputed consultant.

2. SYSTEM PARTICULARS

	Rated System voltage	420 kV, 245kV, 145kV, 36kV
	System frequency	50 Hz, This may vary by $\pm 5\%$
	Number of phases	Three

	Project:	400/220/132 kV GIS Substation at Shamli, U.P. & Rasara Ballia (UP)
	Customer:	Uttar Pradesh Transmission Corporation Ltd (UPPTCL)
	Contractor:	Bharat Heavy Electricals Limited
	Document No.	TB-406-316-TS-04, Rev.00
	Technical Specification:	CABLE TRAY & ACCESSORIES

	Neutral	Effectively Earthed
	Auxiliary power supply:-	
	Auxiliary electrical equipment shall be suitable for operation on the following supply system:	
(a)	Power device (Like drive motors)	400V, 3Phase, 4Wire 50Hz Effectively earthed AC system.
(b)	Lighting fixtures, space heaters, fractional Horse Power motors and control devices.	250V, 2wire, 50Hz, AC supply with one point grounded.
(c)	DC alarm, Control and Protective Devices from sub station batteries as under	2 wire ungrounded DC supplies (i) 400 kV S/S : 220V DC (ii) 220/132kV S/S : 110V DC (iii) Communication : 48 V DC The above supply voltage is subject to variation as follows: All devices must be suitable for a continuous operation over the entire range of voltage variations : (i) AC Voltage may vary by $\pm 10\%$. Frequency by $\pm 5\%$ Combined Voltage & frequency by $\pm 10\%$. (ii) DC a) 220 V may vary between 187 & 242 V b) 110 V may vary between 93 & 121 V c) 48 V may vary between 41 & 53 V

3. System parameters

Sl. No.	Description of Parameters	400 kV System	220 kV System	132 kV System	33 kV System
1	Nominal system voltage	400kV	220kV	132kV	33kV
2	Maximum operating voltage of the system(rms)	420kV	245kV	145kV	36kV
3	Rated frequency	50Hz	50Hz	50Hz	50Hz
4	No. of phase	3	3	3	3
5	Rated short time current	50 kA for 3 Sec.	40 kA for 3 SEC	40 kA for 3 SEC	25 kA for 3 SEC
6	Dry and wet one minute power frequency withstand voltage	680 kV	460 kV	275 kV	95 kV
7	Dry and wet impulse withstand voltage positive and negative	1550 kVp	1050 kVp	650 kVp	250 kVp

	Project:	400/220/132 kV GIS Substation at Shamli, U.P. & Rasara Ballia (UP)
	Customer:	Uttar Pradesh Transmission Corporation Ltd (UPPTCL)
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	Document No.	TB-406-316-TS-04, Rev.00
	Technical Specification:	CABLE TRAY & ACCESSORIES

8	Corona extinction voltage	320 kV	156 kV	105 kV	-
9	Max. Radio interference voltage for frequency between 0.5 MHz and 2 MHz at 508 kV rms for 765kV, 320kV rms for 400kV system and 156kV rms for 220kV system & 92kV rms for 132kV system system & 92kV rms for 132kV system	1000 microvolt	1000 microvolt	500 microvolt	-
10	Minimum total creepage	25mm/kV	25mm/kV	25mm/kV	25mm/kV
		(10500 mm)	(6125 mm)	(3625 mm)	(1300 mm)
11	Min. clearances				
	i. Phase to phase	4000mm (for Conductor-conductor)	2100 mm	1300 mm	320 mm
		4200mm (for rod - Conductor)			
	ii. Phase to earth	3500 mm	2100 mm	1300 mm	320 mm
	iii. Sectional clearances	6500 mm	5000 mm	4000 mm	3000 mm
12.	System neutral earthing	Effectively Earthed			

4. SERVICES TO BE PERFORMED BY THE EQUIPMENT BEING FURNISHED

- 4.1** All equipments shall perform satisfactorily under various electrical, electromechanical and meteorological conditions of the installation site.
- 4.2** All equipment shall be able to withstand all external and internal mechanical thermal and electromechanical forces due to various factors like wind load temperature variation, ice & snow (wherever applicable) short circuit etc for the equipment.
- 4.3** The Bidder shall design the various forces which the terminal connectors of the equipment are required to withstand.
- 4.4** All outdoor EHV equipments except marshalling kiosks shall be suitable for hot line washing.
- 4.5** To facilitate erection of equipment, all items to be assembled at site shall be "matchmarked".

5. STANDARDS

- 5.1** **Except** as modified by this Bid specification, all material and equipment shall conform to the requirement of the latest editions of relevant ISS/ IEC and other applicable standards. The equipments/ works shall be designed, engineered, manufactured, built, tested and

	Project:	400/220/132 kV GIS Substation at Shamli, U.P. & Rasara Ballia (UP)
	Customer:	Uttar Pradesh Transmission Corporation Ltd (UPPTCL)
	Contractor:	Bharat Heavy Electricals Limited
	Document No.	TB-406-316-TS-04, Rev.00
	Technical Specification:	CABLE TRAY & ACCESSORIES

commissioned shall be carried out in accordance with the Acts, Rules, Laws and Regulations in force in India.

- 5.2** In addition to meeting the specific requirements called for in the respective sections of the Technical Specification, the equipment shall also conform to the general requirement of the relevant standards which shall form an integral part of the specification. When the specific requirements stipulated in the specifications exceed or differ than those required by the applicable standards, the stipulation of the specification shall take precedence.
- 5.3** In the event of the Bidder offering equipment conforming to standards other than ISS/IES standards, which ensure equivalent or better performance than that specified in the standards, the salient point of comparison between the standards adopted and relevant ISS/ IEC standards shall be indicated clearly in the proposal, along with English language version of such standard or relevant extract of the same. The equipment conforming to standards other than IS/IEC shall be subject to Purchaser's approval.
- 5.4** The standards mentioned in the respective equipment specifications are not mutually exclusive or complete in themselves. The equipment &/or work shall also conform to any other applicable standard, even if not specifically mentioned in these specifications.
- 5.5** Should the Bidder wish to depart from the provisions of the specifications, either on accounts of manufacturing practices or for any other reason, he shall clearly mention the departure and submit complete justification supported by information, drawings etc. as will enable to assess the suitability of equipment(s) offered. In the event of the Bidder's specifications, drawings, forms and tables etc. being found to disagree with the requirement of the Bid specifications at any stage, Bid specifications shall be binding, unless the departures have been duly approved in writing by the purchaser.

5.6 R E F E R E N C E O F S T A N D A R D S

Reference	Abbreviation	Name and Address
BS	British Standards,	British Standards Institution, 101, Pentonville Road, N-19-ND UK
ISO	International Organization	Danish Board of Standardization Danish Standardising Sraat, Aurehoegvej-12, DK-2900, Heelstrup, DENMARK
NEMA	For Standardization, National Electric Manufacture Associate	115, East 44th Street, New York NY 10017 U.S.A
BS	British Standards,	British Standards Institution, 101, Pentonville Road, N-19-ND UK
ISO	International Organization	Danish Board of Standardization Danish Standardising Sraat, Aurehoegvej-12, DK-2900, Heelstrup,

	Project:	400/220/132 kV GIS Substation at Shamli, U.P. & Rasara Ballia (UP)
	Customer:	Uttar Pradesh Transmission Corporation Ltd (UPPTCL)
	Contractor:	Bharat Heavy Electricals Limited
	Document No.	TB-406-316-TS-04, Rev.00
	Technical Specification:	CABLE TRAY & ACCESSORIES

DENMARK

For
Standardization,
NEMA National Electric
Manufacture
Associate 115, East 44th Street, New York NY 10017 U.S.A

6. ENGINEERING DATA AND DRAWINGS

6.1 SUBMISSION AND APPROVAL OF DRAWINGS/ DOCUMENTS

- 6.1.1 The Bidder shall follow a well-defined coding system for proper and quick identification of all systems/ sub-systems/ equipments/ assemblies/ sub-assemblies/ accessories/ other plant material/ spare parts/ special tools and plants and drawings for the execution of the plant and later for its operation and maintenance.

Copies of coding documents defining the above shall be supplied along with drawings to understand the system.

- 6.1.2 All drawings submitted by the Bidder shall be in sufficient details to indicate the type, size arrangement, weight of each component, details for packing and shipment, the external connections, fixing arrangements, dimensions required for installation arrangement, dimensions required for installation and interconnections with other equipment and other information specifically, as called for in the drawing schedules. All the equipments tapping points etc. shall be numbered according to pre-determined scheme/ system which shall be subject to approval of Purchaser.
- 6.1.3 Each drawing shall be clearly marked with the name of the Purchaser, unit designation, UPPTCL's Contract No. and the name of the project. If standard catalogue pages are submitted the applicable items shall be indicated therein. All titles, noting, markings and writings on the drawings shall be in English. All the dimensions should be in metric units.
- 6.1.4 If any dimension figures on a drawing or a plan differs from those obtained by scaling the drawing or plan, the dimensions as mentioned in figures on the drawing or plan shall be taken as correct.

6.2 Submission and distribution of drawings/ documents

All the drawings which do not require approval shall be submitted along with reproducible in required number and those requiring approval shall be initially submitted for comments/ approval before submitting along with reproducible as per "Document Distribution Schedule".

6.3 APPROVAL OF DRAWINGS

- 6.3.1 The Purchaser shall return to the Bidder one set of drawings, plans and technical data requiring approval after marking them with their comments/ corrections, if any, either (a) marked 'Approved' or (b) marked 'Approved subject to incorporation of comments' or (c) marked 'Not Approved' with comments requiring resubmission of drawings etc. in 14 days or (d) marked 'Approval not required', where drawing is for information only. In case of (a) no further revision of drawings will be required. In case of (b) Bidder can proceed with the

	Project:	400/220/132 kV GIS Substation at Shamli, U.P. & Rasara Ballia (UP)
	Customer:	Uttar Pradesh Transmission Corporation Ltd (UPPTCL)
	Contractor:	Bharat Heavy Electricals Limited
	Document No.	TB-406-316-TS-04, Rev.00
	Technical Specification:	CABLE TRAY & ACCESSORIES

work but will resubmit the drawings incorporating the corrections as per comments only within fourteen (14) days. In case of (c) Bidder can proceed with the work only after resubmitting the drawings within fourteen (14) days and getting approval under (a) or (b) categories above. In case of (d) the Bidder drawing is deemed to have been received only for information purpose.

- 6.3.2 The Purchaser shall have the right to ask the Bidder to make any change in the design/ drawing which may be necessary to make equipment conform to the provisions and intent of the contract, without any extra cost to the Purchaser.

The drawings submitted shall be re-viewed by the Purchaser and shall be modified by the Bidder as required. The Bidder shall incorporate such modifications and/or corrections and submit the final drawings for approval/ reference.

- 6.3.3 No deviation from the approved drawings shall be permitted without the written approval of the Engineer.

- 6.3.4 The review of drawings/ data by the Purchaser will cover only general conformance of the data of the specifications and document, interfaces with the equipment provided under the specifications, external connections and the dimensions which might effect substation layout.

This review by the Purchaser may not indicate thorough review of all dimensions, quantities and details of the equipment, wiring, materials, any devices or items indicated or the accuracy of the information submitted. This review and/ or approval by the purchaser shall not be considered by the Bidder, as limiting any of his responsibilities specified under these specifications and documents.

Approval/ comments conveyed as above shall neither relieve the Bidder of his contractual obligations and his responsibilities for correctness of dimensions, material of construction, quantities, design details, assembly fits, performance particulars, guarantees and conformity of the supplies with the specifications, schemes, systems and statutory laws, nor does it limit the Purchasers right under the contract.

- 6.3.5 Should any minor revision be made after 'approval', at the time of erection/ commissioning the Bidder shall redistribute prints and reproducible, clearly certifying the changes incorporated in the drawing and marking it in a block. Every revision shall be marked by a revision number, date and subject, in a revision block provided in the drawing, clearly marking the changes incorporated.
- 6.3.6 The Bidder shall be responsible for and shall pay for any alterations of the work due to any discrepancies, errors and omissions in the drawings or other particulars supplied by him, whether such drawings or particulars have been approved by Engineer or not.

No extension of delivery periods shall be granted on this account.

7. QUALITY CONTROL PROGRAMME

	Project:	400/220/132 kV GIS Substation at Shamli, U.P. & Rasara Ballia (UP)
	Customer:	Uttar Pradesh Transmission Corporation Ltd (UPPTCL)
	Contractor:	Bharat Heavy Electricals Limited
	Document No.	TB-406-316-TS-04, Rev.00
	Technical Specification:	CABLE TRAY & ACCESSORIES

To ensure that the equipment construction work and the services covered under this job are in accordance with the specifications and conform to the high standard of workmanship. It is obligatory on the part of the Bidder to adopt a suitable quality control program. Such a program shall include suitable hold point for check for major equipments during manufacture at supplier's work, during erection at site and during the construction stage such that material checks for attaining proper strength and dimensional checks for attaining close tolerances required for equipment installation can be obtained.

In order to attain the above objectives, the Bidder shall draw out a plan listing all quality control checks in detail, including all hold points at which the quality checks shall be applied, also specifically mentioning those hold points where the Purchaser shall also participate in the quality check to assure him of the quality of the products supplied. Such a program shall be outlined by the Bidder for the acceptance by the Purchaser. The Bidder shall furnish detailed information regarding his quality control program and its strict implementation. Following information shall be included in the proposal along with others regarding quality control program:

- I. The quality control organizations and the proposal of its implementation.
- II. The system for controlling drawings and documents for correctness.
- III. The system of quality control for raw materials, process control and maintaining
- IV. tolerances during manufacturing, assembly and fabrication.
- V. Quality control during purchase of components, sub-systems and assemblies.
- VI. Methods for ensuring selection of proper vendors/ sub-vendors.
- VII. Inspection of testing at shop after assembly.
- VIII. Control of accuracy during calibration of measuring and testing equipments.
- IX. Preservation and quality control during the transit.
- X. Procedure for inspection before erection and quality control during erection.
- XI. System for storage and delivery.

Bidder shall be wholly responsible for the quality control and quality assurance for the manufacture, supply, erection, testing and commissioning etc.

During inspection, destructive testing and non destructive test evaluation shall be done wherever applicable, in presence of Purchaser's representative in accordance with established norms. Directions of Purchaser shall be rigorously followed.

8. INSPECTION

&

TESTING

8.1 The Purchaser reserves the right to inspect any machinery and material to ensure that approved Q.A.P. is being strictly implemented by the Bidder or his Sub Bidder/ Supplier under this contract and to reject any item found defective in workmanship or design or otherwise unsuitable for the use and purpose intended or which is not in accordance with the intent of this contract. The Bidder should on demand by the Purchaser, rectify or replace such defective or unsuitable equipment, or the Purchaser may at the Bidder's expense, rectify or replace such defective or unsuitable equipment whether before or after supply.

8.2 That Bidder shall, for purpose of clause 15 of the annexed conditions of contract Form-A

	Project:	400/220/132 kV GIS Substation at Shamli, U.P. & Rasara Ballia (UP)
	Customer:	Uttar Pradesh Transmission Corporation Ltd (UPPTCL)
	Contractor:	Bharat Heavy Electricals Limited
	Document No.	TB-406-316-TS-04, Rev.00
	Technical Specification:	CABLE TRAY & ACCESSORIES

inform to the Purchaser places of manufacture, testing and inspection of various equipment offered by him. Unless specifically provided otherwise, all tests shall be carried out at the Bidder's work or for bought out items at sub-vendors works before dispatch.

- 8.3** The Bidder shall advise the Purchaser at least 4 weeks in advance as to when the equipment will be ready for stage/ final inspection at the Bidder's works or at his Sub-Bidder's works.

PENAL CHARGES

In case the equipment is not available for inspection at the time of arrival of inspection officers, the Bidder shall pay to UPPTCL towards futile journey a sum decided by Chief Engineer (765 KV DU), UPPTCL and demanded by "Engineer of Contract". This amount shall be paid within 10 days from the date of demand. Further action for inspection of the material shall be taken only after the said amount is deposited.

- 8.4** During inspection, the Purchaser's Inspecting Engineers at all times have access to all part of shops where the equipment is being manufactured and also shall be provided with all reasonable inspection facilities by the Bidder and/ or sub-Bidders. Even without scheduled inspection, the Engineer and/or his duly authorized representative shall have at all reasonable times access to the Bidder's premises, works or site and shall have the power to inspect and examine the materials and workmanship of the works during it's manufacture or erection.
- 8.5** All plants equipment/ parts, sub assemblies/ assemblies shall comply with the requirement of type tests and shall be subjected to the routine/ acceptance tests specified in the set of standards adopted and to such other tests as are stipulated in the respective technical specifications.

The Purchaser reserves to himself the right of having at his own expense any inspection or special test of a reasonable nature at Bidder's premises or at site, in addition to those prescribed in applicable standards and the enclosed technical specifications.

- 8.6** The Engineer shall either depute his representative to witness the tests as applicable and inspect the material or shall waive the inspection. In case of waiver the Bidder or his sub-Bidder shall carryout the all applicable tests in absence of Purchaser's representative. In both the cases i.e. either inspection or waiver the test certificates shall be submitted to Engineer of Contract for approval and issue of dispatch authorization. In case of inspection the test certificates must bear signatures of the Purchaser's inspecting officer.

The Engineer of Contract, within 10 days of receipt of test certificates, shall issue approval/ dispatch authorization, if test certificates are found satisfactory.

In case test certificates are not found satisfactory the Engineer of Contract, within 10 days of receipt of test certificates, shall communicate his objections and actions required to be taken in writing to the Bidder. The Bidder shall take remedial action and shall re-

	Project:	400/220/132 kV GIS Substation at Shamli, U.P. & Rasara Ballia (UP)
	Customer:	Uttar Pradesh Transmission Corporation Ltd (UPPTCL)
	Contractor:	Bharat Heavy Electricals Limited
	Document No.	TB-406-316-TS-04, Rev.00
	Technical Specification:	CABLE TRAY & ACCESSORIES

submit the test certificates or re-offer the material for inspection as asked for by the Engineer. Subsequent actions shall follow as in case of fresh offer for inspection. No extension of delivery/ completion period shall be granted on this account.

8.7 REJECTON

Purchaser reserves the right to reject any equipment if during the tests at works or site, the test value achieved do not comply with the respective standard/ specifications and exceeds that tolerable limits. Rejection of any equipment will not be held as a valid reason for delay in timely completion of the work.

8.8 No equipment to be furnished or used in connection with this contract shall be dispatched, until factory inspection and acceptance test have been carried out satisfactorily and dispatch authorization issued by Engineer of Contract. Such factory inspection of the equipment or approval of acceptance tests shall not however, relieve the Bidder from full responsibility for supplying equipment conforming to the requirements of this contract, nor prejudice any claim, right or privilege which the Purchaser may have because of the use of defective or unsatisfactory equipment. Should Purchaser waive the right to inspect any equipment, such waiver shall not relieve the Bidder in any way from his obligations under this contract. The inspection/waiver by Engineer and/ or approval of test certificates shall in no way limit the liabilities and responsibilities of the Bidder in respect of the agreed quality assurance program, and the desired performance of the equipment.

8.9 In all cases where the contract provides for tests whether at the premises or works of the Bidder or of any Sub-Bidder, the Bidder shall provide free of charge such items as labour, materials, electricity, fuel, water, stores, apparatus and instruments as may be reasonably required to carry out effectively, such tests on the equipment in accordance with the contract and shall give facilities to the Engineer or to his authorized representative to accomplish inspection. All the expenses incurred for testing including material consumed in testing shall be to the Bidder's account.

8.10 Purchaser will not entertain any request for waiver of inspection on the ground that subvendors are not agreeing for the Purchaser's inspection. It is the responsibility of the Bidder to ensure that all the requirements of the Purchaser as envisaged in the technical specifications are incorporated.

8.11 The Bidder is required to record the following certificates on the invoices and challans of each and every consignment:
 "Certified that material being dispatched against the above invoices and challan has been inspected and tested by the representative of Engineer of the contract on (date) and all the test results were satisfactory, as per approved test certificate enclosed."

Or

Certified that inspection of material being dispatched against the above invoice and challan has been waived off by Engineer of Contract vide letter
 No.....Dt..... (Copy enclosed) and all the acceptance and routine

	Project:	400/220/132 kV GIS Substation at Shamli, U.P. & Rasara Ballia (UP)
	Customer:	Uttar Pradesh Transmission Corporation Ltd (UPPTCL)
	Contractor:	Bharat Heavy Electricals Limited
	Document No.	TB-406-316-TS-04, Rev.00
	Technical Specification:	CABLE TRAY & ACCESSORIES

tests as per relevant standards and those provided in Contract, have been conducted and all the test results were found satisfactory as per test certificates enclosed."

- 8.12** In case the inspection or testing of the material is to be carried out outside India, all the expenditure including boarding and lodging etc. of the inspecting officer/ officers shall be borne by the contractor and information regarding inspection has to given at least 8 weeks in advance.

9. PACKING

- 9.1** All equipment shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection.
While packing all the materials, the limitations from the point of view of availability of transportation facilities in India should be taken into account. The Bidder shall be responsible for any loss or damage during transportation, handling and storage.
- 9.2** The Bidder shall include and provide for security protection and packing the plant so as to avoid loss or damage during transport by any mode.
- 9.3** All packing shall allow for easy removal and checking at site. Wherever necessary, proper arrangement for attaching slings for lifting shall be provided. All packages shall be clearly marked for with signs showing 'UP' and 'DOWN' side of boxes, and handling and unpacking instructions as considered necessary. Special precautions shall be taken to prevent rusting of steel and iron parts during transit and storage. Gas seals or other methods proposed to be adopted for protection against moisture during transit shall be to the satisfaction of the engineer.
- 9.4** The cases containing easily damageable material shall be very carefully packed and marked with appropriate caution symbols i.e. FRAGILE, HANDLE WITH CARE, USE NO HOOKS etc.
- 9.5** Each package delivered under the contract shall be marked by the Bidder at his expense and such marking must be distinct (all previous irrelevant marking being carefully obliterated). Such marking shall show the description and quantity of contents, the name of consignee and address, the gross and net weights of the package, the name of Bidder with a distinctive number of mark sufficient for purpose of identification. All markings shall be carried out with such materials as to ensure quickness of drying, fastness and legibility.
- 9.6** Each Package shall contain a note quoting specifically the name of the Bidder, the number and date of contract or order and the name of office placing the contract, nomenclature of the stores and include a schedule of parts for each complete equipment giving the parts number with reference to the General Arrangement/ Assembly drawing and the quantity of each part, drawing number and tag numbers.
- 9.7** All equipment/ material shall be suitably packed for transport, carriage at site and outdoor storage during transit. The Bidder shall be responsible for any damage to the equipment during transit. The contents of each package shall bear marking that can be
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	Project:	400/220/132 kV GIS Substation at Shamli, U.P. & Rasara Ballia (UP)
	Customer:	Uttar Pradesh Transmission Corporation Ltd (UPPTCL)
	Contractor:	Bharat Heavy Electricals Limited
	Document No.	TB-406-316-TS-04, Rev.00
	Technical Specification:	CABLE TRAY & ACCESSORIES

readily identified from the package list and packing shall provide complete protection from moisture, termites and mechanical shocks etc.

- 9.8** Any material found short inside the packing cases shall be supplied by the Bidder without any extra cost.
- 9.9** Notwithstanding anything stated in this clause the Bidder shall be entirely responsible for any loss, damage or depreciation to the stores.

10. DESPATCH OF EQUIPMENT

- 10.1** Detailed dispatch instructions will be intimated to the Bidder. All materials shall be dispatched by road.
- 10.2** The Bidder shall intimate, at least thirty (30) days in advance to the consignee as well as the concerned Superintending Engineer at site, the probable date when the equipment will be ready for dispatch from the works. Notification of delivery or dispatch in regard to each and every consignment shall be made to the Purchaser immediately after dispatch or delivery. The supplier shall further supply to the consignee a priced invoice and packing account of all stores delivered or dispatched by him. All packages, containers, bundles and loose materials forming parts of each and every consignment shall be described fully in the packing account, and full details of the contents of packages and quantity of material shall be given to enable the consignee to check the stores on arrival at destination.
- 10.3** A list in duplicate containing details of equipment for verification at site shall also be placed inside each package and shall correspond with the advice note. One additional copy of each of the package lists shall also be sent to the consignee.

11. TYPE TESTING, INSPECTION, TESTING & INSPECTION CERTIFICATE

The Bidder shall supply type tested (including special test as per technical specification) equipments and materials. The test reports/details shall be furnished by the Bidder in the bid.

In the event of any discrepancy in the test reports i.e. any test report not acceptable due to any design/manufacturing changes or due to non-compliance with the requirement stipulated in the Technical Specification and/or IEC/ IS, same, shall be carried out without any additional cost implication to the Purchaser. The Purchaser reserves the right to get any or all type tests conducted/ repeated.

The reports for all type tests and additional type tests as per technical specification furnished by the Bidder shall be of the tests conducted within last 10(five) years prior to the date of bid opening. The type tests conducted should have either been conducted in accredited laboratory (accredited based on ISO/ IEC Guide 25/ 17025 or EN 45001 by the national accreditation body of the country where laboratory is located) or witnessed by UPPTCL or representative authorized by UPPTCL or Utility or representative of accredited test lab or reputed consultant.

	Project:	400/220/132 kV GIS Substation at Shamli, U.P. & Rasara Ballia (UP)
	Customer:	Uttar Pradesh Transmission Corporation Ltd (UPPTCL)
	Contractor:	Bharat Heavy Electricals Limited
	Document No.	TB-406-316-TS-04, Rev.00
	Technical Specification:	CABLE TRAY & ACCESSORIES

12. MATERIAL WORKMANSHIP

12.1 General Requirement

Where the specification does not contain references to workmanship, equipment, materials and components of the covered equipment, it is understood that the same must be new, of highest grade of the best quality of their kind, conforming to best engineering practice and suitable for the purpose for which they are intended.

The design of the works shall be such that installation, future expansions, replacements and general maintenance may be undertaken with a minimum of time and expenses. Each component shall be designed to be consistent with its duty and suitable factors of safety, subject to mutual agreements. All joints and fastenings shall be devised, constructed and documented so that the component parts shall be accurately positioned and restrained to fulfil their required function. In general screw threads shall be standard metric threads. The use of other thread forms will only be permitted when prior approval has been obtained from the Purchaser.

Whenever possible, all similar part of the Works shall be made to gauge and shall also be made interchangeable with similar parts. All spare parts shall also be interchangeable and shall be made of the same materials and workmanship as the corresponding parts of the Equipment supplied under the Specification. Where feasible, common component units shall be employed in different pieces of equipment in order to minimize spare parts stocking requirements. All equipment of the same type and rating shall be physically and electrically interchangeable.

All materials and equipment shall be installed in strict accordance with the manufacturer's recommendation(s). Only first-class work in accordance with the best modern practices will be accepted. Installation shall be considered as being the erection of equipment at its permanent location. This, unless otherwise specified, shall include unpacking, cleaning and lifting into position, grouting, leveling, aligning, coupling of or bolting down to previously installed equipment bases/foundations, performing the alignment check and final adjustment prior to initial operation, testing and commissioning in accordance with the manufacturer's tolerances, instructions and the Specification. All factory assembled rotating machinery shall be checked for alignment and adjustments made as necessary to re-establish the manufacturer's limits.

Suitable guards shall be provided for the protection of personnel on all exposed rotating and/ or moving machine parts and shall be designed for easy installation and removal for maintenance purposes. The spare equipment(s) shall be installed at designated locations and tested for healthiness.

The Bidder shall apply oil and grease of the proper specification to suit the machinery, as is necessary for the installation of the equipment. Lubricants used for installation purposes shall be drained out and the system flushed through where necessary for applying the lubricant required for operation. The Bidder shall apply all operational lubricants to the equipment installed by him.

	Project:	400/220/132 kV GIS Substation at Shamli, U.P. & Rasara Ballia (UP)
	Customer:	Uttar Pradesh Transmission Corporation Ltd (UPPTCL)
	Contractor:	Bharat Heavy Electricals Limited
	Document No.	TB-406-316-TS-04, Rev.00
	Technical Specification:	CABLE TRAY & ACCESSORIES

All oil, grease and other consumables used in the Works/ Equipment shall be purchased in India unless the Bidder has any special requirement for the specific application of a type of oil or grease not available in India. In such is the case he shall declare in the proposal, where such oil or grease is available. He shall help Purchaser in establishing equivalent Indian make and Indian Contractor. The same shall be applicable to other consumables too.

A cast iron or welded steel base plate shall be provided for all rotating equipment which are to be installed on a concrete base unless otherwise agreed to by the Purchaser. Each base plate shall support the unit and its drive assembly, shall be of design with pads for anchoring the units and shall have a raised up all around and shall have threaded in air connections, of so required.

12.2 Provisions For Exposure to Hot and Humid climate

Outdoor equipment supplied under the specification shall be suitable for service and storage under tropical conditions of high temperature, high humidity, heavy rainfall and environment favourable to the growth of fungi and mildew. The indoor equipments located in non-air conditioned areas shall also be of same type.

13. Surface finish

All interiors and exteriors of tanks, control cubicles and other metal parts shall be thoroughly cleaned to remove all rust, scales, corrosion, greases or other adhering foreign matter. All steel surfaces in contact with insulating oil as far as accessible shall be painted with not less than two coats of heat resistant, oil insoluble, insulating paints.

All metal surfaces exposed to atmosphere shall be given two primer coats of zinc chromate and two coats of epoxy paint with epoxy base thinner. All metal parts not accessible for painting shall be made of corrosion resisting material. All machine finished or bright surfaces shall be coated with a suitable preventive compound and suitably wrapped or otherwise protected. All paints shall be carefully selected to withstand tropical heat and extremes of weather within the limit specified. The paint shall not scale off or wrinkle or be removed by abrasion due to normal handling.

All external painting shall be as per shade No. 631 of IS: 5.

14. HOT DIP GALVANISING

All ferrous parts including all sizes of nuts, bolts, plain and spring washers, support channels, structures, shall be hot dip galvanized conforming to latest version of IS: 2629 or any other equivalent authoritative standard. However, hardware less than M12 size shall be electrogalvanized.

Minimum weight of zinc coating shall be 610 gm/ sq.mm and minimum thickness of coating shall be 85 microns for all items thicker than 6 mm. For items lower than 6mm thickness, requirement of coating shall be as per relevant ASTM. For surface which shall be embedded in concrete, the zinc coating shall be 610 gm/sq. m minimum.

The galvanized surfaces shall have a continuous and uniform thick coating of zinc, firmly

	Project:	400/220/132 kV GIS Substation at Shamli, U.P. & Rasara Ballia (UP)
	Customer:	Uttar Pradesh Transmission Corporation Ltd (UPPTCL)
	Contractor:	Bharat Heavy Electricals Limited
	Document No.	TB-406-316-TS-04, Rev.00
	Technical Specification:	CABLE TRAY & ACCESSORIES

adhering to the surface of steel. The finished surface shall be clean and smooth and shall be free from defects like discoloured patches, bare spots, unevenness of coating, spelter which is loosely attached to the steel globules, spiky deposits, blistered surface, flaking or peeling off, etc. The presence of any of these defects noticed on visual or microscopic inspection shall render the material liable to rejection.

After galvanizing, no drilling or welding shall be performed on the galvanized parts of the equipment excepting that nuts may be threaded after galvanizing. Sodium dichromate treatment shall be provided to avoid formation of white rust after hot dip galvanization.

Galvanised material must be transported properly to ensure that galvanised surfaces are not damaged during transit. Application of zinc rich paint at site shall not be allowed.

	Project:	400/220/132 kV GIS Substation at Shamli, U.P. & Rasara Ballia (UP)
	Customer:	Uttar Pradesh Transmission Corporation Ltd (UPPTCL)
	Contractor:	Bharat Heavy Electricals Limited
	Document No.	TB-406-316-TS-04, Rev.00
	Technical Specification:	CABLE TRAY & ACCESSORIES

SECTION-4
GUARANTEED TECHNICAL PARTICULARS
(To be submitted by the supplier at the contract execution stage)

- 1.0 Name of the Project :
- 2.0 Tenderer's Name and Address :
- 3.0 Manufacturer's Name and Address :
- 4.0 Material Specification :
- 5.0 Applicable Standards :
- 6.0 Thickness of sheet metal for Cable Trays, fittings etc. :
- 7.0 Max. Permissible loading for a 2.5m long simply supported at Both ends. :
- 8.0 Corresponding deflection at centre for The loading as in 7.0 above :
- 9.0 Weight of Zinc coating :
- 10.0 Min. Thickness of Zinc deposit at any spot :
- 10.0 Dimension of angle used for fabricating Racks assembly :
- 10.0 Max. Permissible loading at another end Of trays :

Name of the firm:-----

Signature of the Tenderer:-----

Designation:-----

Date:

Place:



Project:	400/220/132 kV GIS Substation at Shamli, U.P. & Rasara Ballia (UP)
Customer:	Uttar Pradesh Transmission Corporation Ltd (UPPTCL)
Contractor:	Bharat Heavy Electricals Limited
Document No.	TB-406-316-TS-04, Rev.00
Technical Specification:	CABLE TRAY & ACCESSORIES

SECTION-5

CHECK LIST FOR INFORMATION TO BE FURNISHED WITH OFFER RETURN THIS CHECKLIST AS PART OF THE OFFER DULY SIGNED

The offer may not be considered if the following information and this Checklist are not enclosed with the Offer.

BHEL ENQUIRY. NO:

BIDDER OFFER REFERENCE:

(1) S.No.	(2) Parameter	(3) Requirement	(4) Yes / No	(5) Remarks in case reply in Col (4) is <i>NO</i>
A)	Trays:			
1.	Type	Ladder type	YES / NO	
2.	Material	Rolled mild sheet steel	YES / NO	
3.	Thickness (minimum)	2mm for trays 3mm for coupler plates	YES / NO	
D)	Galvanization:			
1.	Type	Hot dip galvanization	YES / NO	
2.	Weight of zinc coating	610 gm/m ²	YES / NO	
3.	Min. thickness of zinc coating	85 microns	YES / NO	
E)	Following hardware not limited to this is included in scope			
1.	All Hardware for fixing of accessories	Included	YES / NO	
2.	2 % extra hardware mentioned in Section-1 of specification	Included	YES / NO	

TESTS

ROUTINE TESTS

Whether during manufacture and on completion, all items are subjected to the routine tests in accordance with latest IS/IEC and are in line with section-2 of this specification.

	Project:	400/220/132 kV GIS Substation at Shamli, U.P. & Rasara Ballia (UP)
	Customer:	Uttar Pradesh Transmission Corporation Ltd (UPPTCL)
	Contractor:	Bharat Heavy Electricals Limited
	Document No.	TB-406-316-TS-04, Rev.00
	Technical Specification:	CABLE TRAY & ACCESSORIES

(YES)

TYPE TESTS

i) Whether valid type test reports of all the tests as per relevant IS/IEC & section-2 of this specification, conducted earlier on identical material/ equipment are available (test reports shall be of the tests conducted not earlier than 5 (five) years from the date of bid opening 07-Sept-2018). **(YES/NO)**

ii) If the valid type test reports are not available with the bidder then the mentioned tests shall be conducted by the bidder without any cost/ delivery implication to BHEL/ UPPTCL.

(YES)