

DAMODAR VALLEY CORPORATION LIMITED

1 x 500MW NEW BOKARO TPS

**TECHNICAL SPECIFICATION
FOR
CABLE TRAY SUPPORT SYSTEM**

SPECIFICATION NO. PE-TS-317-507-E012

REVISION 0



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
POWER PROJECT ENGINEERING INSTITUTE
NOIDA (U.P), INDIA**



1X500 MW BOKARO TPS
TECHNICAL SPECIFICATION FOR CABLE
TRAYS SUPPORT SYSTEM

SPECIFICATION NO. PE-TS-317-507-E012

VOLUME II B

SECTION

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TOTAL NO. OF SHEETS (INCLUDING COVER SHEET)		= 36

IT IS CONFIRMED THAT OUR TECHNICAL OFFER COMPLIES WITH THE SPECIFICATION IN TOTO, & THAT THERE ARE NO TECHNICAL DEVIATIONS.

BIDDER'S STAMP & SIGNATURE

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INSTRUCTIONS TO BIDDERS FOR PREPARING TECHNICAL OFFERS

- 1 Two signed and stamped copies of the following shall be furnished by all bidders as technical offer:
 - a. Unpriced Price Schedule with bidder's signature and company stamp.
 - b. A copy of this sheet ("Instructions to Bidders for Preparing Technical Offer"), with bidder's signature and company stamp.
 - c. A copy of previous sheet ("Contents"), with bidder's signature and company stamp.
- 2 No other technical submittal such as copies of type test certificates, data Sheets, write-up, drawing, technical literature, etc. is required during tender stage. Any such submission, even if made, shall not be considered as part of offer.
- 3 No comments/ additions/ deletions shall be made by the bidder on the signed & stamped copy of the specification. Any such changes made by the bidder shall not be considered.
- 4 Confirmations/ comments (if any) regarding delivery schedules shall be furnished as part of the commercial offer. Any reference elsewhere/ covering letter of technical offer shall not be considered by BHEL.
- 5 Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.
- 6 Any changes made by the bidder in the price schedule with respect to the material description/ quantities, notes etc. from those given in Annexure of specification shall not be considered (i.e., technical description, quantities, notes etc. as per specification shall prevail).

BIDDER'S STAMP & SIGNATURE

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PREAMBLE

1 The Tender documents contain Two (2) volumes. The bidder shall meet the requirements of all two volumes.

1.1 VOLUME - I CONDITIONS OF CONTRACT

This consists of four parts as below: -

Volume – IA This part contains Instructions to bidders for making bids to BHEL.

Volume – IB This part contains General Commercial Conditions of the Tender & includes provision that vender shall be responsible for the quality of item supplied by their sub-vendors.

Volume – IC This part contains Special Conditions of Contract.

Volume – ID This part contains Commercial Conditions for Erection & Commissioning site work, as applicable.

1.2 VOLUME – II TECHNICAL SPECIFICATIONS

Technical requirements are stipulated in Volume – II, which comprises of: -

Volume – IIA General Technical Conditions.

Volume – IIB Technical Specification including Drawings, if any.

1.3 VOLUME – IIB

This volume is sub-divided in to following sections:-

Section – A This section outlines the Intent of Specification

Section – B This section provides "Project Information".

Section – C This section indicates Technical Requirements specific to Contract, not covered in Section - D

Section – D This section comprises of Technical Specifications of Equipments Complete with Data Sheets A & C.

Data sheet - A: - Specific data and other requirements pertaining to the equipments.

Data sheet - C: - Not applicable.

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SECTION – 'A'

SCOPE OF ENQUIRY

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SCOPE OF ENQUIRY

- 1.0 This specification covers design, manufacture, assembly, inspection & testing at manufacturer's works; proper packing, delivery to **1X500 MW BOKARO TPS** of **Cable Tray Support System** as mentioned in different sections of this specification, complete with all accessories for efficient and trouble-free operation of project as indicated in Section-B (Project Information).
- 2.0 It is not the intent to specify completely herein all details of the design and manufacture. However, the equipment shall conform in all respects to high standards of design engineering and workmanship and shall be capable of performing in continuous commercial operation up to bidder's guarantee.
- 3.0 The general terms and conditions, instruction to bidders and other attachment referred to elsewhere are hereby made part of the Technical Specification.
- 4.0 The Bidder shall be responsible for and governed by all requirements stipulated hereinafter.
- 5.0 Bidder shall confirm total compliance to the specification without any deviations from the technical / quality assurance requirements stipulated.
- 6.0 The documents shall be in English language and MKS system of units.

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SECTION – B

PROJECT INFORMATION

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**1X500 MW
NEW BOKARO THERMAL POWER STATION - A**

PROJECT INFORMATION

1. Owner
The Damodar Valley Corporation has five (5) major thermal power generating stations of which Bokaro T.P.S. is the first set up unit commissioned in 1953. Four (4) units with gross installed capacity of 247.5 MW. The proposed 500 MW unit would replace these BTPS units. The proposed Bokaro Thermal Power Station-A would be set up by Damodar Valley Corporation (DVC).
2. Project
1X500 MW NEW BOKARO THERMAL POWER STATION - A
3. Owner's Consultant
Development Consultants Private Limited, Kolkata.
4. Approach To Site
The site is about 3 KM from District Road connecting Bermo with Bargura. Nearest broad gauge railway station is Bokaro close to plant. Nearest port is Kolkata. The equipment will be normally transported by rail only and under exceptional cases by road. The material consignments shall be as per the restrictions of rail and road transportation prevailing in the country. The nearest airport is 'Ranchi' and Netaji Subhash International Airport, Kolkata.
5. Nearest Airport
Ranchi and Netaji Subhash International Airport, Kolkata.
6. Nearest Seaport
Kolkata
7. Land
This is a replacement unit in place of abandoned BTPS-A units. So the land of BTPS-A is available for the proposed 500 MW unit. 294.57 Ha of land is thus available with DVC. For remote ash dump 65 Ha has to be acquired.
8. Source of Coal
The Power Station located in the close vicinity of coal mines Bermo, Kalyani, Karoi mines. Major part of coal will be transported on rail and left out may be by road. Fuel oil (HFO/LDO) will normally be transported by railway oil tankers from nearest oil depot.
9. Source of Water
The water requirement for the Power station will be met by drawing water from upstream of Bokaro barrage which is located within 0.8 KM from plant. The Power station will operate on semi open cooling system using Natural Draft cooling towers. In addition all water conservation and recycling measures will be adopted to minimize requirement of make up water. The Bidder



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shall include in his proposal all such conservation measures adopted.

10. Ash disposal area

The fly ash would be collected & disposed in dry form. The bottom ash would be wet collected and disposed off in slurry form in permanent ash pond.

11. Salient Design Data

(i) Meteorological Data of Bokaro:

- a) Ambient Temperature Max / Min : 41.0 / 7.0
- b) Extreme ambient temp. Highest/ Lowest : 46.6 / - 0.3
- c) Maximum relative humidity (RH)/ Annual avg : 85% / 59 %
- d) Wet bulb temp. Highest/Lowest RH : 25.8 °C / 14.7 & 38
- e) Total annual rainfall : 1267.8 mm

(ii) Design Data

The following design data to be considered unless otherwise specified elsewhere

- (a) Design Ambient Temperature Max 50 °C / Min -0.3 °C
- (b) Design Wet Bulb Temperature 25.8 °C
- (c) Design RH 100 %
- (d) Seismic zone : Zone-III as per IS-1893
- (e) Wind load : 47 m/sec. (As per IS-875) up to a height of 10 metres above mean ground level.
- (f) Altitude: 242 meter above MSL.

12. Auxiliary Power Supply :

Supply	Description	Consumer
H.T. Supply	11000 V, 3 ϕ , 3W, 50 Hz non-effectively earthed	Motors of 1000kW and above
	11000 V, 3 ϕ , 3W, 50 Hz non-effectively earthed	Motors below 1000 KW & also for LT transformer(11KV/415V)
	Fault level 40 KA symm.	
L.T. Supply	415V, 3 ϕ , 4W, 50 Hz effectively earthed	Motors above 200W to 160 KW
	Fault level 50 KA symm.	
D.C Supply	240V, 1 ϕ , 2W, 50 Hz effectively earthed	Motors up to 200W Lighting, space heating, A.C. control & protective devices
	220V, 2W, unearthed & protective devices Fault level 25 KA	D.C. alarm, control



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13. RANGE OF VARIATION

A.C. Supply

Voltage : $\pm 10\%$ Frequency : $\pm 5\%$ Combined Volt : 10%
+ frequency (absolute sum)

D.C. Supply

Voltage : 198 to 240 Volt



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SECTION – 'C'

SPECIFIC TECHNICAL REQUIREMENTS

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1.0 SCOPE OF ENQUIRY


- 1.1 This enquiry covers the supply of Galvanised sheet steel structural members for boltable type cable tray support system as per requirement of this specification.
- 1.2 General technical requirements are indicated in Section-D and Datasheet-A. Project specific technical/ quality requirements/ changes are listed below.
- 1.3 Material shall conform in all respects to the requirements stipulated in all the above parts of the specification.
- 1.4 The stipulations of Section-C, followed by those of Datasheet-A shall prevail in case of any conflict between the stipulations of Section-C, Datasheet-A and Section-D.

2.0 BILL OF QUANTITIES:

- 2.1 Quantity requirements shall be as per Annexure-I (Bill of Quantities (BOQ)) enclosed.
- 2.2 Delivery schedule (i.e. contractual calendar dates) for the package shall be given separately to the bidders for compliance. Supplies shall be completed conforming to the lot requirements stipulated in the BOQ within the overall delivery schedule.
- 2.3 The total quantity variation shall be limited to – 20/+30 % of the total contract value derived on the basis of the Order Quantities.

2.4 SPECIFIC TECHNICAL REQUIREMENTS:

- 3.1.0 Specific technical requirements shall be specified in Datasheet – A (enclosed with section-D). Type Test shall be conducted as per enclosed Type test typical drawings (Annexure-IV) with this specification. However, the same shall be subjected to customer/ BHEL approval during contract stage without any commercial implications to BHEL.
- 3.2.0 Document distribution schedule for the project shall be as per Annexure-III enclosed.
- 3.3.0 Documents to be submitted by all bidders;
- a. Unpriced Price Schedule with bidder's signature and company stamp.
 - b. "Instructions to Bidders for Preparing Technical Offer", with bidder's signature and company stamp.
 - c. "Contents" sheet, with bidder's signature and company stamp.
- 3.4.0 After award of contract, Vendor is required to furnish Drawings / Documents as per Annexure -II of this specification.

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ANNEXURE - I
BILL OF QUANTITIES

Sr No.	Item Code	Item Description	Unit	Order Quantity	Lot-I Quantity
1.0	507-34016-A	SINGLE CHANNEL SC1 (IN STANDARD LENGTH OF 6M PER PIECE)	M	15000	12000
2.0	507-34012-A	DOUBLE CHANNEL DC1 (IN STANDARD LENGTH OF 6M PER PIECE)	M	15000	12000
3.0		CANTILEVER ARM EACH COMPLETE WITH 2 NOS. - M12 HEX. BOLT & WASHER 2 NOS. - M12 SPRING NUTS 2 NOS. - M6 PAN HEAD SCREWS & WASHER 2 NOS. - M6 SPRING NUTS			
(i)	507-34009-A	For 600mm wide cable trays	Nos.	15000	12000
(ii)	507-34008-A	For 450mm wide cable trays	Nos.	4000	3200
(iii)	507-34007-A	For 300mm wide cable trays	Nos.	13000	10400
(iv)	507-34006-A	For 150mm wide cable trays	Nos.	5000	4000
4.0		CLAMPS AND FITTINGS COMPLETE WITH REQUIRED HARDWARES(Spring nuts/ washers etc. as required for complete installation)			
(i)	507-34004-A	BASE PLATE FOR SINGLE CHANNEL BP1 (With 1 no. ANCHOR BOLT)	Nos.	2000	1600
(ii)	507-34003-A	BASE PLATE FOR DOUBLE CHANNEL BP2 (With 2 no. ANCHOR BOLT)	Nos.	5000	4000
(iii)	507-34005-A	BEAM CLAMP BC1	Nos.	6500	5200
(iv)	507-34002-A	90° ANGLE FITTING LA1	Nos.	19000	15200
(v)	507-34001-A	90° ANGLE FITTING HL1	Nos.	3500	2800
(vi)	507-34014-A	FLAT PLATE STRAIGHT FITTING PF2	Nos.	450	360
(vii)	507-34015-A	FLAT PLATE TEE FITTING PF1	Nos.	300	240
(viii)	507-34010-A	CLAMP FOR SINGLE CHANNEL CC1 (WITH 2 Nos. ANCHOR BOLTS)	Nos.	10000	8000
(ix)	507-34011-A	CLAMP CC2	Nos.	6000	4800

Notes:

- The quantities will be released for manufacture in more than one lot. Lot-I quantities, which are indicated above, shall be released for manufacture along with LOI.
- Manufacturing of Lot-I quantities shall be done after the approval of technical and quality documentation, and supply of same shall be completed within four months of date of approval of documents.
- Subsequent lots shall be cleared for manufacture based on progress of engineering and site requirements. A lead-time of three months shall be given for completion of supply of each lot from the date of clearance of the quantities.
- The total quantity variation shall be limited to - 20 /+30% of the total contract value derived on the basis of the order quantities.
- Raw materials - Steel shall be procured from SAIL / Tisco / authorised re-rollers. Makes / source of other raw materials shall be subject to approval during detailed engineering stage

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ANNEXURE – II
LIST OF DRAWINGS / DOCUMENTS
(REQUIRED TO BE FURNISHED BY SUCCESSFUL BIDDER AFTER AWARD OF CONTRACT)

Sl. No.	Drawings/Document Description	Drawings / Document Number	Submission date by vendor
a)	Standard Quality Plan	PE-V0-317-507-E901	Within two weeks of award of contract
b)	Recommended Field Quality Plan	PE-V0-317-507-E902	Within two weeks of award of contract
c)	Type test procedure including drawings	PE-V0-317-507-E903	Within two weeks of award of contract
d)	Typical details for cable tray support system	PE-V0-317-507-E904	Within two weeks of award of contract

ANNEXURE – III

Nos. OF DRAWINGS/ DOCUMENTS REQUIRED FROM VENDOR

Document distribution schedule for the project shall be as below after award of contract for All Documents / Drawings.

- | | | |
|----|---|----------------------|
| 1) | First Submission: | 2 Prints + Soft Copy |
| 2) | Subsequent Submissions Till Final Award: | 9 Prints + Soft Copy |
| 3) | Distribution Prints of Approved Drawings: | 9 Prints + Soft Copy |

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SECTION – 'D'

STANDARD TECHNICAL REQUIREMENTS



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1.0 GENERAL

This specification covers the design, manufacture, inspection & testing at vendor's works, packing and delivery to site of galvanized cable tray support system (bolt able).

2.0 CODES AND STANDARDS

The material, constructional features and various processes involved in manufacture shall comply with currently applicable Indian standards. All relevant parts of the applicable Indian standards shall be considered.

3.0 DESIGN REQUIREMENTS AND CONSTRUCTIONAL FEATURES

- 3.1 All items listed in the Bill of Quantities (Sec-C of the specification) shall be manufactured as per this specification & generally as per drawings enclosed with this specification.

However, minor dimensional differences arising out of manufacturer's fabrication processes may be acceptable after review & approval by BHEL, only if the dimensions are as those for the type tested design of the manufacturer.

- 3.2 Cable tray supports shall be formed out of sheet steel.

However standard length of SC1/ DC1 channels shall be fabricated out of single piece & it shall not have welded joints in between.

- 3.4 All welded joints shall be smooth enough to provide a good appearance and shall not cause any injury to working personnel or any damage to the cable laid directly on it. All welding work shall be done by skilled personnel.

4.0 SURFACE TREATMENT

- 4.1 Galvanizing

- 4.2 Surface cleaning : In the first step complete surface shall be cleaned with sand paper and / or cotton cloth to remove accumulated dust and dirt.

- 4.3 Pre-treatment : Surface pre-treatment shall be done as per IS:6005 before galvanization.

- 4.4 Surface Finish : Articles shall be hot dip galvanized after fabrication, surface cleaning and pre-treatment. The galvanizing shall be uniform, clean, smooth, continuous and free from acid spots. If the galvanizing of the samples is found defective, the entire batch of steel will have to be regularized at vendor's cost.

- 4.5 The amount of zinc deposited shall not be less than 610 grams per square metre of surface area and in addition, the thickness of the zinc deposit at any spot whatsoever shall not be less than 75 microns. The purchaser reserves the right to measure the thickness of zinc deposit by an Elko meter or any other instrument acceptable to purchaser and reject any component, which shows thickness of zinc at any location to be less than 75 microns.

5.0 INSPECTION

- 5.1 The following stages of manufacture shall be stage inspected by purchaser or his duly authorised representative.

- 5.2 Inspection of raw materials including hardware items such as bolts, nuts etc.

- 5.3 Inspection of manufacturing processes such as shearing, punching, bending, welding, galvanizing, painting etc.

- 5.4 Inspection of finished products.

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5.5 Inspection of packing material and procedure.

5.6 The inspection shall be carried out as per BHEL quality plan no. PED-507-00-Q-013/00

6.0 TESTING:

6.1 The supplier shall perform all tests necessary to ensure that the material and workmanship conform to the relevant standards and comply with the requirements of this specification.

6.2 The tests shall be in accordance with appropriate Indian standards. The extent of the tests to be performed by the supplier shall include but not be limited to the following: -

a) Type tests on Support System for Cable Trays:

Cable tray support system shall be proven type & of type tested design conforming to type tests as under:

- a) Load test for Main support channel with cantilever arm fixed on one side
- b) Load test for Main support channel with cantilever arm fixed on both sides
- c) Load test for Channel fixed on Beam/Floor
- d) Load test for channel supported on wall with Cantilever arm
- e) Channel nut slip characteristics (wherever applicable)
- f) Weld integrity test
- g) Test for galvanizing: Weight, thickness and uniformity of zinc coating shall be determined in accordance with IS: 6745 and IS: 2633 for the values indicated in Data Sheet- A.

Type testing shall be carried out for tests listed at "(a) through (f)" above in line with drawings attached in Annexure-IV. The final type test procedure shall be to BHEL/customer approval.

Type tests listed at (a) through (f) shall be conducted once. However, type test listed at (g) shall be conducted on each lot offered for inspection.

b) Routine Tests:

(i) Dimension checks

c) Acceptance Test:

- (i) Dimension checks
- (ii) Tests for galvanizing

6.0 PACKING

The material shall be packed to ensure protection against damage during transit, storage for prolonged periods and handling. Packing procedure shall be subject to the purchaser's approval.

7.0 DRAWING DATA AND DOCUMENTS REQUIRED (within two weeks of award of contract)

- i) Standard Quality Plan
- ii) Any other drawings / documents listed in Sec-C.

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DATASHEET A
(SPECIFIC TECHNICAL REQUIREMENTS)

1.0 APPLICABLE STANDARDS:

- a) IS: 2062 For Structural steel.
- b) IS: 1079 For hot rolled carbon steel sheet and strip.
- c) IS: 1730 For dimensions for steel sheet and strip.
- d) IS: 1363 Hexagon head bolts, screws and nuts.
- e) IS: 5 For colours of paint.
- f) IS: 6005 For surface pre-treatment.
- g) IS: 2629 For hot dip galvanising of steel.
- h) IS: 2633 For testing of zinc coating.
- i) IS: 6745 For determining of mass of zinc coating.
- j) IS: 1852 For Rolling and Cutting Tolerances of hot rolled steel products.
- k) IS: 513 For cold rolled low carbon steel sheet & strip

2.0 CABLE TRAY SUPPORT

- a) Tray support type: Bolted type
- b) Material: Cold rolled MS sheet steel for channel SC1/ DC1 and channel portion of cantilever arms as per IS:513/IS:1079 & IS:2062
- c) Thickness: 2.5 mm
- d) Fabrication : At works
- e) Construction: Conforming to enclosed drawings [PE-DG-317-507-E013]

3.0 SURFACE TREATMENT:

Galvanizing:

- i) Pre-treatment: IS 6005 before galvanisation.
- ii) Type: Hot dip galvanization
- iii) Applicable Standard: IS 2629
- iv) Minimum thickness: 75 microns (minimum)
- v) Min. weight of Zinc deposit : 610 gms per square meter
- vi) Tests for galvanizing: Weight, thickness and uniformity of zinc coating as per IS: 6745 and IS: 2633.

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QUALITY PLAN

ANNEXURE – 1

INSTRUCTIONS FOR QUALITY PLAN

The Quality Plan shall include all the Quality Control Measures and Checks adopted by the Vendor to ensure that the material/component/assembly/services supplied by him meet/will meet the requirements as per specifications and good practices. They shall include all stages of operation such as materials, processes, manufacture, assembly, packing and despatch. The following guide lines may be noted:

- Column 1- Serial Number
- Column 2- Component/Operation- The component and/or operation being checked shall be given here.
- Column 3- Characteristics check- The characteristics being checked shall be given here, e.g., chemical composition, mechanical properties, leak tightness, surface defects etc..
- Column 4- Category - 'CR' stands for critical characteristic - affecting safety of equipment and personnel
'MA' stands for major Characteristic - affecting safety of equipment and personnel
'MI' stands for minor characteristic - affecting appearance etc.
- Column 5- Type/Method of check e.g. chemical analysis tensile testing, hydraulic test, visual examination radiography etc.
- Column 6- Extent of check, such as, 100, 10, 1 percent etc.
- Column 7- Reference Documents - Documents, such as technical specification, drawings, standard specifications (IS, BS ETC) procedure, etc. according to which check is done.
- Column 8- Acceptance Norms - Standards etc. according to which acceptability or otherwise of the characteristics being checked is decided.
- Column 9- Format of Record - Formats, log sheets, reports, etc. in which the observations are recorded. Standard log sheets, reports, formats etc. of the Vendors shall be numbered and such reference numbers shall be included here.
- Column 10- Agency - The agency which performs the test/instruction shall be written in sub-column 'W'
The agency which verifies test certificates/inspection records and carries out audit check of the components/operation shall be written in sub-column 'V'
- The agencies are codified as 1,2 & 3
- '1' stands for (BHEL)
- '1' * means the operation shall be cleared by BHEL before the start of the next operation
- '2' Stands for Vendor
- '3' stands for sub-Vendor of the Vendor and so on.
- Example :
- Entry '3' in column 'P' means test/inspection to be performed by sub-Vendor's QC
- Entry '2' in column 'W' means test/inspection to be witnessed by Vendor's QC
- Entry '1' in column 'V' means verification shall be done by BHEL and next stage to be started only after the hold point is cleared by BHEL
- Column 11- Remarks - Any special remarks shall be given here

NOTES :

- 1 In absence of correlation with the test certificate(s) (e.g. material identification) samples shall be drawn by BHEL and all tests as per relevant specifications shall be carried out in their presence or in recognized Government Laboratory.
- 2 When materials and components are initially identified and stamped by BHEL QS engineer, the identification marks shall be preserved till despatch. Wherever this is not possible, the identification mark shall be transferred to the components in the presence of BHEL QS Engineer unless other wise agreed.
3. For castings and forgings integral test specimens shall be provided, When this is not possible for casting, they shall be poured in the presence of BHEL QS Engineer unless otherwise, if witnessing of test by BHEL is called for.
4. When welders qualified by reputed inspection agencies or statutory bodies are not available, qualification tests shall be conducted in the presence of BHEL QS Engineer.
- 5 This Quality Plan is liable to be modified as per the requirements of approved drawings and changes in technical specifications/drawings., If there are contradictions in respect of column 7 & 8 between this Quality Plan and the approved drawings specifications, the latter shall prevail.
- 6 Wherever inspection by BHELs Purchaser/Third Party/Statutory authorities are mandatory, this shall be compiled with.
- 7 Inspection reports, log sheets, test reports/certificate. etc. shall be furnished to BHEL at the appropriate stages or at the time of final inspection, as required.
- 8 This Quality Plan is also applicable to spares, if any, under scope of supply of Vendor
- 9 The quality plan shall be submitted in minimum 4 copies with a soft copy of the same or in line with contract requirements.

<div>QUALITY PLAN</div> <div>SHEET 1 OF 2</div>		CUSTOMER		PROJECT		SPECIFICATION											
								NUMBER									
										TITLE							
BIDDER/ VENDOR		NUMBER PED-507-00-Q-01300		SPECIFICATION													
SYSTEM		ITEM : CABLE TRAY SUPPORT MATERIAL & ACCESSORIES (BOLTABLE)		SECTION		VOLUME III											
CAT		REFERENCE DOCUMENT		ACCEPTANCE NORM		FORMAT OF RECORD											
TYPE/ METHOD OF CHECK		EXTENT OF CHECK		P		W		V		REMARKS							
CHECK		CHECK		CHECK		CHECK		CHECK		CHECK							
3		4		5		6		7		8		9		10		11	
1.0	RAW MATERIAL																
1.1	ROLLED SHEET																
	1 CHEM & PHY PROPERTIES	MA	VERIFICATION OF TCS	100%	IS-1079 (for hot rolled) IS-513 (for cold rolled)	IS-1079 (for hot rolled) IS-513 (for cold rolled)	MILL TC	3/2	-	-							AS PER CONTRACT & AS APPLICABLE IN TECH. SPECIFICATION
	2 DIMENSIONS	MA	MEASUREMENT	100%	IS-1730/ SPECIFICATION	IS-1730/ SPECIFICATION	QC RECORD	3/2	-	-							
	3 SURFACE FINISH	MA	VISUAL	100%	IS-1079 (for hot rolled) IS-513 (for cold rolled)	IS-1079 (for hot rolled) IS-513 (for cold rolled)	QC RECORD	3/2	-	-							
1.2	ZINC	MA	CHEM TEST	EACH HEAT	IS-209	IS-209	QC RECORD	3/2	-	1/2							
2.0	IN-PROCESS																
2.1	FABRICATION																
	1 DIMENSIONS	MA	MEASUREMENT	100%	APPD. DRGS.	APPD. DRGS.	QC RECORD	2	-	1							
	2 WELDING QUALITY	MA	VISUAL	100%	GOOD WELDING PRACTICE	FREE FROM DEFECTS & SLAG	QC RECORD	2	-	1							WELDING IS TO BE DONE BY QUALIFIED WELDERS
	3 SURFACE FINISH	MA	VISUAL	100%	SPECIFICATION	SPECIFICATION	QC RECORD	2	-	1							
2.2	SURFACE PREPARATION																
	1 CLEANING, PICKLING, RINSING & FLUXING	MA	MEASUREMENT	PERIODIC IN EACH SHIFT	IS-2629	IS-2629	QC RECORD	2	-	-							
	2 SURFACE QUALITY	MA	VISUAL	100%	IS-2629	IS-2629	QC RECORD	2	-	-							
2.3	GALVANISING																
	1 TEMPERATURE OF BATH	MA	TEMPERATURE INDICATOR	CONTINUOUS	IS-2629	IS-2629	QC RECORD	2	-	-							
BHEL																	
BIDDER/VENDOR																	
NAME																	
SIGNATURE																	
DATE																	
BIDDER'S/VENDOR'S COMPANY SEAL																	

17

QUALITY PLAN		CUSTOMER		PROJECT		SPECIFICATION						
BIDDER/ VENDOR		TITLE		NUMBER		SPECIFICATION TITLE						
SYSTEM		ITEM: CABLE TRAY SUPPORT MATERIAL & ACCESSORIES (BOLT TABLE)		SECTION		VOLUME III						
SHEET 2 OF 2		REFERENCE DOCUMENT		ACCEPTANCE NORM		FORMAT OF RECORD						
EXTENT OF CHECK		TYPE/ METHOD OF CHECK		5		6						
CAT		4		3		2						
CHARACTERISTIC CHECK		3		1		11						
COMPONENT/OPERATION		2		1		10						
SL NO		1		1		1						
3.0	FINISHED ITEMS	2. DROSS	MA	VISUAL	CONTINUOUS	IS - 2629	IS - 2629	QC RECORD	2	-	-	FASTENERS SHALL BE OF REPUTED & APPROVED MAKE
		3. RATE OF IMMERSION	MA	VISUAL / MEASUREMENT	100%	IS - 2629 / MFR'S PRACTICE	IS - 2629 / MFR'S PRACTICE	QC RECORD	3	-	2	
		4. SURFACE QUALITY	MA	VISUAL	100%	IS - 2629 /	FREE FROM BURRS, SLAG, ROUGHNESS, FLUX STAIN ETC	QC RECORD	2	-	-	
3.1	SINGLE / DOUBLE CHANNELS, CANTILEVER ARMS, CLAMPS	1. DIMENSIONS DISTORTION	MA	MEASUREMENT	IS-2500 LEVEL IV	APPD. DRG	APPD. DRG	INSP. REPORT	3	2, 1	-	
		2. SURFACE FINISH	MA	VISUAL	IS-2500 LEVEL IV	SPECIFICATION	FREE FROM BURRS, SLAG, ROUGHNESS, FLUX, STAIN, ETC	INSP. REPORT	3	2, 1	-	
		3. MASS OF ZINC COATING	MA	CHEM. TEST	IS-4759 / SPECIFICATION	IS-6745 / SPECIFICATION	SPECIFICATION	INSP. REPORT	3	2, 1	-	
		4. UNIFORMITY OF ZINC COATING	MA	CHEM. TEST	IS-4759 / SPECIFICATION	IS-2633	IS-2633	INSP. REPORT	2	1	-	
		5. THICKNESS OF ZINC COATING	MA	ELCOMETER	IS-4759 / SPECIFICATION	SPECIFICATION	SPECIFICATION	INSP. REPORT	3	2, 1	-	
		6. ADHESION	MA	MECH. TEST	IS-4759	IS-2629	IS-2629	INSP. REPORT	3	2, 1	-	
3.1.1	TYPE TESTING		CR	TEST	1 SAMPLE	SPECIFICATION / APPD. TYPE TEST PROCEDURE	SPECIFICATION / APPD. TYPE TEST PROCEDURE	INSP. REPORT	2	1	-	
3.1.2	WELD INTEGRITY TEST	SOUNDNESS	CR	MPI	SAMPLE TESTED DURING TYPE TESTING	SPECIFICATION	NO DEFECT	INSP. REPORT	2	1	-	AFTER CARRYING OUT TYPE TEST, WELD INTEGRITY TEST TO CHECK THE WELD SOUNDNESS/ ACCEPTANCE SHALL BE DONE BY MANUFACTURER
NOTE: INSTRUCTIONS FOR QUALITY PLAN IS ATTACHED AS ANNEXURE-1.												
BH&L												
PARTICULARS												
NAME												
SIGNATURE												
DATE												
BIDDER'S/VENDOR'S COMPANY SEAL												

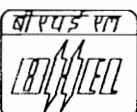
NOTE: INSTRUCTIONS FOR QUALITY PLAN IS ATTACHED AS ANNEXURE-1.

BHEL		BIDDER/VENDOR	
PARTICULARS			
NAME			
SIGNATURE			
DATE			
		BIDDER/SVENDORS COMPANY SEAL	

TYPICAL DETAILS OF BOLTABLE TYPE CABLE TRAY SUPPORT MATERIAL & ACCESSORIES

REVISIONS				
	NAME	DATE		

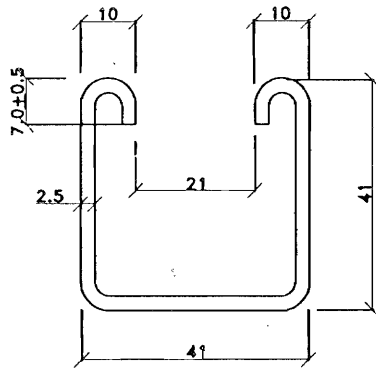
PROJECT:	DAMODAR VALLEY CORPORATION 1X500 MW BOKARO TPS	DRAWN	NAME	DATE
		DSGN	KG	10.01.11
		CHKD	SS	10.01.11
		APPD	SKG	10.01.11
DRG. NO.	PE-DG-317-507-E013			



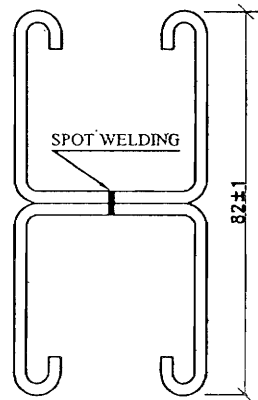
BHARAT HEAVY ELECTRICALS LTD.
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

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SH 1 OF 11



SINGLE CHANNEL SC1



DOUBLE CHANNEL DC1

TWO LENGTHS OF SINGLE CHANNEL

SPOT WELDED BACK TO BACK

AT 75MM C/C

NOTE:

1. ALL DIMENSIONS ARE IN mm.
2. MATERIAL : COLD ROLLED M.S. AS PER IS : 513
3. FINISH : HOT DIP GALVANISED AS PER IS 2629
4. TOLERANCE ON THICKNESS IS AS PER IS 1852
5. PROFILE TOLERANCE ± 0.5 mm



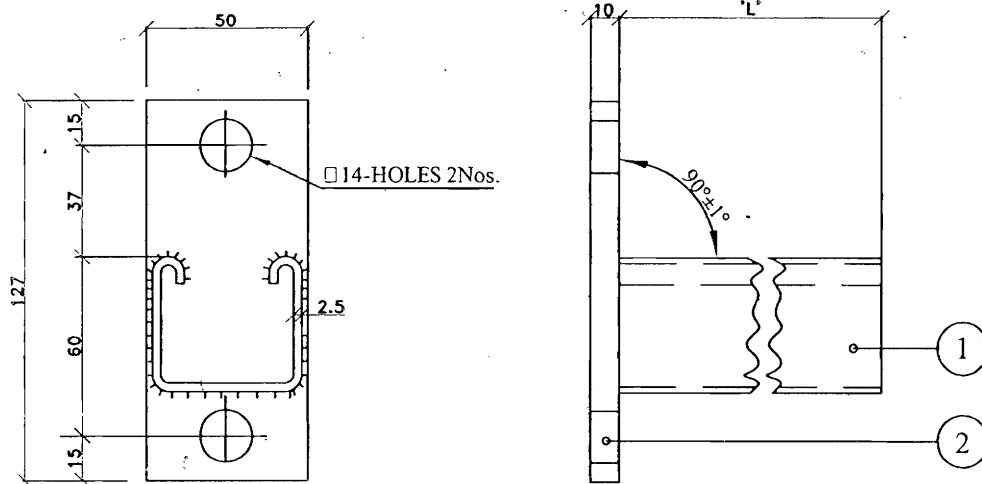
TITLE: TYPICAL DETAILS OF BOLTABLE
TYPE CABLE TRAY SUPPORT
MATERIAL & ACCESSORIES

DRG. NO.

PE-DG-317-507-E013

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(A)



CANTILEVER ARMS

TRAY WIDTH IN MM	CANTILEVER ARM LENGTH (L) IN MM
150	200
300	350
450	500
600	650

NOTES :

1. ALL DIMENSIONS ARE IN mm.
2. ITEM NO.1 MATERIAL : COLD ROLLED M.S.AS PER IS 513
3. ITEM NO.2 MATERIAL : M.S AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629
5. TOLERANCE ON THICKNESS IS AS PER IS:1852
5. ALL FABRICATION TOLERANCES ARE $\pm 1.0\text{mm}$



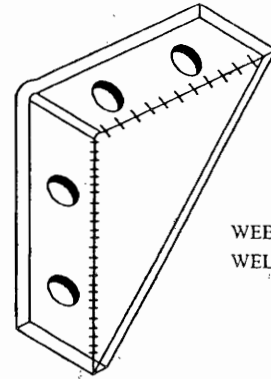
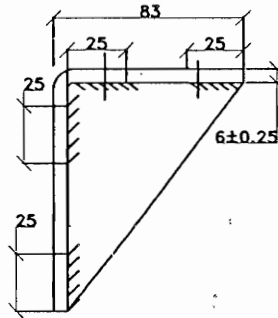
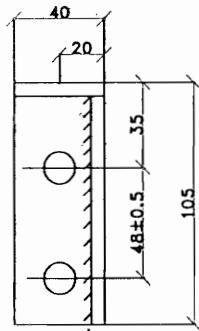
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TYPE CABLE TRAY SUPPORT
MATERIAL & ACCESSORIES**

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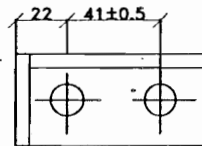
PE-DG-317+507-E013

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WEB 3 ±0.25mm
WELDED 6mm FILLET



90° ANGLE FITTING HL1

NOTES :

1. ALL DIMENSIONS ARE IN mm.
2. ALL FABRICATION TOLERANCES ±1.0 mm
3. MATERIAL :MILD STEEL AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629
5. TOLERANCE ON THICKNESS AS PER IS:1852

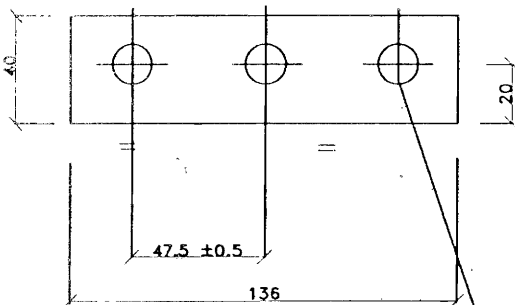
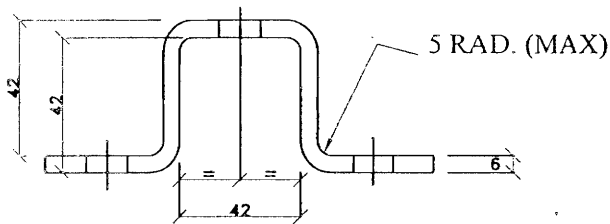
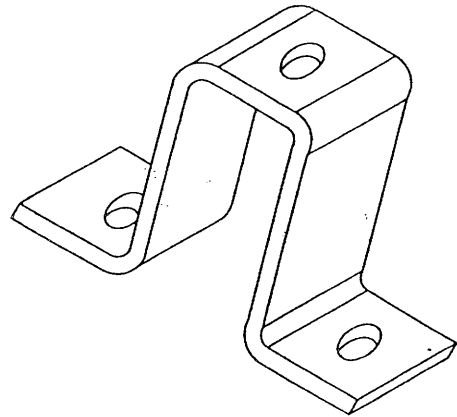
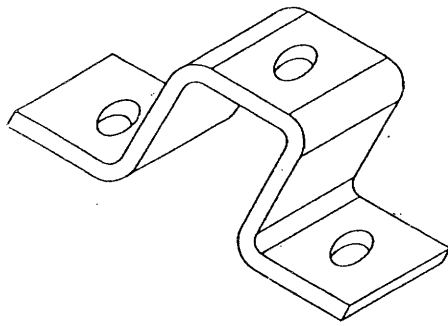


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TYPE CABLE TRAY SUPPORT
MATERIAL & ACCESSORIES

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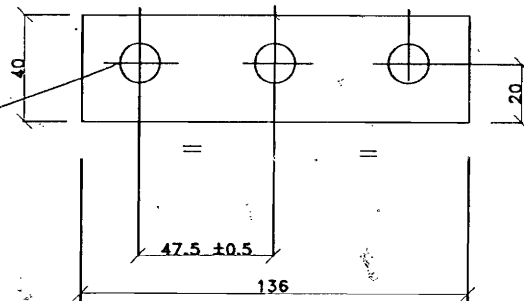
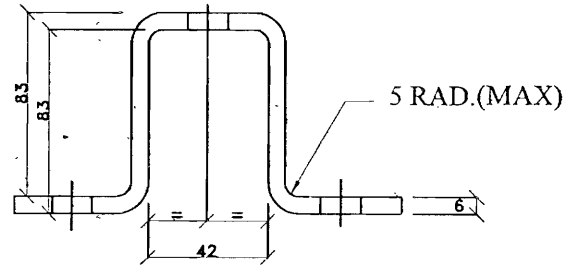
PE-DG-317-507-E013

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Ø14 HOLES
3 Nos

CLAMP FOR SINGLE CHANNEL CC1



CLAMP FOR DOUBLE CHANNEL CC2

NOTES

1. ALL DIMENSIONS ARE IN mm.
2. ALL FABRICATION TOLERANCES ± 1.0 mm
3. MATERIAL : MILD STEEL AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629
5. TOLERANCE ON THICKNESS AS PER IS:1852

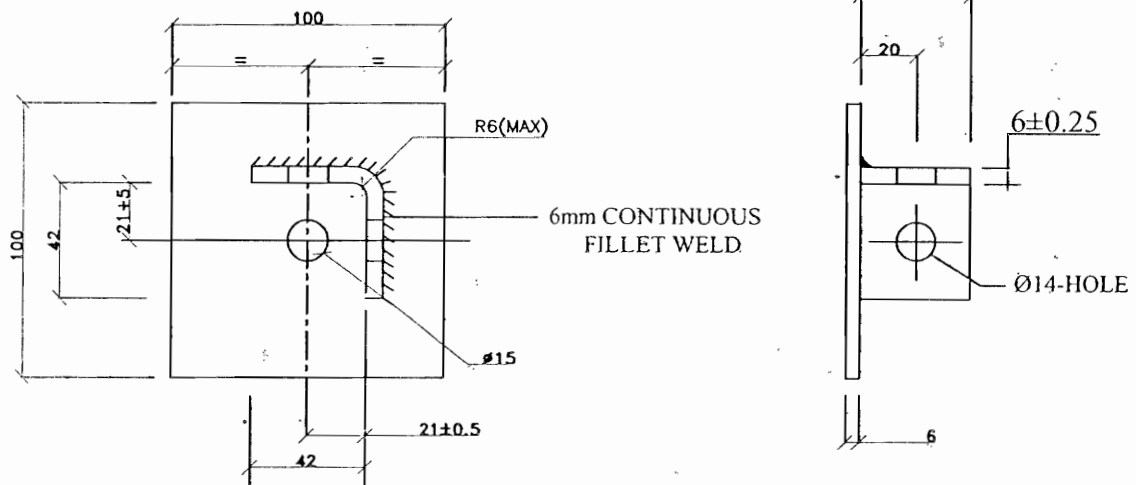
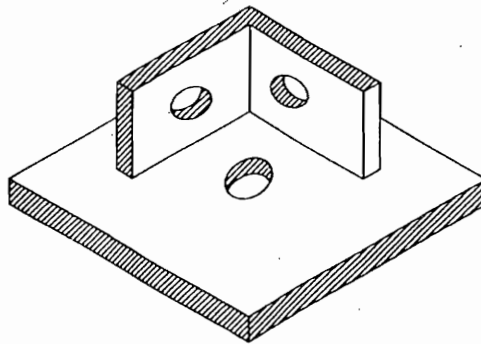


**TITLE: TYPICAL DETAILS OF BOLTABLE
TYPE CABLE TRAY SUPPORT
MATERIAL & ACCESSORIES**

DRG. NO.

PE-DG-317-507-E013

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BASE PLATE FOR SINGLE CHANNEL BPI

NOTE

1. ALL DIMENSIONS ARE IN MM.
2. ALL FABRICATION TOLERANCES $\pm 1.0\text{mm}$.
3. MATERIAL : MILD STEEL AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629
5. TOLERANCE ON THICKNESS AS PER IS:1852



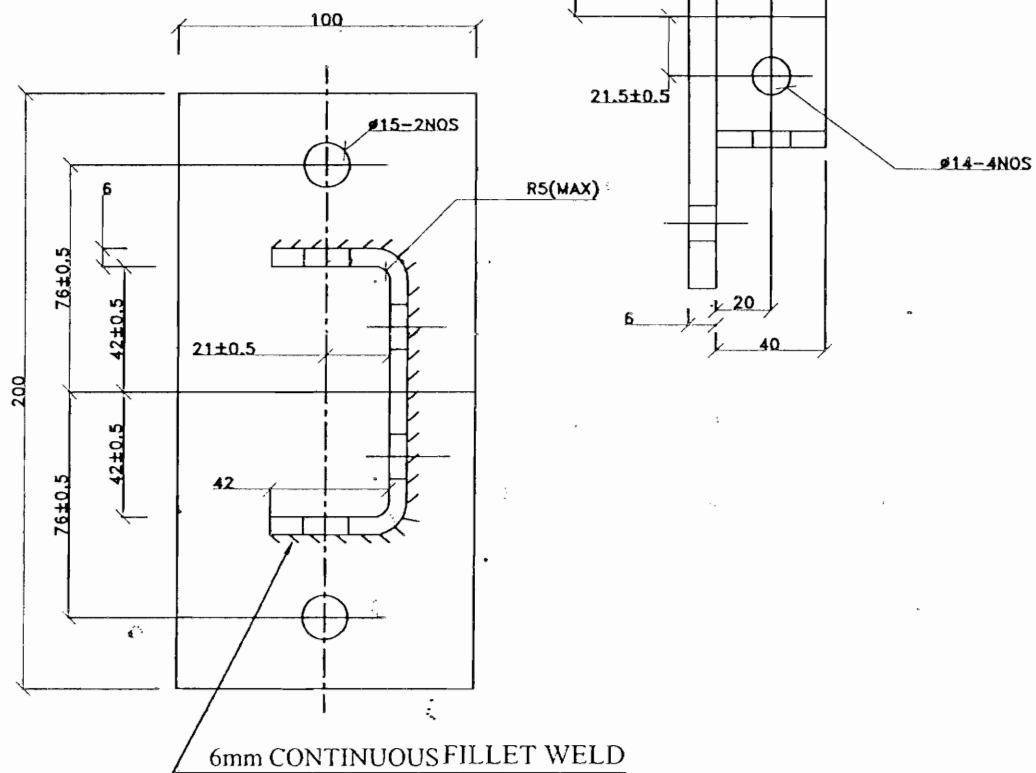
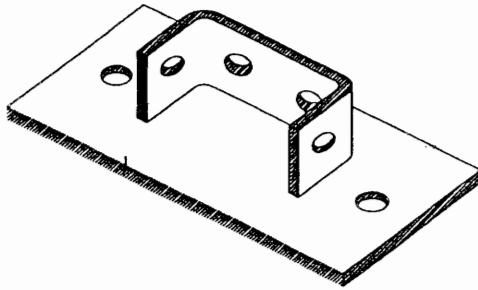
TITLE: TYPICAL DETAILS OF BOLTABLE
TYPE CABLE TRAY SUPPORT
MATERIAL & ACCESSORIES

DRG. NO.

PE-DG-317-507-E013

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BASE PLATE FOR DOUBLE CHANNEL BP2

NOTES

1. ALL DIMENSIONS ARE IN MM
2. ALL FABRICATION TOLERANCES $\pm 1.0\text{mm}$
3. MATERIAL :MILD STEEL AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629
5. TOLERANCE ON THICKNESS AS PER IS:1852



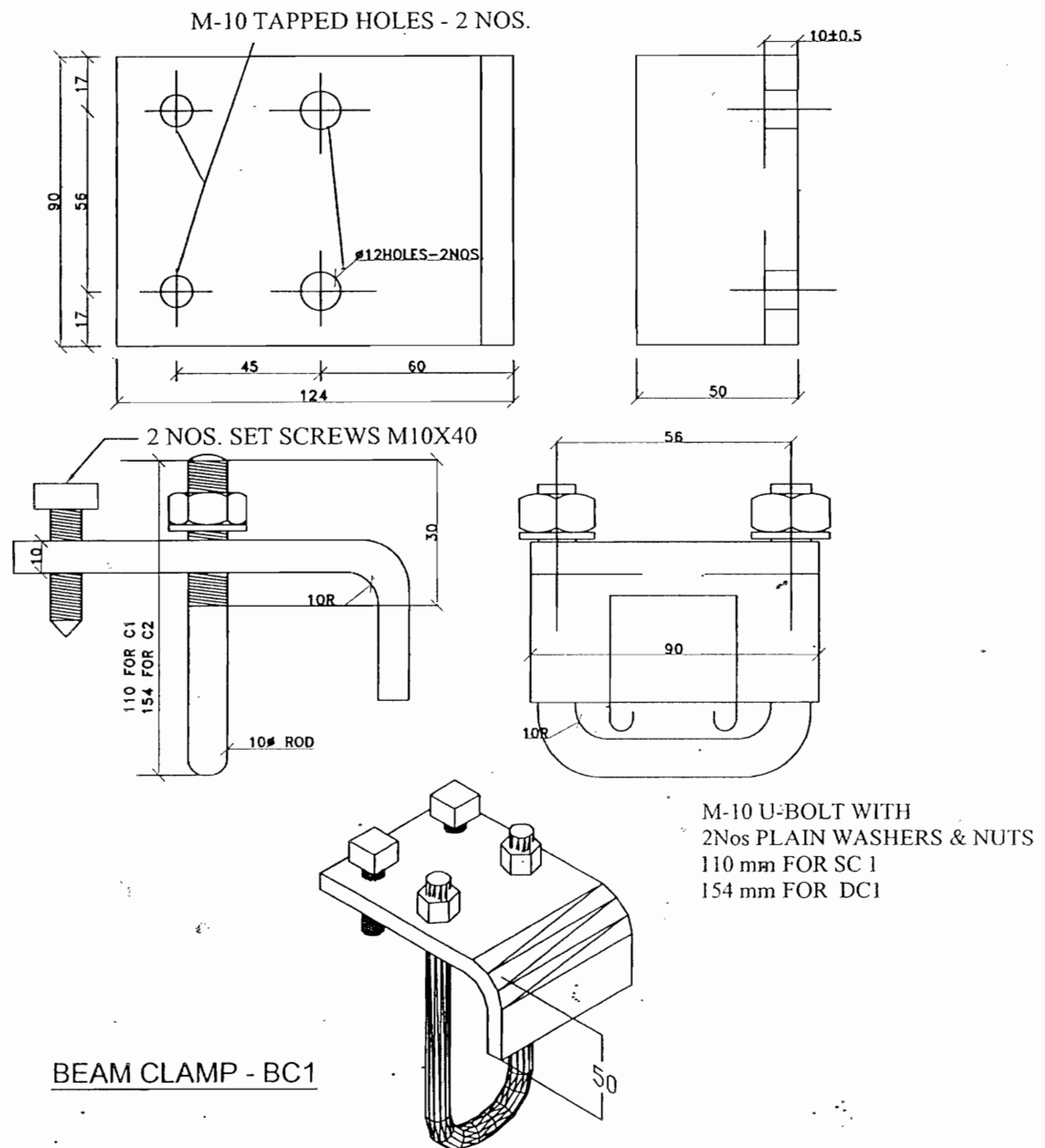
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TYPE CABLE TRAY SUPPORT
MATERIAL & ACCESSORIES

DRG. NO.

PE-DG-317-507-E013

SH 7 OF 11

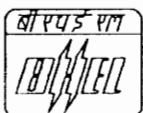
9



BEAM CLAMP - BC1

NOTES

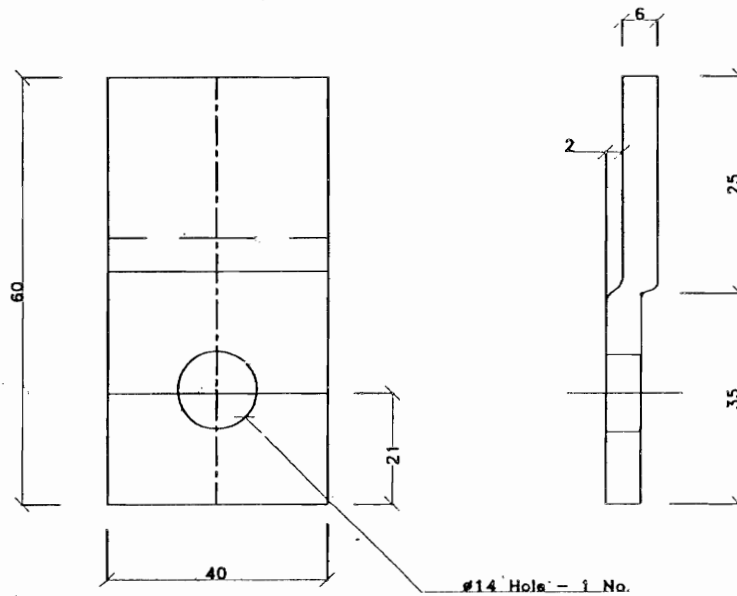
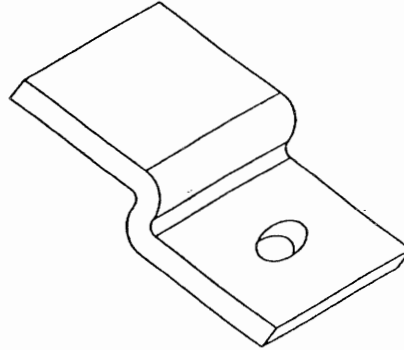
1. ALL DIMENSIONS ARE IN mm.
2. ALL FABRICATION TOLERANCES ± 1.0 mm
3. MATERIAL :MILD STEEL AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629
5. TOLERANCE ON THICKNESS AS PER IS:1852



**TITLE: TYPICAL DETAILS OF BOLTABLE
TYPE CABLE TRAY SUPPORT
MATERIAL & ACCESSORIES**

**BHEL DRAWING NO.
PE-DG-317-507-E013**

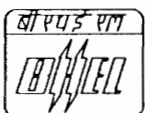
SH 8 OF 11



TRAY FIXING CLAMP.- TC1

NOTES

1. ALL DIMENSIONS ARE IN mm.
2. ALL FABRICATION TOLERANCES : $\pm 1.0\text{mm}$
3. MATERIAL : MILD STEEL AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629
5. TOLERANCE ON THICKNESS AS PER IS:1852

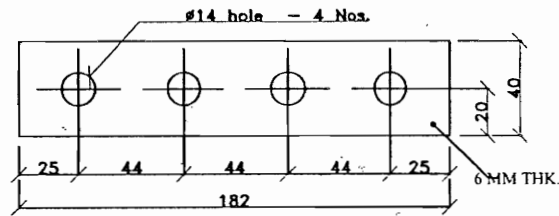


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TYPE CABLE TRAY SUPPORT
MATERIAL & ACCESSORIES**

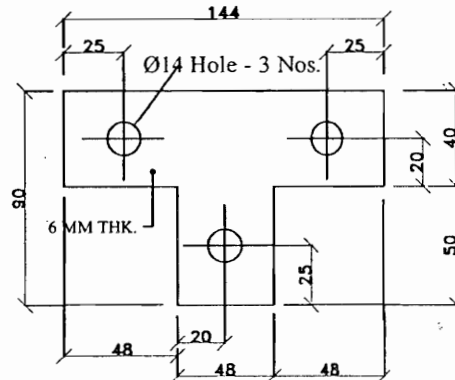
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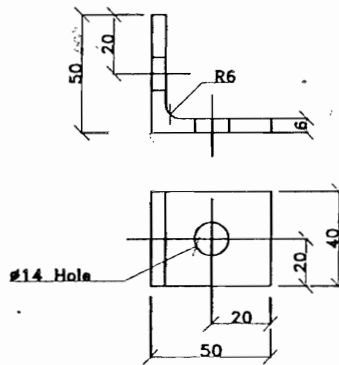
SH 9 OF 11



FLAT PLATE STRAIGHT FITTING PF2



FLAT PLATE TEE FITTING PF1



90° ANGLE FITTING LA1

NOTES

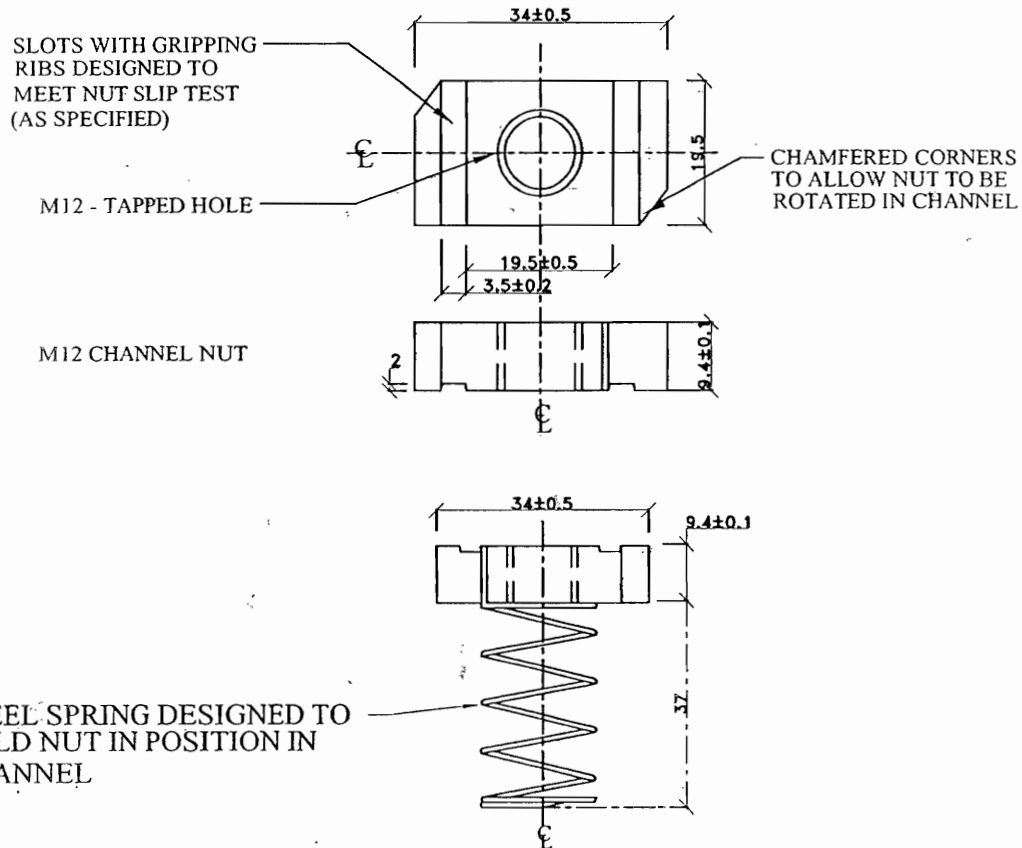
1. ALL DIMENSIONS ARE IN mm.
2. ALL FABRICATION TOLERANCES ± 1.0 mm
3. MATERIAL : MILD STEEL AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629



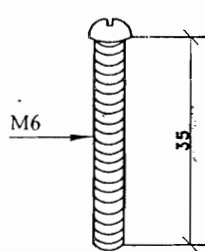
TITLE: TYPICAL DETAILS OF BOLTABLE
TYPE CABLE TRAY SUPPORT
MATERIAL & ACCESSORIES

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PE-DG-317-507-E013

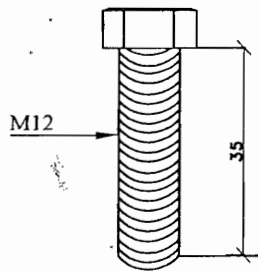
SH 10 OF 11



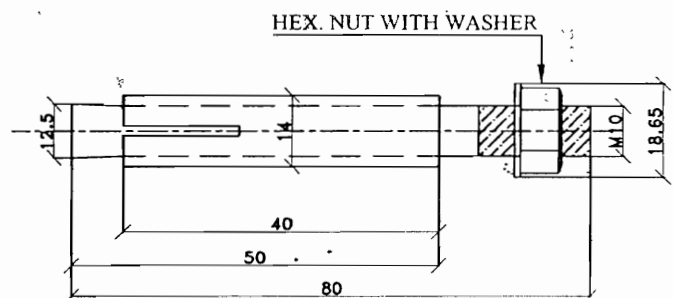
SPRING NUT ASSEMBLY



PAN HEAD SCREW



HEX BOLT



ANCHOR BOLT M10

NOTES:

1. MATERIAL - MS AS PER IS - 2062.
2. M6 CHANNEL NUT DIMENSIONAL SIMILAR TO M12.
EXCEPT HOLE DRILLED AND TAPPED TO M6 PAN HEAD SCREWS.
3. TAPPED HOLE THREADING TO MATCH WITH THREADING OF BOLTS.
4. SURFACE PROTECTION ELECTROGALVANISED / CADMIUM PLATED.
5. ALL DIMENSIONS ARE IN MM.
6. ALL NUT, BOLTS, WASHERS ETC. SHALL BE HOT DIP GALVANISED




TITLE: **TYPICAL DETAILS OF BOLTABLE
TYPE CABLE TRAY SUPPORT
MATERIAL & ACCESSORIES**

BHEL DRAWING NO.

PE-DG-317-507-E013

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	DOCUMENT TITLE TYPE TEST PROCEDURE FOR CABLE TRAY SUPPORT SYSTEM	SPECIFICATION NO. PES-507-22	
		VOLUME II B	
		SECTION - D	
		Rev. O	DATE: 12/01/2011
		SHEET 1	OF 4

ANNEXURE-IV

1.0 Type tests on Support System for Cable Trays

1.1 TEST 1 A

On main support channel type-DC1 for cantilever arms fixed on one side only. A 3.5 metre length of main support channel shall be fixed vertically at each end to a rigid structure as per the fixing arrangement as shown in the enclosed drawing. Eight (8) nos. 650 mm cantilever arms shall be fixed to the main channel and each arm shall be loaded over the outboard 600 mm with a uniform working load of 100 kg. Subsequently a point load of 100 kg shall be applied on arm 2. A uniform proof load on all the arms equal to twice the working load shall be then be applied. Deflections shall be measured at the points shown in the enclosed drawings and at the following load intervals:

- i) Working load
- ii) Working load + point load
- iii) Offload
- iv) Proof load + point load
- v) Offload

The deflection measured at working loads shall not exceed 16mm. The permanent deflection after removing the combination of working load and point load shall not exceed 10 mm at the arm tips and 6 mm on the channel. No collapse of the structure shall occur with a combination of proof load and point load applied.

1.2 TEST 1 B

Test 1 A shall be repeated with Eight Cantilever arms uniformly loaded and with the same point load on arm 2.

2.0 TEST 2

On Main support channel type – DC1 for cantilever arms fixed on both sides

2.1 TEST 2 A

A 3.5 m length of main support channel DC1 for cantilever arms fixing on both sides shall be fixed at each end to rigid structure as per the fixing arrangement as shown in the enclosed drawing. Six (6), 650 mm cantilever arms shall be attached to each sides and each arm uniformly loaded to a working load of 100 kg over the outboard 600 mm. A point load of 100 kg shall than be applied to arm 2, followed by a uniform proof load of twice the working load on all the arms,



DOCUMENT TITLE

TYPE TEST PROCEDURE FOR
CABLE TRAY SUPPORT SYSTEM

SPECIFICATION NO. PES-507-22

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SECTION - D

Rev. O

DATE: 12/01/2011

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deflection shall be measured at points shown in the enclosed drawings at the following load intervals.

- i) Working load
- ii) Working load + point load
- iii) Offload
- iv) Proof load + point load
- v) Offload

The deflection measured at working loads shall not exceed 16mm. The permanent deflection after removing the combination of working load and point load shall not exceed 10 mm at the arm tips and 6 mm on the channel. No collapse of the structure shall occur with a combination of proof load and point load applied.

2.2 TEST 2 B

Test 2 A shall be repeated with the assembly but with an asymmetrical load on the DC1 column and point load applied to arm 8. The 100 kg and 200 kg uniformly distributed loads shall be applied to the upper three arms on one side and the lower three arms on the opposite side.

3.0 TEST 3

Tests on Channel Fixed on Beam/Floor

A length of main support channel section shall be fixed to steel structure/ floor and have loads applied as shown in the drawing enclosed and as detailed below.

3.1 TEST 3 A

A length of steel structure shall be rigidly supported. It should be fitted on a metre length of channel section using beam clamps welded/bolted. A point load of 1200 kg shall be applied to the centre point via two brackets. No distortion or pulling of the components shall take place.

3.2 TEST 3 B

With the components assembled in Test 3A, two perpendicular point loads of 600 kg shall be simultaneously applied at positions 150 mm either side of the centre line, no distortion or pulling of the components shall take place.

3.3 TEST 3 C

With the components assembled as in Test 3 A, a perpendicular point load of shall be applied at a point 150 mm on one side of the centre line.



DOCUMENT TITLE

TYPE TEST PROCEDURE FOR
CABLE TRAY SUPPORT SYSTEM

SPECIFICATION NO. PES-507-22

VOLUME II B

SECTION - D

Rev. 0

DATE: 12/01/2011

SHEET 3 OF 4

The load shall be gradually increased to the maximum value that can be applied without causing distortion or pulling of the components. This value shall be recorded.

4.0 TEST 4: CHANNEL INSERT (If applicable)

2.5 metre of SC1 Channel fixed to the concrete wall / steel structure as per actual site installation conditions. 6 no.s of 650 mm cantilever arms shall be fixed to the SC1 Channel as shown in enclosed drawing. Each arm uniformly loaded to a working load of 100 kg over the out board 600 mm. A point load of 100 kg shall then be applied to arm 2, followed by a uniform proof load of twice the working load on all the arms; deflection shall be measured at points shown in the enclosed drawing at the following load intervals:

- i) Working load
- ii) Working load + point load
- iii) Offload
- iv) Proof load + point load
- v) Offload

The deflection measured at working loads shall not exceed 16mm. The permanent deflection after removing the combination of working load and point load shall not exceed 10 mm at the arm tips and 6 mm on the channel. No collapse of the structure shall occur with a combination of proof load and point load applied.

5.0 TEST 5:**Channel nut slip characteristics (If applicable)****TEST 5 A1, 5 A2, 5 A3 :**

A length of channel SC1 section 200 mm long shall have fitted brackets with the two bolt fixing as shown in drawing enclosed.

With loads applied at the position shown in drawing enclosed nut slip shall be determined with bolt torque of 30 NM, 50 NM and 65 NM. No fewer than three measurements shall be made for each torque setting.

A minimum loading of 720 kg shall be obtained before nut slip with bolt torque of 65 NM.

TEST 5 B1, 5 B2, 5 B3 :

The length of channel SC1 section 200 mm long shall have fitted bracket with the one bolt fixing as shown in drawing enclosed.

With loads applied at the position shown in drawing enclosed nut slip shall be determined with bolt torque of 30 NM, 50 NM and 65 NM. No fewer than three measurements shall be made for each torque setting



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A minimum loading of 350 kg shall be obtained before nut slip with a bolt torque of 65 NM.

6.0 Weld Integrity Test

After the deflection test as per test 1A, 1B, 2, 3 and 4 above weld integrity shall be checked by magnetic particle inspection to detect sub- surface cracks developed, if any.