ITEMS : Single channel, double channel, cantilever arms, clamps & fittings
SCOPE: Supply: YES; Erection & Commissioning: NO

1.	Availability of type test certificates as per GDCD standard.
2.	Vendor should have in-house fabrication, manufacturing & testing facility (as per GDCD standard).
3.	Capability of manufacturing channels & cantilever arms for 40km per month.
4.	Vendor has his own galvanization plant. OR Galvanization of cable tray support-boltable type shall be done from any of galvanizers as mentioned in annexure-I of Quality plan (part of Technical specification).
5.	Manufactured & supplied at least 100 km of channels (SCI & DCI) & cantilever arms in one or more orders and at least 30 km in a single order.
6.	Minimum two (2) nos. purchase orders for cable tray support system- boltable type shall be submitted which should not be more than five (5) years old from the date of techno-commercial bid opening for establishing continuity in business.

Notes (General points of PQR):

1. Offers of the JV companies/ Joint Bidders/ bidders having collaboration/ licensing agreement/ MOU/Indian subsidiaries shall be evaluated as follows:

   a. If bidder happens to be an Indian subsidiaries of foreign OEM, then the credentials of the foreign OEM can also be considered for meeting PQR.
   b. If bidder happens to be the Joint Venture Company, then the credentials of any of JV partners can be also considered for meeting PQR.
   c. If bidder happens to bid jointly with their partner, then credentials of both the partners will be considered for meeting PQR as per distribution of the work. In all such cases, lead bidder as specified in bid documents shall be responsible for overall execution of the contract and all guarantee/ warranty.
   d. If bidder happens to be the having valid collaboration agreement/ MOW licensing agreement with some other company, then the credentials of collaborator/ MOU partner/ licensing company can also be considered for meeting PQR.

   Note: If bidder(s) qualifies on the basis of credentials of his principal/ JV partner/ Collaborator/ joint bidder etc., then the principal/ JV partner/ Collaborator/ MOU partner/ joint bidder shall be responsible for overall design vetting and warranty/ guarantee of the package. The scope matrix clearly defining their respective roles including design vetting, manufacturing of critical component, E&C etc. etc. and warranty/ guarantee shall be submitted along with the offer.

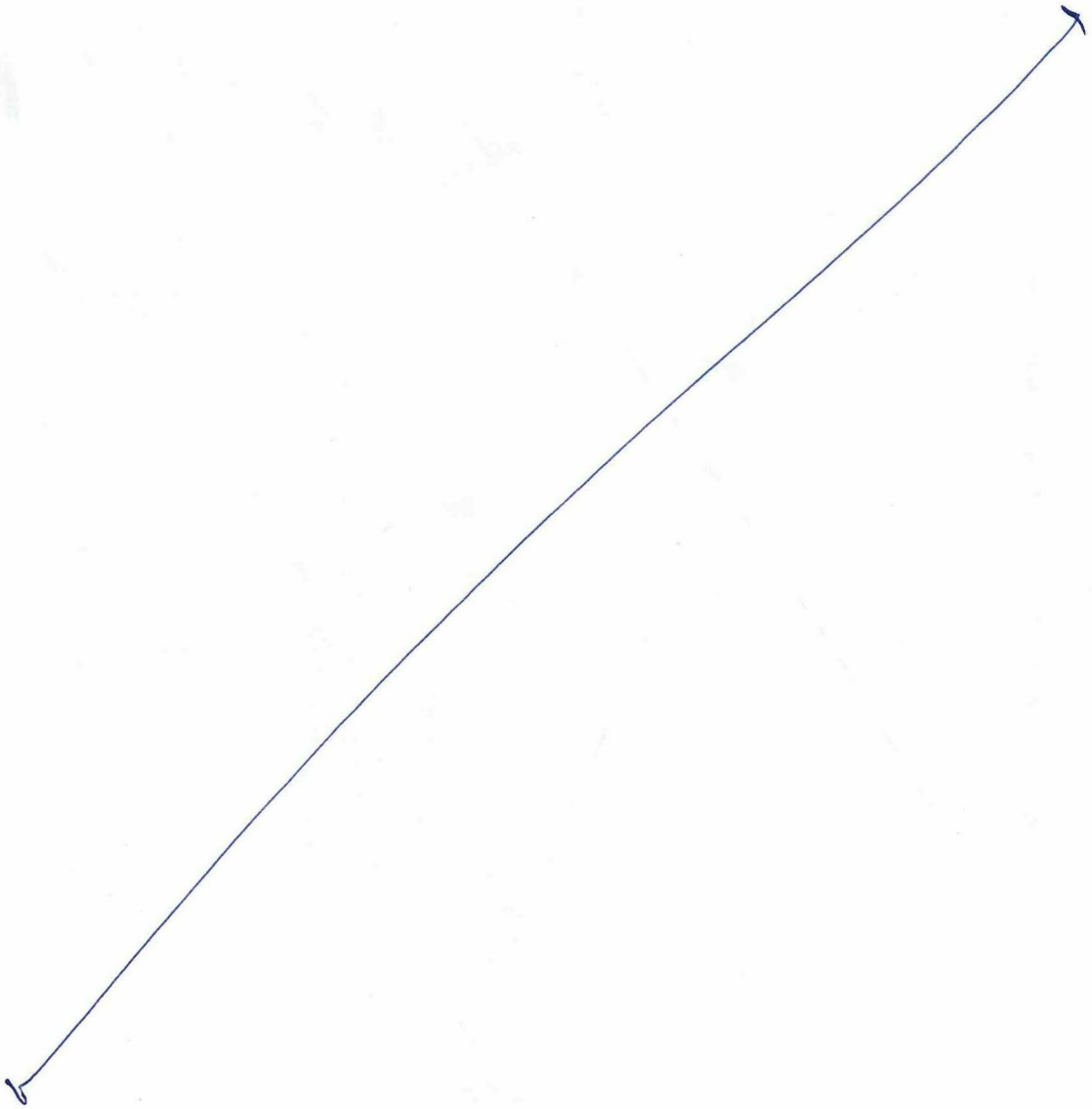
2. Bidder to note that the arrangement of bidding (joint bid partners/ collaborator/ MOU partner/ licensing company etc.) once offered to BHEL as a part of bidding documents cannot be changed till the execution of the project.

3. Consideration of offer shall be subject to customer's approval of bidder, if applicable.

4. Bidder to submit all supporting documents in English. If documents submitted by bidder are in language other than English, a self- attested English translated document should also be submitted.

5. Notwithstanding anything stated above, BHEL reserves the right to assess the capabilities and capacity of the bidder to perform the contract, should the circumstances warrant such assessment in the overall interest of BHEL.

6. After satisfactory fulfilment of the above criteria/ requirement, offer shall be considered for further evaluation as per NIT and all the other terms of tender.



PREPARED BY	CHECKED BY	REVIEWED BY	APPROVED BY
NAME:M S S RAJPAL DESIGNATION: MANAGER	NAME: MEGHA DESIGNATION: MANAGER	NAME: AYAN SAHA DESIGNATION: DGM SANDEEP LODH SR DGM	NAME: DEBASISA RATH DESIGNATION: AGM & DH-ELECT

2 X 660 MW UDANGUDI SUPER CRITICAL TPS, STAGE-I

BOQ CUM PRICE SCHEDULE FOR CABLE TRAY SUPPORT SYSTEM-BOLTABLE TYPE

1	ITEM CODE	GALVANISED MS CABLE TRAY SUPPORTS	UNIT	PEM BOQ	ISG BOQ	TOTAL INDENTED BOQ	UNIT PRICE (EX-WORKS) Rs	TOTAL PRICE (EX-WORKS) Rs
1.1	507-34016-A	SINGLE CHANNEL (SC-1) (STANDARD LEGTH OF 6 METERS PER PIECE)	Metres	27750	26000	53750		
1.2	507-34012-A	DOUBLE CHANNEL (DC-1) (STANDARD LEGTH OF 6 METERS PER PIECE)	Metres	19200	12000	31200		
1.3		CANTILEVER ARM EACH COMPLETE WITH (1)2 NOS.-M12 HEX. BOLT & WASHER, (2) 2 NOS.-M12 SPRING NUTS, (3) 2 NOS.-M6 PAN HEAD SCREWS A WASHER, (4) 2 NOS.-M6 SPRING NUTS						
(i)	507-34009-A	For 600mm wide trays(650mm)	Nos.	41510	11000	52510		
(ii)	507-34008-A	For 450mm wide trays(500mm)	Nos.	3290	0	3290		
(iii)	507-34007-A	For 300mm wide trays(350mm)	Nos.	17760	500	18260		
(iv)	507-34006-A	For 150mm wide trays(200mm)	Nos.	5760	50	5810		
1.4		CLAMPS AND FITTINGS COMPLETE WITH REQUIRED HARDWARS (SPRING NUTS/WASHERS ETC. AS REQUIRED FOR COMPLETE INSTALLATION)						
(i)	507-34010-A	CLAMP FOR SINGLE CHANNEL(CC1)	Nos.	14460	13500	27960		
(ii)	507-34011-A	CLAMP (CC2)	Nos.	1170	2500	3670		
(iii)	507-34004-A	BASE PLATE FOR SINGLE CHANNEL (BP1)	Nos.	2950	7000	9950		
(iv)	507-34003-A	BASE PLATE FOR DOUBLE CHANNEL (BP2)	Nos.	2970	5000	7970		
(v)	507-34005-A	BEAM CLAMPS (BC1)	Nos.	18880	500	19380		
(vi)	507-34002-A	90 DEGREE ANGLE FITTING (LA1)	Nos.	26540	35000	61540		
(vii)	507-34001-A	90 DEGREE ANGLE FITTING (HL1)	Nos.	5030	500	5530		
(viii)	507-34015-A	FLAT PLATE TEE FITTING (PF1)	Nos.	2240		2240		
(ix)	507-34014-A	FLAT PLATE STRAIGHT FITTING (PF2)	Nos.	2030		2030		
(x)	507-34021-A	Tray Fixing Clamp-TC1	Nos.	31070	75000	106070		
(xi)	507-34036-A	FRP Tray Fixing Clamp	Nos.	72670		72670		
(xii)	507-34038-A	TRAY FIXING PLATE TF1	Nos.		900	900		
(xiii)	507-34039-A	TRAY FIXING PLATE TF2	Nos.		900	900		
(xiv)	507-34040-A	Z CLAMP FOR 100MM PERFORATED TRAY TZ1	Nos.		2500	2500		
(xv)	507-34041-A	MS GALVANIZED HARDWARE (1NOS M6x35MM LONG PAN HEAD BOLT, 1 NOS M6 SPRING NUT, 1 NOS M6	Set		16000	16000		

VOLUME-II

2X660 MW UDANGUDI SUPERCRITICAL STPP

TECHNICAL SPECIFICATION

FOR

GALVANISED CABLE TRAY SUPPORT SYSTEM (BOLTABLE TYPE)

SPECIFICATION NO: ***PE-TS-435-507-E013***

REVISION: **0**

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, UP (INDIA) – 201301

CONTENTS

Total nos. of sheets including cover & separator sheets = 37 sheets

SECTION – I

SPECIFIC TECHNICAL REQUIREMENTS

COMPLIANCE CERTIFICATE

The bidder shall confirm compliance to the following by signing/ stamping this compliance certificate and furnishing same with the offer.

1. The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusion/ deviation with regard to same.

2. There are no deviation with respect to specification other than those furnished in the 'schedule of deviations'.

3. Only those technical submittals which are specifically asked for in NIT to be submitted at tender stage shall be considered as part of offer. Any other submission, even if made, shall not be considered as part of offer.

4. 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.

5. Any changes made by the bidder in the price schedule with respect to the description/ quantities from those given in 'BOQ-cum-Price Schedule' of the specification shall not be considered (i.e., technical description & quantities as per specification shall prevail).

BIDDER'S STAMP & SIGNATURE

1.0 PURPOSE

1.1 This specification covers the design, manufacture, Inspection and Testing at Manufacturer's works, proper packing and delivery to site of Galvanised Cable Tray Support System (Boltable Type) conforming to this specification.

1.2 It is not the intent to specify herein all the details of design & manufacture of material. However, the material shall, conform in all respects to high standard of design, engineering and workmanship and shall be capable of performing in continuous commercial operation at site conditions.

1.3 Technical requirements of Galvanised Cable Tray Support System (Boltable Type) are indicated in Data Sheet-A & Section-II.

1.4 The stipulation of Data Sheet-A shall prevail in case of any conflict between the stipulations of Data Sheet-A & Section-II.

2.0 BILL OF QUANTITIES

2.1 Quantity requirements shall be as per BOQ-cum-price schedule as part of NIT.

2.2 Vendor shall submit the drawing/document submission/resubmission schedule after approval of documents.

2.3 In BOM each of the item to be uniquely identified with item code no. or item Sl. No. Supplier to ensure that all the items which will find separate mention in the packing list are covered in detailed BOM.

2.4 Supplier to also give the following undertaking in the BOM: "The BoM provided herewith completes the scope (in content and intent) of material supply under PO No. ----------, dated --------. Any additional material which may become necessary for the intended application of the supplied item(s)/package will be supplied free of cost in most reasonable time."

3.0 DRAWINGS & DOCUMENTS TO BE SUBMITTED

3.1 Document submission / resubmission schedule after placement of order shall be as per NIT

DATASHEET A

1.0 APPLICABLE STANDARDS:

a)	IS: 2062	For structural steel
b)	IS: 1079	For hot rolled carbon steel sheet and strip.
c)	IS: 513	For cold rolled low carbon steel sheet & strips
d)	IS: 1730	For dimensions for steel sheet and strip.
e)	IS: 1363	Hexagon head bolts, screws and nuts.
f)	IS: 5	For colours of paint.
g)	IS: 2629	For hot dip galvanising of steel & surface pre-treatment
h)	IS: 2633	For testing uniformity of zinc coating
i)	IS: 6745	For determination of mass of zinc coating
j)	IS: 1852	For rolling and cutting tolerances of hot rolled steel products
k)	IS: 4759	For Hot dip zinc coating on structural steel & other allied products

2.0 CABLE TRAY SUPPORT

a)	Tray support type:	Boltable type
b)	Material:	Hot/ Cold Rolled MS sheet steel for channel SC1/ DC1 and channel portion of cantilever arms
c)	Thickness:	2.5 mm
d)	Length:	Standard length of 6 meters
e)	Fabrication :	At works
f)	Construction:	Conforming to enclosed drg. [PE-DG-999-507-E013]

3.0 SURFACE TREATMENT:

Galvanizing:

a)	Pre-treatment:	As per IS 2629 prior to galvanisation
b)	Type	Hot dip galvanization
c)	Applicable Standard:	IS 2629
d)	Minimum thickness:	75 microns (minimum), 86 microns (average)
e)	Min. wt. of Zinc deposit:	610 gms. per square meter
f)	Tests for galvanizing:	i) Weight of zinc coating as per IS : 6745
		ii) Thickness of zinc coating as per IS : 4759
		iii) Uniformity of zinc coating as per IS : 2633
		iv) Adhesion as per IS: 2629

4.0 TYPE TEST, ROUTINE TEST AND ACCEPTANCE TEST

For details of routine test, acceptance test and type test, please refer to Annexure 4 (Type test procedure) and QP no. PED-507-00-Q-013/01.

SECTION-II

STANDARD TECHNICAL REQUIREMENTS

1.0 CODES AND STANDARDS

2.1 The material shall comply with all currently applicable safety codes and statutory regulations of India as well as of the locality where the material is to be installed.

2.2 The design, material, construction, manufacture, inspection, testing and performance of cable tray support system (boltable type) shall conform to the latest revision of relevant standards as per Datasheet-A.

2.3 In case of conflict between the applicable reference standard and this specification, this specification shall govern.

2.0 TECHNICAL REQUIREMENTS

3.1 Cable Trays Support (boltable type) shall be supplied as per technical particulars specified in Data Sheet – A.

3.3 All finished galvanised MS structural members for cable tray supports shall be free from sharp edges, corners, burs & unevenness.

3.4 Necessary fasteners shall be provided with each cable tray support accessory as specified in enclosed drawings.

3.5 All welded joints of cable tray support accessories shall be smooth enough to provide a good appearance & shall not cause any injury to working personnel. All welding work shall be done by skilled personnel.

4.0 QUALITY ASSURANCE, TESTING & INSPECTION

4.1 Bidder shall confirm compliance with the BHEL's Standard Quality Plan (PE-QP-999-507-E007, Rev. 0) as attached with the specification without any deviations. After issuance of purchase order for specific project, the successful bidder shall submit the Quality Plan for BHEL/ ultimate customer's approval. In case bidder has reference Quality Plan agreed with ultimate customer, same can be submitted for specific project after award of contract for BHEL/ ultimate customer's approval. There shall be no commercial implication to BHEL on account of minor changes in Quality Plan during contract stage.

4.2 All materials shall be procured, manufactured, inspected and tested by vendor/ sub-vendor as per approved quality plan.

4.3 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 the specification. Charges for all these tests for all the equipment & components shall be deemed to be included in the bid price.

5.0 **TESTING:**

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:

5.1 Type tests :

Cable tray support system (Boltable Type) shall be of proven type & 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 insert test

f) Channel nut slip characteristics (wherever applicable)

g) Weld integrity test

h) 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 (g)” above in line with Type test procedure and drawings attached in Annexure-4. The final type test procedure shall be subjected to BHEL/customer approval.

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

5.2 Routine Tests:

a) Dimension checks

5.3 Acceptance Test:

a) Dimension checks

b) Tests for galvanizing

6.0 **PACKING**

The material shall be packed to ensure protection against damage during transit, storage for prolonged periods and handling.

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO :	DATE:
		CUSTOMER :		QP NO.: PED-507-00-Q-013, REV. 02	DATE: 05.07.2020
		PROJECT:		PO NO.:	DATE:
		ITEM: CABLE TRAY SUPPORT SYSTEM -BOLTABLE	SYSTEM: CABLING	SECTION: II	SHEET 1 OF 4

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/ N				D	M	C	N	
1.0 RAW MATERIAL														
1.1	ROLLED CARBON STEEL SHEET	1.CHEM.& PHY. PROPERTIES	MA	VERIFICATION OF TC'S	100%	-	IS1079 (for hot rolled) IS-513 (for cold rolled)	IS1079 (for hot rolled) IS-513 (for cold rolled)	MILL TC		P	-	-	Steel shall be procured from SAIL/TISCO/RINL/BHUSAN/JINDAL ISPAT/ESSAR/LLOYD/ IISCO/ authorised SAIL Re Rollers.
		2.DIMENSIONS	MA	MEASUREMENT	100%	-	IS-1730/ APPD.DRG	IS-1730/ APPD.DRG	QC RECORD		P	-	-	
		3.SURFACE FINISH	MA	VISUAL	100%	-	IS1079 (for hot rolled) IS-513 (for cold rolled)	IS1079 (for hot rolled) IS-513 (for cold rolled)	QC RECORD		P	-	-	
1.2	ZINC	CHEM.COMP.	MA	CHEM TEST	EACH HEAT	-	IS-209	IS-209	QC RECORD	√	P/V	V	V	
2.0 IN-PROCESS														
2.1	FABRICATION	1.DIMENSIONS	MA	MEASUREMENT	100%	-	APPD.DRG	APPD.DRG	QC RECORD	√	P	V	V	
		2.WELDING QUALITY	MA	VISUAL	100%	-	ASME SEC. IX	ASME SEC. IX	QC RECORD	√	P	V	V	Welding is to be done by qualified welders in accordance with ASME Sec IX article III, WPS, PQR and WPQ to be reviewed during inspection

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	Sujit Kumar Sethy	Sujit Kumar Sethy	Checked by:		Kunal Gandhi
Reviewed by:	MANISH	Manish Shukla	Reviewed by:	RITESH KUMAR JAISWAL	Ritesh Kumar Jaiswal

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO :	DATE:
	CUSTOMER :		QP NO.: PED-507-00-Q-013, REV. 02	DATE: 05.07.2020
	PROJECT:		PO NO.:	DATE:
	ITEM: CABLE TRAY SUPPORT SYSTEM -BOLTABLE	SYSTEM: CABLING	SECTION: II	SHEET 2 OF 4

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/ N				D	M	C	N	
		3.SURFACE FINISH	MA	VISUAL	100%	-	FREE FROM DEFECTS & SLAG	FREE FROM DEFECTS & SLAG	QC RECORD	√	P	V	V	
2.2	SURFACE PREPARATION	1.CLEANING, PICKLING & RINSING & FLUXING	MA	MEASUREMENT	PERIODIC IN EACH SHIFT	-	IS:2629	IS:2629	QC RECORD		P	-	-	
		2. SURFACE FINISH	MA	VISUAL	100%	-	IS:2629	IS:2629	QC RECORD		P	-	-	
2.3	GALVANISING	1.TEMPERATURE OF BATH	MA	MEASUREMENT	CONTINUOUS	-	IS-2629	IS-2629	QC RECORD		P	-	-	Galvanization is to be done at galvanization plant listed in annexure-1 to quality plan.
		2.DROSS	MA	VISUAL	PERIODIC	-	IS-2629	IS-2629	QC RECORD		P	-	-	
		3.RATE OF IMMERSION	MA	VISUAL	100%	-	IS 2629	IS 2629	QC RECORD		P/V	-	-	
		4. SURFACE FINISH	MA	VISUAL	100%	-	IS 2629	FREE FROM BURRS, SLAG, ROUGHNESS, FLUX, STAIN ETC.	QC RECORD		P	-	-	

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	Sujit Kumar Sethy	Sujit Kumar Sethy	Checked by:		Kunal Gandhi
Reviewed by:	MANISH	Manish Shukla	Reviewed by:	RITESH KUMAR JAISWAL	Ritesh Kumar Jaiswal

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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	Sign & Date	Name	Seal
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Approved by:			

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO :	DATE:
		CUSTOMER :		QP NO.: PED-507-00-Q-013, REV. 02	DATE: 05.07.2020
		PROJECT:		PO NO.:	DATE:
		ITEM: CABLE TRAY SUPPORT SYSTEM -BOLTABLE	SYSTEM: CABLING	SECTION: II	SHEET 3 OF 4

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/ N				D	M	C	N	
3.0 FINISHED ITEMS														
3.1	SINGLE / DOUBLE CHANNELS, CANTILEVER ARMS, CLAMPS	1. DIMENSIONS	MA	MEASUREMENT	IS-2500 (PART 1) LEVEL S-4	IS-2500 (PART 1) LEVEL S-4	APPD.DRG	APPD.DRG	INSP.REPORT	√	P	W	W	Fasteners shall be reputed make as per IS 1363 Sec-I
		2. SURFACE FINISH	MA	VISUAL	IS-2500 (PART 1) LEVEL S-4	IS-2500 (PART 1) LEVEL S-4	APPD.DRG	FREE FROM BURRS, SLAG, ROUGHNESS ,FLUX, STAIN ETC.	INSP.REPORT	√	P	W	W	
		3.MASS OF ZINC COATING	MA	CHEM. TEST	IS-4759	IS-4759	IS-6745/ APPD.DRG	APPD.DRG	INSP.REPORT	√	P	W	W	
		4.UNIFORMITY OF ZINC COATING	MA	CHEM. TEST	IS-4759	IS-4759	IS-2633	IS-2633	INSP.REPORT	√	P	W	W	
		5.THICKNESS OF ZINC COATING	MA	MEASUREMENT	IS-4759	IS-4759	APPD.DRG	APPD.DRG	INSP.REPORT	√	P	W	W	
		6.ADHESION	MA	MECH.TEST	IS-4759	IS-4759	IS-2629	IS-2629	INSP.REPORT	√	P	W	W	
3.1.1	TYPE TESTING	PHYSICAL	CR	TEST	1 SAMPLE*	1 SAMPLE*	APPD. TYPE TEST PROCEDURE	APPD. TYPE TEST PROCEDURE	INSP.REPORT	√	P	W	W	*1 sample per P.O.

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	Sujit Kumar Sethy	Sujit Kumar Sethy	Checked by:		Kunal Gandhi
Reviewed by:	MANISH	Manish Shukla	Reviewed by:	RITESH KUMAR JAISWAL	Ritesh Kumar Jaiswal

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO :	DATE:
	CUSTOMER :		QP NO.: PED-507-00-Q-013, REV. 02	DATE: 05.07.2020
	PROJECT:		PO NO.:	DATE:
	ITEM: CABLE TRAY SUPPORT SYSTEM -BOLTABLE	SYSTEM: CABLING	SECTION: II	SHEET 4 OF 4

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/ N				D	M	C	N	
3.1.2	WELD INTEGRITY TEST	SOUNDNESS	CR	MAGNETIC PARTICLE INSPECTION (MPI) DIE-PENETRATION (DP)	SAMPLE TESTED DURING TYPE TESTING	SAMPLE TESTED DURING TYPE TESTING	APPD. TYPE TEST PROCEDURE.	NO DEFECT	INSP.REPORT	√	P	W	W	AFTER CARRYING OUT TYPE TEST, WELD INTEGRITY TEST TO CHECK THE WELD SOUNDNESS/ ACCEPTANCE SHALL BE DONE BY MANUFACTURER
4.0	PACKING	SEALING IDENTIFICATION	MA	VISUAL	100%	100%	BHEL APPD. DOCUMENT	BHEL APPD. DOCUMENT	INSP.REPORT	√	P	W	-	REFER NOTE: 2

NOTES:

1. BHEL RESERVESTHE RIGHT FOR CONDUCTING REPEAT TEST IF REQUIRED.
2. PHOTOGRAPHS OF COMPLETE CABLE TRAY SUPPORT MATERIAL (BOLTABLE) AFTER PACKING TO BE SENT TO BHEL PURCHASE GROUP FOR REVIEW BEFORE ISSUING MDCC.
3. PROJECT SPECIFIC QUALITY PLAN TO BE DEVELOPED BASED ON CUSTOMER REQUIREMENT.
4. FOR EXPORT JOB, BHEL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOB TO BE FOLLOWED.
5. PACKING SHALL BE SUITABLE FOR STORAGE AT SITE IN TROPICAL CLIMATIC CONDITIONS.
6. LATEST REVISION/ YEAR OF ISSUE OF ALL THE STANDARDS (IS/ASME/IEC ETC.) INDICATED IN QP SHALL BE REFERRED.

LEGENDS:

*RECORDS, INDENTIFIED WITH "TICK"(√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION, **D**: DOCUMENTATION
** **M**: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, **C**: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, **N**: CUSTOMER,
P: PERFORM, **W**: WITNESS, **V:** VERIFICATION, AS APPROPRIATE
MA: MAJOR, **MI**: MINOR, **CR:** CRITICAL

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	Sujit Kumar Sethy	Sujit Kumar Sethy	Checked by:		Kunal Gandhi
Reviewed by:	MANISH	Manish Shukla	Reviewed by:	RITESH KUMAR JAISWAL	Ritesh Kumar Jaiswal

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

ANNEXURE-1 TO QUALITY PLAN
(LIST OF BHEL-PEM APPROVED GALVANIZERS)

Sl. No.	Vendor Name	Address
1	Jenco Industrial Corporation	Chincholi Bunder Khkar Road Near Link Road Devruwadi Malad (W) Mumbai 400064
2	National Galvanizing Company	66, Barrackpore Kamarhatt Trunck Road Calcutta-700058
3	Sigma Galvanising Pvt. Ltd.	Plot No.C-169, TTC, MIDC Ind Area Navin Mumbai-400705
4	B.P. Projects PVT LTD	167A, Vivekananda Road Kolkata-700006
5	Standard Galvanisers	Makardah Road, Kabar Para, Bankra, Howarah -711403
6	Steel Products	National Highway No. 6, Chamrail, Kona, Howrah-711114
7	Unitech Fabricators & Engineers Pvt. Ltd.	Village- Ajab Nagar, P.O. -Molla Simlla, P.S. - Singur, Dist - Hoogly, Pin-712223
8	Shivam Engineers & Fabricators	A0-282-284, Industrial Area, South Side of G.T. Road, Ghaziabad, U.P.
9	B.G. Shirke Construction Technology Pvt. Ltd	72-76, Mundhawa, Pune - 401 036
10	Galbro Ispat Galvanizers Pvt. Ltd.	GUT 11 AND 12, OPP. Kudus Steel,Rolling Mill, Wada, Thane , Mumbai
11	Eros Infrastructures Pvt. Ltd.	G-97, MIDC, Bhutibori , Nagpur-441108, Maharashtra
12	Industrial Perforation (India) Pvt. Ltd.	Ganganagr, Katakhal, Kolkata-700132
13	Indmark Formtech Pvt. Ltd.	Phase - 3, E - 11 / 1, M. I. D. C., Chakan, Pune - 410 501, Maharashtra, India.
14	Namdhari Industrial Traders Pvt. Ltd.	Village Latton Dana, Chandigarh Road, Ludhiana
15	Neha Galvaniser	Jalan Industrial Estate, Gate No-1, 1st Right Choise Lane, Near N.G-6, Jangalpur, PO Domjur Howrah - 700071, West Bengal, India
16	Patny Systems (P) Ltd.	Unit-IV, Sy No. -228/9, Plot No. 6, IP Kuchavaram, Toopran(M) Dist.- Medak, Telegana - 502336
17	Parmar Metal Company	Survey No.207,Veraval (Shapar)Dist. Rajkot, India.
18	Rukmani Electrical & Components Pvt Ltd	Urla Industrial Area, Urla Sarora Road, Raipur– 493 221 (Chhattisgarh)
	Rukmani Fab & Gal Pvt Ltd	Shankharidaha Baniyarah, Jalan Industrial Complex, Gate no.3, Lane no. 4, Domjur, Howrah , W.B .- 711411
19	DMP Projects Pvt.Ltd.	Dulagarh Industrial Park , PS-Sankrail , Howrah -711302
20	Vinfab Engineers India Private Limited	Gut no. 224/1 &2 Bhiwandi Wada State Highway, Village khupri, Dist. Thane, Maharashtra -421303

ANNEXURE-1 TO QUALITY PLAN
(LIST OF BHEL-PEM APPROVED GALVANIZERS)

21	Saral Projects & Processors	B-1, Industrial Area, Site-II, Amawan Road Rae Bareli
22	Brahampuri Steels Limited	172 (F) Industrial Area, Jhotwara, Jaipur-302013
23	Indiana Gratings PVT. LTD	F-5, MIDC Jejuri, Pune-412 303
24	M/s AVAIDS TECHNOVATORS PVT. LTD.	131, MATSYA INDUSTRIAL AREA, ALWAR RAJASTHAN

NOTES:
1. ANY CHANGE IN THE ABOVE LIST SHALL BE INFORMED AT THE TIME OF SPECIFIC PROJECT REQUIREMENT AND NO COMMERCIAL IMPLICATION SHALL BE ALLOWED ON THIS ACCOUNT.
2. IT SHALL BE THE RESPONSIBILITY OF THE VENDOR TO GET THE MATERIAL GALVANIZED FROM THE ABOVE LIST WITHOUT ANY COMMERCIAL IMPLICATION TO BHEL.

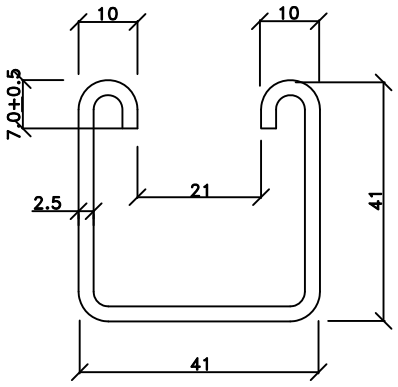
ANNEXURE-2

TYPICAL DETAILS OF BOLTABLE TYPE CABLE TRAY SUPPORT MATERIAL & ACCESSORIES

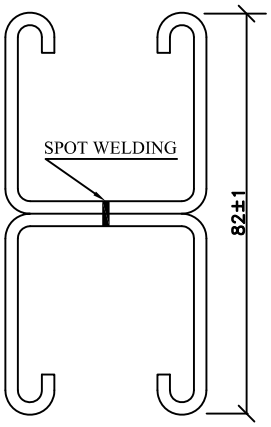
REVISIONS				
		NAME	DATE	

TITLE:	TYPICAL DETAILS OF BOLTABLE TYPE CABLE TRAY SUPPORT MATERIAL & ACCESSORIES		NAME	DATE
		DRAWN		
		DSGN		
DRG. NO.	PE-DG-999-507-E013	CHKD		
		APPD		

BHARAT HEAVY ELECTRICALS LTD.
PROJECT ENGINEERING MANAGEMENT
NOIDA



SINGLE CHANNEL SC1



DOUBLE CHANNEL DC1

TWO LENGTHS OF SINGLE CHANNEL

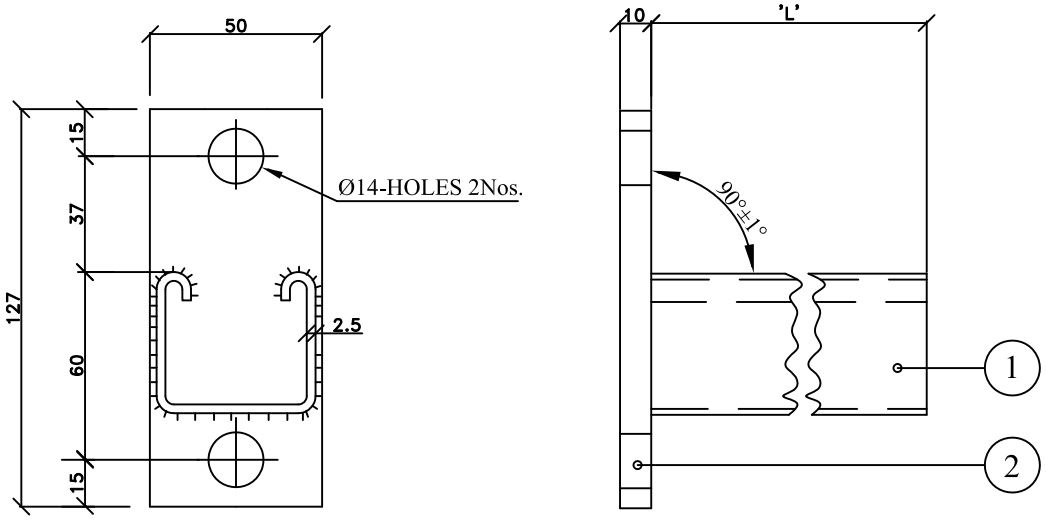
SPOT WELDED BACK TO BACK

AT 75MM C/C

NOTE:

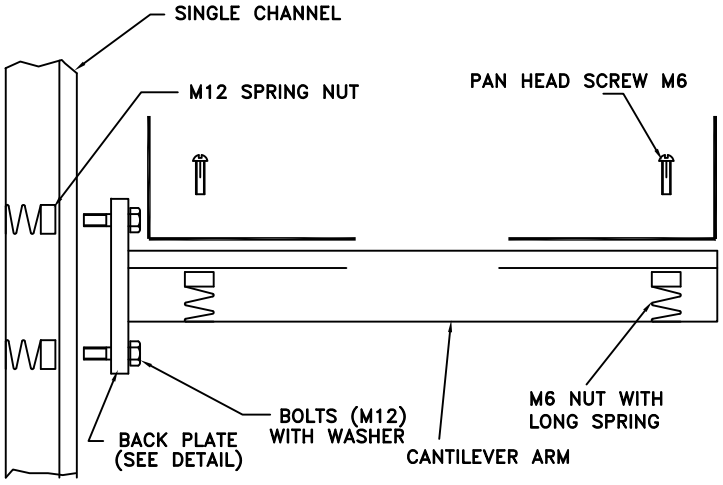
1. ALL DIMENSIONS ARE IN mm.
2. MATERIAL : 2.5MM THICK HOT/ COLD ROLLED M.S. AS PER IS:1079.
3. FINISH : HOT DIP GALVANISED AS PER IS 2629
4. TOLERANCE ON THICKNESS IS AS PER IS 1852
5. ALL FABRICATION TOLERANCE AS PER RELEVANT IS.
6. ZINC COATING SHALL BE MIN. 75 MICRONS/ 610 G/SQ. M.

BHEL	TITLE: TYPICAL DETAILS OF BOLTABLE TYPE CABLE TRAY SUPPORT MATERIAL & ACCESSORIES	DRG. NO. PE-DG-999-507-E013
		SH 2 OF 12



CANTILEVER ARMS

TRAY WIDTH IN MM	CANTILEVER ARM LENGTH (L) IN MM
150	170 (FOR OVERHEAD TRAYS)
300	320 (FOR OVERHEAD TRAYS)
600	620 (FOR OVERHEAD TRAYS)
600	750 (FOR TRENCH)



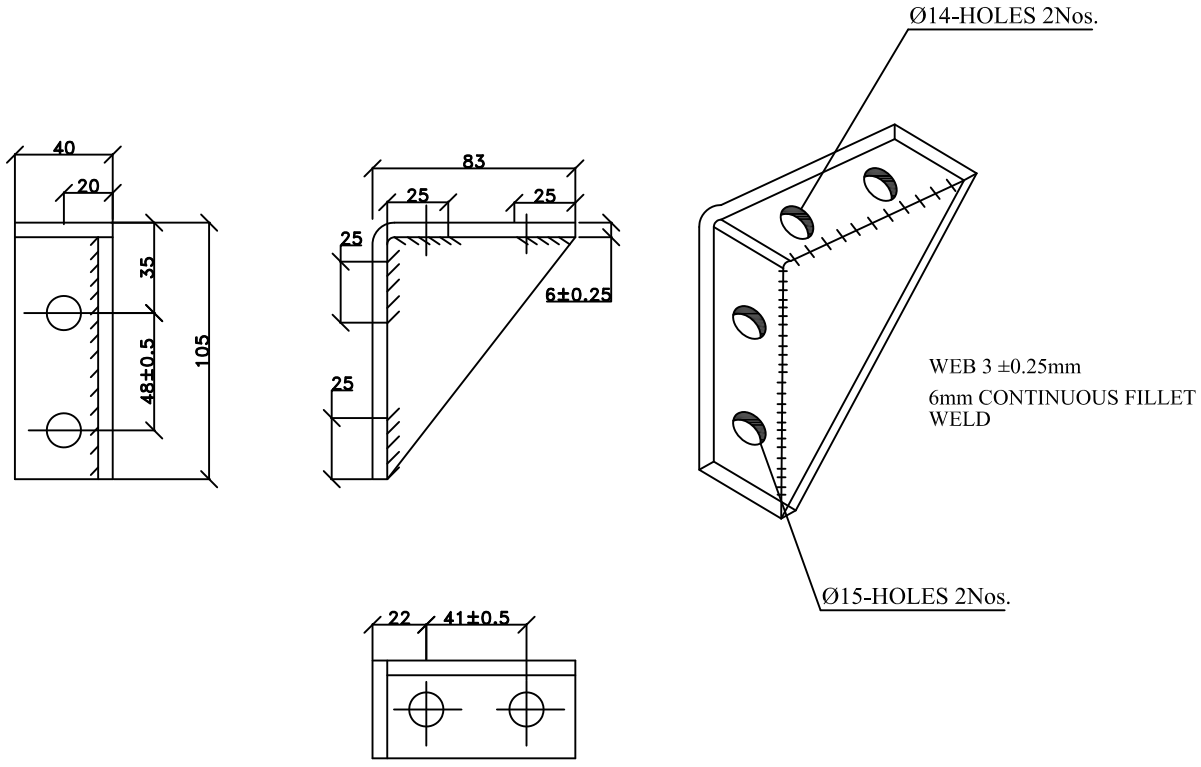
TYPICAL ASSEMBLY OF CHANNEL SUPPORTS AND CABLE TRAY

M12 HEX BOLT & WASHER–2NOs.
M12 SPRING NUTS–2NOs.
M6 PAN HEAD SCREWS & WASHER–2NOs.
M6 SPRING NUTS–2NOs.

NOTES :

1. ALL DIMENSIONS ARE IN mm.
2. ITEM NO.1 MATERIAL : HOT/ COLD ROLLED M.S. AS PER RELEVANT IS.
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
6. ALL FABRICATION TOLERANCE AS PER RELEVANT IS.
7. ZINC COATING SHALL BE MIN. 75 MICRONS/ 610 G/SQ. M.

BHEL	TITLE: TYPICAL DETAILS OF BOLTABLE TYPE CABLE TRAY SUPPORT MATERIAL & ACCESSORIES	DRG. NO. PE–DG–999–507–E013
		SH 3 OF 12



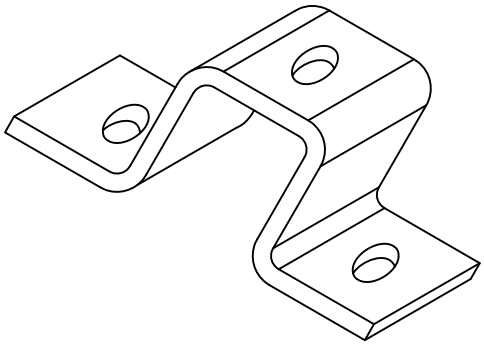
90 ANGLE FITTING HL1 (HEAVY DUTY TYPE)

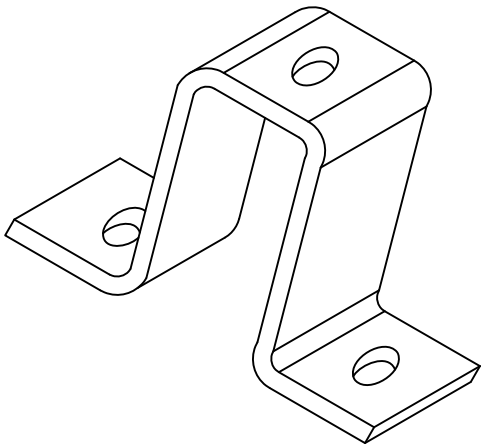
ANCHOR FASTENER–2NOs.
SPRING NUT & WASHER–2NOs.

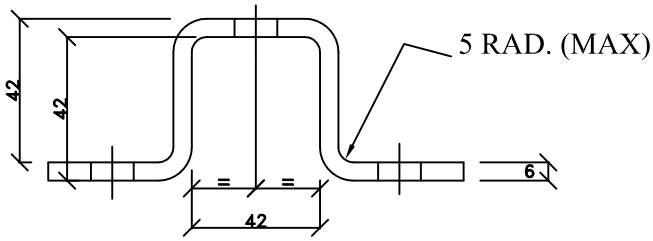
NOTES :

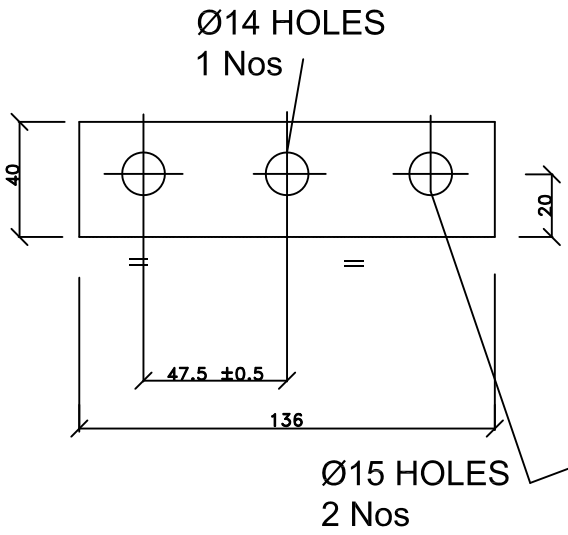
1. ALL DIMENSIONS ARE IN mm.
2. MATERIAL :MILD STEEL AS PER IS-2062
3. FINISH : HOT DIP GALVANISED AS PER IS:2629
4. TOLERANCE ON THICKNESS AS PER IS:1852
5. ALL FABRICATION TOLERANCE AS PER RELEVANT IS.
6. ZINC COATING SHALL BE MIN. 75 MICRONS/ 610 G/SQ. M.

BHEL	TITLE: TYPICAL DETAILS OF BOLTABLE TYPE CABLE TRAY SUPPORT MATERIAL & ACCESSORIES	DRG. NO. PE–DG–999–507–E013
		SH 4 OF 12

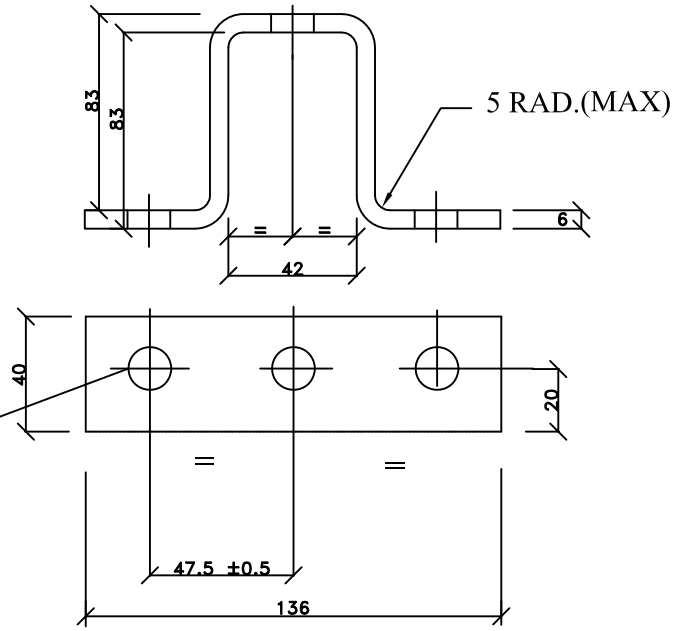








CLAMP FOR SINGLE CHANNEL CC1



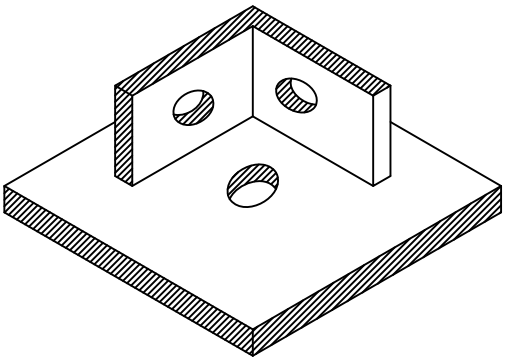
CLAMP FOR DOUBLE CHANNEL CC2

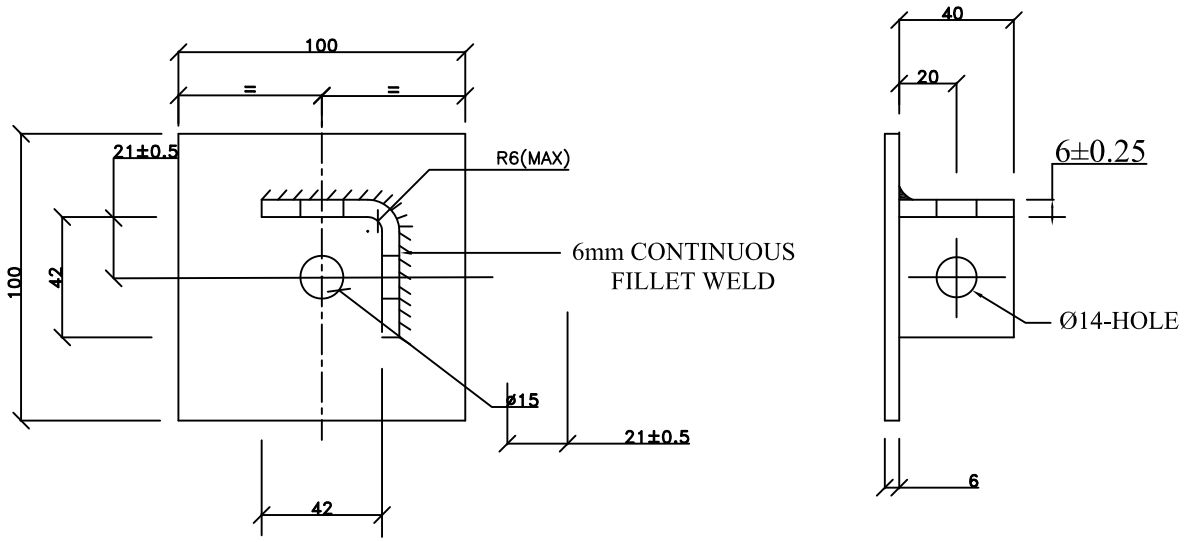
NOTES

1. ALL DIMENSIONS ARE IN mm.
2. MATERIAL :MILD STEEL AS PER IS-2062
3. FINISH : HOT DIP GALVANISED AS PER IS:2629
4. TOLERANCE ON THICKNESS AS PER IS:1852
5. ALL FABRICATION TOLERANCE AS PER RELEVANT IS.
6. ZINC COATING SHALL BE MIN. 75 MICRONS/ 610 G/SQ. M.

ANCHOR FASTENER–2NOs.
SPRING NUT & WASHER–1NO.

BHEL	TITLE: TYPICAL DETAILS OF BOLTABLE TYPE CABLE TRAY SUPPORT MATERIAL & ACCESSORIES	DRG. NO. PE–DG–999–507–E013
		SH 5 OF 12





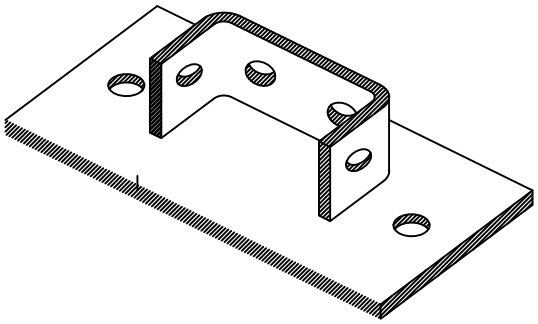
BASE PLATE FOR SINGLE CHANNEL BP1

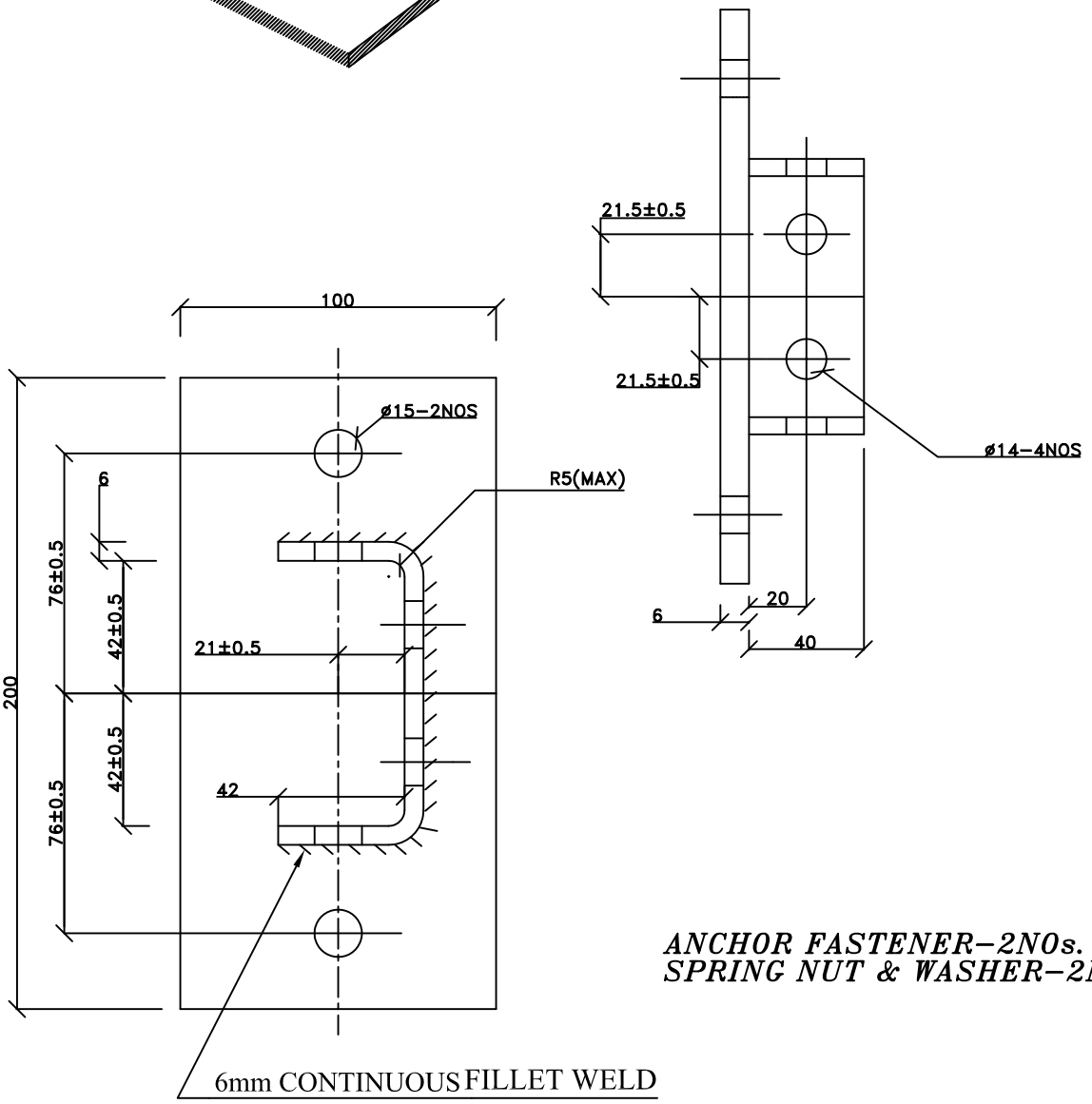
NOTE

ANCHOR FASTENER–1NO.
SPRING NUT & WASHER–1NO.

1. ALL DIMENSIONS ARE IN mm.
2. MATERIAL :MILD STEEL AS PER IS-2062
3. FINISH : HOT DIP GALVANISED AS PER IS:2629
4. TOLERANCE ON THICKNESS AS PER IS:1852
5. ALL FABRICATION TOLERANCE AS PER RELEVANT IS.
6. ZINC COATING SHALL BE MIN. 75 MICRONS/ 610 G/SQ. M.

बीएचईएल BHEL	TITLE: TYPICAL DETAILS OF BOLTABLE TYPE CABLE TRAY SUPPORT MATERIAL & ACCESSORIES	DRG. NO. PE–DG–999–507–E013
		SH 6 OF 12





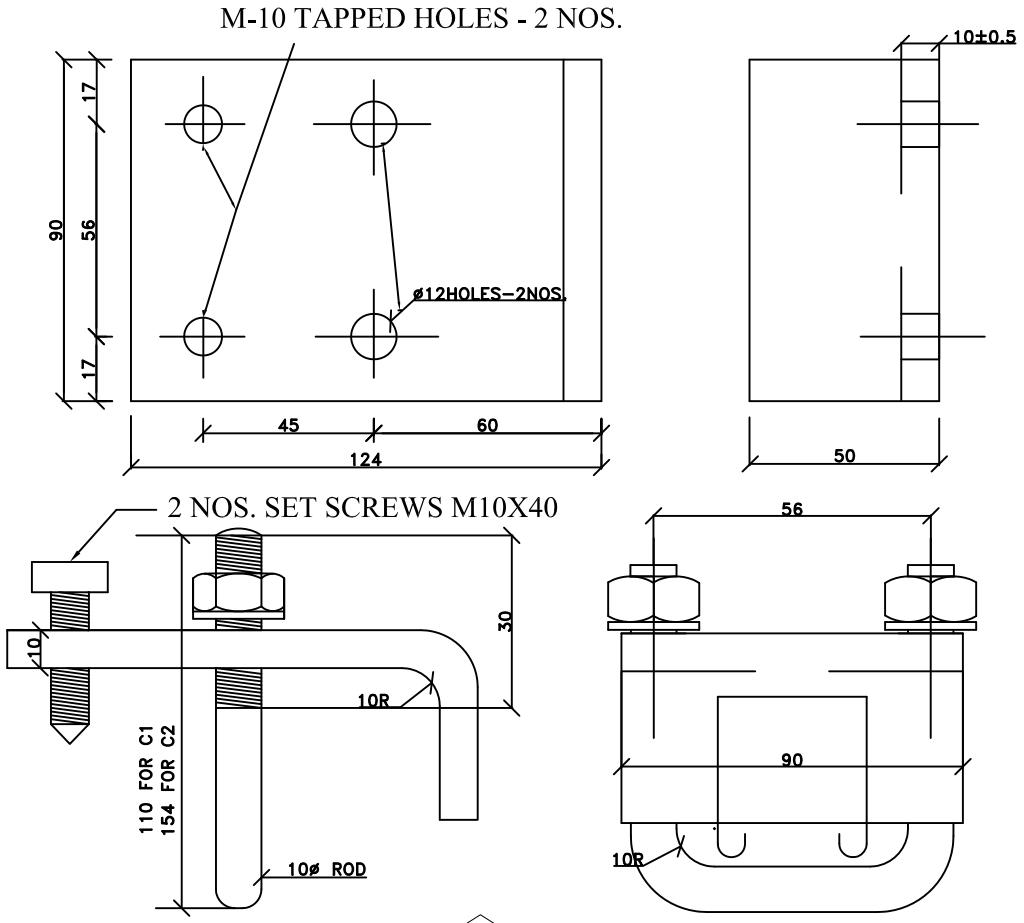
ANCHOR FASTENER–2NOs.
SPRING NUT & WASHER–2NOs.

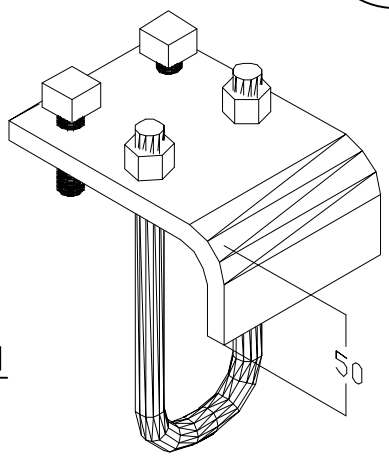
BASE PLATE FOR DOUBLE CHANNEL BP2

NOTE

1. ALL DIMENSIONS ARE IN mm.
2. MATERIAL :MILD STEEL AS PER IS-2062
3. FINISH : HOT DIP GALVANISED AS PER IS:2629
4. TOLERANCE ON THICKNESS AS PER IS:1852
5. ALL FABRICATION TOLERANCE AS PER RELEVANT IS.
6. ZINC COATING SHALL BE MIN. 75 MICRONS/ 610 G/SQ. M.

BHEL	TITLE: TYPICAL DETAILS OF BOLTABLE TYPE CABLE TRAY SUPPORT MATERIAL & ACCESSORIES	DRG. NO. PE–DG–999–507–E013
		SH 7 OF 12





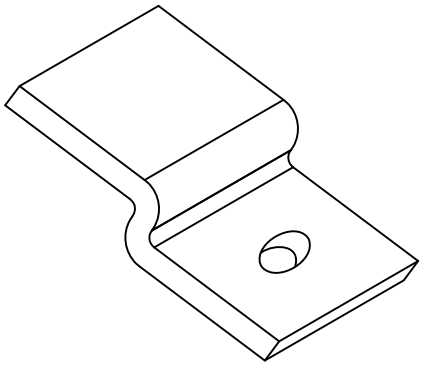
BEAM CLAMP - BC1

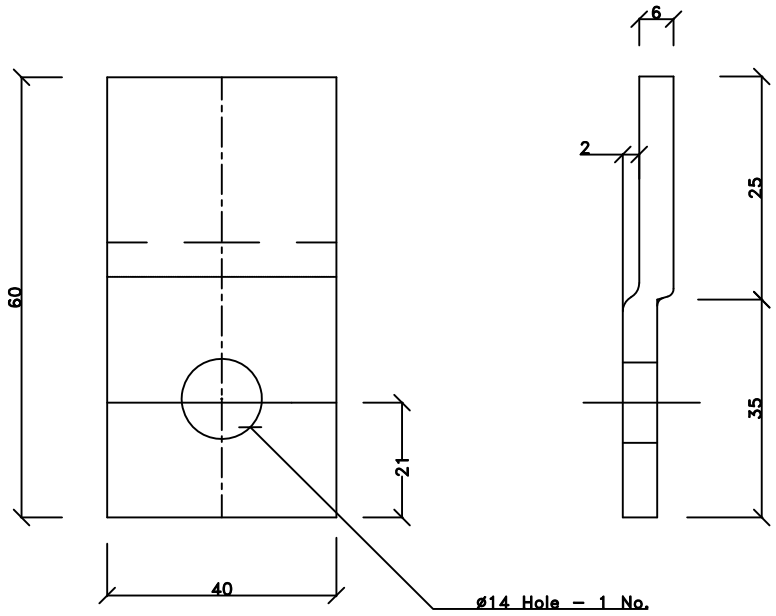
M-10 U-BOLT WITH
2Nos PLAIN WASHERS & NUTS
110 mm FOR SC 1
154 mm FOR DC1
2 NOs. SET SCREWS M10X40

NOTES

1. ALL DIMENSIONS ARE IN mm.
2. MATERIAL :MILD STEEL AS PER IS-2062
3. FINISH : HOT DIP GALVANISED AS PER IS:2629
4. TOLERANCE ON THICKNESS AS PER IS:1852
5. ALL FABRICATION TOLERANCE AS PER RELEVANT IS.
6. ZINC COATING SHALL BE MIN. 75 MICRONS/ 610 G/SQ. M.

BHEL	TITLE: TYPICAL DETAILS OF BOLTABLE TYPE CABLE TRAY SUPPORT MATERIAL & ACCESSORIES	BHEL DRAWING NO. PE-DG-999-507-E013
		SH 8 OF 12





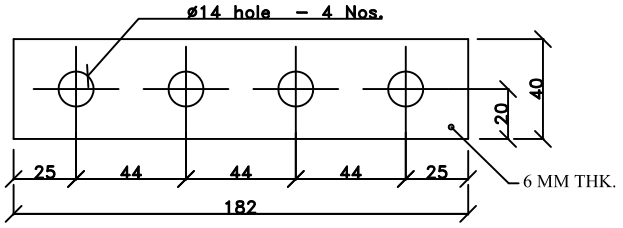
TRAY FIXING CLAMP - TC1

SPRING NUT & WASHER–1NO.

NOTES

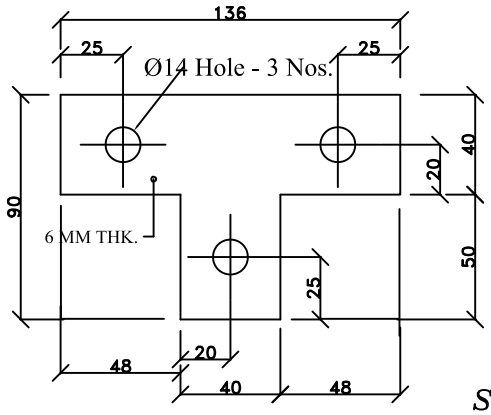
1. ALL DIMENSIONS ARE IN mm.
2. MATERIAL :MILD STEEL AS PER IS-2062
3. FINISH : HOT DIP GALVANISED AS PER IS:2629
4. TOLERANCE ON THICKNESS AS PER IS:1852
5. ALL FABRICATION TOLERANCE AS PER RELEVANT IS.
6. ZINC COATING SHALL BE MIN. 75 MICRONS/ 610 G/SQ. M.

BHEL	TITLE: TYPICAL DETAILS OF BOLTABLE TYPE CABLE TRAY SUPPORT MATERIAL & ACCESSORIES	BHEL DRAWING NO. PE–DG–999–507–E013
		SH 9 OF 12



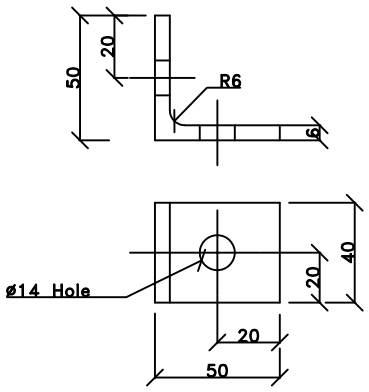
SPRING NUT & WASHER–4NOs.

FLAT PLATE STRAIGHT FITTING PF2



SPRING NUT & WASHER–3NOs.

FLAT PLATE TEE FITTING PF1



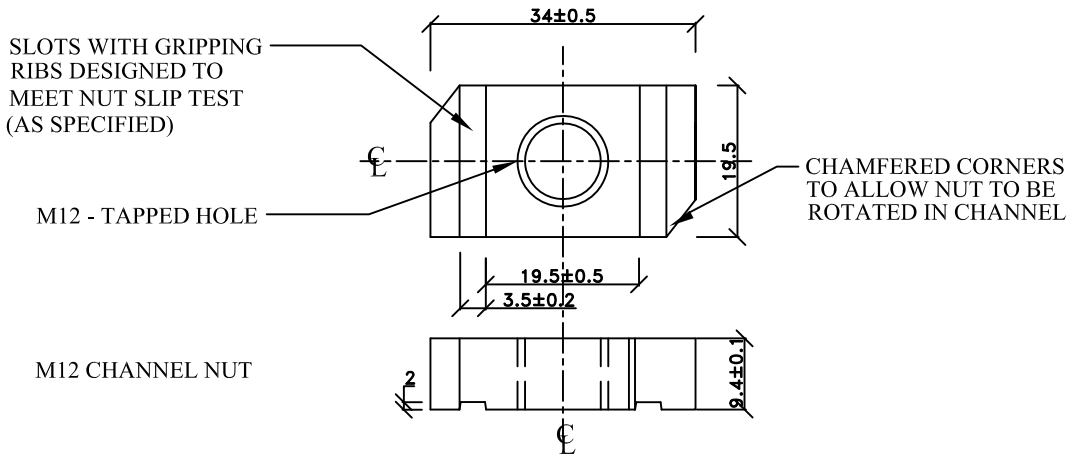
SPRING NUT & WASHER–2NOs.

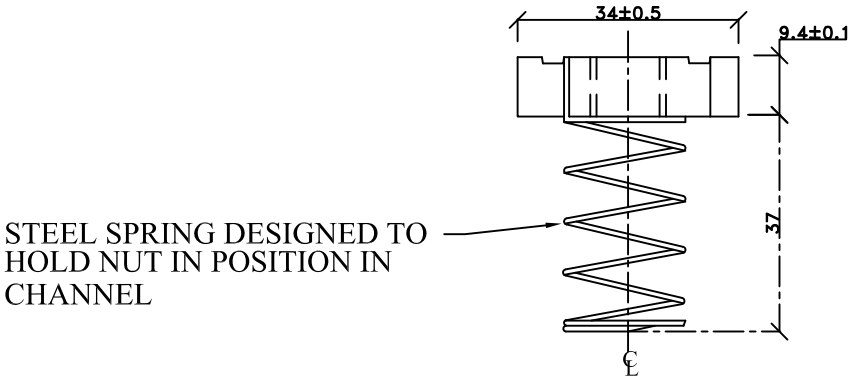
90^0 ANGLE FITTING LA1

NOTES

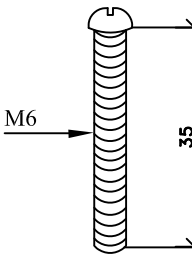
1. ALL DIMENSIONS ARE IN mm.
2. MATERIAL :MILD STEEL AS PER IS-2062
3. FINISH : HOT DIP GALVANISED AS PER IS:2629
4. TOLERANCE ON THICKNESS AS PER IS:1852
5. ALL FABRICATION TOLERANCE AS PER RELEVANT IS.
6. ZINC COATING SHALL BE MIN. 75 MICRONS/ 610 G/SQ. M.

TITLE:	TYPICAL DETAILS OF BOLTABLE TYPE CABLE TRAY SUPPORT MATERIAL & ACCESSORIES	BHEL DRAWING NO. PE–DG–999–507–E013
		SH 10 OF 12

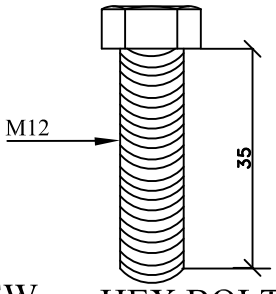




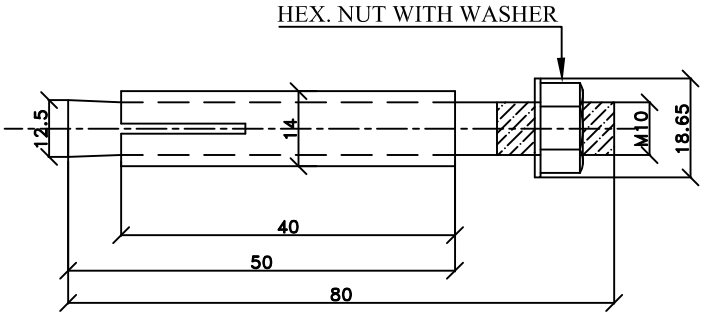
SPRING NUT ASSEMBLY



PAN HEAD SCREW



HEX BOLT

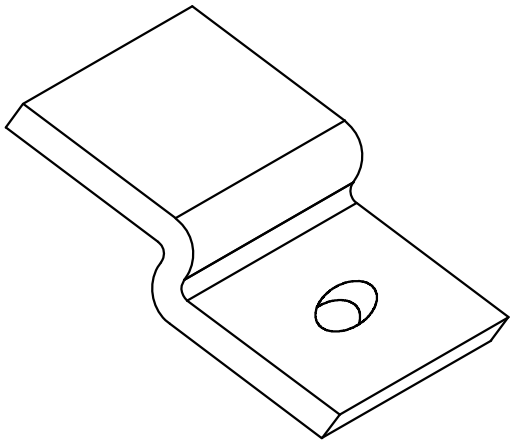


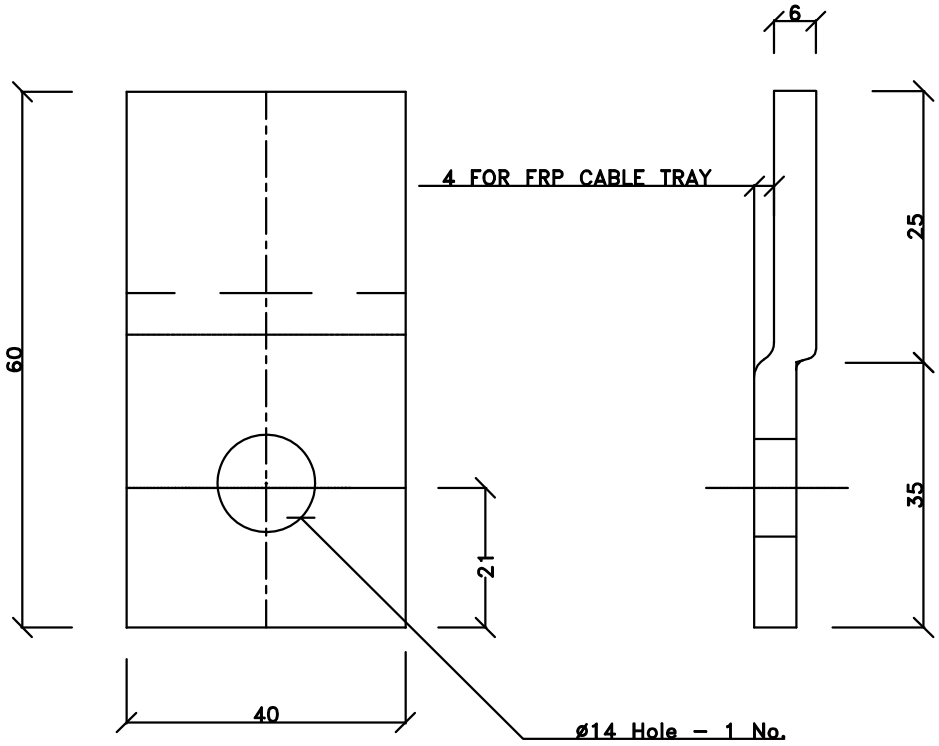
ANCHOR BOLT M10

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. ZINC COATING SHALL BE MIN. 75 MICRONS/ 610 G/SQ. M.

BHEL	**TITLE:** TYPICAL DETAILS OF BOLTABLE TYPE CABLE TRAY SUPPORT MATERIAL & ACCESSORIES	BHEL DRAWING NO. PE-DG-999-507-E013
		SH 11 OF 12





FRP TRAY FIXING CLAMP

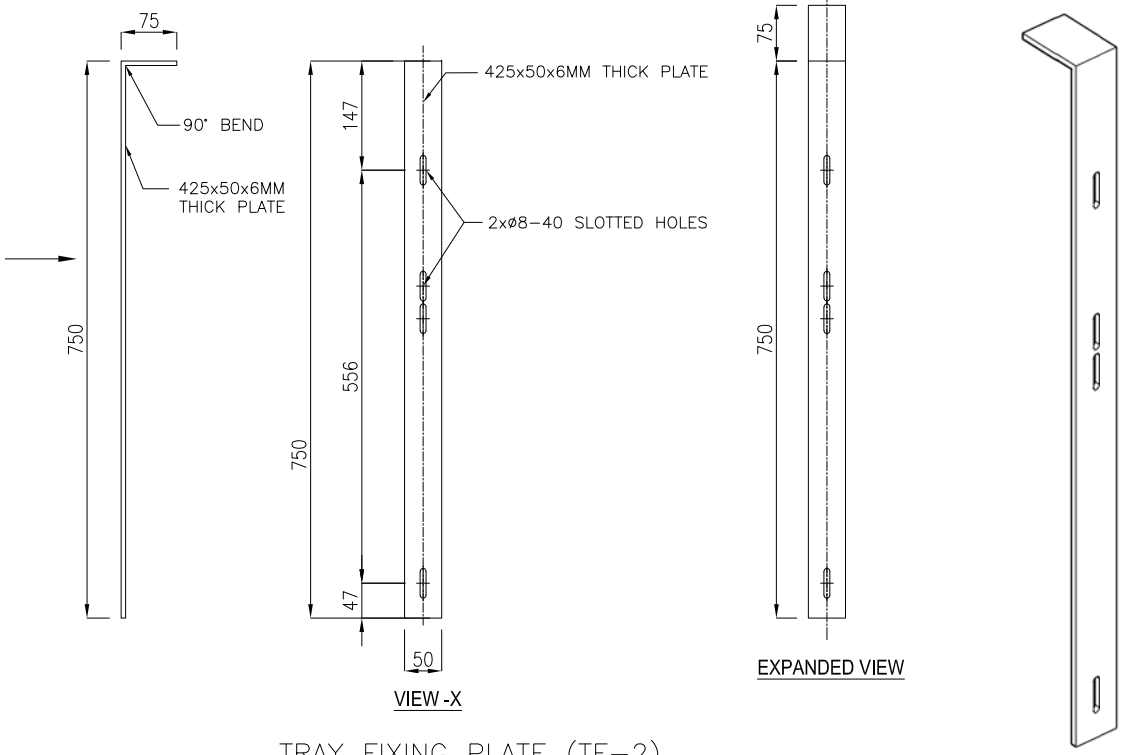
SPRING NUT & WASHER–1NO.

NOTES

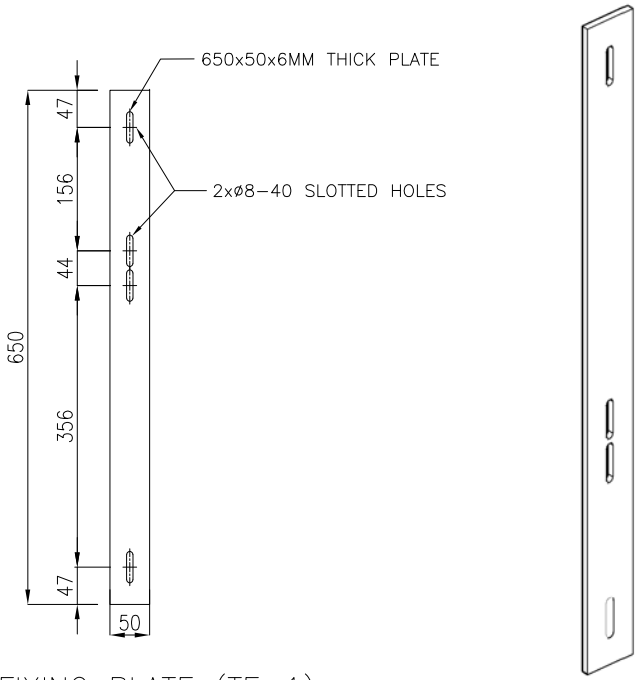
1. ALL DIMENSIONS ARE IN mm.
2. ALL FABRICATION TOLERANCES : ±1.0mm

MATERIAL : HOT/ COLD ROLLED M.S. AS PER IS-2062

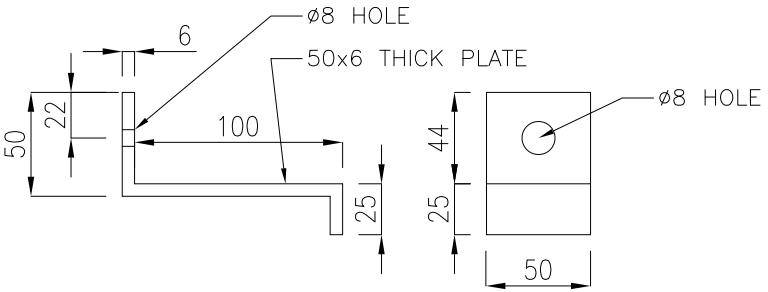
4. FINISH : HOT DIP GALVANISED AS PER IS:2629
5. TOLERANCE ON THICKNESS AS PER IS:1852

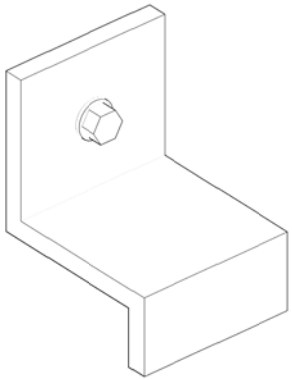


TRAY FIXING PLATE (TF-2)

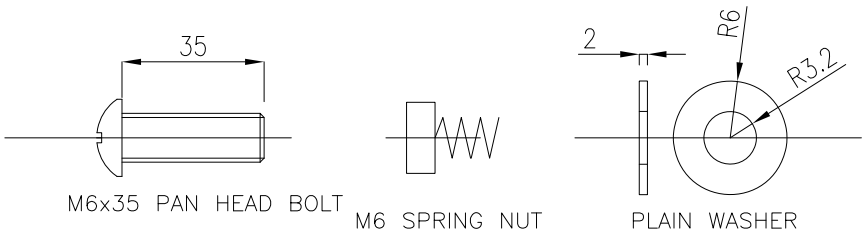


TRAY FIXING PLATE (TF-1)





Z CLAMP (TZ-1)



HARDWARE & ACCESSORIES OF Z CLAMP (TZ-1)

M6x25 HEX BOLT-1NO
M6 WASHER-2NOS
M6 HEX NUT-1NO
M6 SPRING WASHER-1NOS

ANNEXURE-3

TYPE TEST PROCEDURE FOR CABLE TRAY SUPPORT SYSTEM [BOLTABLE TYPE]

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 PE-DG-999-507-E114 (Sheet 05 of 10). Eight (8) nos. 750/650 mm cantilever arms shall be fixed to the main channel and arm 1 & 2 of shall be uniformly loaded to a working load of 100 kg over the outboard 600mm. 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) Off load
iv) Proof load + point load
v) Off load

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 PE-DG-999-507-E114(Sheet 06 of 10). Six (6) nos. 750/650 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 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 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 as shown in the enclosed drawing PE-DG-999-507-E114 (Sheet 07 of 10). 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 no. PE-DG-999-507-E114 (sheet 08 of 10) 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.

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 nos. of 750/650 mm cantilever arms shall be fixed to the SC1 Channel as shown in enclosed drawing PE-DG-999-507-E114 (sheet 09 of 10). 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, and 5 A3:
A length of channel SC1 section 200 mm long shall have fitted brackets with the two bolts fixing as shown in enclosed drawing PE-DG-999-507-E114 (sheet 10 of 10).
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.

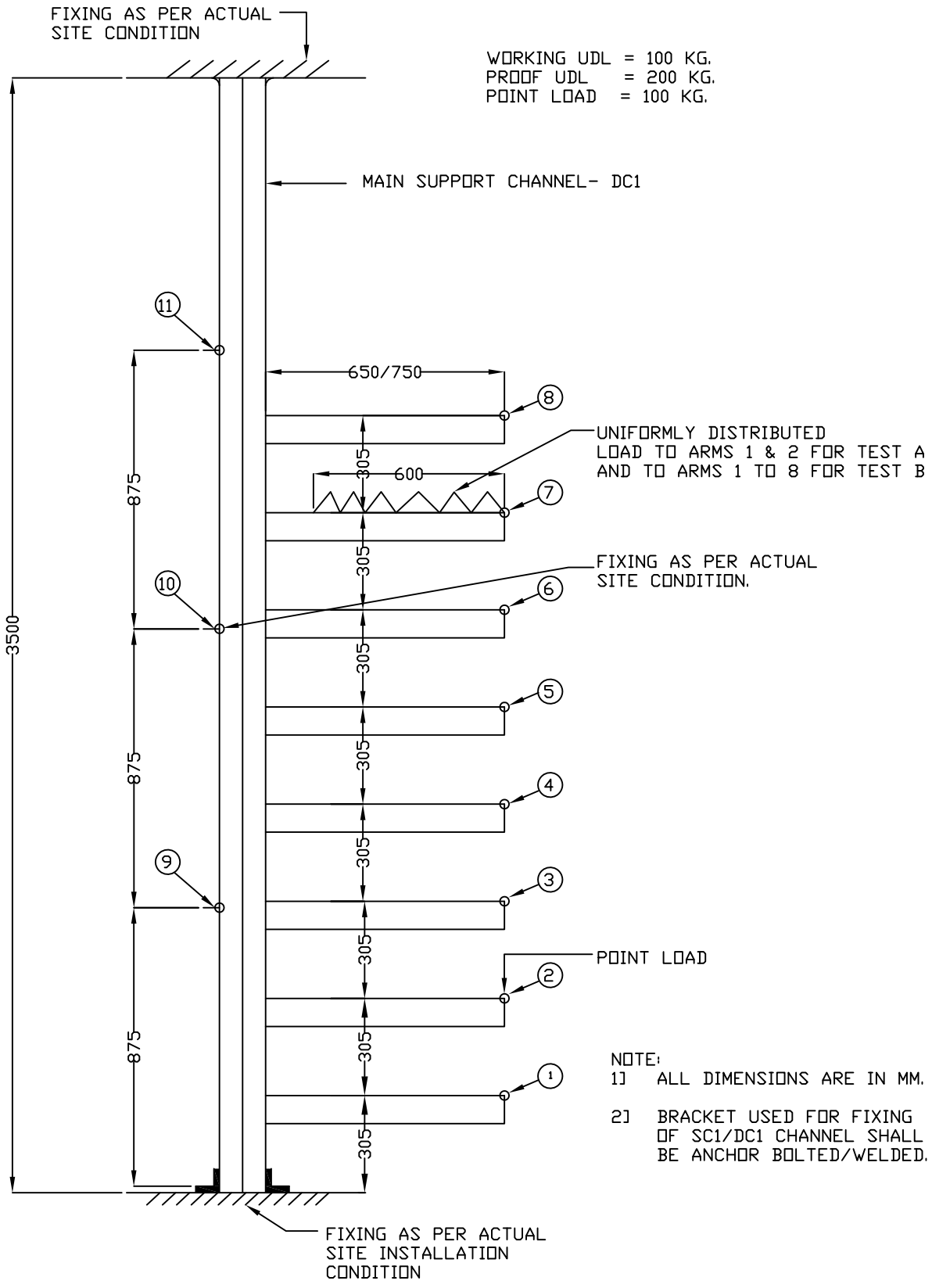
TEST 5 B1, 5 B2, and 5 B3:
The length of channel SC1 section 200 mm long shall have fitted bracket with the one bolt fixing as shown in enclosed drawing PE-DG-999-507-E114 (sheet 10 of 10).
With loads applied at the position shown in drawing enclosed nut slip shall be determined with bolt torque of 30 NM, 50 NM and 65 NM. No fewer than three measurements shall be made for each torque setting.

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

6.0 TEST 6:

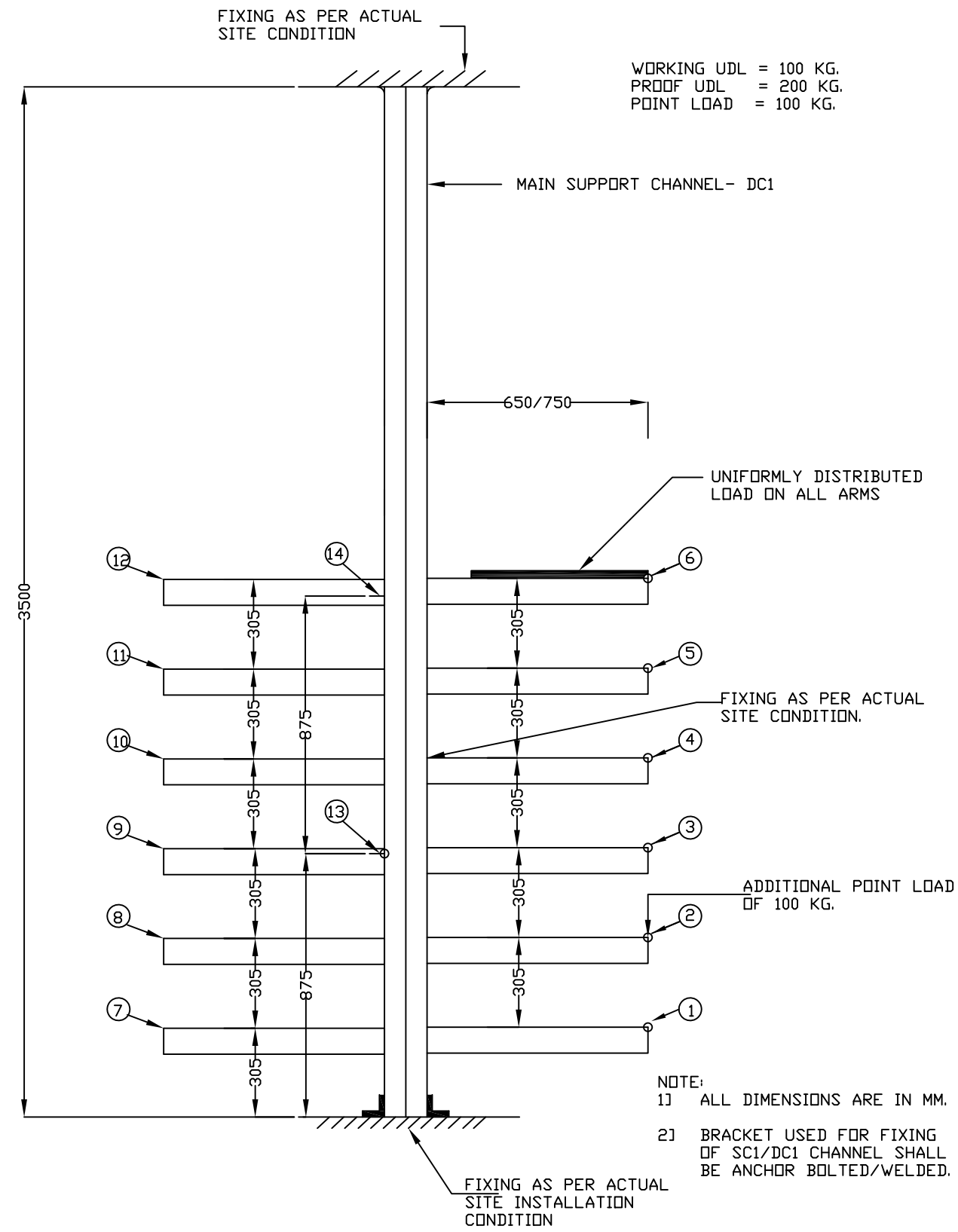
Weld Integrity Test

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



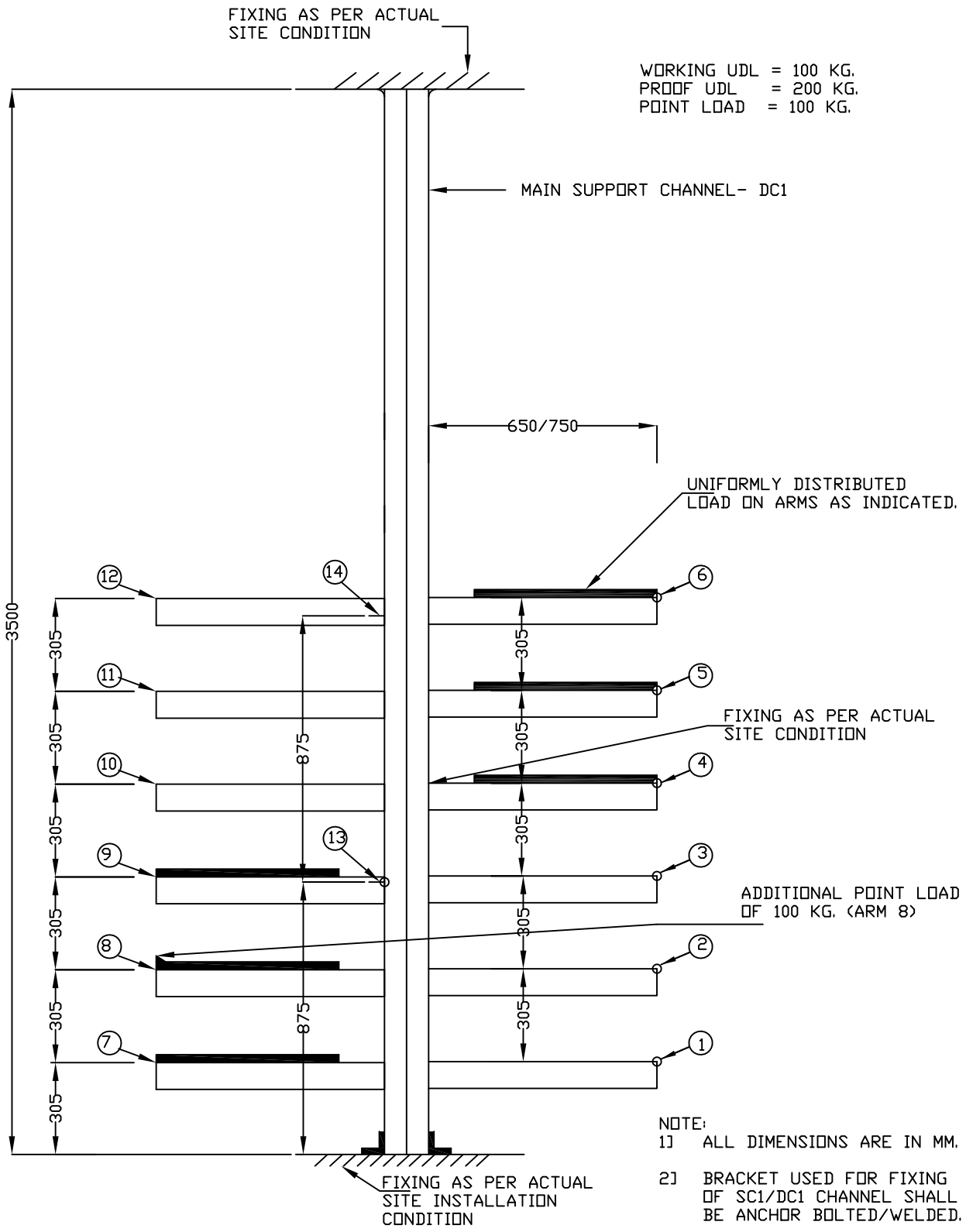
TEST : 1A & 1B: MAIN SUPPORT CHANNEL (CANTILEVER ARM ON ONE SIDE)

BHEL	TITLE: TYPICAL DETAILS OF TYPE TEST ARRANGEMENT	DRG. NO. PE-DG-999-507-E114
		SH 5 OF 10



TEST : 2A: MAIN SUPPORT CHANNEL (CANTILEVER ARM ON BOTH SIDES)

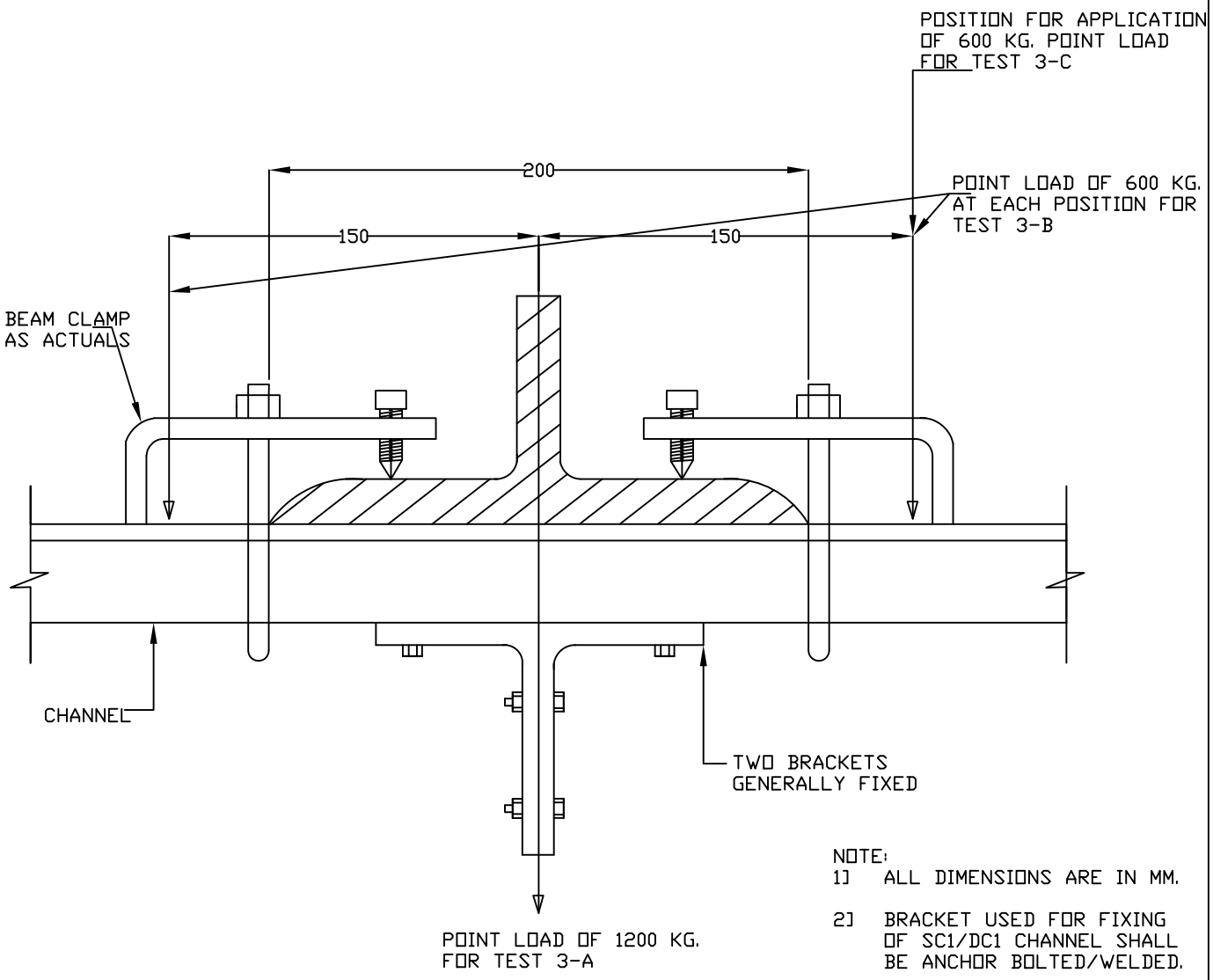
BHEL	TITLE: TYPICAL DETAILS OF TYPE TEST ARRANGEMENT	DRG. NO. PE-DG-999-507-E114
		SH 6 OF 10



DEFLECTION MEASURING POINTS.

TEST : 2B: MAIN SUPPORT CHANNEL (ASYMMETRIC LOADING)

BHEL	TITLE: TYPICAL DETAILS OF TYPE TEST ARRANGEMENT	DRG. NO. PE-DG-999-507-E114
		SH 7 OF 10

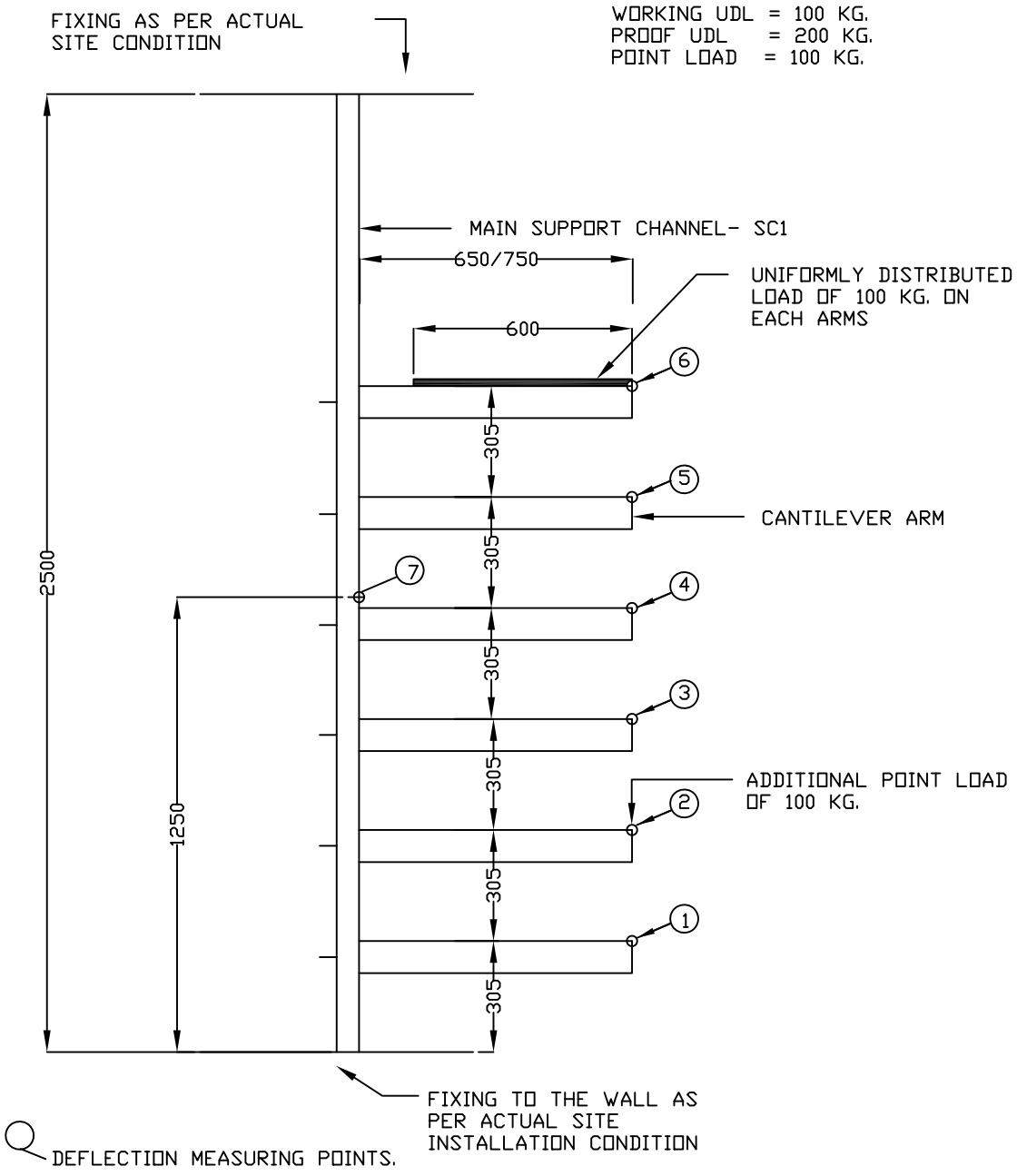


NOTE:
1] ALL DIMENSIONS ARE IN MM.

2] BRACKET USED FOR FIXING OF SC1/DC1 CHANNEL SHALL BE ANCHOR BOLTED/WELDED.

TEST : 3A, 3B, 3C: CHANNEL FIXED ON BEAM/FLOOR.

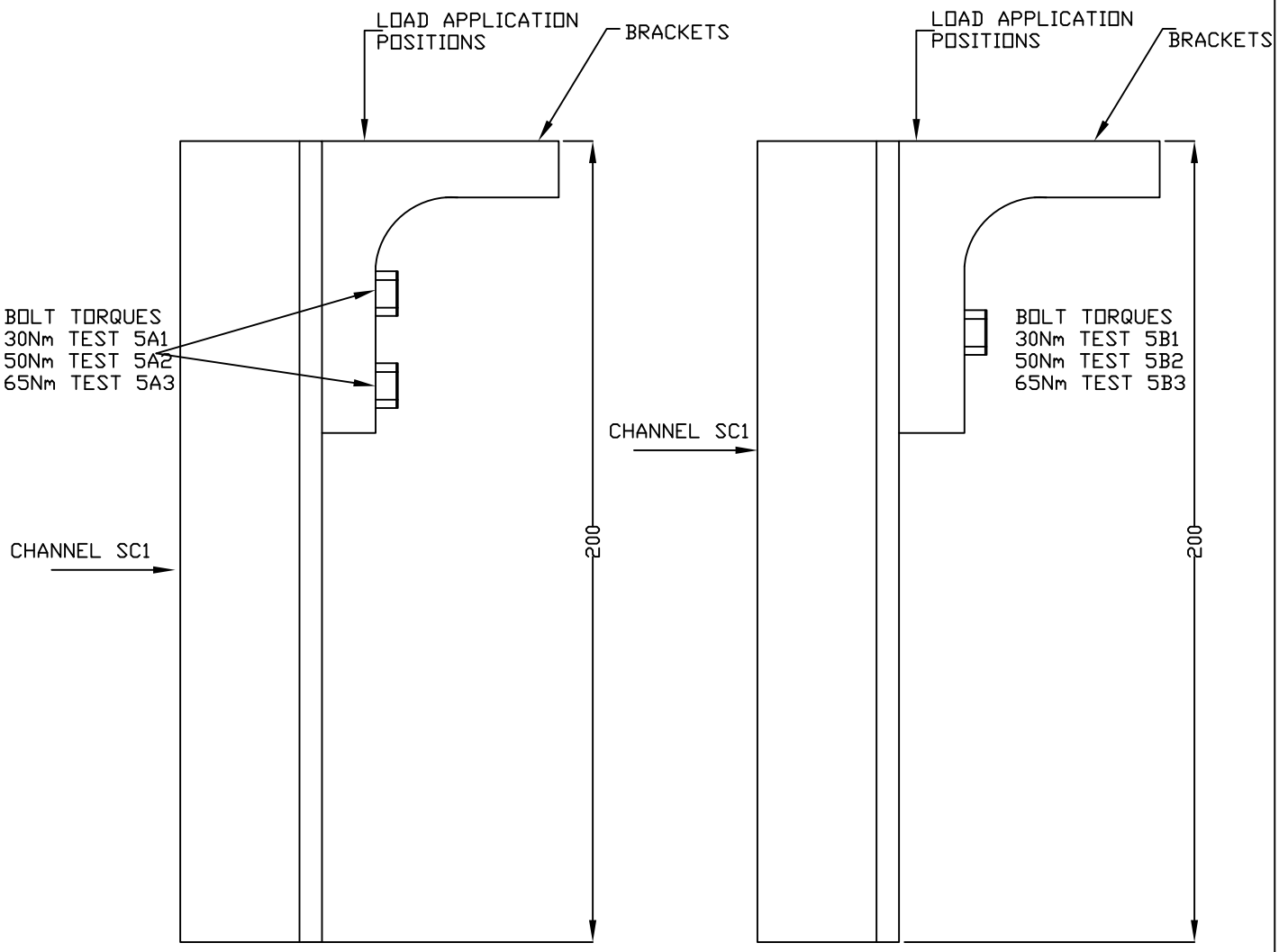
भेल BHEL	**TITLE:** TYPICAL DETAILS OF TYPE TEST ARRANGEMENT	DRG. NO. PE-DG-999-507-E114
		SH 8 OF 10



NOTE:
1] ALL DIMENSIONS ARE IN MM.

TEST : 4: CHANNEL INSERT

बीएचईएल BHEL	TITLE: TYPICAL DETAILS OF TYPE TEST ARRANGEMENT	DRG. NO. PE-DG-999-507-E114
		SH 9 OF 10



ASSEMBLY USING M12 X 25MM LONG HEX. HD. SCREWS LOCK WASHER AND M12 CHANNEL NUT WITH SPRING

TEST : 5A1, 5A2, 5A3:
CHANNEL NUT SLIP CHARACTERISTIC

ASSEMBLY USING M12 X 25MM LONG HEX. HD. SCREWS LOCK WASHER AND M12 CHANNEL NUT WITH SPRING

TEST : 5B1, 5B2, 5B3:
CHANNEL NUT SLIP CHARACTERISTIC

NOTE:
1] ALL DIMENSIONS ARE IN MM.

BHEL	**TITLE:** TYPICAL DETAILS OF TYPE TEST ARRANGEMENT	DRG. NO. PE-DG-999-507-E114
		SH 10 OF 10