
	PRE-QUALIFICATION REQUIREMENTS FOR CABLE TRAY SUPPORT SYSTEM- BOLTABLE OF 2X 800 MW NTPC KARIMNAGAR SG PKG PHASE1	PE-PQ-424-507-E003
		REVISION NO. 00 DATE 30/09/2022
		Page 1 of 2

ITEMS: Single channel, double channel, cantilever arms, clamps & fittings	
SCOPE: Supply: YES; Erection & Commissioning: NO;	
1	Availability of type test certificates as per GDCC standard.
2	Vendor should have in-house fabrication, manufacturing & testing facility (as per GDCC standard).
3	Capability of manufacturing channels & cantilever arms for 4km per month.
4	Vendor has his own galvanization plant. OR Galvanization of cable tray support-boltable type to be done from galvanizers as mentioned in annexure-1 of Quality plan, part of Technical specification.
5	Manufactured & supplied at least 8 km of channels (SC1 & DC1) & cantilever arms in one or more orders and at least 4 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/ MOU/ licensing agreement with some other company, then the credentials of collaborator/ MOU partner/ licensing company can also be considered for meeting PQR.


PREPARED BY	CHECKED BY	REVIEWED BY	APPROVED BY
GIRISH CHANDRA, DY. ENGINEER	HEMA KUSHWAHA, SR. MGR	PRAVEEN DUTTA, AGM	DEBASISA RATH, AGM (DH-ELECT)

	PRE-QUALIFICATION REQUIREMENTS FOR CABLE TRAY SUPPORT SYSTEM- BOLTABLE OF 2X 800 MW NTPC KARIMNAGAR SG PKG PHASE1	PE-PQ-424-507-E003
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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 bidders, 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
GIRISH CHANDRA, DY. ENGINEER	HEMA KUSHWAHA, SR. MGR	PRAVEEN DUTTA, AGM	DEBASISA RATH, AGM (DH-ELECT)

	CABLE TRAY SUPPORT SYSTEM 2 X 800 MW NTPC KARIMNAGAR SG PKG PHASE-1	SPECIFICATION NO. PE-TS-424-507-E013
		JOB NUMBER: 424
		DEPT CODE: ELECT.
		REVISION 0
		SHEETS : 1 Nos

(BOQ FOR CABLE TRAYS SUPPORT SYSTEM)

Item No.	Item Code	Item Description	Unit	QTY
1	507-34016-A	SINGLE CHANNEL SC1 (IN STANDARD LENGTH OF 6M PER PIECE)	Metres	3400
2		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		
2.1	507-34028-A	Cantilever arm for 600mm wide cable trays (620mm)	Nos.	5000
2.2	507-34029-A	Cantilever arm for 300mm wide cable trays (320mm)	Nos.	1170
2.3	507-34034-A	Cantilever arm for 150mm wide cable trays (170mm)	Nos.	10650
3		CLAMPS AND FITTINGS COMPLETE WITH REQUIRED HARDWARES (Spring nuts/ washers etc. as required for complete installation)		
3.1	507-34021-A	TRAY FIXING CLAMP TC1	Nos.	50000
4	507-34037-A	M8 SET (1 NOS. BOLT, 1 NOS. NUT & 2 NOS. WASHER)	Set.	204000

2X 800 MW NTPC KARIMNAGAR SG PKG PHASE1

VOLUME II

TECHNICAL SPECIFICATION FOR CABLE TRAY SUPPORT SYSTEM – (BOLTABLE TYPE)

BHEL DOC. NO. PE-TS-424-507-E013

REVISION 00



BHARAT HEAVY ELECTRICALS LIMITED

POWER SECTOR

PROJECT ENGINEERING MANAGEMENT

NOIDA (U.P), INDIA-201301



**TECHNICAL SPECIFICATION FOR
CABLE TRAY SUPPORT SYSTEM
(BOLTABLE TYPE)**

SPECIFICATION NO. PE-TS-424-507-E013

REVISION 00

DATE: 26.09.2022

SHEET 1 OF 1

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Sl. No.	DESCRIPTION	NO. OF SHEETS
1.0	TITLE SHEET	01
2.0	CONTENT	01
3.0	COMPLIANCE SHEET	01
4.0	SECTION – I	
4.1	SPECIFIC TECHNICAL REQUIREMENT	02
4.2	ANNEXURE-A	01
4.3	TECHNICAL DATA SHEET-A	01
5.0	SECTION- 'II'	
5.1	STANDARD TECHNICAL REQUIREMENTS	03
5.2	STANDADRD QUALITY PLAN	04
6.0	ANNEXURE-3 (TYPICAL DETAILS OF BOLTABLE TYPE CABLE TRAY SUPPORT MATERIAL & ACCESSORIES)	06
7.0	ANNEXURE-4 (TYPICAL DETAILS OF TYPE TEST PROCEDURE/TEST ARRANGEMENT)	10
8.0	ANNEXURE-C (PRICE VARIATION FORMULAE)	02

TOTAL SHEETS INCLUDING COVER SHEET, CONTENT/SEPARATOR SHEET = 32



**TECHNICAL SPECIFICATION FOR
GALVANISED CABLE TRAY
SUPPORT SYSTEM (BOLTABLE
TYPE)**

SPECIFICATION NO. PE-TS-424-507-E013

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COMPLIANCE CERTIFICATE

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DATE: 26.09.2022

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 deviations 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 the specification shall prevail).

BIDDER'S STAMP & SIGNATURE



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SECTION – I

SPECIFIC TECHNICAL REQUIREMENTS



**TECHNICAL SPECIFICATION FOR
GALVANISED CABLE TRAY
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TYPE)**

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1.0 SCOPE OF ENQUIRY

- 1.1 This enquiry covers Manufacture, Inspection and Testing at Manufacturer's works, proper packing and delivery to site of **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 General technical requirements of the Cable Tray Support System (Boltable Type) are indicated in Section-I. Project specific technical/ quality requirements / changes are listed in Data Sheet-A & Section-II.
- 1.4 The stipulations of Section-I, followed by those of Data Sheet-A shall prevail in case of any conflict between the stipulations of Section-I, Data Sheet - A & Section-II.

2.0 BILL OF QUANTITIES:

- 2.1 Quantity requirements shall be as per **Annexure-I (Bill of Quantities (BOQ))** of NIT.

3.0 SPECIFIC REQUIREMENTS:

3.1 Technical:

Sr. No.	Reference Clause No. of Section II (if any)	Specific Requirement/ Change
1	NIL	NIL

3.2 Quality/ Inspection:

Sr. No.	Reference Clause No. of Section II (if any)	Specific Requirement/ Change

3.3 Bill of Material & Packing List

- 3.3.1 Supplier to submit detailed 'Bill of Material' (BoM) at the time of drawing/document submission after placement of PO. Each item of the BoM to be uniquely identified with item code no. or item serial no.
- 3.3.2 Supplier to ensure that all items which will find separate mention in the packing list are covered in this detailed BoM.



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

- 4.1 Drawings/ documents shall be submitted through Document Management System (DMS).
- 4.2 Drawing/Documents required to be submitted shall be as per NIT.
- 4.3 Bidder to submit drawing/document submission schedule at contract stage.



**TECHNICAL SPECIFICATION FOR
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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. **0000-999-QOE-S-38.**



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SECTION-II

STANDARD TECHNICAL REQUIREMENTS



TECHNICAL SPECIFICATION FOR GALVANISED CABLE TRAY SUPPORT SYSTEM (BOLTABLE TYPE)

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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 **NTPC's** Standard Quality Plan (0000-999-QOE-S-38 , 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.



**TECHNICAL SPECIFICATION FOR
GALVANISED CABLE TRAY SUPPORT
SYSTEM (BOLTABLE TYPE)**

SPECIFICATION NO. PE-TS-424-507-E013

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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.

ITEM: (MATERIAL, CLASS, GRADE, RATING, SIZE ETC.) GALVANISED FLEXIBLE CABLE TRAYS SUPPORT SYSTEM		STANDARD QUALITY PLAN				OP NO. 0000-999-QOE-S-38 REV.:00 DATE : 01.09.04 PAGE 1 OF 2 VALID UPTO:31.08.07		REVIEWED BY S.D.SINGH O.P.NIRANJAN I.J.SINGH		APPROVED BY ANIL KUMAR NTPC, Noida			
SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	CONFORMING TO CODE: Design as per NTPC Specification			REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
				TYPE OF CHECK	QUANTUM OF CHECK	C/N				M	C	N	
1.	2. Flexible cable trays Support Structure	3. 1. In Black Condition a) Weld Quality	4. Major	5. Visual	100%	6. Random	7. Manufacturer's Plant Std	8. Manufacturer's Plant Std	9. Inspection Report	P	V	10. V	11. 0
		b) Burs	Major	Visual	Random	-	No Burs	No Burs	-do-	P	-	-	
2.	Finished Galvanized	2. After Galvanizing 2.1 General physical inspection including Galvanizing Quality/Defects, Dicrochromating, White Rusting etc.	Major	Visual	100%	5. Sample/Lot	IS-2629-1985 IS-4759-1996	IS-2629-1985 IS-4759-1996	-do-	P	W	W	
		2.2 Dimensional Check & Thickness Check	Major	Measurement	-do-	-do-	NTPC/Main Supplier Approved Drg.	NTPC/Main Supplier Approved Drg.	-do-	P	W	W	
		2.3 Galvanizing Tests a) Coating thickness measurement survey by Elcometer	Critical	Measurement	IS-4759-1996 IS-3203-1982	-do-	IS-4759-1996 IS-3203-1982	IS-4759-1996 IS-3203-1982	-do-	P	W	W	
		b) Mass of zinc coating	Critical	Measurement	-do-	1 coupon sample of each thickness	IS-6745-1972 IS-4759-1996	IS-6745-1972 IS-4759-1996	-do-	P	W	W	
		c) Uniformity of zinc coating/dip test	Critical	Measurement	-do-	-do-	IS-2633-1986 IS-4759-1996	IS-2633-1986 IS-4759-1996	-do-	P	W	W	
		d) Adhesion Test	Critical	Visual	-do-	-do-	IS-2629-1985	IS-2629-1985	-do-	P	W	W	

LEGEND: RECORDS IDENTIFIED WITH "TICK" SHALL BE ESSENTIALLY INCLUDED BY THE CONTRACTOR IN QA DOCUMENTATION
 **M: MANUFACTURER/SUB-SUPPLIER, C: Main Supplier: NTPC, N: NTPC. INDICATE "P" PERFORM "W" WITNESS AND "V" VERIFICATION AS APPROPRIATE
 "CHP" BY NTPC SHALL BE IDENTIFIED IN COLUMN "N" AS "W"
 FORMAT NO. QS-01-QAI-P-10/F3-R0

1/2

ENGG. DIV./QA&I

ITEM: (MATERIAL, CLASS, GRADE, RATING, SIZE ETC.)		STANDARD QUALITY PLAN		QP NO. 0000-999-QOE-S-38 REV:00 DATE: 01.09.04 PAGE 2 OF 2 VALID UPTO: 31.08.07		REVIEWED BY S.D.SINGH O.P.NIRANJAN I.J.SINGH		APPROVED BY ANIL GUPTA NTPC, New Delhi					
SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			
					M	C/N				M	C	N	W
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	
		Proof Load Test as per note 6 Followed by Die Penetration Test (For 600 mm and above cable tray support system)	A	Meas/Visual	One Sample from each offered lot	One Sample from each offered lot	NTPC Technical Specification/ No visible cracks should develop on the weld part	NTPC Technical Specification/ No visible cracks should develop on the weld part	Inspection Report				

Note :

- The supplier to ensure procurement of steel from main producers like SAIL/ITISCO, Rastriya Ispat/Israt Ind. Jindal/Essex/Loyds/JIS Co. and Zinc from Hindustan Zinc Ltd.
- Welding shall be done by qualified welders as per supplier system.
- Material shall be galvanized at NTPC approved sources only.
- Pre-treatment of cable trays support system shall be carried out in seven tank process as per IS-2629. All the process parameters e.g. Concentration, temperature, density etc. to be maintained and recorded by the galvaniser.
- The process of pre-treatment shall be verified by NTPC on surveillance basis during inspection of Galvanised Flexible Cable Trays support system.
- (i) Test on Main support Channel shall be done if only CI channel are in scope of supply and cantilever arms shall be fitted on one side. This test shall be same as test 4 of type test as per tech. Spec.
(ii) Test on Main Support Channel shall be done with C2 Channel and cantilever arms fitted on both sides, if C2 channels are in scope of supply. This test shall be same as test 2 A of type tests. Then test at (i) above shall not be repeated.
(iii) Nut slip characteristic test (It shall support minimum load of 350 Kg. Before Nut Slips with bolt torque of 65 NM). This test shall be same as test 5 B of type tests.
(iv) The procedure for carrying out above test shall be as per details given in Type Tests Specification.

LEGEND: RECORDS IDENTIFIED WITH "TICK" SHALL BE ESSENTIALLY INCLUDED BY THE CONTRACTOR IN QA DOCUMENTATION
 **M: MANUFACTURER/SUB-SUPPLIER, C: Main Supplier, N: NTPC. INDICATE "P" PERFORM "W" WITNESS AND "V" VERIFICATION AS APPROPRIATE
 "CHP" BY NTPC SHALL BE IDENTIFIED IN COLUMN "N" AS "W"
 FORMAT NO. QS-01-QAI-P-10/F3-R0

2/2

ENG. DIV./QA&I

ANNEXURE- 1 to Quality Plan

LIST OF NTPC APPROVED GALVANIZERS (FOR NTPC PROJECTS)

S. NO.	ITEM	VENDOR NAME
1	Galvanising	MJ Engg., Delhi
2	Galvanising	Jamna Metal, Delhi
3	Galvanising	A.V. Engg., Kolkata
4	Galvanising	Inar Profiles, Vishakapatnam
5	Galvanising	Anand Udyog, Mumbai
6	Galvanising	Techno Engg., Chandigarh
7	Galvanising	Steelite Engg., Mumbai
8	Galvanising	National Galvanizer, Kolkata
9	Galvanising	Unistar Galvanizer, Kolkata
10	Galvanising	B.P. Projects, Kolkata
11	Galvanising	Bajaj, Pune
12	Galvanising	Electrocure Industries, Mumbai
13	Galvanising	B.G. Shirke, Pune
14	Galvanising	Gurpreet Galvanizer, Hyderabad
15	Galvanising	Sigma, Mumbai
16	Galvanising	Radhakrishnan Shetty, Chennai
17	Galvanising	Karamtara, Mumbai
18	Galvanising	Poona Galvanizers, Pune
19	Galvanising	Neha Galvanizer, Kolkata
20	Galvanising	Unitech Galvanizers, Hoogly
21	Galvanising	DMP projects, Kolkata
22	Galvanising	Patny Systems, Medhak

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.~~**

Any issue specific to Manufacturer and BHEL shall be taken up separately with BHEL. This should not be made a part of QP.




ANNEXURE- 2
2X 800 MW NTPC KARIMNAGAR SG PKG PHASE1
QUALITY PLAN FOR CABLE TRAY SUPPORT SYSTEM-BOLTABLE

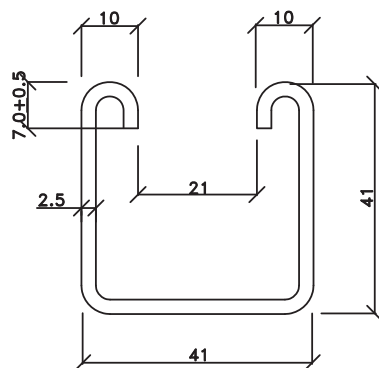
NOTES:

1. BHEL reserves the right for conducting repeat test, if required.
2. The latest revisions/year of issue of all the Standards indicated in the QP shall be referred at the time of inspection.

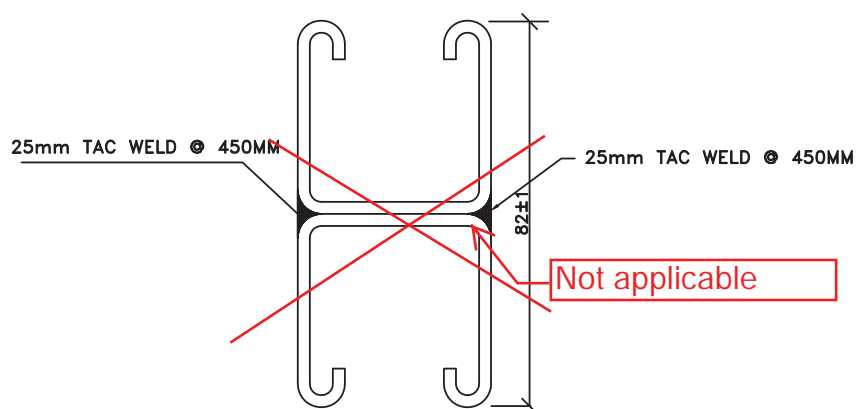
ANNEXURE-3

TYPICAL DETAILS OF BOLTABLE
TYPE CABLE TRAY SUPPORT
MATERIAL & ACCESSORIES

REVISIONS								
		NAME	DATE					
TITLE:				TYPICAL DETAILS OF BOLTABLE TYPE CABLE TRAY SUPPORT MATERIAL & ACCESSORIES		DRAWN DSGN	NAME	DATE
DRG. NO.				PE-DG-999-507-E013		CHKD		
						APPD		
				BHARAT HEAVY ELECTRICALS LTD. PROJECT ENGINEERING MANAGEMENT NOIDA				
							SH 1 OF 06	



SINGLE CHANNEL SC1



DOUBLE CHANNEL DC1

TWO LENGTHS OF SINGLE CHANNEL

SPOT WELDED BACK TO BACK

NOTE:

AT 75MM C/C

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.

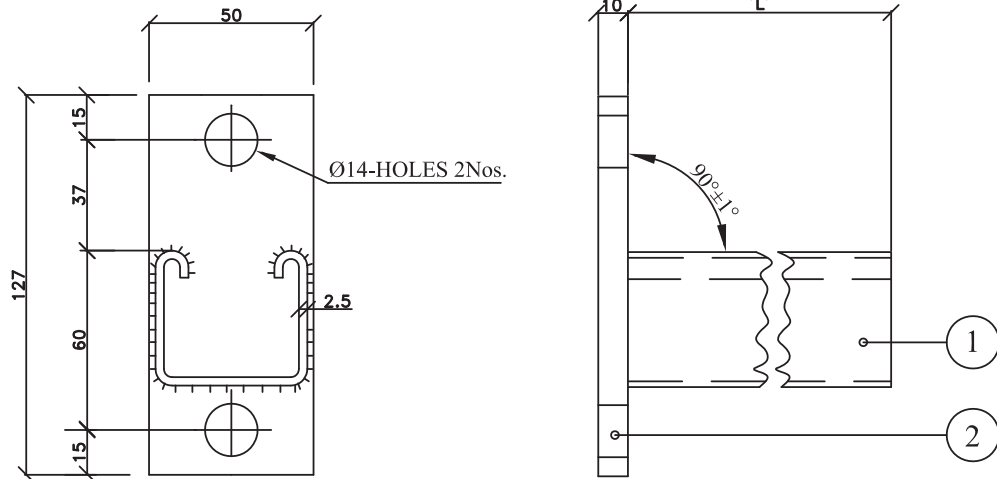


**TITLE: TYPICAL DETAILS OF BOLTABLE
TYPE CABLE TRAY SUPPORT
MATERIAL & ACCESSORIES**

DRG. NO.

PE-DG-999-507-E013

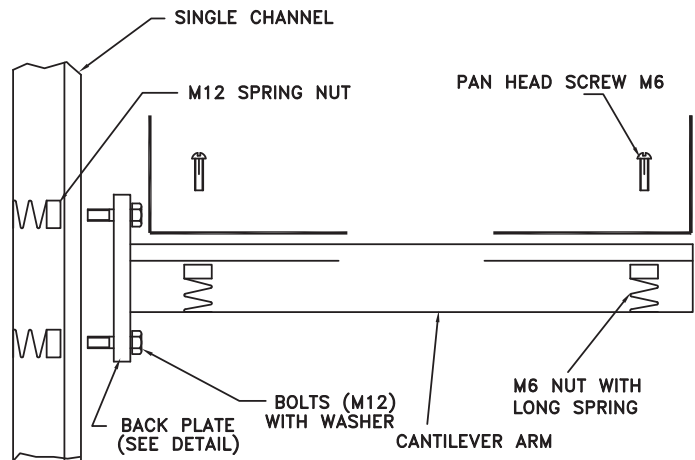
SH 2 OF 06



CANTILEVER ARMS

TRAY WIDTH IN MM	CANTILEVER ARM LENGTH (L) IN MM
150	170/ 200 (FOR OVERHEAD TRAYS)*
300	320/ 350 (FOR OVERHEAD TRAYS)*
450	500 (FOR OVERHEAD TRAYS)
600	620/ 650 (FOR OVERHEAD TRAYS)*
600	750 (FOR TRENCH)

* :- AS SPECIFIED IN BOQ



TYPICAL ASSEMBLY OF CHANNEL SUPPORTS AND CABLE TRAY

M12 HEX BOLT & WASHER-2N0s.
M12 SPRING NUTS-2N0s.
M6 PAN HEAD SCREWS & WASHER-2N0s.
M6 SPRING NUTS-2N0s.

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.

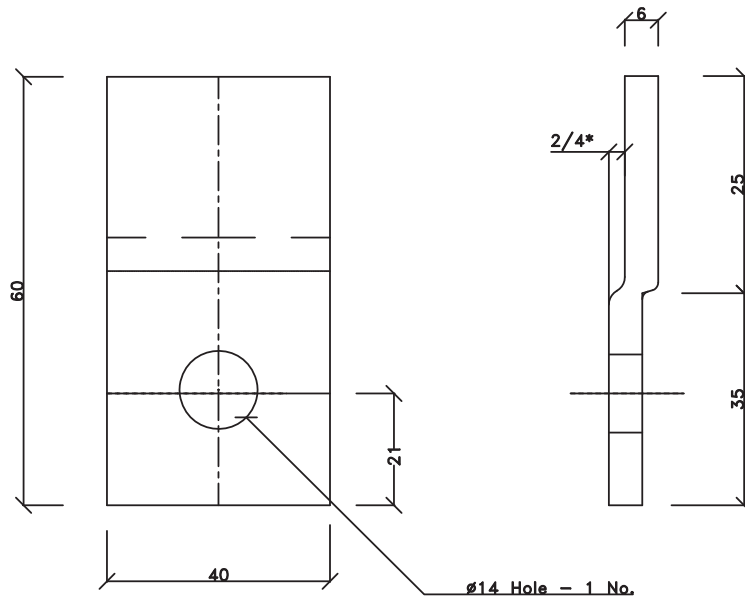
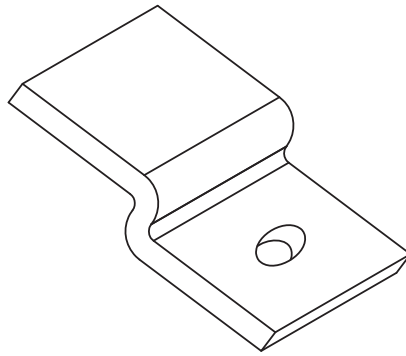


**TITLE: TYPICAL DETAILS OF BOLTABLE
TYPE CABLE TRAY SUPPORT
MATERIAL & ACCESSORIES**

DRG. NO.

PE-DG-999-507-E013

SH 3 OF 06



TRAY FIXING CLAMP - TC1/ FRP TRAY- FIXING CLAMP

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.

SPRING NUT & WASHER-1NO.

**** :-2MM FOR TRAY FIXING CLAMP TC1
4MM FOR FRP TRAY- FIXING CLAMP***



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

BHEL DRAWING NO.

PE-DG-999-507-E013

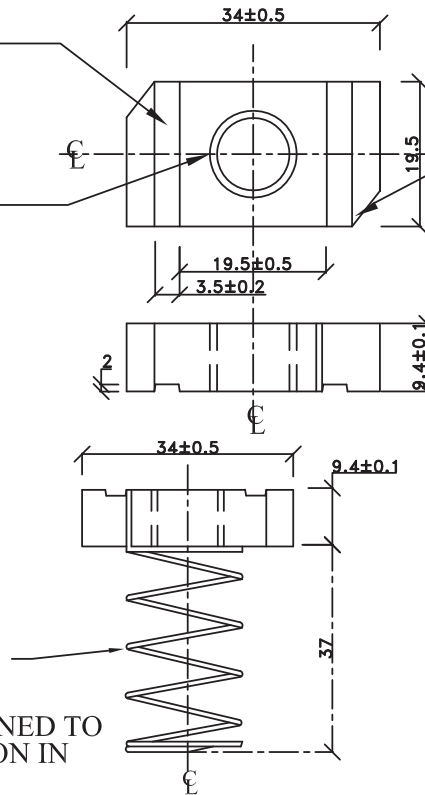
SH 04 OF 06

SLOTS WITH GRIPPING
RIBS DESIGNED TO
MEET NUT SLIP TEST
(AS SPECIFIED)

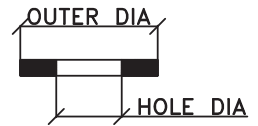
M12 - TAPPED HOLE

M12 CHANNEL NUT

STEEL SPRING DESIGNED TO
HOLD NUT IN POSITION IN
CHANNEL



CHAMFERED CORNERS
TO ALLOW NUT TO BE
ROTATED IN CHANNEL

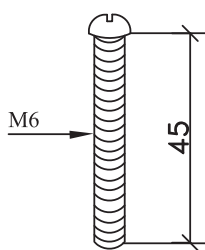


SPRING NUT ASSEMBLY

TYPICAL DETAILS OF WASHER

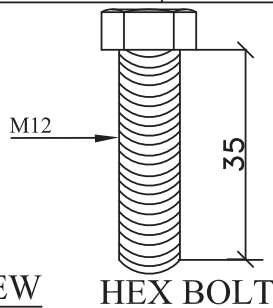
WASHER SIZE DETAILS

Sl.No.	BOLT/SCREW SIZE	HOLE DIA (IN MM)	OUTER DIA (IN MM)	WAHER THICKNESS (IN MM)
1	M6 PAN HEAD SCREW	6.4	12	1.6
2	M12 HEXA BOLT	13	24	2.5

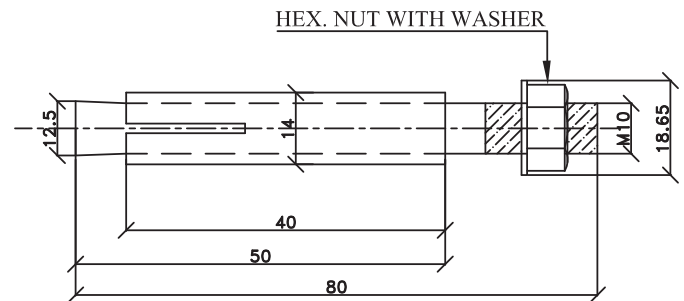


PAN HEAD SCREW

NOTES:



HEX BOLT



ANCHOR BOLT M10

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.

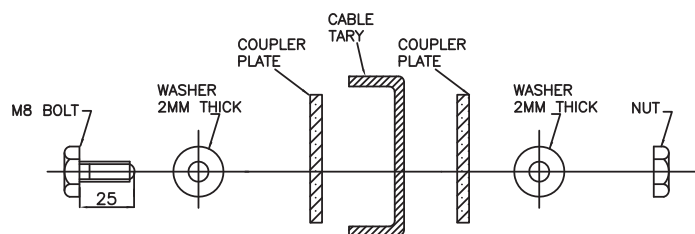


TITLE: **TYPICAL DETAILS OF BOLTABLE
TYPE CABLE TRAY SUPPORT
MATERIAL & ACCESSORIES**

BHEL DRAWING NO.

PE-DG-999-507-E013

SH 05 OF 06



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



TYPICAL DETAILS OF BOLTABLE TYPE
 CABLE TRAY SUPPORT MATERIAL &
 ACCESSORIES

DRAWING NO.


PE-DG-999-507-E013

SH 06 OF 06

REV 01

ANNEXURE-4

TYPICAL DETAILS OF
TYPE TEST PROCEDURE/
TEST ARRANGEMENT

REVISIONS								
		NAME	DATE					
TITLE:				TYPICAL DETAILS OF TYPE TEST ARRANGEMENT		DRAWN	NAME	DATE
						DSGN		
DRG. NO.				PE-DG-999-507-E114		CHKD		
						APPD		
				BHARAT HEAVY ELECTRICALS LTD. PROJECT ENGINEERING MANAGEMENT NOIDA				
							SH 1 OF 10	

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.

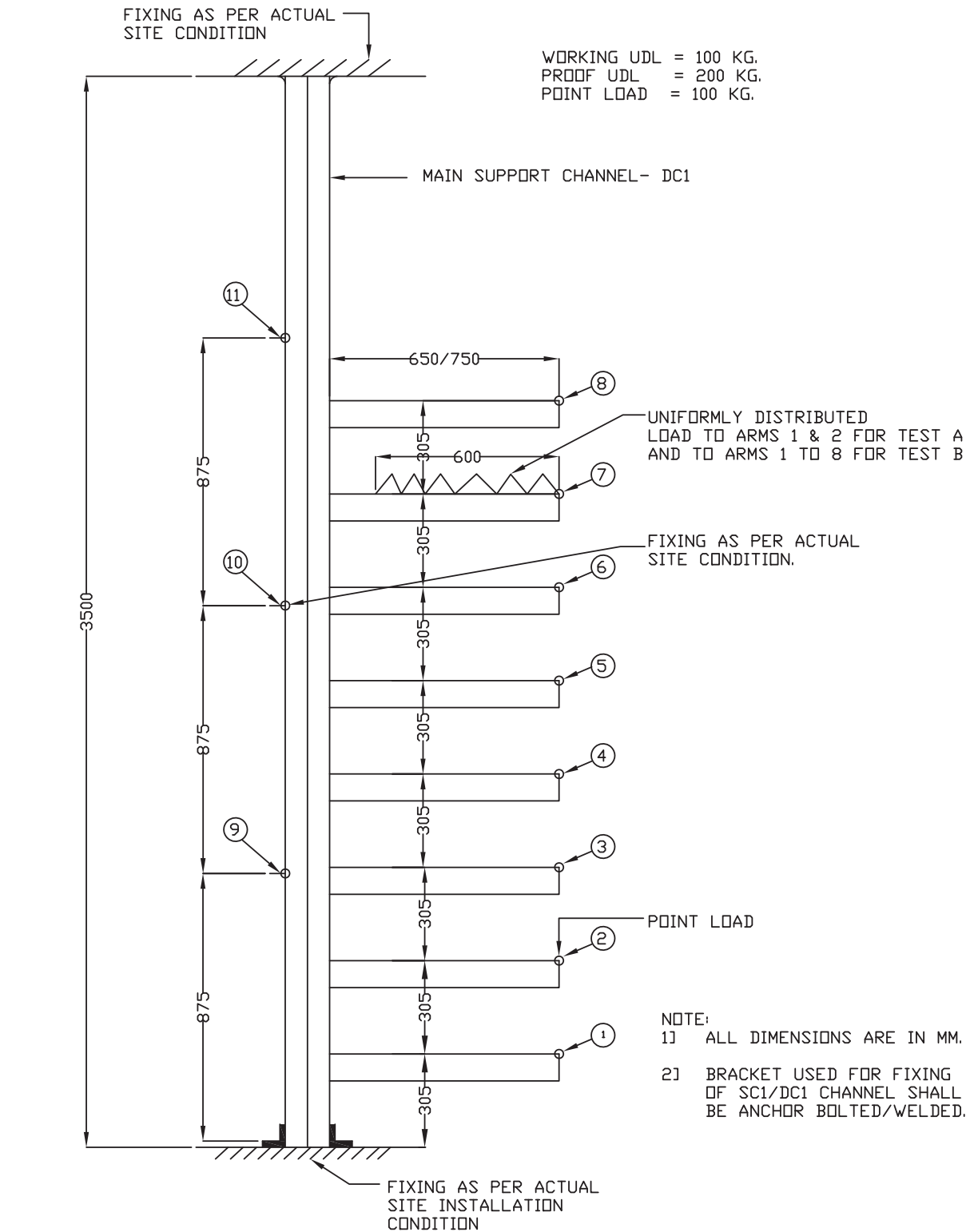
A minimum loading of 350 kg shall be obtained before nut slip with a bolt torque of 65 NM.

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.



DEFLECTION MEASURING POINTS.

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

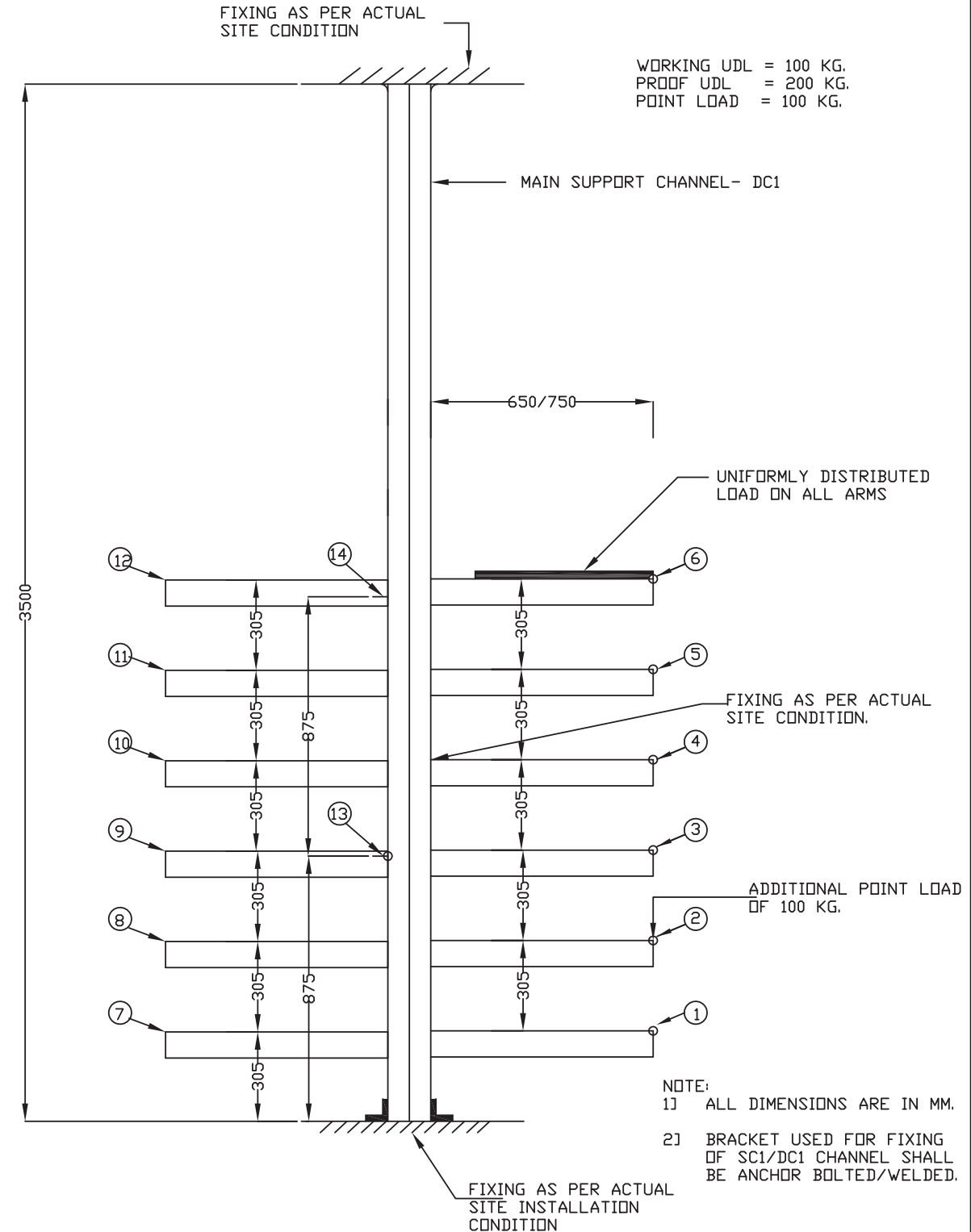


TITLE: TYPICAL DETAILS OF
TYPE TEST ARRANGEMENT

DRG. NO.

PE-DG-999-507-E114

SH 5 OF 10



Q DEFLECTION MEASURING POINTS.

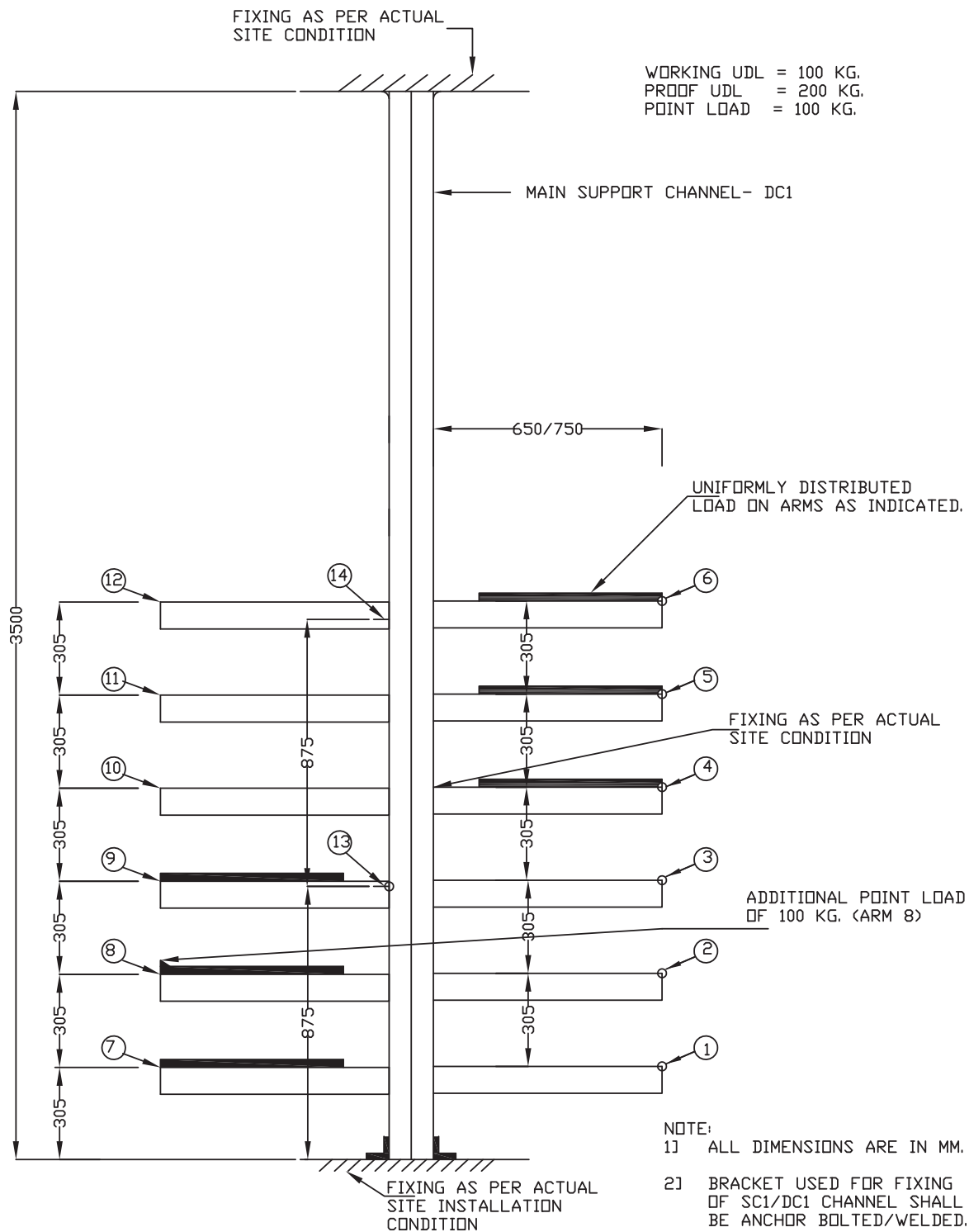
**TEST : 2A: MAIN SUPPORT CHANNEL
(CANTILEVER ARM ON BOTH SIDES)**



**TITLE: TYPICAL DETAILS OF
TYPE TEST ARRANGEMENT**

**DRG. NO.
PE-DG-999-507-E114**

SH 6 OF 10



DEFLECTION MEASURING POINTS.

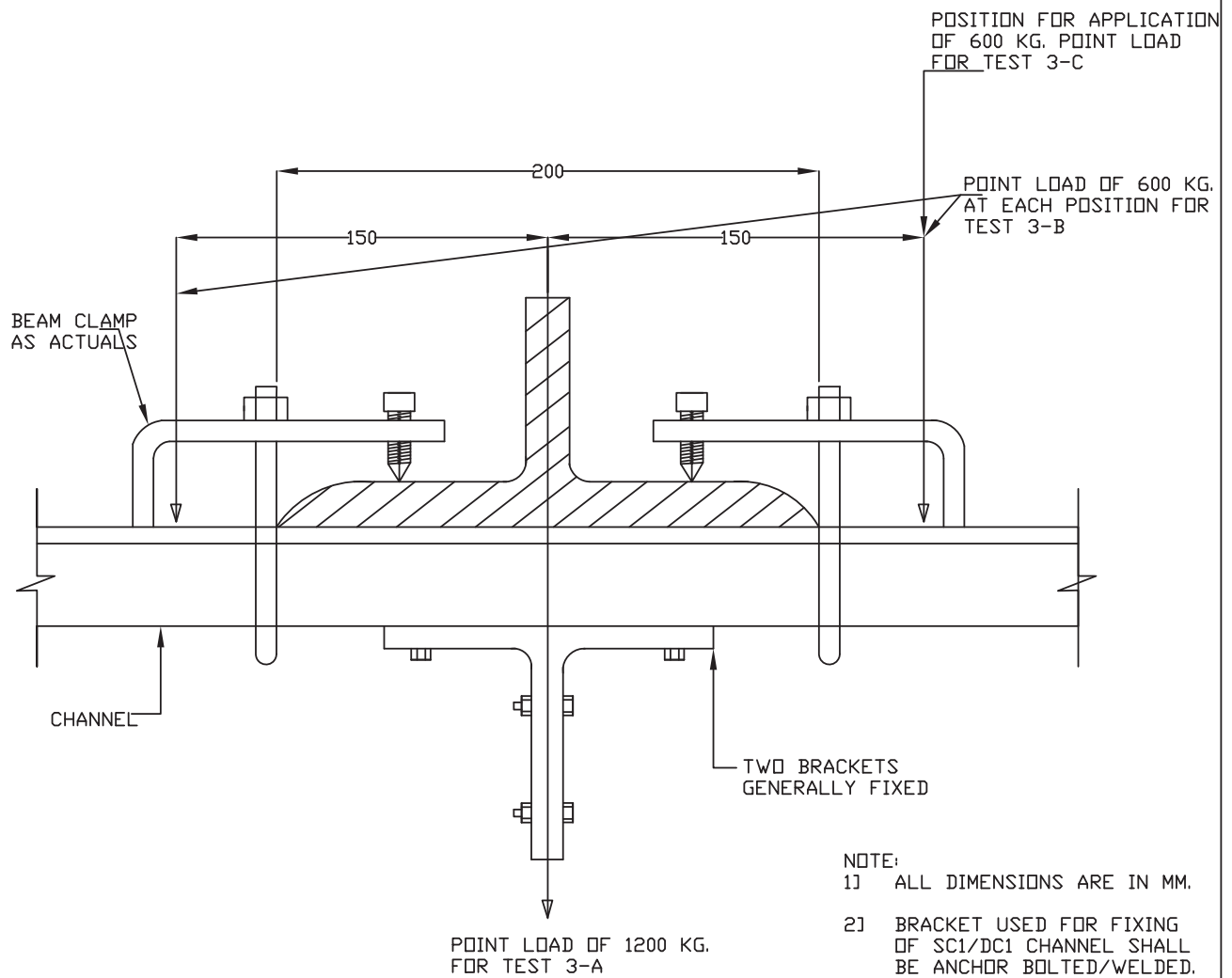
**TEST : 2B: MAIN SUPPORT CHANNEL
(ASYMMETRIC LOADING)**



TITLE: TYPICAL DETAILS OF
TYPE TEST ARRANGEMENT

DRG. NO.
PE-DG-999-507-E114

SH 7 OF 10



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



TITLE:

TYPICAL DETAILS OF
TYPE TEST ARRANGEMENT

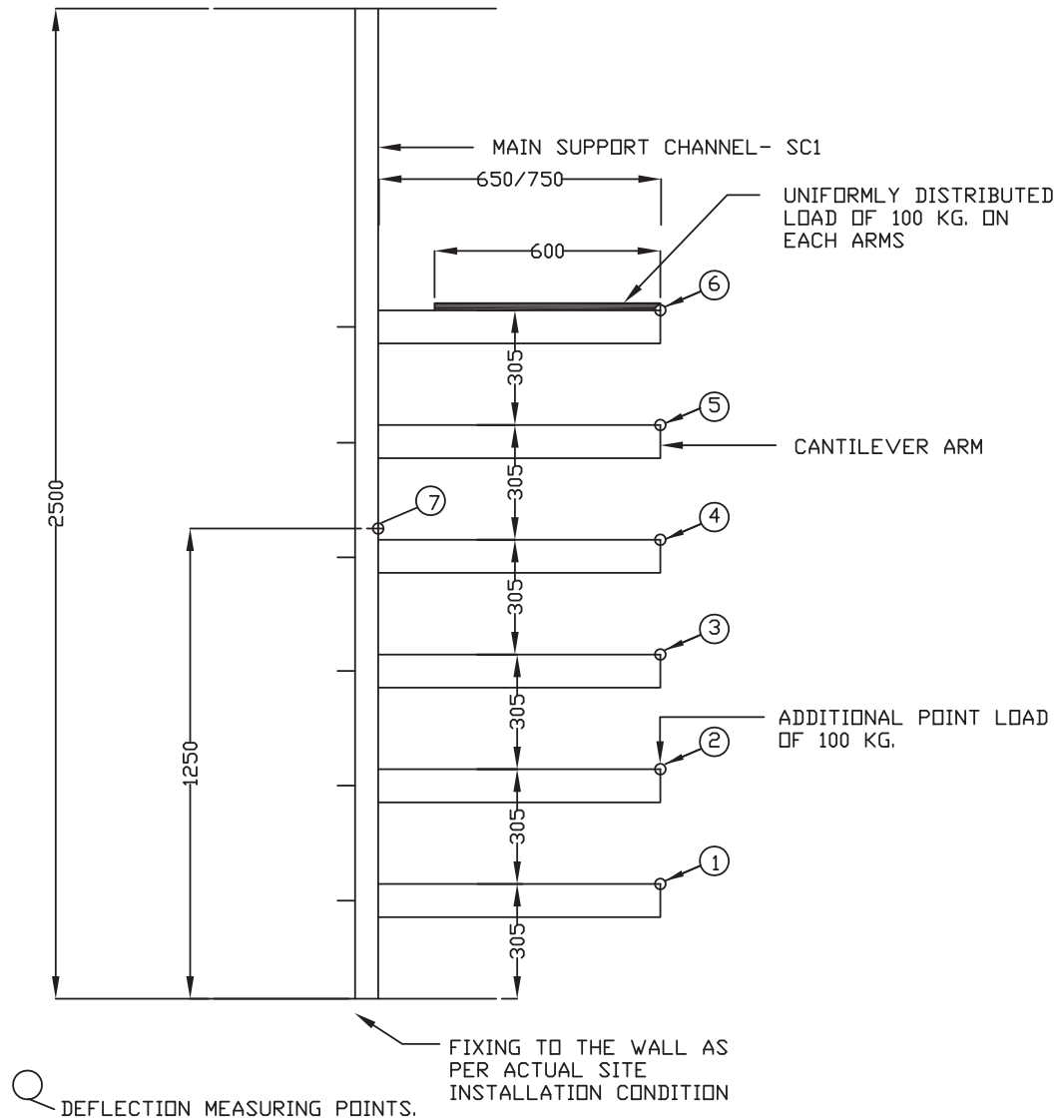
DRG. NO.

PE-DG-999-507-E114

SH 8 OF 10

FIXING AS PER ACTUAL
SITE CONDITION

WORKING UDL = 100 KG.
PROOF UDL = 200 KG.
POINT LOAD = 100 KG.



NOTE:
1] ALL DIMENSIONS ARE IN MM.

TEST : 4: CHANNEL INSERT



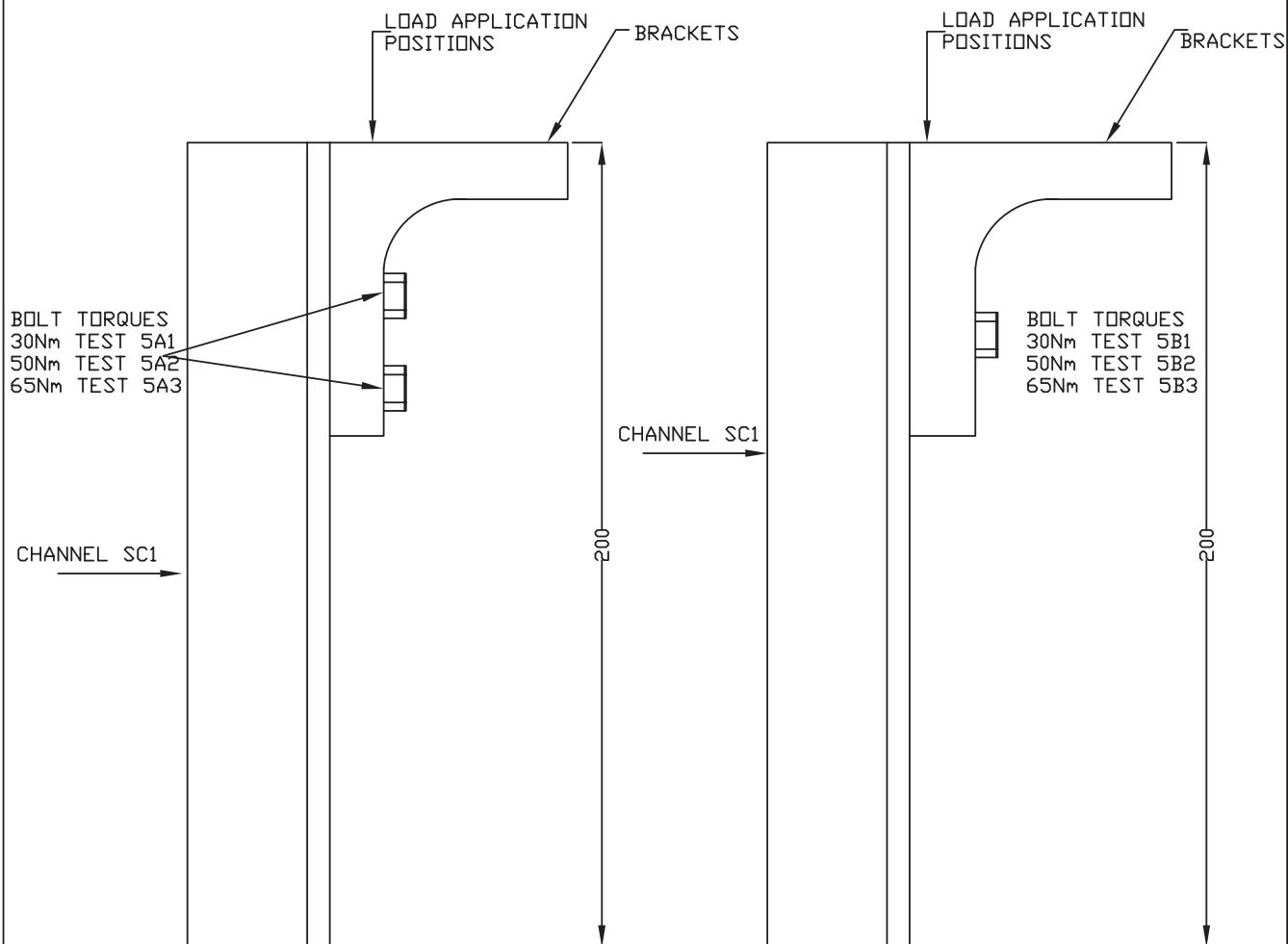
TITLE:

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.



TITLE: TYPICAL DETAILS OF
TYPE TEST ARRANGEMENT

DRG. NO.
PE-DG-999-507-E114

SH 10 OF 10



Price Variation Formulae

ANNEXURE-C

Prices shall be variable as per following PVC formulae: -

Cable tray Support System-Boltable	
$P = P_o/100 (20 + 58 (SBIR/SBIR_o) + 7 (Zn/Zn_o) + 15 (W/ W_o))$	Indices to be taken from IEEMA Circular (IEEMA(PVC)/TLA&H(R-3)/_/_) for the applicable month.

Wherein,

P = Price payable as adjusted in accordance with the above formula.

P_o = Price quoted/confirmed.

SBIR_o = Price of Steel Billets- Retail (refer notes)

This price is as applicable on the 1st working day of the month, one month prior to the date of tendering.

Zn_o = Price of Electrolytic high grade zinc (refer notes)

This price is as applicable on the 1st working day of the month, one month prior to the date of tendering.

W_o = All India average consumer price index number for industrial workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India (Base: 2016 = 100) (Refer notes)

This index number is as applicable on the first working day of the month, **three months** prior to the date of tendering.

SBIR = Price of Steel Billets-Retail (refer notes)

This price is as applicable on the 1st working day of the month, two months prior to the date of delivery.

Zn = Price of Electrolytic high grade zinc (refer notes)

This price is as applicable on the 1st working day of the month, two months prior to the date of delivery.

W = All India average consumer price index number for industrial workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India (Base: 2016 = 100) (refer notes)

This index number is as applicable on the first working day of the month, **four months** prior to the date of delivery.

The date of delivery is the date on which materials are notified as being ready for inspection/dispatch (in the absence of such notification, the date of manufacturer's dispatch note is to be considered as the date of delivery) or the contracted delivery date (including any agreed extension thereto), whichever is earlier.



Price Variation Formulae

ANNEXURE-C

Notes:

- (a) All prices of raw materials are exclusive of modvatable excise/CV duty amount and exclusive of any other central, state or local taxes; octroi etc.
- (b) All prices are as on first working day of the month.
- (c) PVC ceiling limit shall be positive (+ve) 20% and negative (-ve) unlimited.