

# **VOLUME-II**

## **TECHNICAL SPECIFICATION**

### **FOR**

## ***GALVANISED CABLE TRAY SUPPORT SYSTEM (BOLTABLE TYPE)***

**SPECIFICATION NO: *PE-RC-999-507-E013***

***REVISION: 0***



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

|                                                                                  |                                                                                                 |                                      |                  |
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|  | <b>TECHNICAL SPECIFICATION FOR<br/>GALVANISED CABLE TRAY SUPPORT<br/>SYSTEM (BOLTABLE TYPE)</b> | SPECIFICATION NO. PE-RC-999-507-E013 |                  |
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|                                                                                  |                                                                                                 | REVISION 0                           | DATE: 25.04.2017 |
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## **SECTION – I** **SPECIFIC TECHNICAL REQUIREMENTS**

|                                                                                  |                                                                                                 |                                       |                  |
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### **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



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## 1.0 PURPOSE

This specification is intended for finalization of rate contract between BHEL PEM and Bidder. Standard technical detail as indicated in the specification shall be agreed upon between BHEL PEM and bidder. Project specific technical detail shall be made available to the bidder along with project enquiry.

## 2.0 SCOPE

- 2.1 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.
- 2.2 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.
- 2.3 Technical requirements of Galvanised Cable Tray Support System (Boltable Type) are indicated in Data Sheet-A & Section-II.
- 2.4 The stipulation of Data Sheet-A shall prevail in case of any conflict between the stipulations of Data Sheet-A & Section-II.

## 3.0 BILL OF QUANTITIES

The bidder to quote for items as per price schedule attached with NIT. **The quantity as mentioned in the BOQ is only for evaluation purpose.** However actual ordered quantity may vary from project to project throughout the contract.

## 4.0 DRAWINGS & DOCUMENTS TO BE SUBMITTED

- 4.1 After rate contract; against specific project requirement following information shall be furnished by BHEL: -
  - a) Updated list of approved Galvanizers (Annexure 2 to Quality Plan)
  - b) BOQ (Bill of Quantities)
- 4.2 Following documents shall be submitted for specific project requirement after placement of order for BHEL & customer's approval: -



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| Sl. No | Drawing/ Document Description                                          | Document No.       | Document type | First Submission                          | Re-submission             |
|--------|------------------------------------------------------------------------|--------------------|---------------|-------------------------------------------|---------------------------|
| 1      | Technical Data Sheet                                                   | PE-V0-XXX-507-E051 | Primary       | Within 1 week of award of contract        | Within 1 week of comments |
| 2      | GA Drg of cable tray supports (Boltable type)                          | PE-V0-XXX-507-E052 | Primary       | Within 1 week of award of contract        | Within 1 week of comments |
| 3      | Type test procedure including Typical details of type test arrangement | PE-V0-XXX-507-E053 | Primary       | Within 1 week of award of contract        | Within 1 week of comments |
| 4      | Type test certificates                                                 | PE-V0-XXX-507-E054 | Secondary     | Within 1 week of conductance of type test |                           |
| 5      | Quality Plan for cable tray support material (Boltable Type)           | PE-V0-XXX-507-E908 | Primary       | Within 1 week of award of contract        | Within 1 week of comments |

4.3 Drawings/ documents shall be submitted through document management system (DMS).

4.4 There shall be no commercial implication to BHEL on account of project specific applicable galvanizers list.



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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/<br>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<br>ii) Thickness of zinc coating as per IS : 4759<br>iii) Uniformity of zinc coating as per IS : 2633<br>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 enclosed 'Type Test Procedure' and 'QP no. PE-QP-999-507-E007, Rev. 0'.



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**SECTION-II**

**STANDARD TECHNICAL REQUIREMENTS**



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- 1.1 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.
- 1.2 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.
- 1.3 In case of conflict between the applicable reference standard and this specification, this specification shall govern.

## **2.0 TECHNICAL REQUIREMENTS**

- 2.1 Cable Trays Support (boltable type) shall be supplied as per technical particulars specified in Data Sheet – A.
- 2.2 All finished galvanised MS structural members for cable tray supports shall be free from sharp edges, corners, burs & unevenness.
- 2.3 Necessary fasteners shall be provided with each cable tray support accessory as specified in enclosed drawings.
- 2.4 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.

## **3.0 QUALITY ASSURANCE, TESTING & INSPECTION**

- 3.1 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. At contract stage, 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.
- 3.2 All materials shall be procured, manufactured, inspected and tested by vendor/ sub-vendor as per approved quality plan.
- 3.3 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.

## **4.0 TESTING:**



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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:

**4.1 Type tests :**

Cable tray support system (Bolttable 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-IV. 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.

**4.2 Routine Tests:**

- a) Dimension checks

**4.3 Acceptance Test:**

- a) Dimension checks
- b) Tests for galvanizing

**5.0 PACKING**

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

| <div></div> |                     | CUSTOMER :                              |            | PROJECT TITLE :                              |                        | 1x250 MW ROURKELA PP-III EXPANSION                            |                                                     | SPECIFICATION NO. PE-TS-427-507-E013                                           |        |   |     |                                                                                                                                           |
|------------------------------------------------------------------------------------------------|---------------------|-----------------------------------------|------------|----------------------------------------------|------------------------|---------------------------------------------------------------|-----------------------------------------------------|--------------------------------------------------------------------------------|--------|---|-----|-------------------------------------------------------------------------------------------------------------------------------------------|
| QUALITY PLAN                                                                                   |                     | BIDDER/ VENDOR                          |            | STANDARD QP NO. : PE-QP-999-507-E007, REV. 0 |                        | ITEM : CABLE TRAY SUPPORT MATERIAL & ACCESSORIES (BOLT TABLE) |                                                     | SPECIFICATION TITLE: TECHNICAL SPEC FOR CABLE TRAY SUPPORT SYSTEM (BOLT TABLE) |        |   |     |                                                                                                                                           |
|                                                                                                |                     | SYSTEM                                  |            | CABLING                                      |                        |                                                               |                                                     | DOC. NO. :                                                                     |        |   |     |                                                                                                                                           |
| SL. NO.                                                                                        | COMPONENT/OPERATION | CHARACTERISTIC CHECK                    | CAT.       | TYPE/ METHOD OF CHECK                        | EXTENT OF CHECK        | REFERENCE DOCUMENT                                            | ACCEPTANCE NORM                                     | FORMAT OF RECORD                                                               | AGENCY |   |     | REMARKS                                                                                                                                   |
|                                                                                                |                     |                                         |            |                                              |                        |                                                               |                                                     |                                                                                | P      | W | V   |                                                                                                                                           |
| 1                                                                                              | 2                   | 3                                       | 4          | 5                                            | 6                      | 7                                                             | 8                                                   | 9                                                                              | 10     |   |     | 11                                                                                                                                        |
| 1.0                                                                                            | RAW MATERIAL        |                                         |            |                                              |                        |                                                               |                                                     |                                                                                |        |   |     |                                                                                                                                           |
| 1.1                                                                                            | ROLLED SHEET        | 1.CHEM.& PHY. PROPERTIES                | MA         | VERIFICATION OF TC'S                         | 100%                   | IS1079 (for hot rolled)<br>IS-513 (for cold rolled)           | IS1079 (for hot rolled)<br>IS-513 (for cold rolled) | MILL TC                                                                        | 3/2    | - | 1/2 | Steel shall be procured from SAIL/TISCO/RINL/BHUSAN/JINDAL ISPART/ESSAR/LLOYD/ JISCO/ authorised SAIL Re Rollers.                         |
|                                                                                                |                     | 2.DIMENSIONS                            | MA         | MEASUREMENT                                  | 100%                   | IS-1730/ APP. DATA SHEET                                      | IS-1730/ APP. DATA SHEET                            | QC RECORD                                                                      | 3/2    | - | -   |                                                                                                                                           |
|                                                                                                |                     | 3.SURFACE FINISH                        | MA         | VISUAL                                       | 100%                   | IS1079 (for hot rolled)<br>IS-513 (for cold rolled)           | IS1079 (for hot rolled)<br>IS-513 (for cold rolled) | QC RECORD                                                                      | 3/2    | - | -   |                                                                                                                                           |
| 1.2                                                                                            | ZINC                | CHEM.COMP.                              | 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 in accordance with ASME SEC. IX article III. WPS , POR & WPQ to be reviewed during inspection. |
|                                                                                                |                     | 3.SURFACE FINISH                        | MA         | VISUAL                                       | 100%                   | FREE FROM DEFECTS & SLAG                                      | FREE FROM DEFECTS & SLAG                            | QC RECORD                                                                      | 2      | - | 1   |                                                                                                                                           |
| 2.2                                                                                            | SURFACE PREPARATION | 1.CLEANING, PICKLING, RINSING & FLUXING | MA         | VISUAL                                       | 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                                                                      | 3/2    | - | -   | Galvanization is to be done at galvanization plant listed in Annexure-2 to quality plan.                                                  |
| BHEL                                                                                           |                     | PARTICULARS                             |            | BIDDER/VENDOR                                |                        |                                                               |                                                     |                                                                                |        |   |     |                                                                                                                                           |
|                                                                                                |                     | NAME                                    |            |                                              |                        |                                                               |                                                     |                                                                                |        |   |     |                                                                                                                                           |
|                                                                                                |                     | SIGNATURE                               |            |                                              |                        |                                                               |                                                     |                                                                                |        |   |     |                                                                                                                                           |
|                                                                                                |                     | DATE                                    |            |                                              |                        |                                                               |                                                     |                                                                                |        |   |     |                                                                                                                                           |
| LEGEND :                                                                                       |                     | 1 - BHEL/CUSTOMER                       | 2 - VENDOR | 3 - SUB-VENDOR                               | P - PERFORM            | W - WITNESS                                                   | V - VERIFICATION                                    | BIDDER'S/VENDORS COMPANY SEAL                                                  |        |   |     |                                                                                                                                           |

| <div></div> |                                                   | CUSTOMER :                   |      | PROJECT TITLE :                                         |                                   | 1x250 MW ROURKELA PP-III EXPANSION                                           |                                                     | SPECIFICATION NO. PE-TS-427-507-E013 |        |         |   |                                                                                                                         |
|------------------------------------------------------------------------------------------------|---------------------------------------------------|------------------------------|------|---------------------------------------------------------|-----------------------------------|------------------------------------------------------------------------------|-----------------------------------------------------|--------------------------------------|--------|---------|---|-------------------------------------------------------------------------------------------------------------------------|
| QUALITY PLAN                                                                                   |                                                   | BIDDER/ VENDOR               |      | STANDARD QP NO. : PE-QP-999-507-E007, REV. 0            |                                   | SPECIFICATION TITLE: TECHNICAL SPEC FOR CABLE TRAY SUPPORT SYSTEM (BOLTABLE) |                                                     |                                      |        |         |   |                                                                                                                         |
| SHEET 2 OF 2                                                                                   |                                                   | SYSTEM                       |      | CABLING                                                 |                                   | ITEM : CABLE TRAY SUPPORT MATERIAL & ACCESSORIES (BOLTABLE)                  |                                                     | DOC. NO. :                           |        |         |   |                                                                                                                         |
| SL. NO.                                                                                        | COMPONENT/OPERATION                               | CHARACTERISTIC CHECK         | CAT. | TYPE/ METHOD OF CHECK                                   | EXTENT OF CHECK                   | REFERENCE DOCUMENT                                                           | ACCEPTANCE NORM                                     | FORMAT OF RECORD                     | AGENCY | REMARKS |   |                                                                                                                         |
|                                                                                                |                                                   |                              |      |                                                         |                                   |                                                                              |                                                     |                                      | P      | W       | V |                                                                                                                         |
| 1                                                                                              | 2                                                 | 3                            | 4    | 5                                                       | 6                                 | 7                                                                            | 8                                                   | 9                                    | 1011   |         |   |                                                                                                                         |
| 3.0<br>FINISHED ITEMS                                                                          | SINGLE / DOUBLE CHANNELS, CANTILEVER ARMS, CLAMPS | 2. DROSS                     | MA   | VISUAL                                                  | PERIODIC                          | IS - 2629                                                                    | IS - 2629                                           | QC RECORD                            | 3/2    | -       | - |                                                                                                                         |
|                                                                                                |                                                   | 3. RATE OF IMMERSION         | MA   | VISUAL / MEASUREMENT                                    | 100%                              | IS - 2629 / MFR'S PRACTICE                                                   | IS - 2629 / MFR'S PRACTICE                          | QC RECORD                            | 3/2    | -       | 2 |                                                                                                                         |
|                                                                                                |                                                   | 4.SURFACE QUALITY            | MA   | VISUAL                                                  | 100%                              | IS - 2629                                                                    | FREE FROM BURRS, SLAG, ROUGHNESS, FLUX, STAIN, ETC. | QC RECORD                            | 3/2    | -       | - |                                                                                                                         |
|                                                                                                |                                                   | 1.DIMENSIONS DISTORTION      | MA   | MEASUREMENT                                             | IS-2500 (PART 1) LEVEL S-4        | APPD. DRG                                                                    | APPD. DRG                                           | INSP. REPORT                         | 2      | 1       | - | Fastners shall be of good quality as per IS 1363                                                                        |
|                                                                                                |                                                   | 2.SURFACE FINISH             | MA   | VISUAL                                                  | IS-2500 (PART 1) LEVEL S-4        | FREE FROM BURRS, SLAG, ROUGHNESS, FLUX, STAIN, ETC.                          | FREE FROM BURRS, SLAG, ROUGHNESS, FLUX, STAIN, ETC. | INSP. REPORT                         | 2      | 1       | - |                                                                                                                         |
| 3.1.1<br>TYPE TESTING                                                                          | 3.MASS OF ZINC COATING                            | 4.UNIFORMITY OF ZINC COATING | MA   | CHEM. TEST                                              | IS-4759                           | IS-6745 / APP. DATA SHEET                                                    | APP. DATA SHEET                                     | INSP. REPORT                         | 2      | 1       | - |                                                                                                                         |
|                                                                                                |                                                   | 5.THICKNESS OF ZINC COATING  | MA   | CHEM. TEST                                              | IS-4759                           | IS-2633                                                                      | IS-2633                                             | INSP. REPORT                         | 2      | 1       | - |                                                                                                                         |
|                                                                                                |                                                   | 6.ADHESION                   | MA   | ELCOMETER                                               | IS-4759                           | APP. DATA SHEET                                                              | APP. DATA SHEET                                     | INSP. REPORT                         | 2      | 1       | - |                                                                                                                         |
|                                                                                                |                                                   |                              | MA   | MECH.TEST                                               | IS-4759                           | IS-2629                                                                      | IS-2629                                             | INSP. REPORT                         | 2      | 1       | - |                                                                                                                         |
|                                                                                                |                                                   |                              | CR   | TEST                                                    | 1 SAMPLE                          | APPD. TYPE TEST PROCEDURE                                                    | APPD. TYPE TEST PROCEDURE                           | INSP. REPORT                         | 2      | 1       | - |                                                                                                                         |
| 3.1.2<br>WELD INTEGRITY TEST                                                                   |                                                   | SOUNDNESS                    | CR   | MAGNETIC PARTICLE INSPECTION (MPI) DIE-PENETRATION (DP) | SAMPLE TESTED DURING TYPE TESTING | APPD. TYPE TEST PROCEDURE                                                    | 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 |
| BHEL                                                                                           |                                                   | PARTICULARS                  |      | BIDDER/VENDOR                                           |                                   |                                                                              |                                                     |                                      |        |         |   |                                                                                                                         |
|                                                                                                |                                                   | NAME                         |      |                                                         |                                   |                                                                              |                                                     |                                      |        |         |   |                                                                                                                         |
|                                                                                                |                                                   | SIGNATURE                    |      |                                                         |                                   |                                                                              |                                                     |                                      |        |         |   |                                                                                                                         |
|                                                                                                |                                                   | DATE                         |      |                                                         |                                   |                                                                              |                                                     |                                      |        |         |   |                                                                                                                         |
|                                                                                                |                                                   |                              |      |                                                         |                                   |                                                                              |                                                     |                                      |        |         |   |                                                                                                                         |
|                                                                                                |                                                   |                              |      |                                                         |                                   |                                                                              |                                                     |                                      |        |         |   |                                                                                                                         |
|                                                                                                |                                                   |                              |      |                                                         |                                   |                                                                              |                                                     |                                      |        |         |   |                                                                                                                         |
|                                                                                                |                                                   |                              |      |                                                         |                                   |                                                                              |                                                     |                                      |        |         |   |                                                                                                                         |
|                                                                                                |                                                   |                              |      |                                                         |                                   |                                                                              |                                                     |                                      |        |         |   |                                                                                                                         |
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## **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 otherwise 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 complied 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.

**ANNEXURE-2 to Quality Plan**  
**(LIST OF APPROVED GALVANIZERS)**

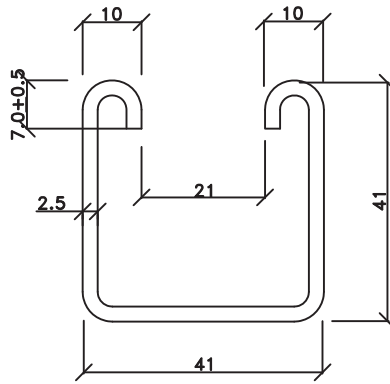
| SL. NO. | ITEM          | VENDOR NAME                                  | ADDRESS                                                                                                                         |
|---------|---------------|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| 1       | Galvanising   | Jenco Industrial Corporation                 | Chincholi Bunder Khkar Road Near Link Road Devruwadi Malad (W) Mumbai 400064                                                    |
| 2       | Galvanising * | National Galvanizer                          | 66, Barrackpore Kamarhatt Trunck Road Calcutta-700058                                                                           |
| 3       | Galvanising * | Sigma Galvanising Pvt. Ltd.                  | Plot No.C-169, TTC, MIDC Ind Area Navin Mumbai-400705                                                                           |
| 4       | Galvanising * | B.P. Projects PVT LTD                        | 167A, Vivekananda Road Kolkata-700006                                                                                           |
| 5       | Galvanising   | Standard Galvanisers                         | Makardah Road, Kabar Para, Bankra, Howarah -711403                                                                              |
| 6       | Galvanising   | Steel Products                               | National Highway No. 6, Chamrail, Kona, Howrah-711114                                                                           |
| 7       | Galvanising * | Unitech Fabricators & Engineers Pvt. Ltd.    | Village- Ajab Nagar, P.O. -Molla Simlla, P.S. - Singur, Dist - Hoogly, Pin-712223                                               |
| 8       | Galvanising   | Shivam Engineers & Fabricators               | A0-282-284, Industrial Area, South Side of G.T. Road, Ghaziabad, U.P.                                                           |
| 9       | Galvanising * | B.G. Shirke Construction Technology Pvt. Ltd | 72-76, Mundhawa, Pune - 401 036                                                                                                 |
| 10      | Galvanising   | Galbro Ispat Galvanizers Pvt. Ltd.           | GUT 11 AND 12, OPP. Kudus Steel,Rolling Mill, Wada, Thane , Mumbai                                                              |
| 11      | Galvanising   | Eros Metals                                  | G-97, MIDC, Bhutibori , Nagpur                                                                                                  |
| 12      | Galvanising   | Industrial Perforation (India) Pvt. Ltd.     | Ganganagr, Katakhal, Kolkata-700132                                                                                             |
| 13      | Galvanising * | Indmark Formtech Pvt. Ltd.                   | Phase - 3, E - 11 / 1, M. I. D. C., Chakan, Pune - 410 501, Maharashtra, India.                                                 |
| 14      | Galvanising   | Namdhari Industrial Traders Pvt. Ltd.        | Village Latton Dana, Chandigarh Road, Ludhiana                                                                                  |
| 15      | Galvanising * | 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      | Galvanising * | Patny Systems (P) Ltd.                       | Unit-IV, Sy No. -228/9, Plot No. 6, IP Kuchavaram, Toopran(M) Dist.- Medak, Telegana - 502336                                   |
| 17      | Galvanising   | Parmar Metal Company                         | Survey No.207,Veraval (Shapar) Dist. Rajkot, India.                                                                             |
| 18      | Galvanising * | Passive Infra Projects Pvt. Ltd              | 8th KM Stone, Sampla Kharkhoda Road, Hassangarh, Rohtak, Haryana                                                                |
| 19      | Galvanising   | Rukmani Electrical & Fabricators Pvt. Ltd.   | Urla Industrial Area, Urla Sarora Road, Raipur- 493 221 (Chhattisgarh)                                                          |
| 20      | Galvanising * | DMP Projects Pvt.Ltd.                        | Dulagarh Industrial Park , PS-Sankrail , Howrah -711302                                                                         |
| 21      | Galvanising   | Vinfab Engineers India Private Limited       | Gut no. 224/1 &2 Bhiwandi Wada State Highway, Village khupri, Dist. Thane,Maharashtra -421303                                   |
| 22      | Galvanising   | Saral Projects & Processors                  | B-1, Industrial Area, Site-II, Amawan Road Rae Bareli                                                                           |
| 23      | Galvanising * | Jamna Metal Company                          | D - 1513, DSIDC, Narela Industrial Area Delhi - 110040, India                                                                   |
| 24      | Galvanising * | Brahampuri Steels Limited                    | 172 (F) Industrial Area, Jhotwara, Jaipur-302013                                                                                |
| 25      | Galvanising   | TJSV Steel Fabrication & Hot dip Galvanizing | No. 83, Vasavanaickenpatti, Gudimangalam, Kondampatti P.O., Udumalpet, Tiruppur Dist.- 642201, Tamil Nadu                       |
| 26      | Galvanising * | A.V. Engg., Kolkata                          |                                                                                                                                 |
| 27      | Galvanising * | Bajaj, Pune                                  |                                                                                                                                 |
| 28      | Galvanising * | Electrocare Industries, Mumbai               |                                                                                                                                 |
| 29      | Galvanising * | Gurpreet Galvanizer, Hyderabad               |                                                                                                                                 |
| 30      | Galvanising * | Inar Profiles, Vishakapatnam                 |                                                                                                                                 |
| 31      | Galvanising * | Karamtara, Mumbai                            |                                                                                                                                 |
| 32      | Galvanising * | MJ Engg., Delhi                              |                                                                                                                                 |
| 33      | Galvanising * | Poona Galvanizers, Pune                      |                                                                                                                                 |
| 34      | Galvanising * | Radhakrishnan Shetty, Chennai                |                                                                                                                                 |
| 35      | Galvanising * | Anand Udyog, Mumbai                          |                                                                                                                                 |
| 36      | Galvanising * | Steelite Engg., Mumbai                       |                                                                                                                                 |
| 37      | Galvanising * | Techno Engg., Chandigarh                     |                                                                                                                                 |
| 38      | Galvanising * | Unistar Galvanizer, Kolkata                  |                                                                                                                                 |

**NOTES:**

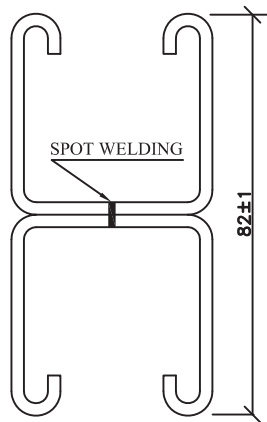
- 1 ANY CHANGE IN THE ABOVE LIST SHALL BE INFORMED AT THE TIME OF SPECIFIC PROJECT REQUIREMENT AND NO COMMERCIAL IMPLICATION SHALL BE ALLOWED ON THIS ACCOUNT.
- 2 IT SHALL BE THE RESPONSIBILITY OF THE VENDOR TO GET THE MATERIAL GALVANIZED FROM THE ABOVE LIST WITHOUT ANY COMMERCIAL IMPLICATION TO BHEL.
- 3 \* - NTPC APPROVED GALVANISERS. FOR NTPC PROJECTS, GALVANISING SHALL BE DONE FROM NTPC APPROVED GALVANISERS.

TYPICAL DETAILS OF BOLTABLE  
TYPE CABLE TRAY SUPPORT  
MATERIAL & ACCESSORIES

|                                                                                                                                                                                   |  |             |             |  |              |             |             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------------|-------------|--|--------------|-------------|-------------|
| <b>REVISIONS</b>                                                                                                                                                                  |  |             |             |  |              |             |             |
|                                                                                                                                                                                   |  |             |             |  |              |             |             |
|                                                                                                                                                                                   |  |             |             |  |              |             |             |
|                                                                                                                                                                                   |  | <b>NAME</b> | <b>DATE</b> |  |              |             |             |
| <b>TITLE:</b> TYPICAL DETAILS OF BOLTABLE<br>TYPE CABLE TRAY SUPPORT<br>MATERIAL & ACCESSORIES                                                                                    |  |             |             |  |              |             |             |
| <b>DRG. NO.</b> PE-DG-999-507-E013                                                                                                                                                |  |             |             |  |              |             |             |
|                                                                                                                                                                                   |  |             |             |  | <b>DRAWN</b> | <b>NAME</b> | <b>DATE</b> |
|                                                                                                                                                                                   |  |             |             |  | <b>DSGN</b>  |             |             |
|                                                                                                                                                                                   |  |             |             |  |              |             |             |
|                                                                                                                                                                                   |  |             |             |  | <b>CHKD</b>  |             |             |
|                                                                                                                                                                                   |  |             |             |  |              |             |             |
|                                                                                                                                                                                   |  |             |             |  | <b>APPD</b>  |             |             |
|  <b>BHARAT HEAVY ELECTRICALS LTD.</b><br><b>PROJECT ENGINEERING MANAGEMENT</b><br><b>NOIDA</b> |  |             |             |  |              |             |             |
| <b>SH 1 OF 12</b>                                                                                                                                                                 |  |             |             |  |              |             |             |



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.

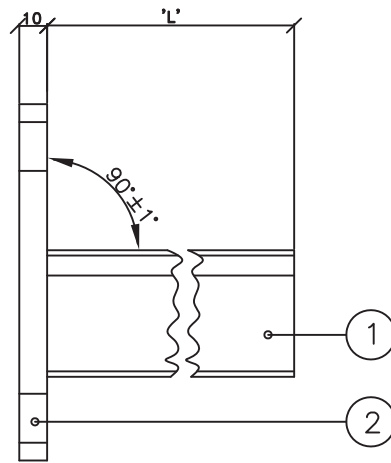
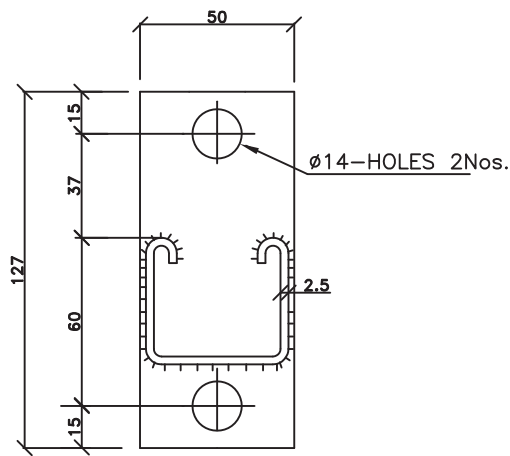


**TITLE: TYPICAL DETAILS OF BOLTABLE  
TYPE CABLE TRAY SUPPORT  
MATERIAL & ACCESSORIES**

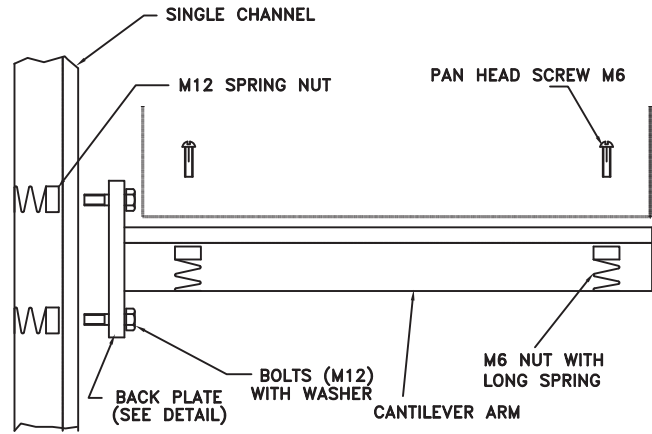
DRG. NO.

**PE-DG-999-507-E013**

SH 2 OF 12



| TRAY<br>WIDTH<br>IN MM | CANTILEVER<br>ARM LENGTH (IN MM)<br>OVER HEAD TRAYS |
|------------------------|-----------------------------------------------------|
| 150                    | 170/200 (FOR OVERHEAD TRAYS)                        |
| 300                    | 320/350 (FOR OVERHEAD TRAYS)                        |
| 600                    | 620/650 (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.

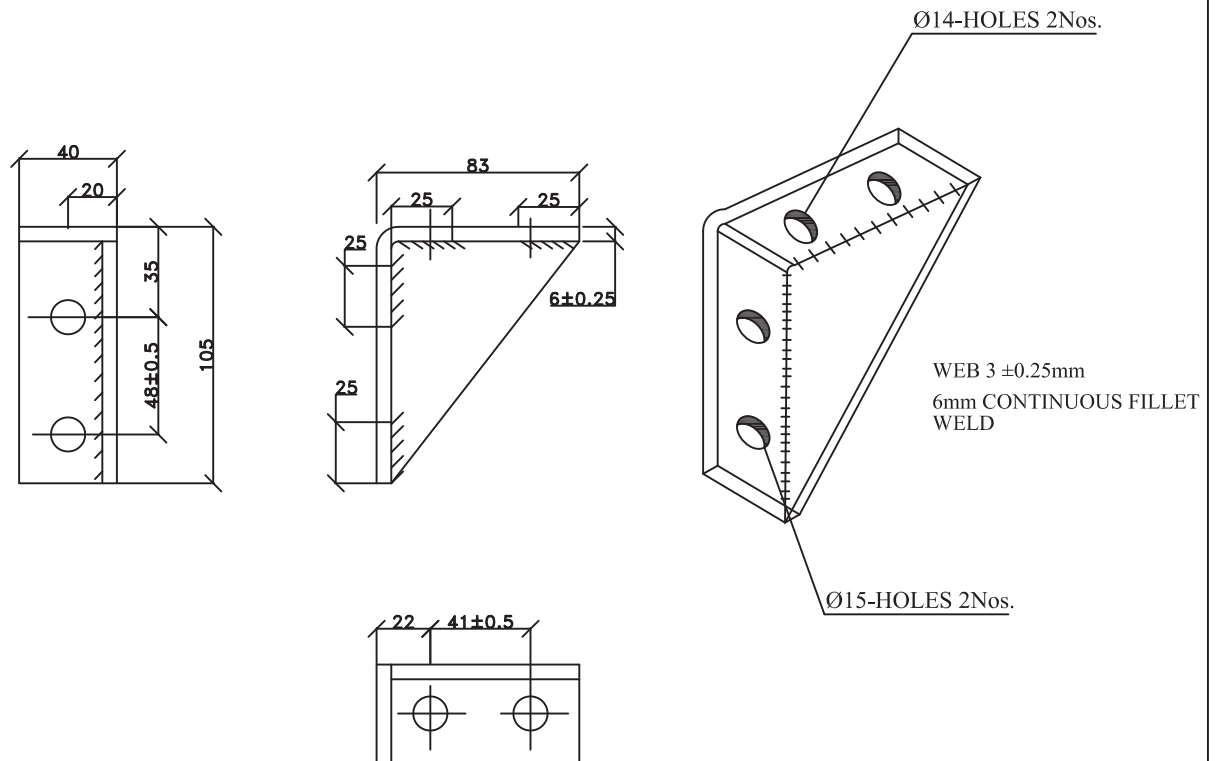
## NOTES :

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 TOLERANCES AS PER RELEVANT IS
7. ZINC COATING SHALL BE MIN 75 MICRON/610GM/SQ.M



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.

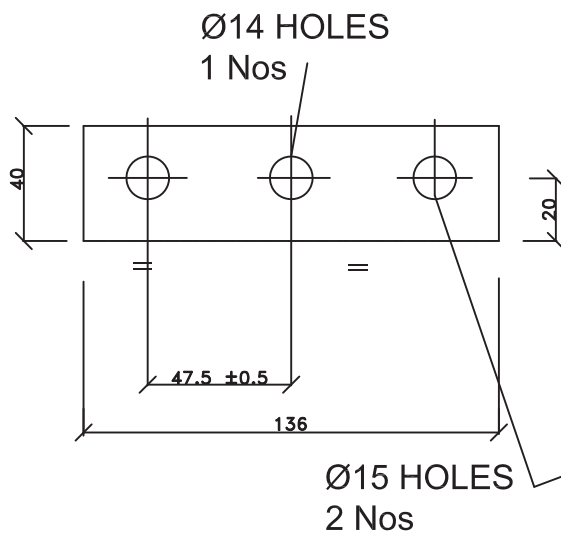
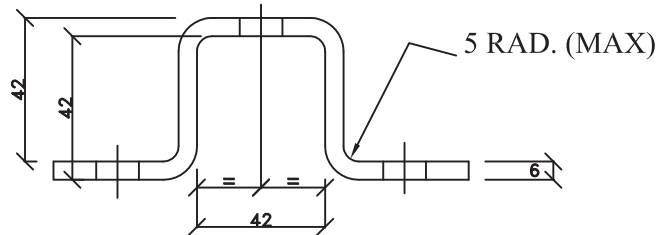
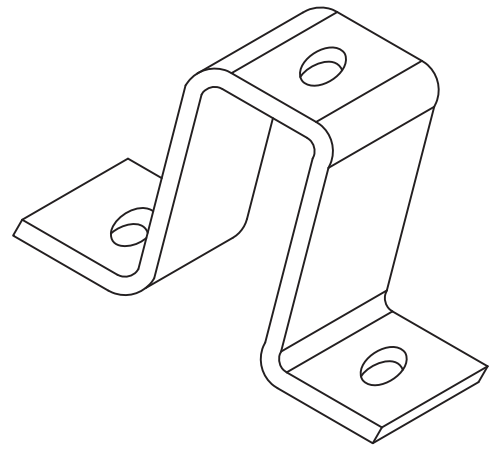
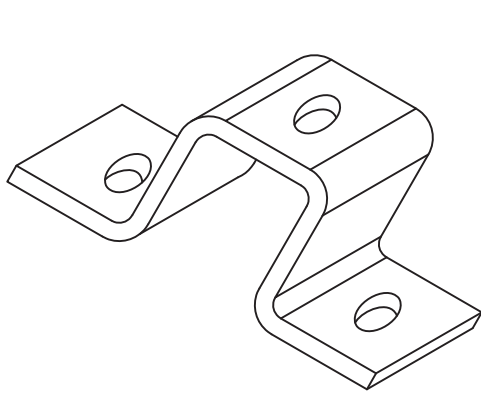


**TITLE: TYPICAL DETAILS OF BOLTABLE  
TYPE CABLE TRAY SUPPORT  
MATERIAL & ACCESSORIES**

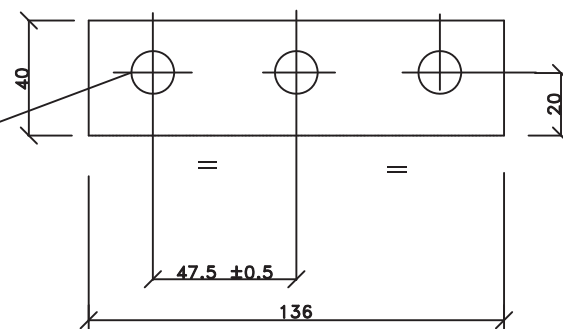
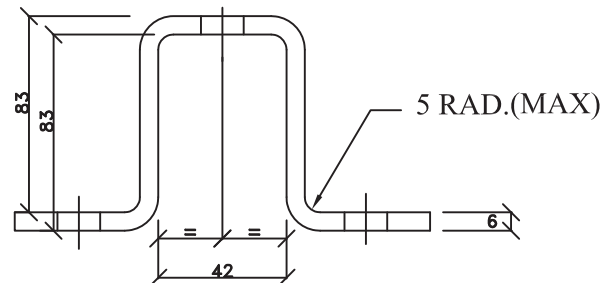
DRG. NO.

**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.

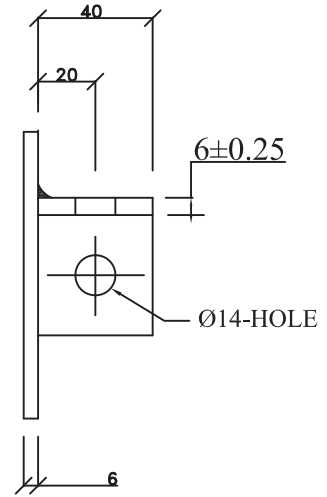
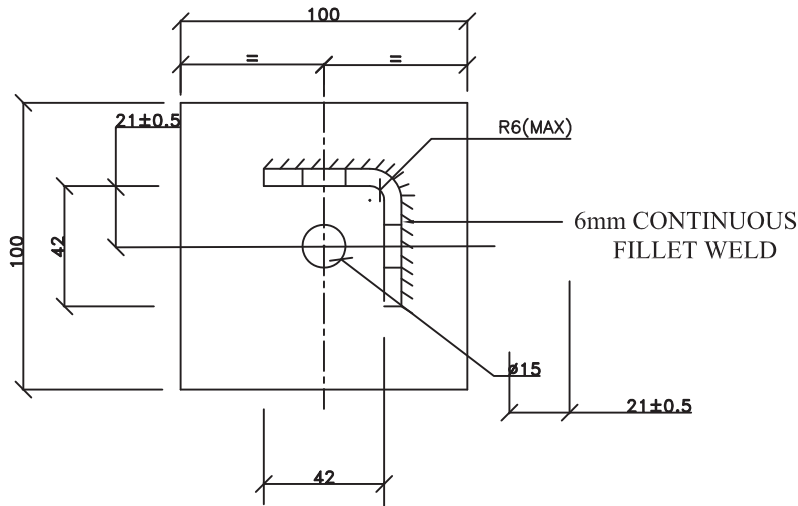
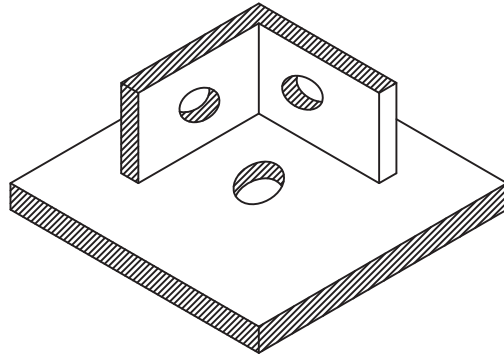
**ANCHOR FASTENER-2NOS.  
SPRING NUT & WASHER-1NO.**



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

DRG. NO.

PE-DG-999-507-E013



### 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.

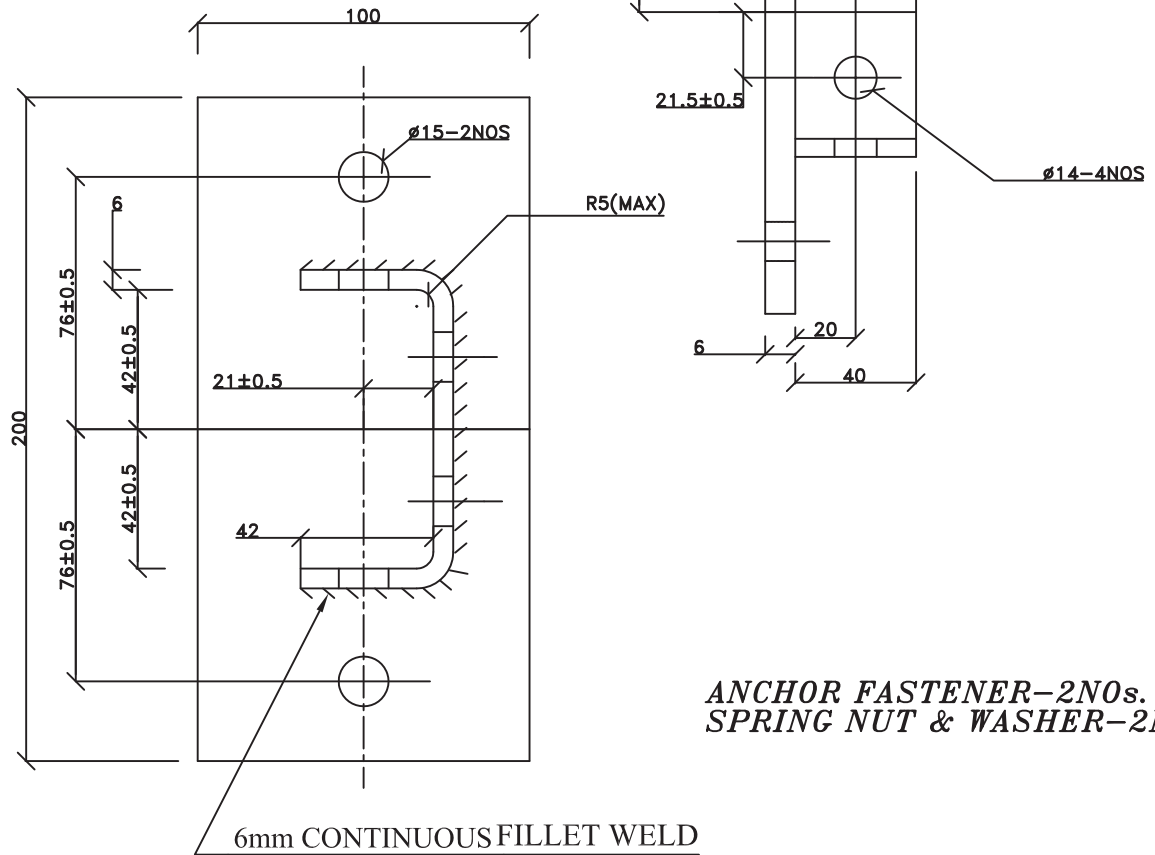
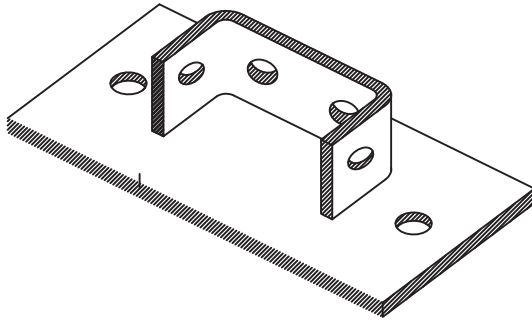


**TITLE: TYPICAL DETAILS OF BOLTABLE  
TYPE CABLE TRAY SUPPORT  
MATERIAL & ACCESSORIES**

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

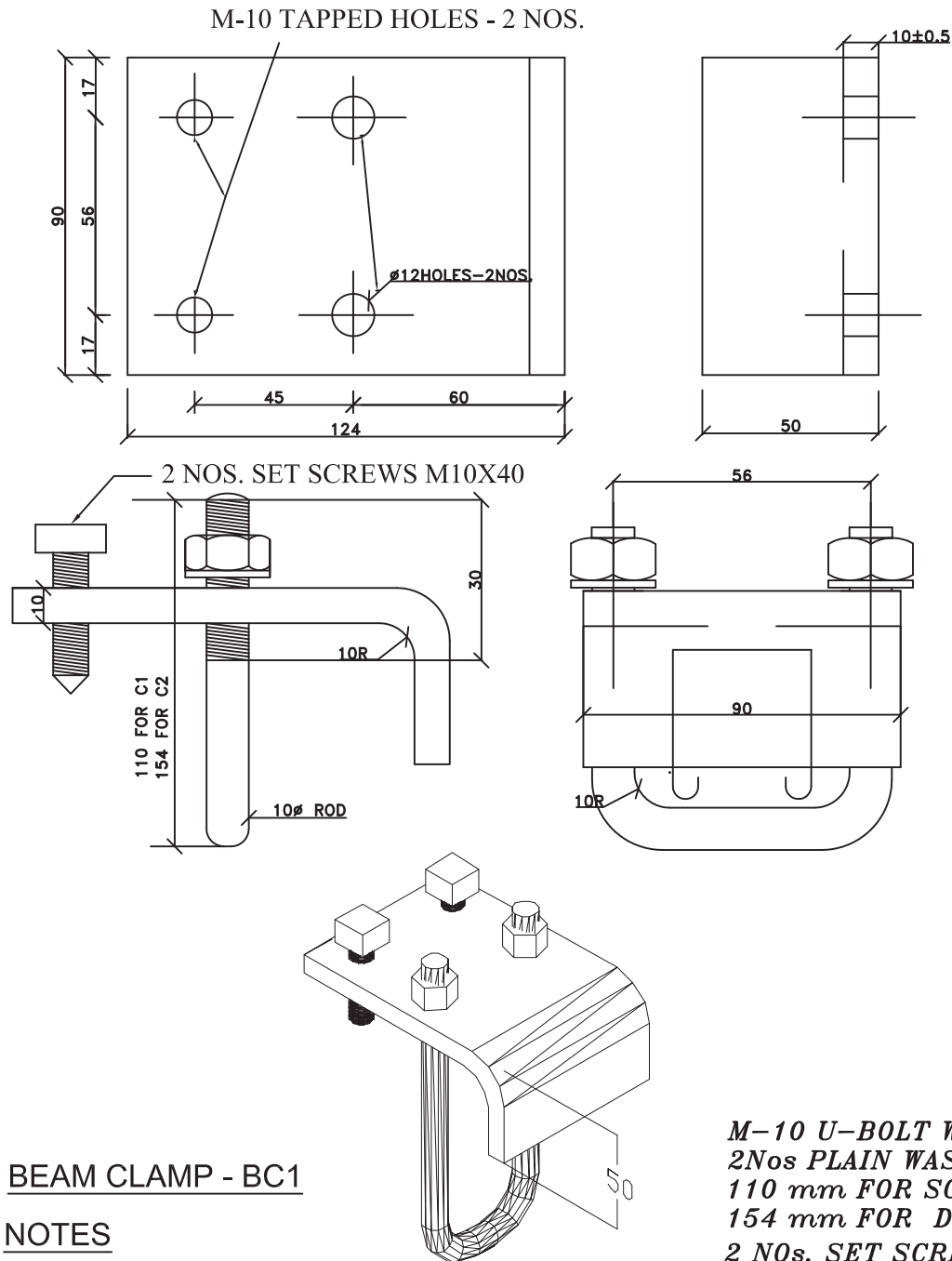
1. ALL DIMENSIONS ARE IN mm.
2. MATERIAL :MILD STEEL AS PER IS-2062
3. FINISH : HOT DIP GALVANISED AS PER IS:2629
4. TOLERANCE ON THICKNESS AS PER IS:1852
5. ALL FABRICATION TOLERANCE AS PER RELEVANT IS.
6. ZINC COATING SHALL BE MIN. 75 MICRONS/ 610 G/SQ. M.



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

DRG. NO.

PE-DG-999-507-E013



## BEAM CLAMP - BC1

### 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.

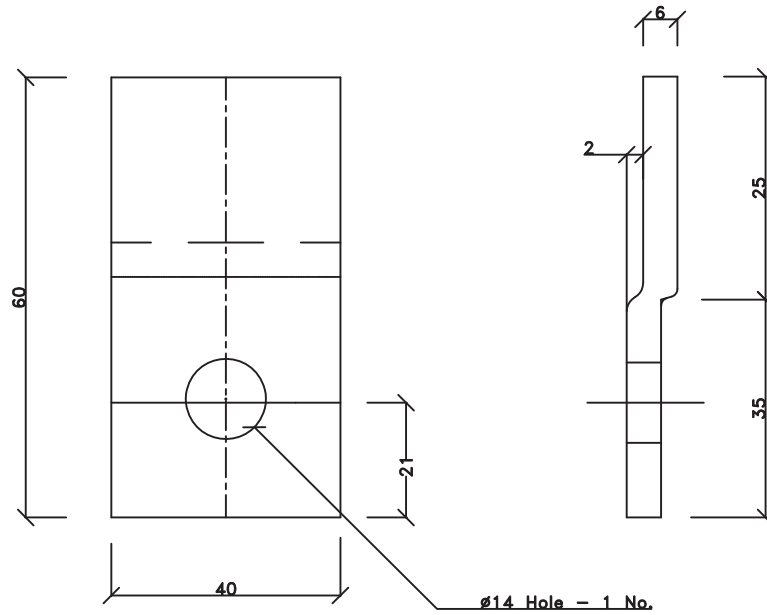
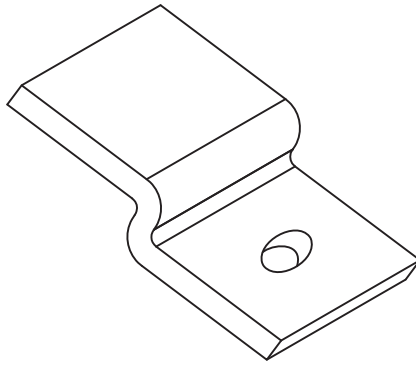
**M-10 U-BOLT WITH  
2Nos PLAIN WASHERS & NUTS  
110 mm FOR SC 1  
154 mm FOR DC1  
2 NOS. SET SCREWS M10X40**



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

BHEL DRAWING NO.

**PE-DG-999-507-E013**



### TRAY FIXING CLAMP - TC1

#### NOTES

***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.

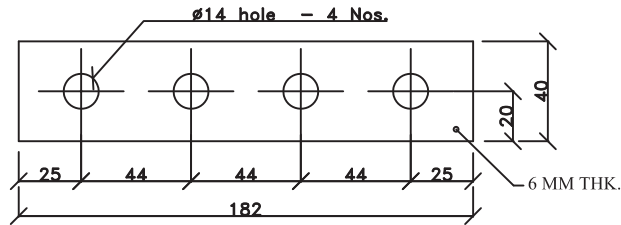


**TITLE: TYPICAL DETAILS OF BOLTABLE  
TYPE CABLE TRAY SUPPORT  
MATERIAL & ACCESSORIES**

BHEL DRAWING NO.

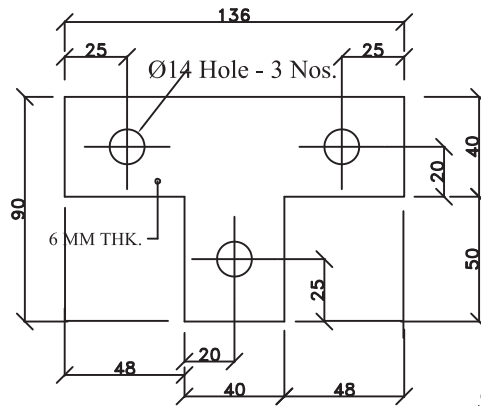
**PE-DG-999-507-E013**

SH 9 OF 12



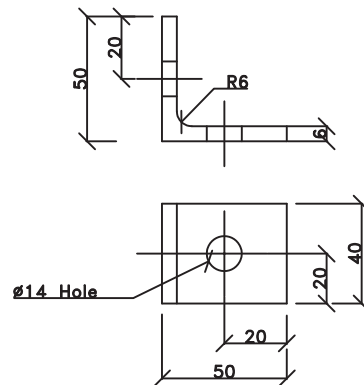
**SPRING NUT & WASHER-4Nos.**

### FLAT PLATE STRAIGHT FITTING PF2



**SPRING NUT & WASHER-3Nos.**

### FLAT PLATE TEE FITTING PF1



**SPRING NUT & WASHER-2Nos.**

### 90° 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.

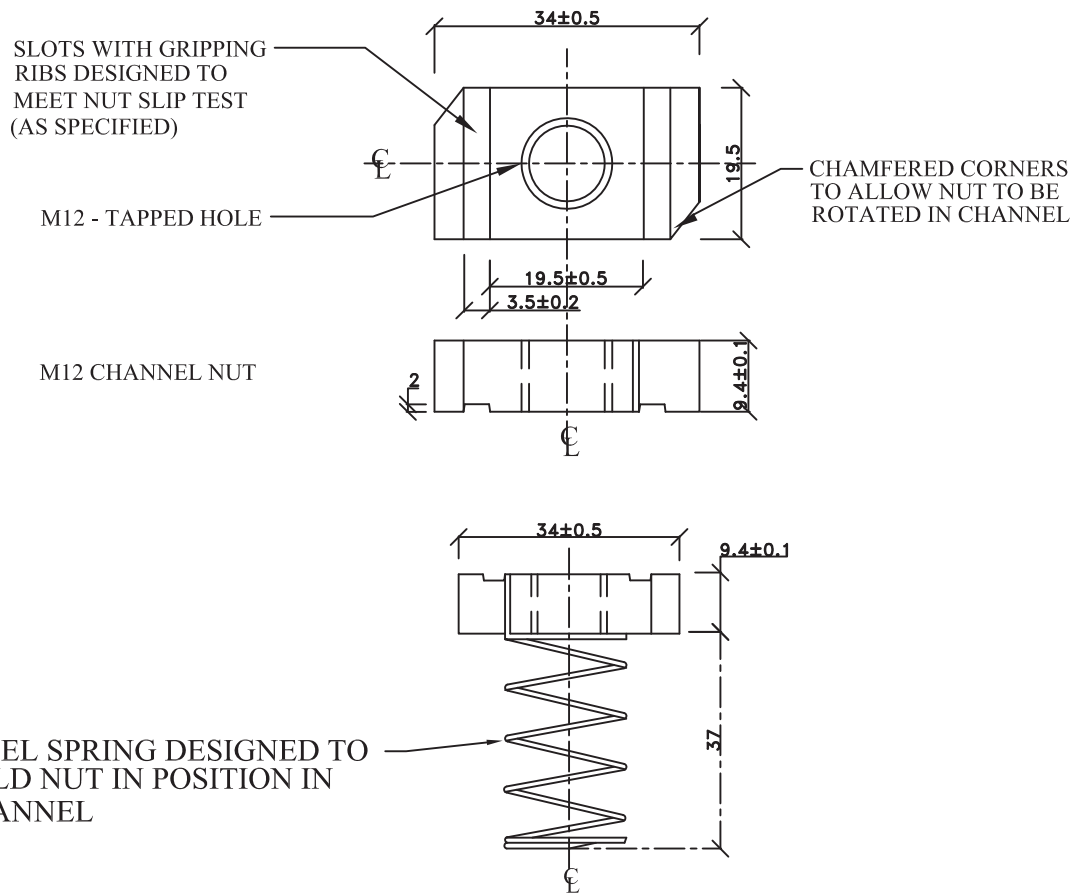


**TITLE: TYPICAL DETAILS OF BOLTABLE  
TYPE CABLE TRAY SUPPORT  
MATERIAL & ACCESSORIES**

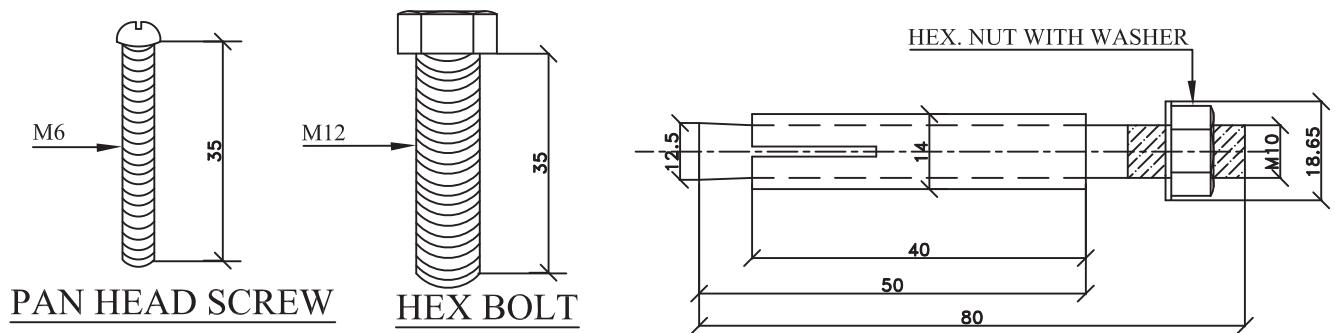
**BHEL DRAWING NO.**

**PE-DG-999-507-E013**

**SH 10 OF 12**



### SPRING NUT ASSEMBLY



### PAN HEAD SCREW

### HEX BOLT

### 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.

### ANCHOR BOLT M10

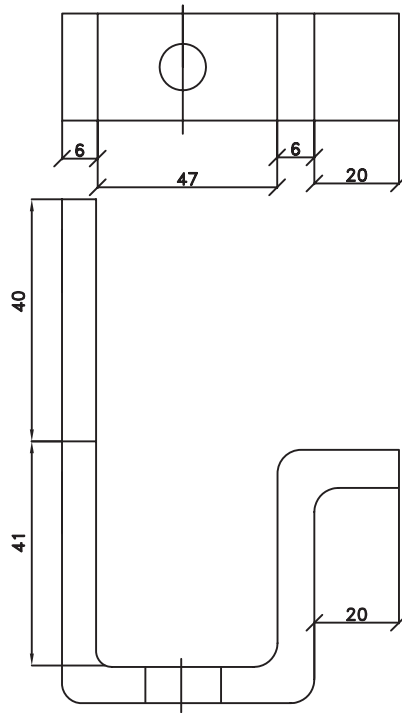


**TITLE: TYPICAL DETAILS OF BOLTABLE  
TYPE CABLE TRAY SUPPORT  
MATERIAL & ACCESSORIES**

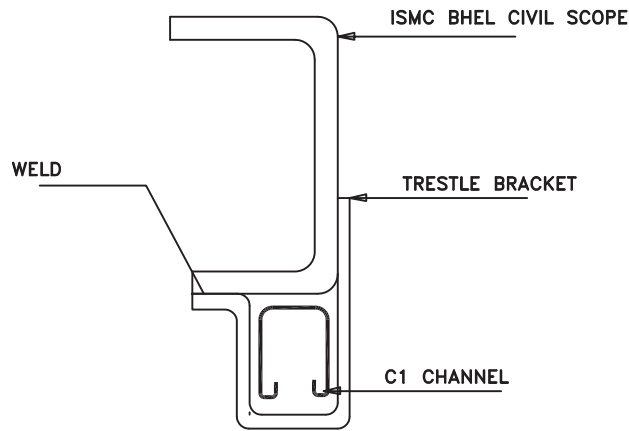
BHEL DRAWING NO.

**PE-DG-999-507-E013**

SH 11 OF 12



TRESTLE BRAKET



FIXING ARRANGMENT OF TRESTLE BRACKET

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 FOR  
CABLE TRAY SUPPORT SYSTEM**

BHEL DRAWING NO.

**PE-DG-999-507-E007**

REV. 0

SH 12 OF 12

TYPICAL DETAILS OF  
TYPE TEST PROCEDURE/  
TEST ARRANGEMENT

|                                                                                                                                                                                                                                                                                                                                                                                                                         |  |             |             |              |             |             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------------|-------------|--------------|-------------|-------------|
| <b>REVISIONS</b>                                                                                                                                                                                                                                                                                                                                                                                                        |  |             |             |              |             |             |
|                                                                                                                                                                                                                                                                                                                                                                                                                         |  |             |             |              |             |             |
|                                                                                                                                                                                                                                                                                                                                                                                                                         |  |             |             |              |             |             |
|                                                                                                                                                                                                                                                                                                                                                                                                                         |  | <b>NAME</b> | <b>DATE</b> |              |             |             |
| <b>TITLE:</b> <span style="float: right;"><b>TYPICAL DETAILS OF<br/>TYPE TEST ARRANGEMENT</b></span>                                                                                                                                                                                                                                                                                                                    |  |             |             |              |             |             |
|                                                                                                                                                                                                                                                                                                                                                                                                                         |  |             |             | <b>DRAWN</b> | <b>NAME</b> | <b>DATE</b> |
|                                                                                                                                                                                                                                                                                                                                                                                                                         |  |             |             | <b>DSGN</b>  |             |             |
| <b>DRG. NO.</b> <span style="float: right;"><b>PE-DG-999-507-E114</b></span>                                                                                                                                                                                                                                                                                                                                            |  |             |             | <b>CHKD</b>  |             |             |
|                                                                                                                                                                                                                                                                                                                                                                                                                         |  |             |             | <b>APPD</b>  |             |             |
| <div style="display: flex; justify-content: space-between; align-items: center;"><div style="text-align: left;"></div><div><b>BHARAT HEAVY ELECTRICALS LTD.</b><br/><b>PROJECT ENGINEERING MANAGEMENT</b><br/><b>NOIDA</b></div><div style="text-align: right; border: 1px solid black; padding: 2px;"><b>SH 1 OF 10</b></div></div> |  |             |             |              |             |             |

## **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.

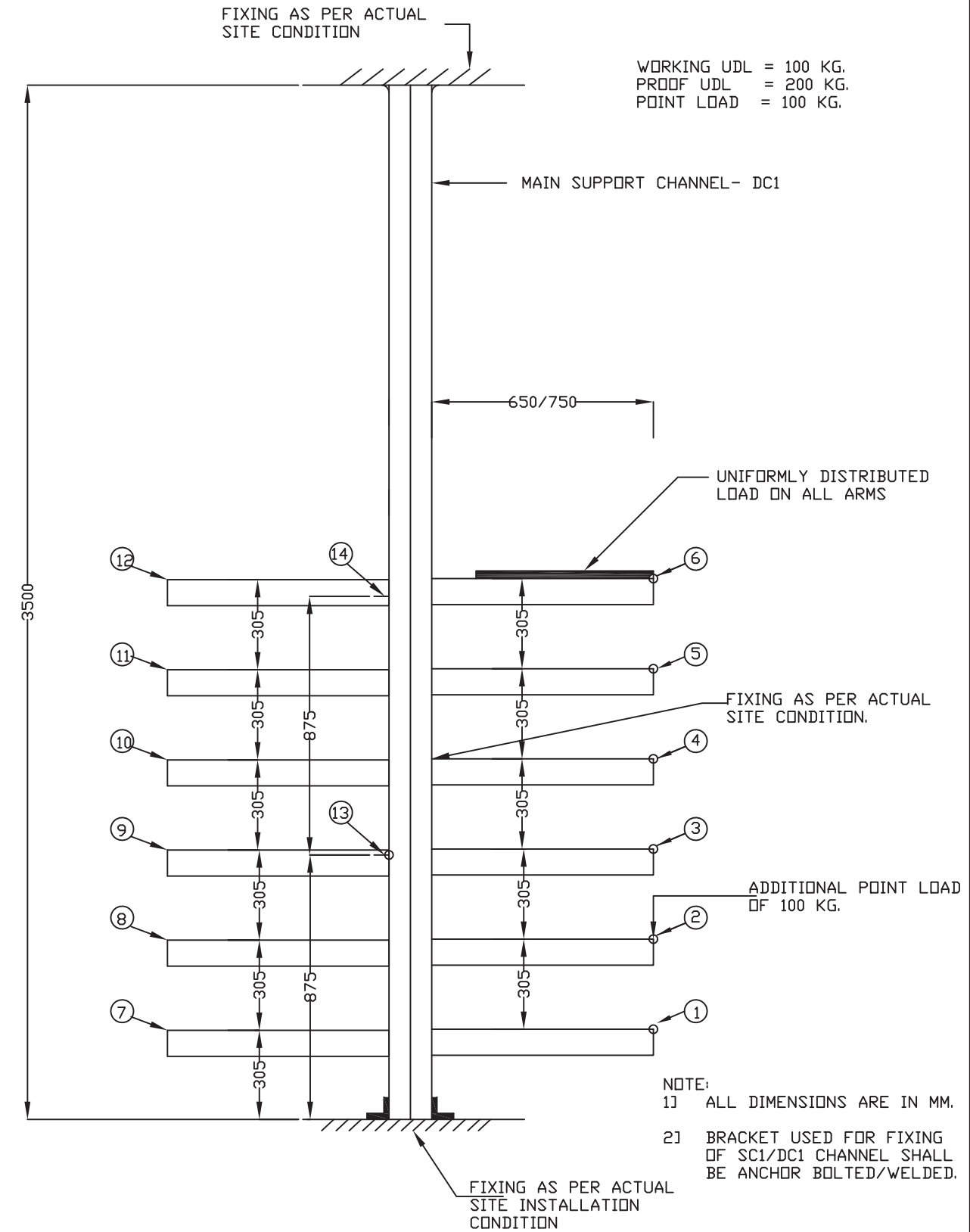
## **6.0**

### **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.



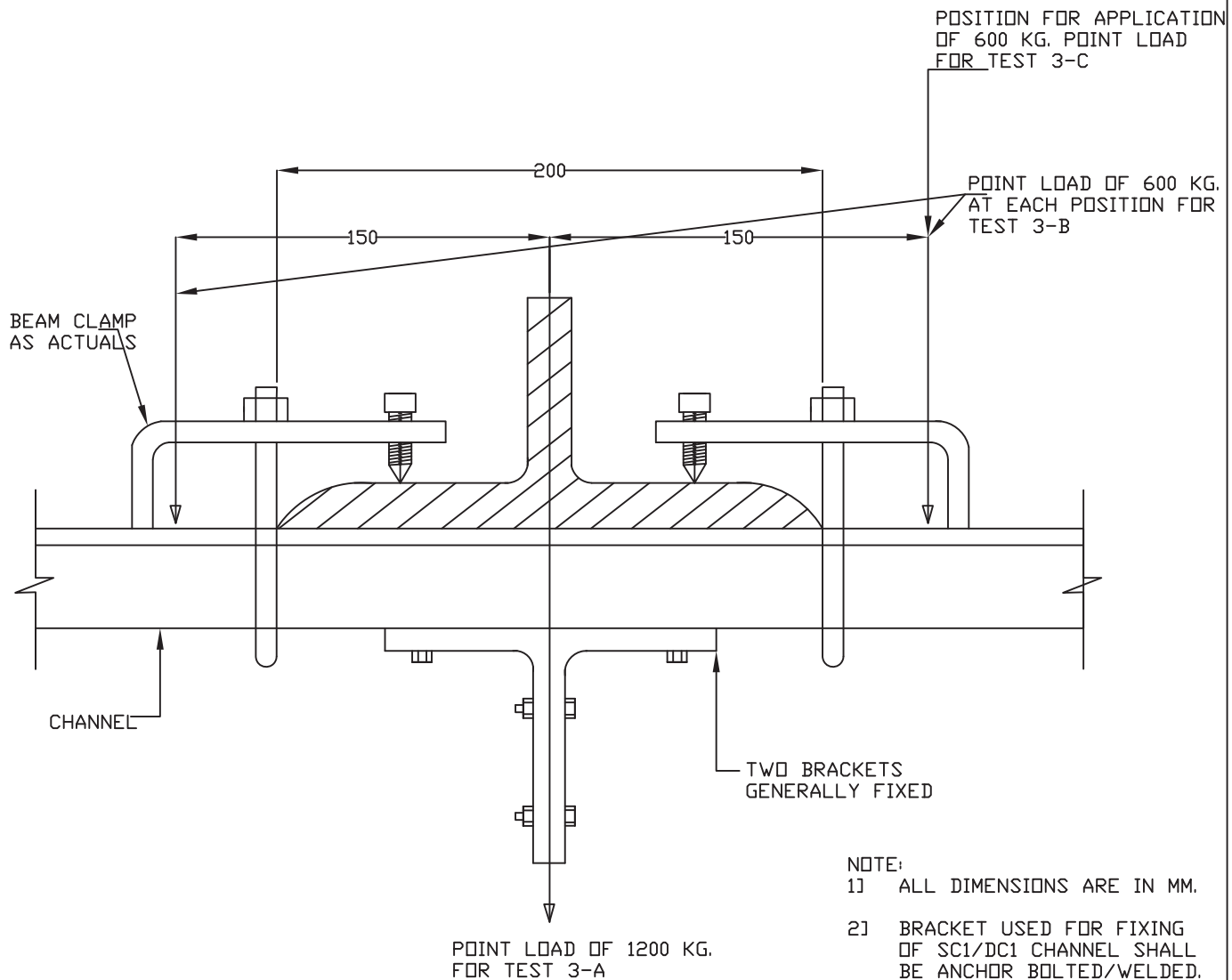


TITLE: TYPICAL DETAILS OF  
TYPE TEST ARRANGEMENT

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



SH 7 OF 10

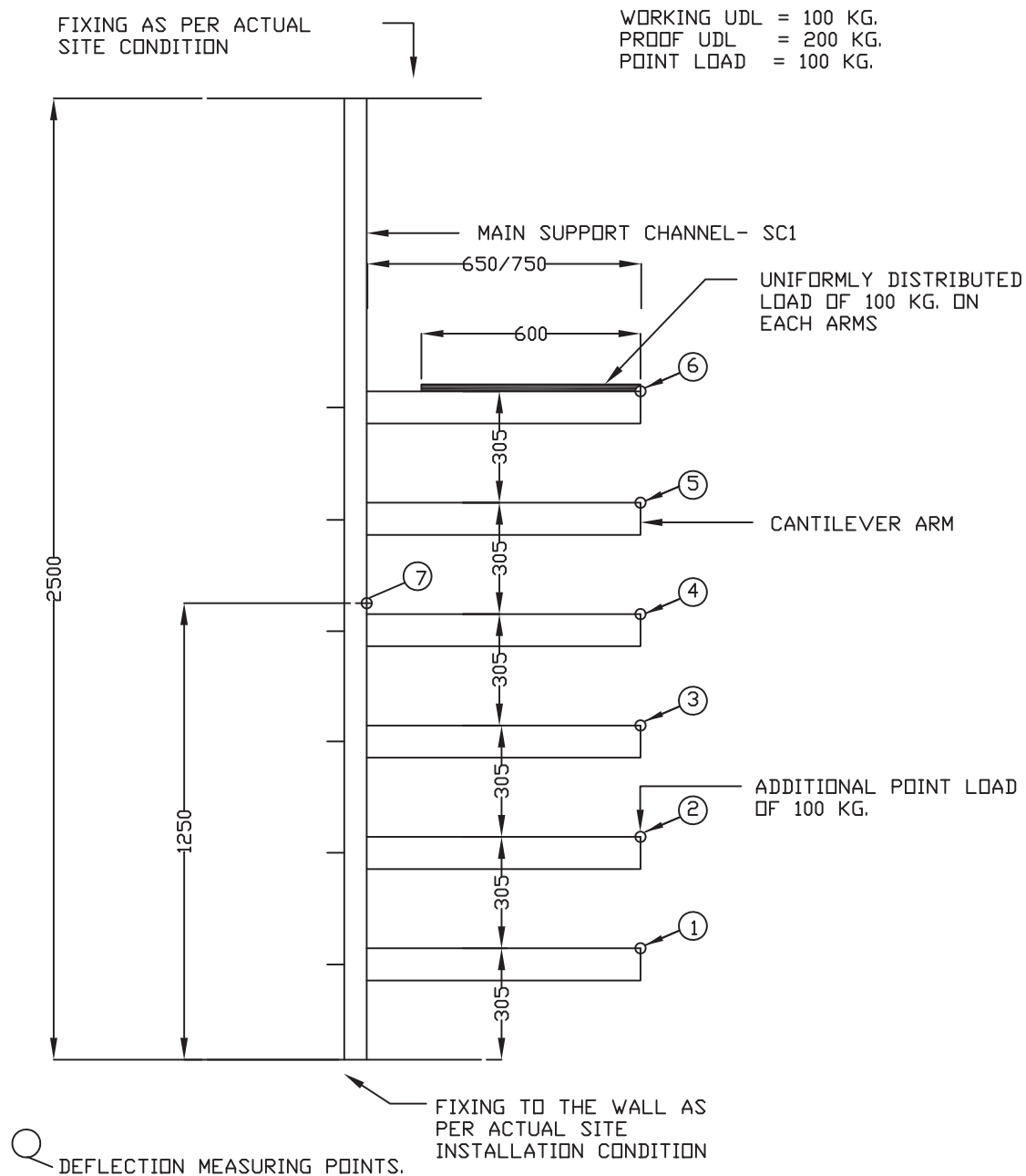


**TEST : 3A, 3B, 3C: CHANNEL FIXED ON BEAM/FLOOR.**



TITLE: TYPICAL DETAILS OF  
TYPE TEST ARRANGEMENT

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



NOTE:  
1) ALL DIMENSIONS ARE IN MM.

#### TEST : 4: CHANNEL INSERT

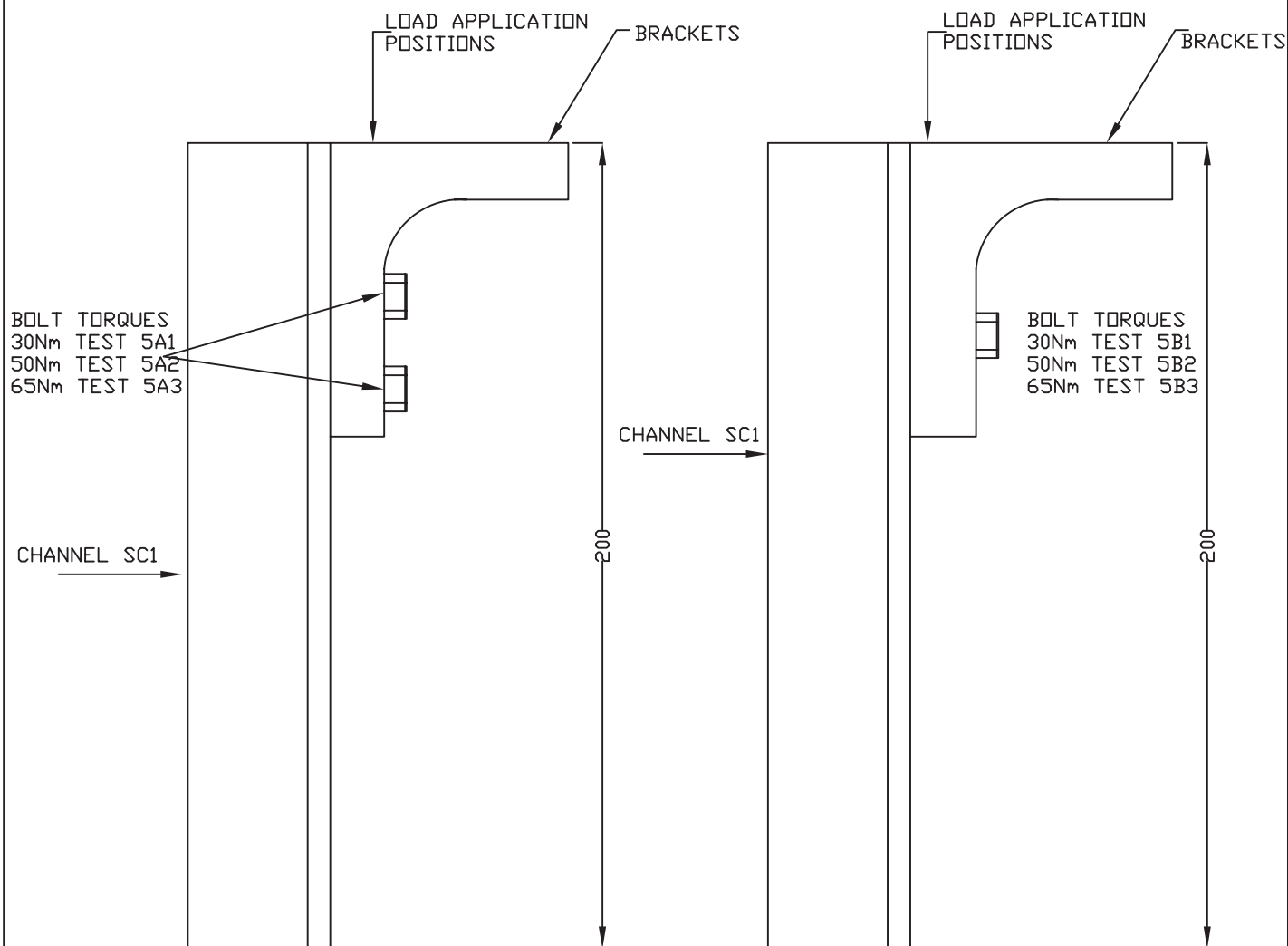


TITLE:

TYPICAL DETAILS OF  
TYPE TEST ARRANGEMENT

DRG. NO.

PE-DG-999-507-E114



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