

**2X660MW BIFPCL MAITREE KHULNA STPP  
(BANGLADESH)**

**VOLUME – II**

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

**SPECIFICATION NO: *PE-TS-421-507-E013*  
REVISION: 0**



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



**2X660MW BIPCL MAITREE KHULNA STPP  
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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 the specification shall prevail).

-----  
BIDDER'S STAMP & SIGNATURE



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**SECTION – I**  
**SPECIFIC TECHNICAL REQUIREMENTS**



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## 1.0 SCOPE

- 1.1 Manufacture, Inspection and Testing at Manufacturer's works, proper sea worthy packing and delivery to site of Cable Tray Support System (Boltable Type) conforming to this specification.
- 1.2 Technical requirements of Cable Tray Support System (Boltable Type) are indicated in Data Sheet-A & Section-II.
- 1.3 The stipulation of Data Sheet-A shall prevail in case of any conflict between the stipulations of Data Sheet-A, Section-I & Section-II.

## 2.0 BILL OF QUANTITIES

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

## 3.0 SPECIFIC TECHNICAL REQUIREMENTS

| S. No. | Reference clause<br>No. of Section II<br>(if any) | Specific Requirement/ Change |
|--------|---------------------------------------------------|------------------------------|
| 1      | NIL                                               | NIL                          |

## 4.0 DRAWINGS & DOCUMENTS TO BE SUBMITTED

### 4.1 Documents required along with Technical offer

Signed and Stamped copies of following documents:-

- Schedule of BOQ cum Price Schedule (Unpriced)
- Compliance certificate
- Schedule of deviations.

### 4.2 Documents required after award of LOI

Following documents/drawings shall be submitted after placement of order for BHEL & customer's approval:-

| Sl. No. | Drawings/Document Description                                          | Drawings / Document Number | Submission date by vendor            | Resubmission              |
|---------|------------------------------------------------------------------------|----------------------------|--------------------------------------|---------------------------|
| 1       | Technical Data Sheet                                                   | PE-V0-421-507-E051         | Within one week of award of contract | Within 1 week of comments |
| 2       | GA Drg of cable tray supports (Boltable type)                          | PE-V0-421-507-E052         | Within one week of award of contract | Within 1 week of comments |
| 3       | Type test procedure including Typical details of type test arrangement | PE-V0-421-507-E053         | Within one week of award of contract | Within 1 week of comments |
| 4       | Type test certificates                                                 | PE-V0-421-507-E054         | Within one week of award of contract | Within 1 week of comments |
| 5       | Quality Plan                                                           | PE-V0-421-507-E908         | Within one week of award of contract | Within 1 week of comments |



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| Sl. No. | Drawings/Document Description                                       | Drawings / Document Number | Submission date by vendor      | Resubmission              |
|---------|---------------------------------------------------------------------|----------------------------|--------------------------------|---------------------------|
| 6.      | Boq of Nut Bolt, Anchor Fastener etc for lot wise ordered quantity. | PE-V0-421-507-E909         | Within 1 week of lot clearance | Within 1 week of comments |

**Note:-**

1. It may please be noted that successful bidder is not to make any fresh submittals at contract stage w.r.t. above mentioned drawings/documents except document against sl.no 04. Data Sheet-A, GA Drg of cable tray supports & Standard Quality Plan as enclosed in the technical specification are to be appended with cover sheet bearing drawing/document number & description as stated above. The signed & stamped for the same shall be submitted by successful bidder to BHEL within one week of award of contract without making any changes in the contents of the drawing/document.
2. Document indicated at clause no. 4.2 above, shall be submitted through document management system (DMS).



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**DATASHEET A**  
(SPECIFIC TECHNICAL REQUIREMENTS)

**1.0 APPLICABLE STANDARDS:**

- a) IS: 2062 For Structural steel.
- b) IS: 1079 For hot rolled carbon steel sheet and strip.
- c) IS: 1730 For dimensions for steel sheet and strip.
- d) IS: 1363 Hexagon head bolts, screws and nuts.
- e) IS: 5 For colours of paint.
- f) IS: 6005 For surface pre-treatment.
- g) IS: 2629 For hot dip galvanising of steel.
- h) IS: 2633 For testing of zinc coating.
- i) IS: 6745 For determining of mass of zinc coating.
- j) IS: 1852 For Rolling and Cutting Tolerances of hot rolled steel products.
- k) IS: 513 For cold rolled low carbon steel sheet & strip
- l) IS: 1367 For requirement for Bolt, screw and Studs

**2.0 CABLE TRAY SUPPORT**

- a) Tray support type: Bolt able type
- b) Material: Hot/ Cold Rolled MS sheet steel for channel SC1/ DC1 and channel portion of cantilever arms
- c) Make: SAIL/ TISCO/ RINL / JINDAL STEEL/ JINDAL ISPAT/ BHUSHAN STEEL/ ESSAR/ LLOYD/ IISCO or authorised re-rollers of SAIL
- d) Thickness: 2.5 mm
- e) Length: Standard length of 6 meters
- f) Fabrication: At works
- g) Construction: Conforming to enclosed drawings

**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 micron (average)
- e) Min. weight 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



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#### **4.0 TYPE TEST, ROUTINE TEST AND ACCEPTANCE TEST**

For details of routine test, acceptance test and type test please refer to Annexure III (Type test procedure) and QAP no PE-QP-999-507-E007 REV 0.



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## SECTION – II

### STANDARD TECHNICAL SPECIFICATION



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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) shall conform to the latest revision of relevant standards and codes of practices 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 (bolt table type) shall be supplied as per technical particulars of cable tray support system 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/ INSPECTION:**

- 4.1 BHEL's Standard QP (QP NO. PE-QP-999-507-E007 REV 0) is enclosed as per Annexure-A for reference. However, at contract stage, the successful bidder shall submit the QP for BHEL/ ultimate customer's approval. In case bidder has reference QP 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 QP approval.
- 4.2 All materials shall be procured, manufactured, inspected and tested by vendor/ subvendor 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 equipments & components shall be deemed to be included in the bid price.

|                                                                                  |                                   |  |                    |
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|                                                                                  | TECHNICAL SPECIFICATION FOR CABLE |  | REVISION 0         |
|                                                                                  | TRAYS SUPPORT SYSTEM              |  | DATE: 10.04.2018   |
|                                                                                  |                                   |  | SHEET              |

## 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: -

### a) 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-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.

### b) Routine Tests:

(i) Dimension checks

### c) Acceptance Test:

(i) Dimension checks

(ii) Tests for galvanizing

## 6.0 **PACKING**

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



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**Annexure-A**

**STANDARD QUALITY PLAN**

|                                                                                   |                     |                                         |             |                       |                        |                                                     |                                                     |                                                                                 |                               |            |     |                                                                                                                                           |
|-----------------------------------------------------------------------------------|---------------------|-----------------------------------------|-------------|-----------------------|------------------------|-----------------------------------------------------|-----------------------------------------------------|---------------------------------------------------------------------------------|-------------------------------|------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------|
|  |                     | <b>QUALITY PLAN</b>                     |             | CUSTOMER :            |                        | PROJECT TITLE : 2X660 MW MAITREE STPP               |                                                     | SPECIFICATION NO. PE-TS-421-507-E013                                            |                               |            |     |                                                                                                                                           |
|                                                                                   |                     |                                         |             | BIDDER/ VENDOR :      |                        | STANDARD QP NO. : PE-QP-999-507-E007, REV. 0        |                                                     | SPECIFICATION TITLE:<br>TECHNICAL SPEC FOR CABLE TRAY SUPPORT SYSTEM (BOLTABLE) |                               |            |     |                                                                                                                                           |
|                                                                                   |                     |                                         |             | SHEET 1 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                                                                               | 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 STEEL/JINDAL ISPAT/ESSAR/LLOYD/ IISCO/ 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 , PQR & 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                           | -          | -   | Applicability of galvanizing shall be as per Annexure-2 to quality plan.                                                                  |
| BHEL                                                                              |                     |                                         | PARTICULARS |                       |                        | BIDDER/VENDOR                                       |                                                     |                                                                                 |                               |            |     |                                                                                                                                           |
|                                                                                   |                     |                                         | NAME        |                       |                        |                                                     |                                                     |                                                                                 |                               |            |     |                                                                                                                                           |
|                                                                                   |                     |                                         | SIGNATURE   |                       |                        |                                                     |                                                     |                                                                                 |                               |            |     |                                                                                                                                           |
|                                                                                   |                     |                                         | DATE        |                       |                        |                                                     |                                                     |                                                                                 | BIDDER'S/VENDORS COMPANY SEAL |            |     |                                                                                                                                           |

LEGEND :

1 - BHEL/ CUSTOMER

2 - VENDOR

3 - SUB- VENDOR

P - PERFORM

W - WITNESS

V - VERIFICATION



|  |                                                   | <b>QUALITY PLAN</b>          |             | CUSTOMER :                                              |                                   | PROJECT TITLE : 2X660 MW MAITREE STPP                       |                                                     | SPECIFICATION NO. PE-TS-421-507-E013                                            |                               |   |   |                                                                                                                         |
|-----------------------------------------------------------------------------------|---------------------------------------------------|------------------------------|-------------|---------------------------------------------------------|-----------------------------------|-------------------------------------------------------------|-----------------------------------------------------|---------------------------------------------------------------------------------|-------------------------------|---|---|-------------------------------------------------------------------------------------------------------------------------|
|                                                                                   |                                                   |                              |             | BIDDER/ VENDOR :                                        |                                   | STANDARD QP NO. : PE-QP-999-507-E007, REV. 0                |                                                     | SPECIFICATION TITLE:<br>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                                                                                                                 |
| 1                                                                                 | 2                                                 | 3                            | 4           | 5                                                       | 6                                 | 7                                                           | 8                                                   | 9                                                                               | P                             | W | V | 11                                                                                                                      |
| 3.0                                                                               | FINISHED ITEMS                                    | 2. DROSS                     | MA          | VISUAL                                                  | PERIODIC                          | IS - 2629                                                   | IS - 2629                                           | QC RECORD                                                                       | 3/2                           | - | - | FASTENERS SHALL BE OF REPUTED MAKE                                                                                      |
|                                                                                   |                                                   | 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                           | - | - |                                                                                                                         |
| 3.1                                                                               | SINGLE / DOUBLE CHANNELS, CANTILEVER ARMS, CLAMPS | 1.DIMENSIONS DISTORTION      | MA          | MEASUREMENT                                             | IS-2500 (PART 1) LEVEL S-4        | APPD. DRG                                                   | APPD. DRG                                           | INSP. REPORT                                                                    | 2                             | 1 | - |                                                                                                                         |
|                                                                                   |                                                   | 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.MASS OF ZINC COATING       | MA          | CHEM. TEST                                              | IS-4759                           | IS-6745 / APP. DATA SHEET                                   | APP. DATA SHEET                                     | INSP. REPORT                                                                    | 2                             | 1 | - |                                                                                                                         |
|                                                                                   |                                                   | 4.UNIFORMITY OF ZINC COATING | MA          | CHEM. TEST                                              | IS-4759                           | IS-2633                                                     | IS-2633                                             | INSP. REPORT                                                                    | 2                             | 1 | - |                                                                                                                         |
|                                                                                   |                                                   | 5.THICKNESS OF ZINC COATING  | MA          | ELCOMETER                                               | IS-4759                           | APP. DATA SHEET                                             | APP. DATA SHEET                                     | INSP. REPORT                                                                    | 2                             | 1 | - |                                                                                                                         |
|                                                                                   |                                                   | 6.ADHESION                   | MA          | MECH.TEST                                               | IS-4759                           | IS-2629                                                     | IS-2629                                             | INSP. REPORT                                                                    | 2                             | 1 | - |                                                                                                                         |
| 3.1.1                                                                             | TYPE TESTING                                      |                              | CR          | TEST                                                    | 1 SAMPLE                          | APPD. TYPE TEST PROCEDURE                                   | APPD. TYPE TEST PROCEDURE                           | INSP. REPORT                                                                    | 2                             | 1 | - |                                                                                                                         |
| 3.1.2                                                                             | 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                     |                                                             |                                                     |                                                                                 | BIDDER'S/VENDORS COMPANY SEAL |   |   |                                                                                                                         |
|                                                                                   |                                                   |                              | NAME        |                                                         |                                   |                                                             |                                                     |                                                                                 |                               |   |   |                                                                                                                         |
|                                                                                   |                                                   |                              | SIGNATURE   |                                                         |                                   |                                                             |                                                     |                                                                                 |                               |   |   |                                                                                                                         |
|                                                                                   |                                                   |                              | DATE        |                                                         |                                   |                                                             |                                                     |                                                                                 |                               |   |   |                                                                                                                         |

LEGEND : 1 - BHEL/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS V - VERIFICATION

## **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<br>'MA' stands for major Characteristic - affecting safety of equipment and personnel<br>'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'<br>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

Column11- 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 BHEL- PEM APPROVED GALVANIZERS)**

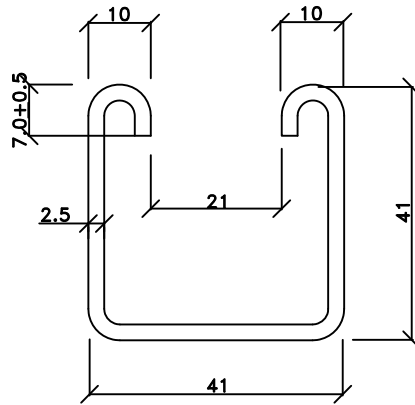
| SL. NO. | ITEM        | VENDOR NAME                                  | ADDRESS                                                                                                                                                                        |
|---------|-------------|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Galvanising | Jenco Industrial Corporation                 | Chincholi Bunder Khkar Road Near Link Road Devruwadi Malad (W) Mumbai 400064                                                                                                   |
| 2       | Galvanising | National Galvanizing Company                 | 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) Shankharidaha Baniyarah, Jalan Industrial Complex, Gate no.3, Lane no. 4, Domjur, Howrah , W.B :- 71141 |
| 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 | Indiana Gratings PVT. LTD                    | F-5, MIDC Jejuri, Pune-412 303                                                                                                                                                 |

**NOTES:**

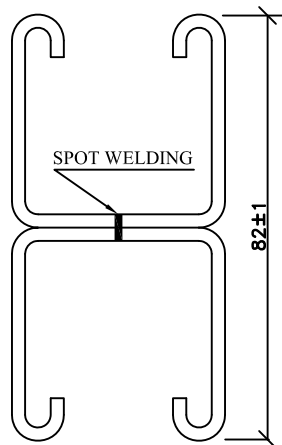
**VENDOR CAN PROPOSE ADDITIONAL SOURCE OF GALVANIZERS WITH COMPLETE CREDENTIALS ALONG WITH BID WHICH SHALL BE REVIEWED AND ASSESSED BY BHEL/CUSTOMER. NON-ACCEPTANCE OF ADDITIONAL GALVANIZERS BY BHEL/CUSTOMER SHALL HAVE NO COMMERCIAL IMPLICATION TO BHEL. IN CASE OF NON ACCEPTANCE OF ADDITIONAL GALVANIZERS BY CUSTOMER, ABOVE LIST SHALL BE APPLICABLE. IN CASE OF NON-COMPLIANCE TO THIS REQUIREMENT, BID IS LIKELY TO BE REJECTED.**

# INSTALLATION DETAILS FOR CABLE TRAY SUPPORT SYSTEM (BOLTABLE TYPE)

|                                                                                     |  |                                                 |                                                                                                        |     |      |         |          |
|-------------------------------------------------------------------------------------|--|-------------------------------------------------|--------------------------------------------------------------------------------------------------------|-----|------|---------|----------|
| PROJECT                                                                             |  | 2X660MW BIFPCL MAITREE KHULNA STPP (BANGLADESH) |                                                                                                        |     |      |         |          |
|  |  | OWNER                                           | BANGLADESH-INDIA FRIENDSHIP POWER CO. (Pvt.) LIMITED (BIFPCL)                                          |     |      |         |          |
|  |  | OWNER'S CONSULTANT                              | FICHTNER GmbH & Co KG GERMANY                                                                          |     |      |         |          |
|  |  | EPC CONTRACTOR                                  | BHARAT HEAVY ELECTRICALS LIMITED<br>POWER SECTOR<br>PROJECT ENGINEERING MANAGEMENT<br>NOIDA(U.P) INDIA |     |      |         |          |
| DOCUMENT TITLE:                                                                     |  |                                                 | DPT CODE-E                                                                                             |     | NAME | SIGN    | DATE     |
| INSTALLATION DETAILS FOR CABLE TRAY SUPPORT SYSTEM(BOLTABLE TYPE)                   |  |                                                 |                                                                                                        | DRN | MKM  | -SD-    | 19.07.17 |
|                                                                                     |  |                                                 |                                                                                                        | CHD | AB   | -SD-    | 19.07.17 |
|                                                                                     |  |                                                 |                                                                                                        | APP | SL   | -SD-    | 19.07.17 |
| DOCUMENT NO:                                                                        |  | Maitree-00-BTW-EDB-421507E006-PEM-01            |                                                                                                        |     |      | REV. 01 |          |
| SHT. 01 OF 19                                                                       |  |                                                 |                                                                                                        |     |      |         |          |



SINGLE CHANNEL C1



DOUBLE CHANNEL C2

TWO LENGTHS OF SINGLE CHANNEL

SPOT WELDED BACK TO BACK

AT 75MM C/C

NOTE:

1. ALL DIMENSIONS ARE IN mm.
2. MATERIAL : HOT/ COLD ROLLED M.S. AS PER IS-2062
3. FINISH : HOT DIP GALVANISED AS PER IS 2629
4. TOLERANCE ON THICKNESS IS AS PER IS 1852
5. PROFILE TOLERANCE  $\pm 0.5$  mm



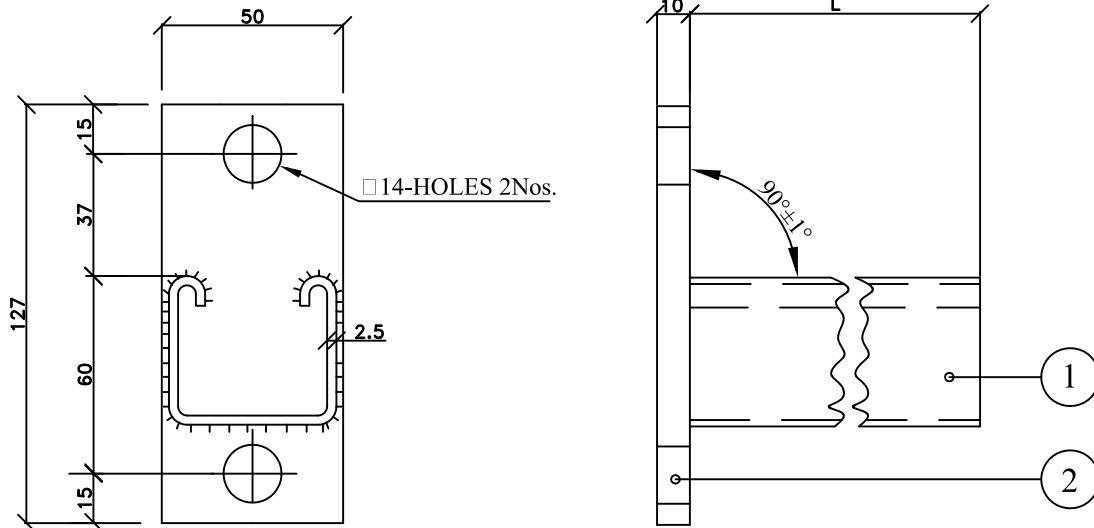
**TITLE:**

**INSTALLATION DETAILS FOR  
CABLE TRAYS SUPPORT SYSTEM**

DRG. NO.

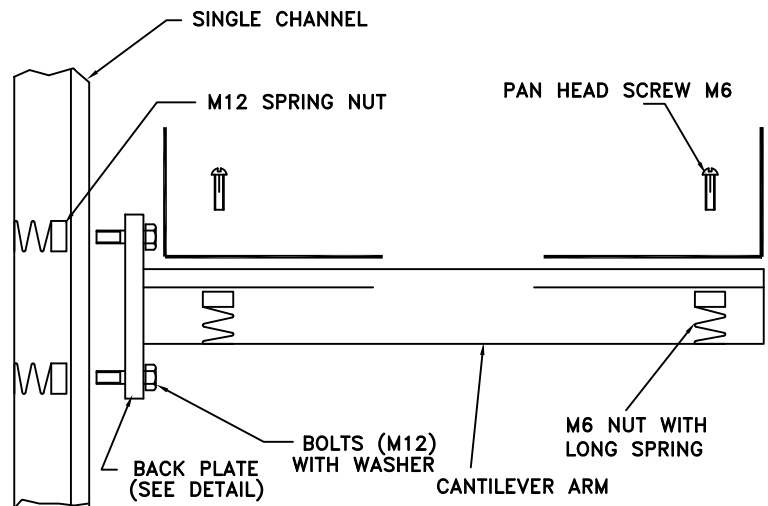
**Maitree-00-BTW-EDB  
-421507E006-PEM-1**

SH 2 OF 19



### CANTILEVER ARMS

| TRAY WIDTH<br>IN MM | CANTILEVER ARM<br>LENGTH (L) IN MM |
|---------------------|------------------------------------|
| 150                 | 200                                |
| 300                 | 350                                |
| 450                 | 500                                |
| 600                 | 650                                |



### 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 IS-2062
3. MATERIAL :MILD STEEL AS PER IS-2062/ BS EN 1993 EUROCODE 3
4. FINISH : HOT DIP GALVANISED AS PER IS:2629/ BS EN ISO 1461
5. TOLERANCE ON THICKNESS AS PER IS:1852/ BS EN 10131
6. ALL FABRICATION TOLERANCES ARE  $\pm 1.0\text{mm}$



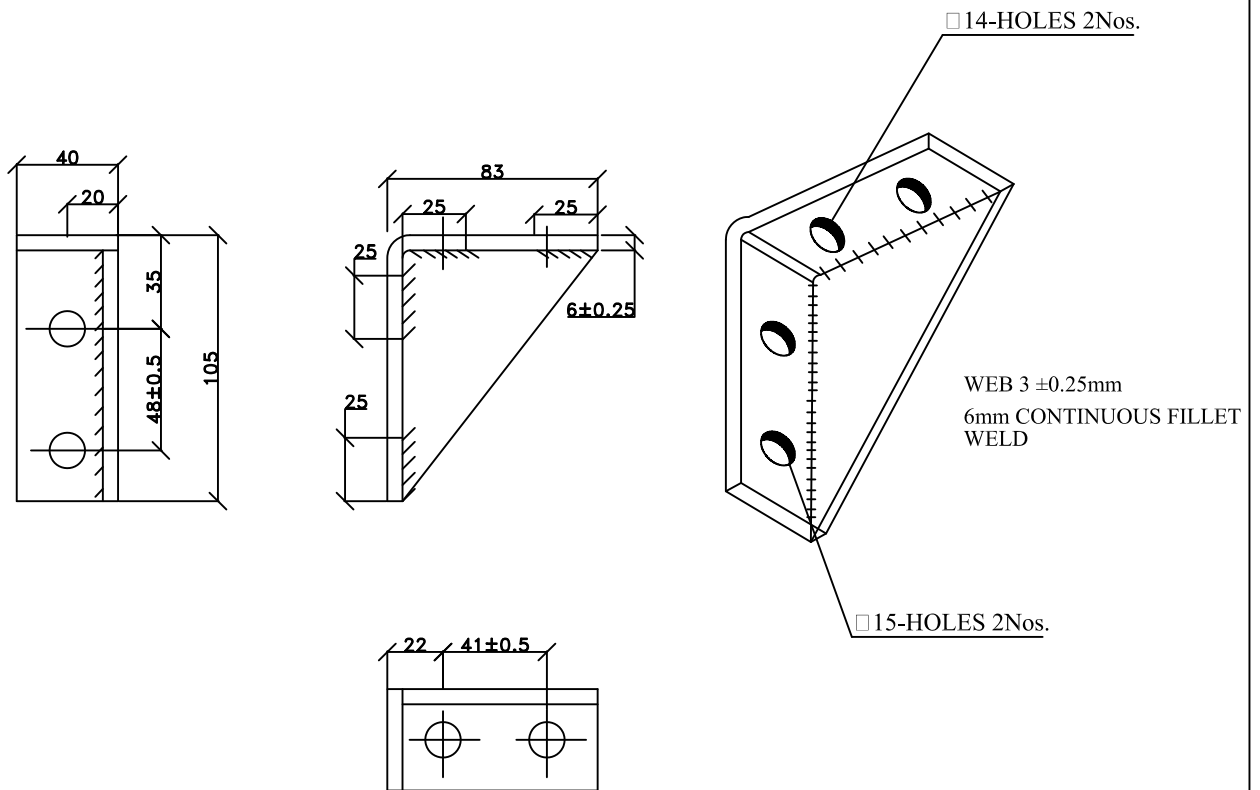
**TITLE:**

**INSTALLATION DETAILS FOR  
CABLE TRAYS SUPPORT SYSTEM**

**DRG. NO.**

**Maitree-00-BTW-EDB  
-421507E006-PEM-1**

**SH 3 OF 19**



### 90° ANGLE FITTING HL1

***ANCHOR FASTENER-2NOs.  
SPRING NUT & WASHER-2NOs.***

### NOTES :

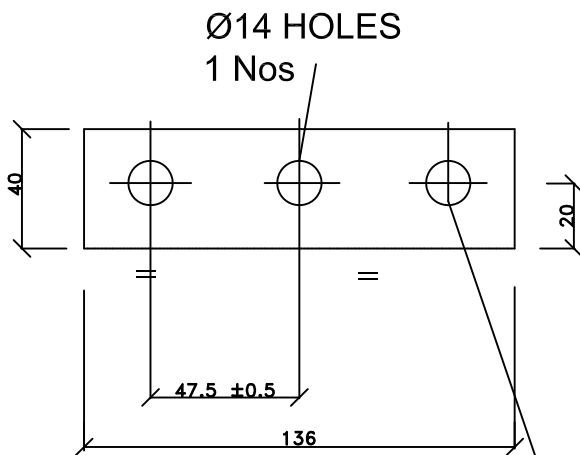
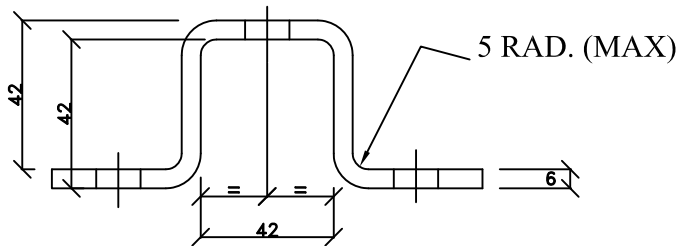
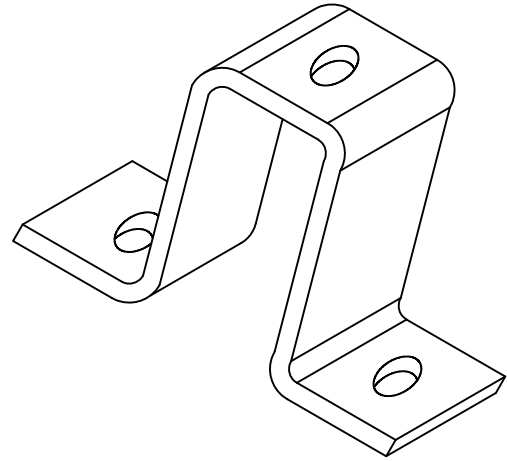
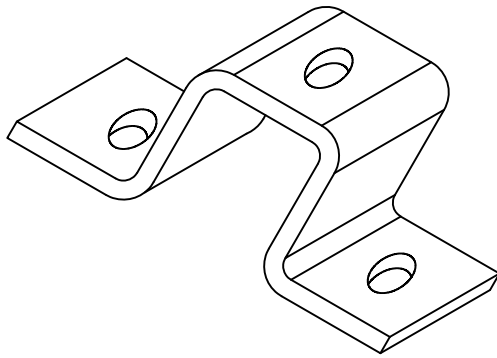
1. ALL DIMENSIONS ARE IN mm.
2. ALL FABRICATION TOLERANCES  $\pm 1.0$  mm
- MATERIAL : HOT/ COLD ROLLED M.S. AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629
5. TOLERANCE ON THICKNESS AS PER IS:1852



**TITLE:**  
**INSTALLATION DETAILS FOR  
CABLE TRAYS SUPPORT SYSTEM**

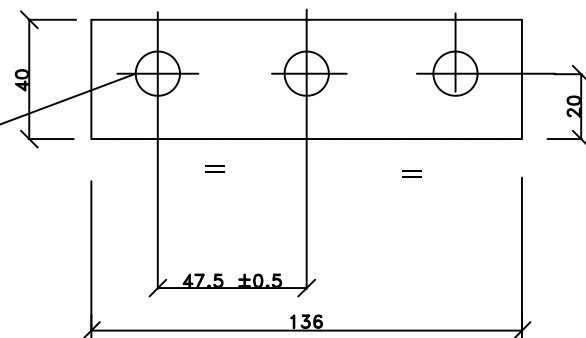
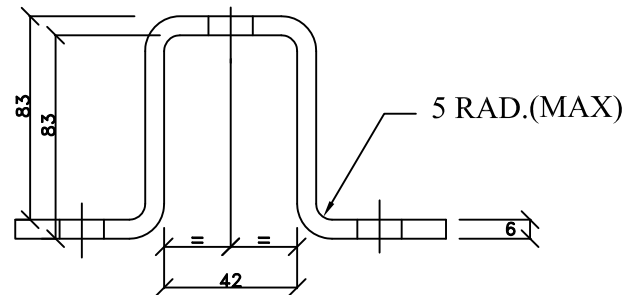
**DRG. NO.**  
**Maitree-00-BTW-EDB  
-421507E006-PEM-1**

**SH 4 OF 19**



Ø15 HOLES  
2 Nos

CLAMP FOR SINGLE CHANNEL CC1



CLAMP FOR DOUBLE CHANNEL CC2

### NOTES

1. ALL DIMENSIONS ARE IN mm.
2. ALL FABRICATION TOLERANCES  $\pm 1.0$  mm
- MATERIAL : HOT/ COLD ROLLED M.S. AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629
5. TOLERANCE ON THICKNESS AS PER IS:1852

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



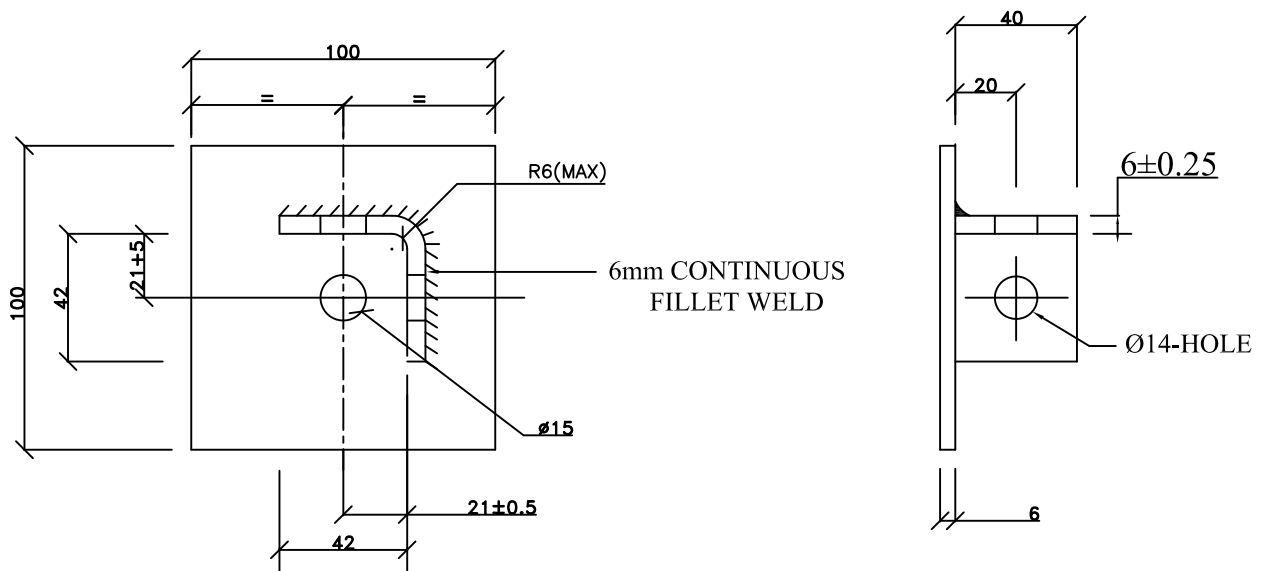
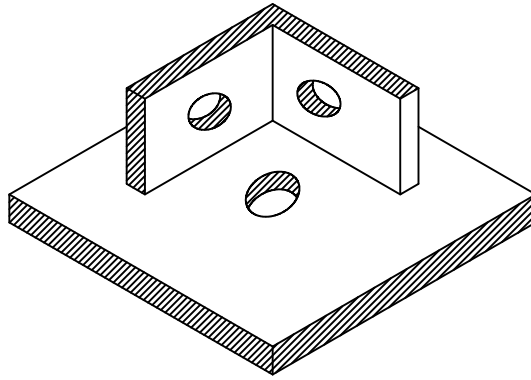
**TITLE:**

**INSTALLATION DETAILS FOR  
CABLE TRAYS SUPPORT SYSTEM**

**DRG. NO.**

**Maitree-00-BTW-EDB  
-421507E006-PEM-1**

**SH 5 OF 19**



### BASE PLATE FOR SINGLE CHANNEL BP1

#### NOTE

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



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



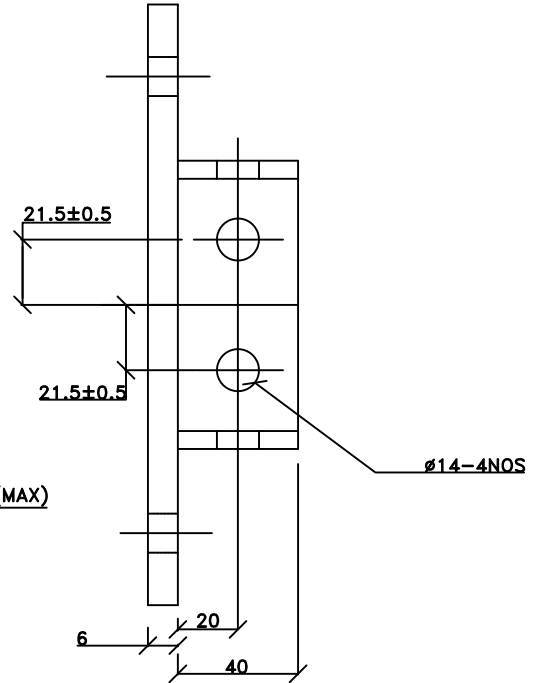
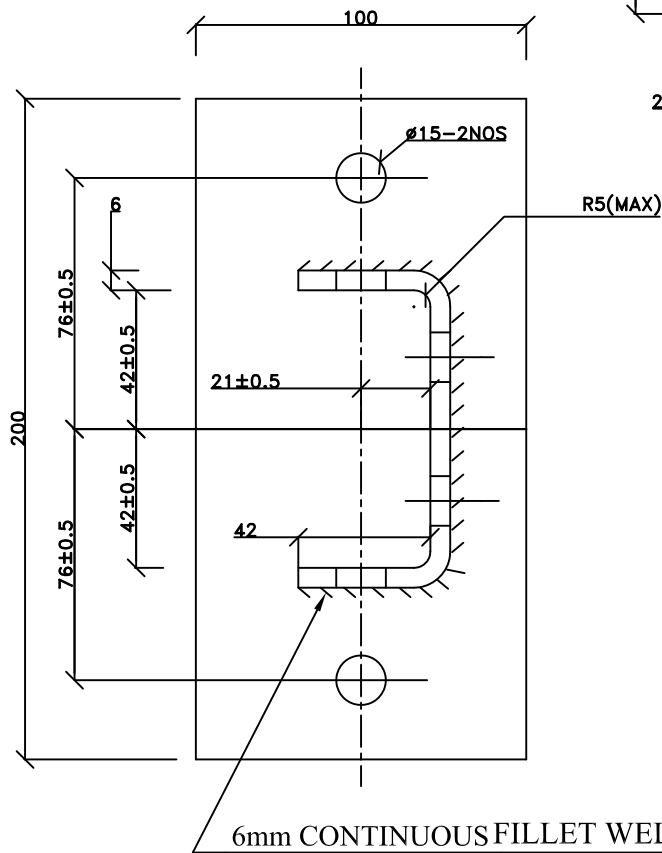
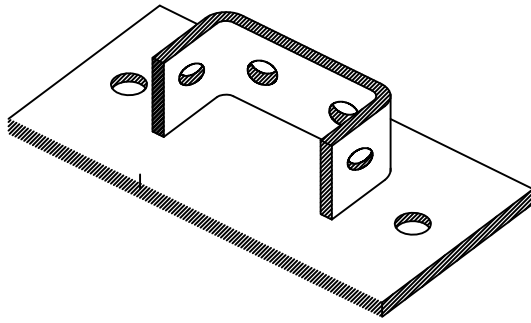
**TITLE:**

**INSTALLATION DETAILS FOR  
CABLE TRAYS SUPPORT SYSTEM**

**DRG. NO.**

**Maitree-00-BTW-EDB  
-421507E006-PEM-1**

**SH 6 OF 19**



**ANCHOR FASTENER-2NOS.  
SPRING NUT & WASHER-2NOS.**

### BASE PLATE FOR DOUBLE CHANNEL BP2

#### NOTES

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



**TITLE:**

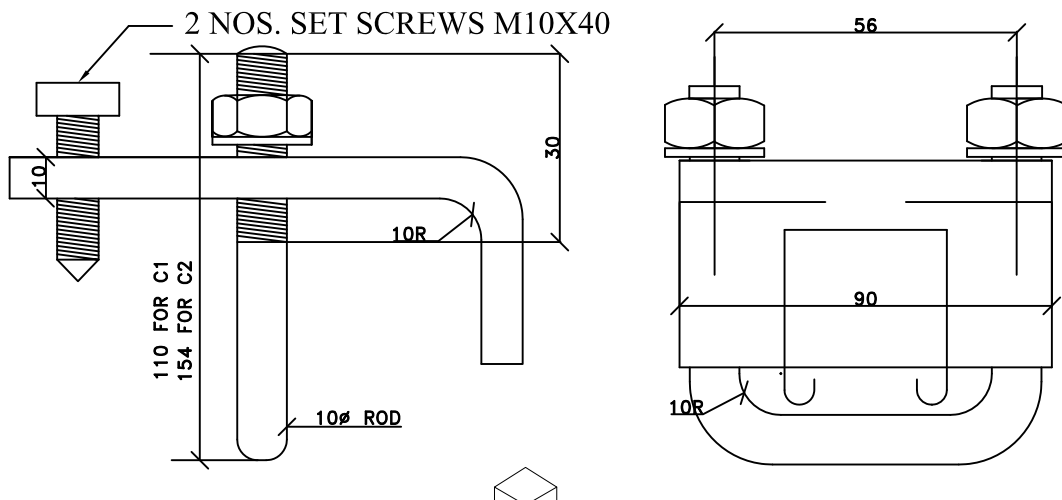
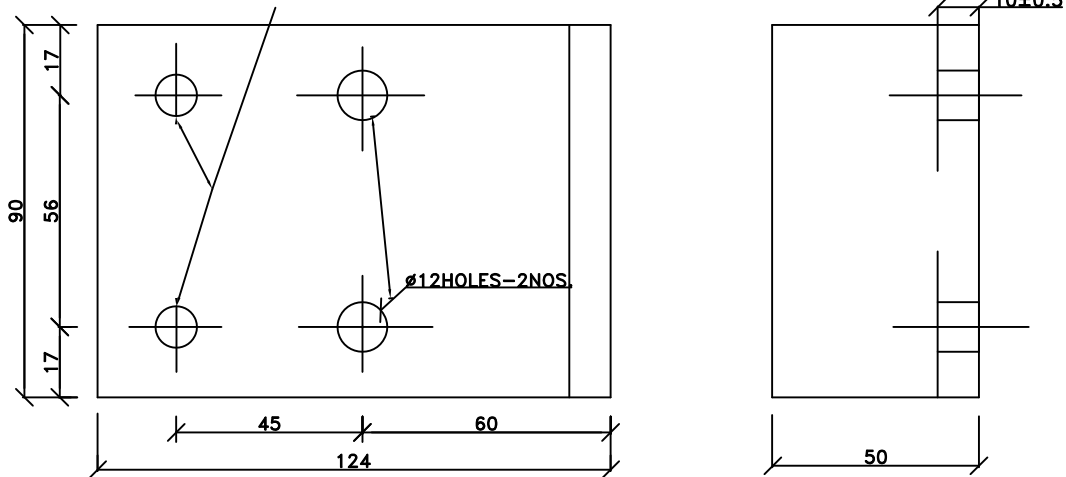
**INSTALLATION DETAILS FOR  
CABLE TRAYS SUPPORT SYSTEM**

**DRG. NO.**

**Maitree-00-BTW-EDB  
-421507E006-PEM-1**

**SH 7 OF 19**

M-10 TAPPED HOLES - 2 NOS.



**BEAM CLAMP - BC1**

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

## NOTES

1. ALL DIMENSIONS ARE IN mm.
2. ALL FABRICATION TOLERANCES  $\pm 1.0$ mm
- MATERIAL : HOT/ COLD ROLLED M.S. AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629
5. TOLERANCE ON THICKNESS AS PER IS:1852



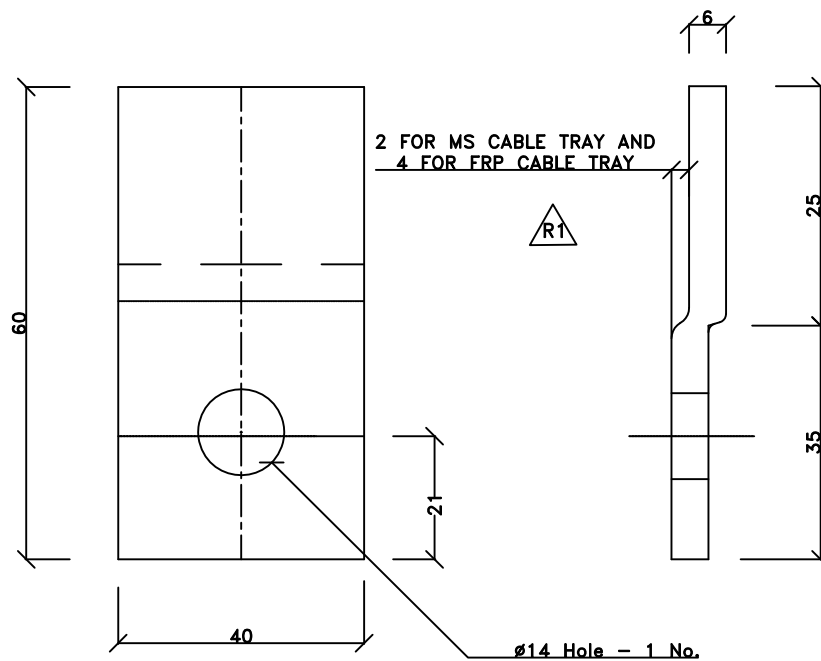
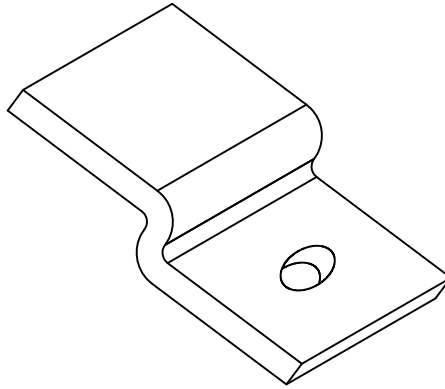
**TITLE:**

**INSTALLATION DETAILS FOR  
CABLE TRAYS SUPPORT SYSTEM**

**BHEL DRAWING NO.**

**Maitree-00-BTW-EDB  
-421507E006-PEM-1**

**SH 8 OF 19**



### TRAY FIXING CLAMP - TC1

*SPRING NUT & WASHER-1NO.*

### NOTES

1. ALL DIMENSIONS ARE IN mm.
2. ALL FABRICATION TOLERANCES :  $\pm 1.0$ mm
- MATERIAL : HOT/ COLD ROLLED M.S. AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629
5. TOLERANCE ON THICKNESS AS PER IS:1852



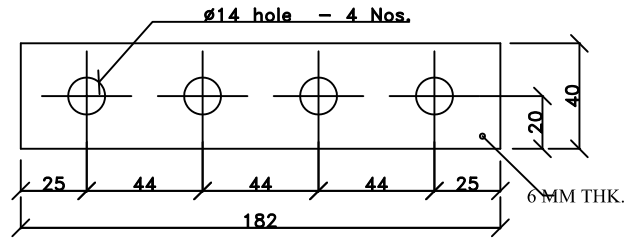
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**INSTALLATION DETAILS FOR  
CABLE TRAYS SUPPORT SYSTEM**

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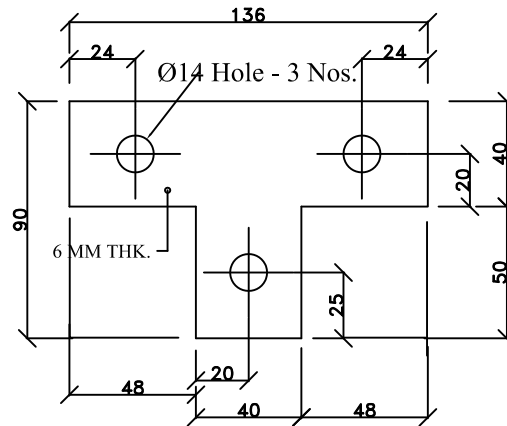
**Maitree-00-BTW-EDB  
-421507E006-PEM-0**

SH 9 OF 19



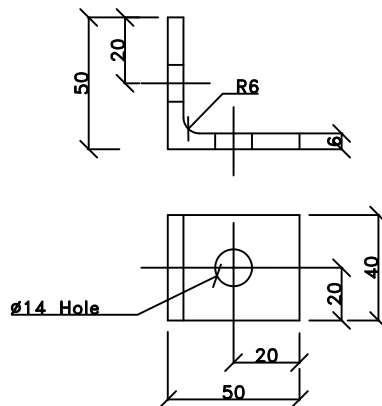
*SPRING NUT & WASHER-4Nos.*

### 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. ALL FABRICATION TOLERANCES  $\pm 1.0$  mm
- MATERIAL : HOT/ COLD ROLLED M.S. AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629



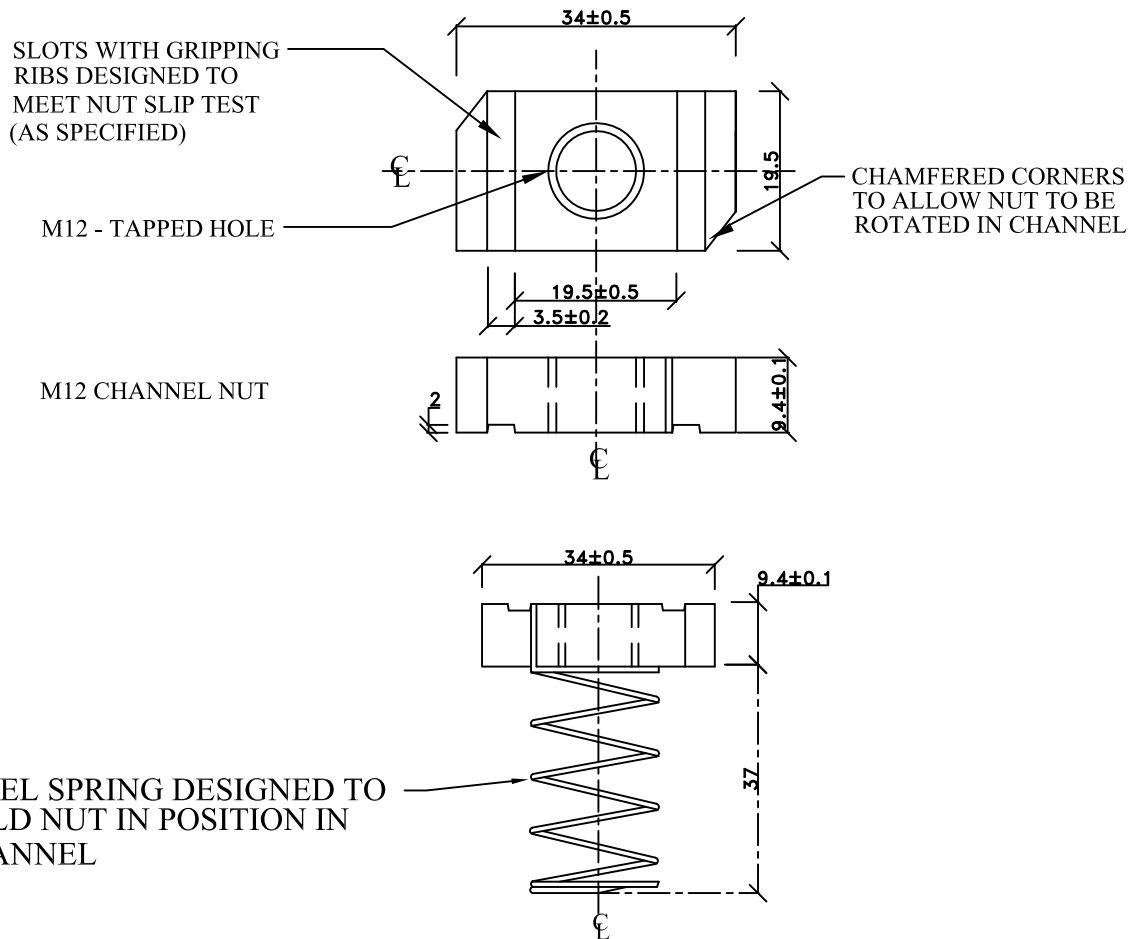
**TITLE:**

**INSTALLATION DETAILS FOR  
CABLE TRAYS SUPPORT SYSTEM**

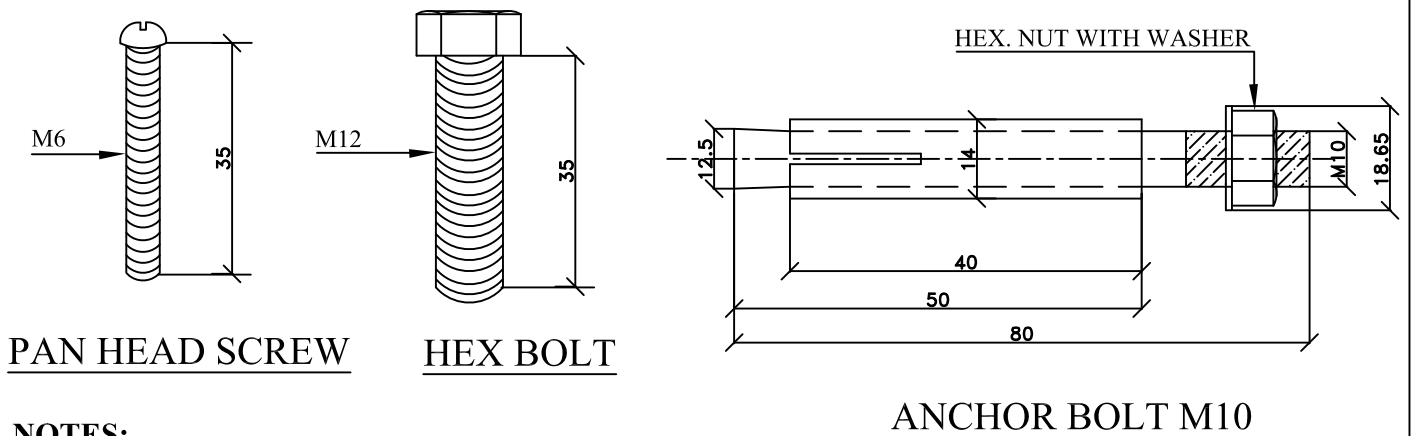
BHEL DRAWING NO.

**Maitree-00-BTW-EDB  
-421507E006-PEM-0**

SH 10 OF 19



### SPRING NUT ASSEMBLY



### 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.



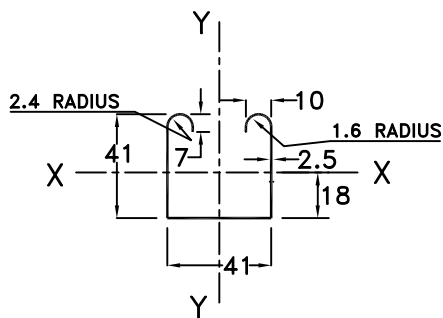
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INSTALLATION DETAILS FOR  
CABLE TRAYS SUPPORT SYSTEM

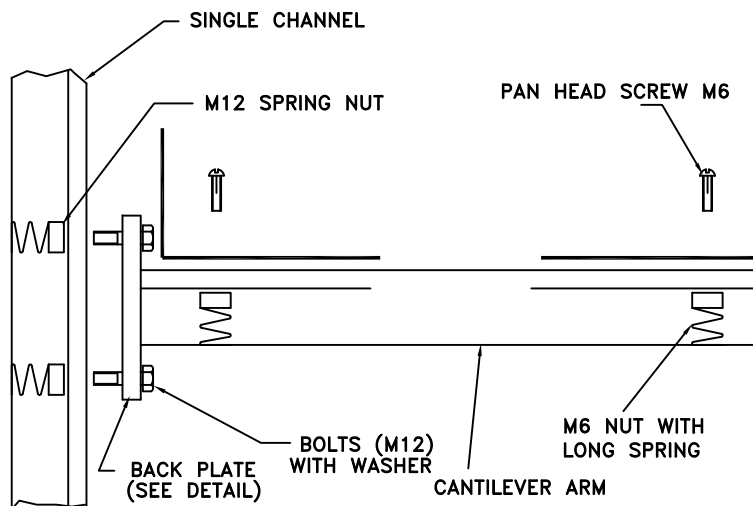
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-421507E006-PEM-0

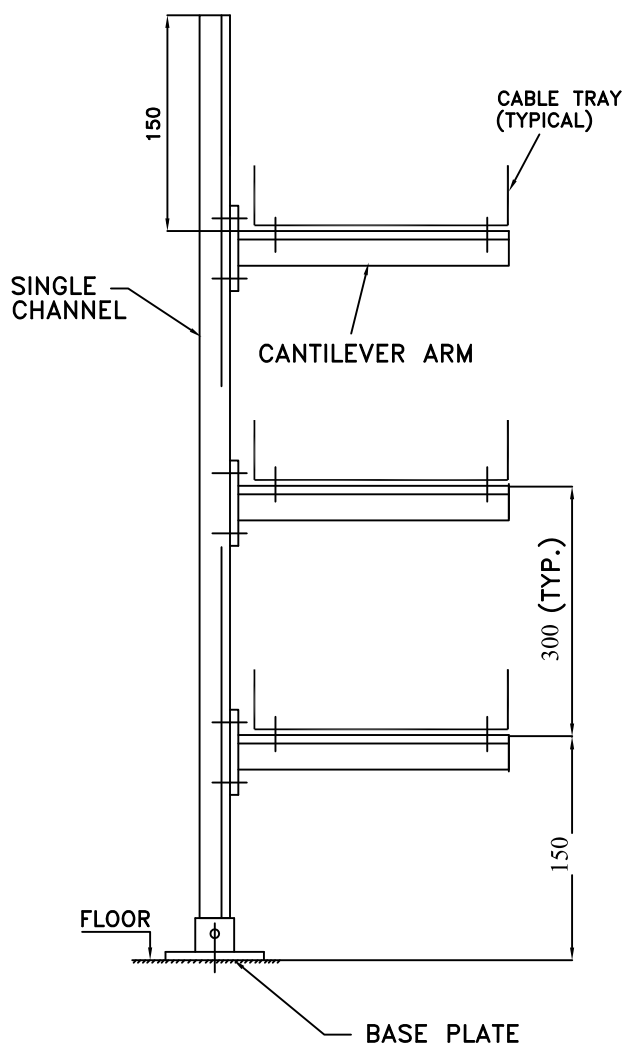
SH 11 OF 19



DETAIL OF ITEM-1  
(SINGLE CHANNEL)

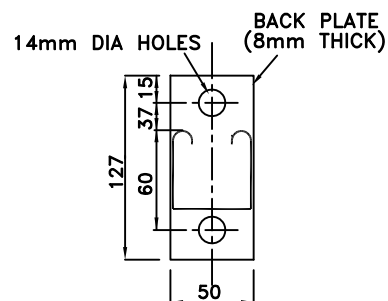


TYPICAL ASSEMBLY OF CHANNEL  
SUPPORTS AND CABLE TRAY

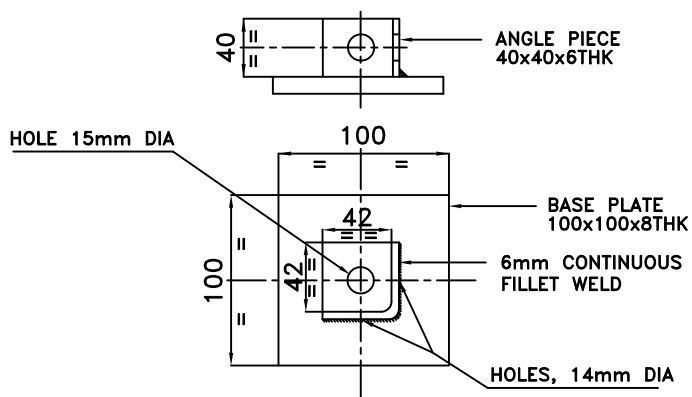


FLOOR SUPPORTED (SINGLE SIDE TYPE)

SEE GENERAL NOTES IN SHEET 15.



END VIEW OF  
(CANTILEVER ARM)



DETAILS OF BASE PLATE  
FOR SINGLE CHANNEL



TITLE:

INSTALLATION DETAILS FOR  
CABLE TRAYS SUPPORT SYSTEM

BHEL DRAWING NO.

Maitree-00-BTW-EDB  
-421507E006-PEM-1



**2X660MW BIPCL MAITREE KHULNA  
STPP (BANGLADESH)  
TECHNICAL SPECIFICATION FOR CABLE  
TRAYS SUPPORT SYSTEM**

SPECIFICATION NO. PE-TS-421-507-E013

SECTION - D

Rev. O

DATE: 10/04/2018

SHEET 1 OF 3

**ANNEXURE-III**

**Type tests on Support System for Cable Trays**

**C1 shall be read as SC1** :- having provision of supporting cable trays on one side

**C2 shall be read as DC1** :- having provision of supporting cable trays on both sides

**Type Test reports shall be furnished for the following**

Type tests on Cable Trays support system

**A) Test 1A:**

On main support channel type-C2 for cantilever arms fixed on one side only. A 3.5 meter length of main support channel shall be fixed vertically at each end to a rigid structure as per the fixing arrangement as shown in the enclosed drawing. Eight (8) nos. 750 mm cantilever arms shall be fixed to the main channel and each arm shall be loaded over the outboard 600 mm with a uniform working load of 100 kg. Subsequently a point load of 100 kg shall be applied on arm 2. A uniform proof load on all the arms equal to twice the working load shall be then be applied. Deflections shall be measured at the points shown in the enclosed drawings and at the following load intervals:

- i) Working load
- ii) Working load + point load
- iii) 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.

**B) Test 1B:**

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

**Test 2: On Main support channel type -C2 for cantilever arms fixed on both Sides**

**a) Test 2A:** A 3.5 m length of main support channel C2 for cantilever arms fixing on both sides shall be fixed at each end to rigid structure as per the fixing arrangement as shown in the enclosed drawing. Six (6), 750 mm cantilever arms shall be attached to each sides and each arm uniformly loaded to a working load of 100 kg over the out board 600 mm. A point load of 100 kg shall than be applied to arm 2, followed by a uniform proof load of twice the working load on all the arms; 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) 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



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**b) Test 2 B:** The test 2 A shall be repeated with the assembly but with an asymmetrical load on the C2 column and point load applied to arm 8. The 100 kg and 200 kg uniformly distributed loads shall be applied to the upper three arms on one side and the lower three arms on the opposite side.

**Test 3 : Tests on Channel Fixed on Beam/Floor**

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

**a) Test 3A :** A length of steel structure shall be rigidly supported. It should be fitted on a meter 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.

**b) Test 3B:** With the components assembled as 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.

**c) Test 3C:** With the components assembled as in Test 3A, a perpendicular point load 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.

**Test 4 : Channel Insert Test**

A 2.5 m length of C1 channel fixed to the concrete wall/ steel structure as per actual site installation conditions. 6 nos. of 750 mm cantilever arms shall be attached to C1 channel as shown in enclosed drawing. Each arm uniformly loaded to a working load of 100 kg over the out board 600 mm. A point load of 100 kg shall then be applied to arm 2, followed by a uniform proof load of twice the working load on all the arms; deflection shall be measured at points shown in the enclosed drawings 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.

**Test 5 : Channel nut slip characteristics (whatever applicable)**

**Tests 5A1,5A2,5A3 :** A length of channel C1 section 200mm long shall have fitted bracket with the two bolt fixing as shown in drawing enclosed. With loads applied at the position shown in drawing enclosed nut slip shall be determined with bolt torque of 30NM, 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 65NM.

**Tests 5B1,5B2,5B3:** The length of channel C1 section 200 mm long shall have fitted bracket with the one bolt fixing as shown in drawing enclosed. With loads applied at the position shown in drawing, nut slip shall be determined with bolt torques 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 65NM.

**Test 6 Weld Integrity Test**



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

### **Routine/ Acceptance Tests**

#### **7.03.01 Routine Tests**

- a) Routine tests as per specification and applicable standards shall be carried out on all requirements/items covered in the specification.
- b) Physical & dimensional check on all equipments as per approved drawings/standards.
- c) Check/measurement of thickness of paint/zinc coating/nickel-chrome plating as per specification & applicable standard.

#### **7.03.02 Acceptance Test**

- a) Galvanising Tests as per applicable standards
- b) Welding checks
- c) Deflection tests on cable trays:
  - d) One piece each of 2.5m length of cable tray of 300mm & above shall be taken as sample from each offered lot. It shall be supported at both end & loaded with uniform load of 76 kg/meter along the length of cable tray. The maximum deflection at the mid-span of each size shall not exceed 7mm.
- d) Proof load tests on cable tray support system
  - i) Tests on Main Support Channel shall be done if only C1 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.
  - 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 2A of type test. Then test (i) above shall not be done.
  - iii) Nut slip characteristic test (it shall support minimum load of 350kg before nut slips with a bolt torque of 65 NM). This test shall be same as test 5B3 of type test.

The procedure for carrying out tests at "d" above shall be as per details given in Type Tests in specification thereafter Die-Penetration test shall be carried out to check weld integrity.

- e) The above acceptance tests shall be done only on one sample from each offered lot.