


BHEL- ISG, BANGALORE 	Enquiry Specification for Flexible Cable tray Supports for AHP, CHP, LHP and GHP of 2x660MW Maitree Superthermal Power Project	DOCUMENT NUMBER IS-1-15-2004/FCTS2
	Customer : Bangladesh-India Friendship Power Company (Pvt.) Limited (A Joint-Venture Company of NTPC Ltd., India & BPDB, Bangladesh).	




TECHNICAL SPECIFICATION


FOR

FLEXIBLE CABLE TRAY SUPPORTS LOT-2

INSTRUCTIONS TO BIDDER'S:

- Bidders are encouraged to raise technical queries (if any) before bid submission to enable final offer submission with NIL technical deviations. Necessary pre bid clarifications shall be issued by BHEL, if deemed necessary.
- No deviations wrt BHEL's technical specification shall be accepted in bidder's offer.
- Please contact us at rki@bhel.in with copy at mas@bhel.in , in case of any technical clarifications.

Prepared By	Checked by	Approved by
 Rakesh Sonwani	 Rakesh Sonwani	 MA Sangeetha
Deputy Manager	Deputy Manager	DGM


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- ANNEXURE-C : SEAWORTHY PACKAGING DETAILS (53 PAGES)
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- ANNEXURE-H : FRP CABLE TRAY GA DRAWING (6 PAGES)
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SECTION I GENERAL PROJECT INFORMATION

Bangladesh-India Friendship Power Company (Pvt.) Ltd. BIFPCL ("The Employer") is constructing a 2X660MW Coal fired power plant with supercritical steam parameters at Rampal in Bagherhat district of Khulna Division, Bangladesh. The employer has mandated Fichtner GmbH & Co. KG to provide Consulting services and Engineer/Employer's Engineer. BHEL is the EPC contractor for the 2X660MW coal Based Maitree- STPP. The site of Maitree STPP is geographically located at approximately 14Km northeast of Mongla Port and 14Km northwest of Sundarbans.

Basic site information


Highest temperature :27.3 Deg Celsius
 Lowest temperature :12.1 Deg Celsius
 Maximum rainfall :300-350mm
 Maximum Ambient humidity :87%
 Maximum Ambient Pressure :1017.2 mBar
 Average Wind speed :1.7M/ sec

Voltage Levels

400KV and 230KV ,50Hz	Connection Voltage to public grid
18 to 27KV, 50Hz	Generator voltage, depending on manufacturer's standard
11KV \pm 6%, 50Hz	Voltage for motors equal/ bigger than 1500kW and power distribution within the plant
3.3kV \pm 6%, 50 Hz	Voltage for motors equal to/bigger than 160 kW and for power distribution within the Plant
240/415V (+/-) 10%, 50 Hz	standard voltage for power supplies to small electric power consumers and motors below 160 kW lighting and domestic power outlets
240/415V (+/-) 10%, 50 Hz	voltage for power supply of essential electric power consumers - the system shall be operated with ungrounded neutral
220V DC +10%/-15%	voltage for emergency users of electricity, like turbine emergency oil pumps, circuit breaker control, inverters
240/415 V \pm 10%, 50 Hz	uninterrupted voltage supplies to consumers, which require uninterrupted infeed like DDCMIS components, control actuators, burner control panels, VDUs.
24 V DC \pm 15%	for power supplies to the DDCMIS system components
24 V \pm 10%, 50 Hz	for erection work in enclosed plant items of metal

Fault Current of 415V system : - 50 kA for 1 sec.

Fault current of DC system limited up to(max) :- 25kA for 1 Sec.

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SECTION II APPLICABLE STANDARDS

The cable tray support system shall conform to the latest Indian Electricity Rules as regards safety, earthing and other essential provision specified therein for installation and operation of electrical plant and equipment.

All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions as on date of opening of bid. In case of conflict between this specification and those (IS codes, standards, etc.) referred to herein, the former shall prevail. The tray support system and hardware shall be manufactured and tested in accordance with following Standards as applicable

IS:1079-2009	Hot Rolled carbon steel sheet & strips
IS:2629-1985(R2006)	Recommended practice for hot dip galvanizing of iron & steel
IS:2633-1986(R2006)	Method for testing uniformity of coating on zinc coated articles.
IS:6745-1972(R2016)	Method for determination of mass of zinc coating on zinc coated iron and steel articles
IS:2062-2011	Hot Rolled Medium and Tensile Structural Steel
IS:4759-1996(R2006)	Hot Dip Coatings on Structural Steel and Other allied products
IS:1852-1985(R2003)	Rolling and cutting tolerance for Hot- Rolled Steel products
IS:1573-1986(R2006)	Specification for Electroplated Coatings of Zinc on Iron and Steel
IS:8500-1991(R1995)	Structural Steel-Micro alloyed (Medium and High Strength Qualities)
IS:513	Cold Reduced low carbon steel sheet and strip
IS:1367	Technical Supply Conditions for Threaded Steel Fasteners
IS:3203-1982(R2014)	Methods of testing local thickness of electroplated coatings &
Indian Electricity Rules	
IS:1852	Rolling and cutting tolerances for hot rolled steel products

This above list is not exhaustive. Standards not listed above but are applicable also to be followed to meet requirement.

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SECTION III SCOPE OF WORK

DESCRIPTION

This specification defines the requirement of design, manufacture, testing at work shop and supply of C1 channel, cantilever arm, clamps along with its accessories. The main support channel and cantilever arms shall be fabricated out of minimum 2.5 thick rolled steel sheet conforming to IS.

SCOPE OF WORK

Supply of C1 channel, Cantilever Arm, Clamps along with its accessories as per the BOQ issued with respective tender. Suggestive list of items is as follows: -

NOTE:

1. GALVANIZATION (FOR FLEXIBLE CABLE TRAY SUPPORTS) TO BE CARRIED OUT AT NTPC APPROVED SOURCES ONLY AS PER ANNEXURE-A.
2. RAW MATERIALS (FOR FLEXIBLE CABLE TRAY SUPPORTS): - HOT/COLD ROLLED STEEL SHALL BE PROCURED FROM SAIL/ TISCO / RINL/BHUSAN/ JINDAL ISPAT / JINDAL STEEL/ ESSAR/LLOYDS/AUTHORISED SAIL RE-ROLLERS.
3. GI CONDUITS SHALL BE PROCURED FROM SOURCES HAVING BIS LICENSE / ISI MARKED WITH VALID CML NO.
4. VARIATION IN QTY SHALL BE AS PER NIT TERMS.

CABLE TRAY DESCRIPTION:

ALL THE HARDWARE & ACCESSORIES SHALL BE SUITABLE TO SUPPORT CABLE TRAYS STANDARD WIDTH OF 50MM/100MM/150 MM/300 MM/ 600 MM, STANDARD LENGTHS OF 2.5 / 3 METER AND STANDARD COLLAR HEIGHT OF 50MM/ 100MM.

CABLE TRAYS OF SHEET WIDTH 2MM(FOR GI TRAYS) AND 4MM(FOR FRP TRAYS) ARE BEING SUPPLIED.


BILL OF QUANTITY:

The bidder to quote for items as per 'BOQ-cum-Price Schedule' attached with NIT.

NOTE :-


Bidder to procure cable gland from either of the following NTPC approved vendors:-
Sunil & Co/Arup Engg/Comet/Quality Precision/Standard Metal Industries/Braco/Metal Craft Industries.

Reference approved datasheet of Metal Craft Industries MODEL-MCW01S (UN) suitable for 12-16.5mm OD is attached for reference. Similar cable gland shall be offered by vendor, matching the approved datasheet.

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SECTION IV TECHNICAL SPECIFICATION

- 4.1 Support Cable tray support system shall be pre-fabricated out of single sheet similar or equivalent to "Unistrut make".
- 4.2 Support system for cable trays shall essentially comprise of the two components i.e main support channel and cantilever arms. The main support channel shall be of type: C1:- having provision of supporting cable trays on one side .The support system shall be the type described hereunder.
- 4.3 Cable supporting steel work for cable racks/cables shall comprise of various channel sections, cantilever arms, various brackets, clamps, floor plates, all hardware such as lock washers, hexagon nuts, hexagon head bolt, support hooks, stud nuts, hexagon head screw, channel nut, channel nut with springs, fixing studs, etc.
- 4.4 The system shall be designed such that it allows easy assembly at site by using bolting. All cable supporting steel work, hardware fittings and accessories shall be prefabricated factory galvanised.
- 4.5 The main support and cantilever arms shall be fixed at site using necessary brackets, clamps, fittings, bolts, nuts and other hardware etc. to form various arrangements required to support the cable trays. Welding of the components shall not be allowed. However, welding of the bracket (to which the main support channel is bolted) to the overhead beams, structural steel, insert plates or reinforcement bars will be permitted. Any cutting or welding of the galvanised surface shall be brushed and red lead primer, oil primer & aluminium paint shall be applied.
- 4.6 All steel components, accessories, fittings and hardware shall be hot dip galvanised after completing welding, cutting, drilling and other machining operation.
- 4.7 The typical arrangement of flexible support system is shown in the enclosed drawings and described briefly below: The main support channel and cantilever arms shall be fabricated out of minimum 2.5 thick rolled steel sheet conforming to IS.
- 4.8 Cantilever arms shall be as shown in the enclosed drawing. The arm portion shall be suitable for assembling the complete arm assembly on to component constructed of standard channel section. The back plate shall allow sufficient clearance for fixing bolt to be tightened with tray in position.
- 4.9 The size of structural steel members or thickness of sheet steel of main support channel and cantilever arms and other accessories as indicated above or in the enclosed drawings are indicative only. The support system shall be designed by the bidder to fully meet the requirements of type tests as specified. In case the system fails in the tests, the components design modification shall be done by the Bidder without any additional cost to the Customer.
- 4.10 Galvanising of steel components and accessories shall conform to IS:2629, IS:2633, IS-6745 & IS 4759. Additionally, galvanising shall be uniform, clean smooth, continuous and free from acid spots. The amount of zinc deposit over threaded portion of bolts, nuts, screws and washers shall be as per IS:1367. The removal of extra zinc on threaded portion of components shall be carefully done to ensure that the threads shall have the

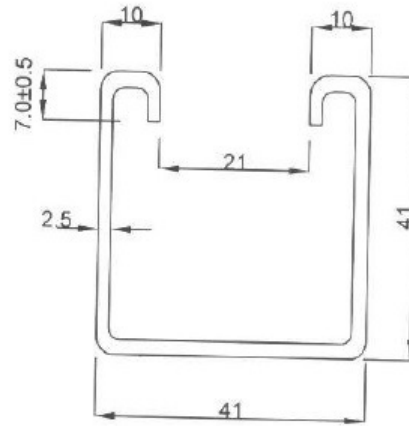
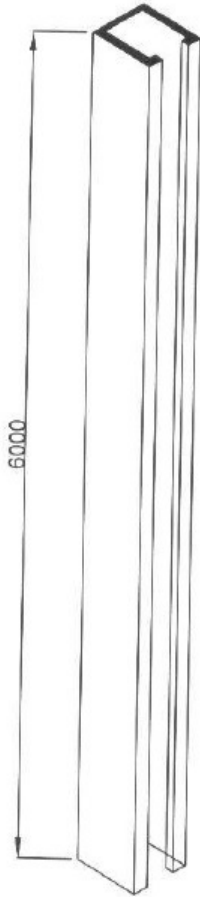
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required zinc coating on them as specified. However, nuts and bolts of size lesser than M12 can be electro galvanized / electro plated.

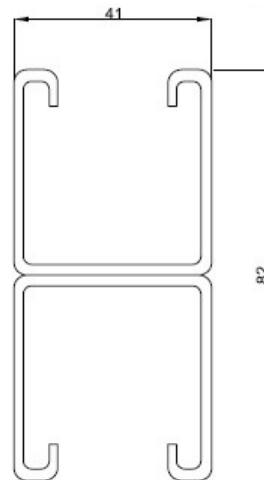
- 4.11 Pretreatment of Cable tray support system shall be carried out in seven tank process as per IS-2629. All the process parameters eg Concentration, temperature, density etc to be maintained and recorded by galvanizer.
- 4.12 The process of pretreatment shall be verified by BHEL/ Customer on surveillance basis during inspection of Galvanized Flexible cable tray support system.
- 4.13 The welding shall be carried out in accordance with IS: 9595. All welding procedures and welder's qualification shall also be followed strictly in line with IS:9595.3.01.04
- 4.14 Galvanized stud type M10 anchor bolts of proven/ reputed make to be supplied. Length of the offered anchor to be min 80mm. Anchor bolt shall be suitable for fixing 8mm/6mm thickness plates to concrete. Bidder to submit catalogue/DS/GA of anchor bolt for BHEL's approval. Bidder shall also submit 2no samples of Anchor bolts to Bangalore office for review & acceptance by BHEL.
- 4.15 Flexible cable tray supports shall be Hot Dipped Galvanized with a minimum zinc deposit 610gm / m² (coating thickness not less than 75microns and coating average thickness not less than 86microns)
- 4.16 The Owner reserves the right to measure the thickness of zinc deposit by Elcometer or any other instrument and reject any component during inspection, which shows thickness of zinc at any location to be less than the specified parameters.
- 4.17 Cable tray supports shall be suitable for fixing GI & FRP cable trays. Pl refer ANNEXURE-G & H for cable trays GA drgs.
- 4.18 M8 spring nut and bolt in BOQ SI no-6 shall be used for fixing GI perforated trays to C1/C2 channel.
- 4.19 Tray fixing clamp Type-1 in BOQ SI no 4.8 shall be used for fixing GI ladder trays and to C1/C2 channel and BOQ SI no 4.9 shall be used for fixing FRP ladder trays and to C1/C2 channel
- 4.20 C1/C2 CHANNEL SHALL BE SUPPLIED IN LENGTHS OF 10-12MTRS.
- 4.21 Bidder to refer ANNEXURE- A to H in addition to this technical specification for complete scope/technical requirements.
- 4.22 GA/DS/Catalogue of all the BOQ items shall be submitted for BHEL/BIFPCL approval
- 4.23 DATASHEET FOR FLEXIBLE PVC COATED GI CONDUIT is enclosed in ANNEXURE-F for 20mm conduit. Bidder to refer this datasheet for 25mm & 50mm conduit specification.
- 4.24 GA of Flexible Support system is shown in the following drawings.

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DRG NO-1 C1 / C2 CHANNEL



SINGLE CHANNEL [C1]




DOUBLE CHANNEL C2

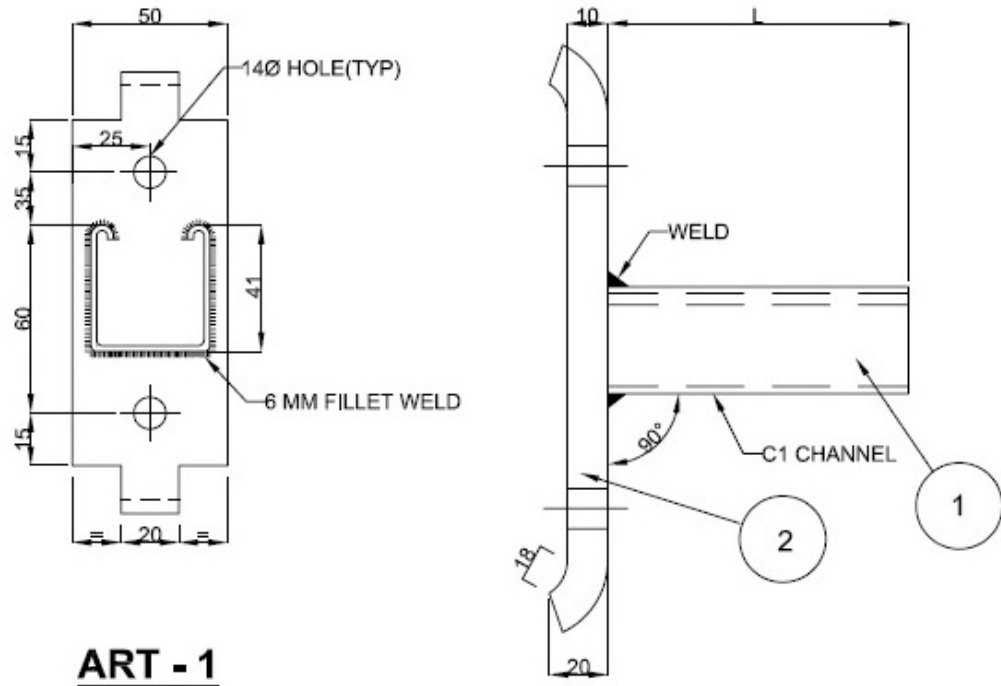
NOTE :

1. ALL DIMENSIONS ARE IN MM.
2. MATERIAL : 2.5MM THICK MS SHEET AS PER IS:513/IS:1079 GR.'O'.
3. SHEET STEEL THICKNESS - 2.5 MM.
4. FINISH : HOT DIP GALVANISED AS PER IS:2629/2633
5. TOLERANCE ON THICKNESS AS PER IS:1852.
6. PROFILE TOLERANCE ± 0.5 MM.
7. ZINC COATING THICKNESS - 85 MICRONS (610 GM/SQ.MTR.)

TWO LENGTHS OF SINGLE CHANNEL SPOT
WELDED BACK TO BACK AT 75MM C/C

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DRG NO-2 CANTILEVER ARM (ART-1)



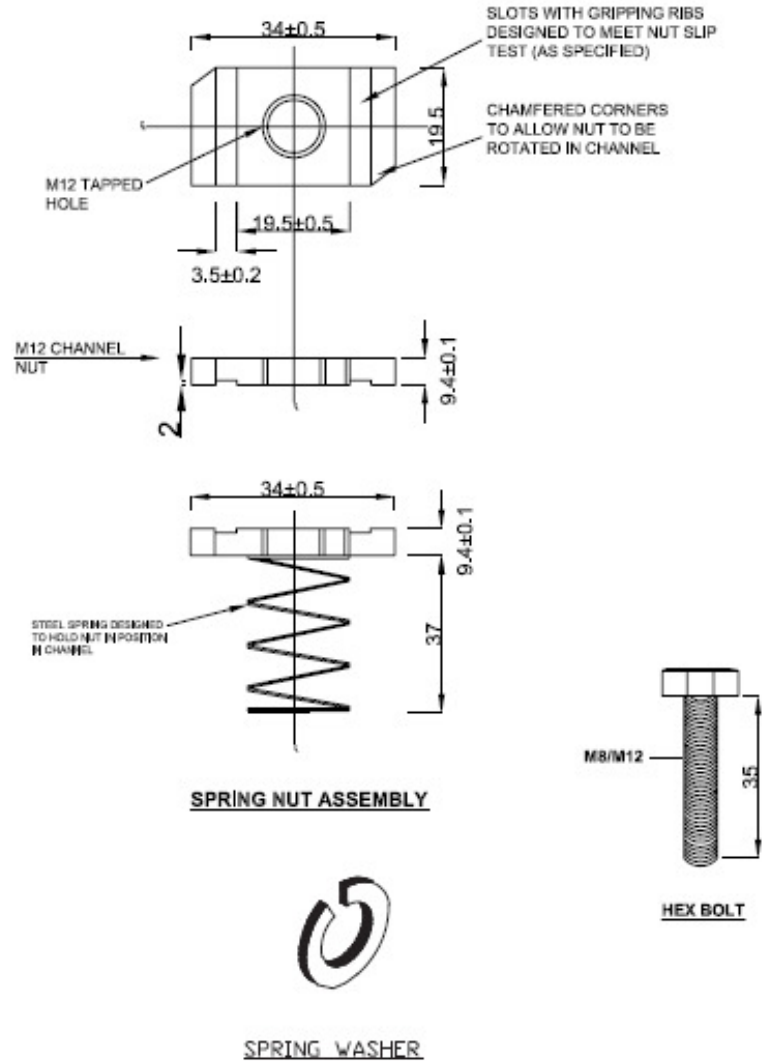
ART - 1

NOTE :

1. ALL DIMENSIONS ARE IN MM.
2. PROFILE TOLERANCE ± 0.5 MM.
3. ITEM NO. 1 - MATERIAL 2.5MM THICKNESS AS PER IS 513/IS 1079 GR 'O'
4. ITEM NO. 2 - MATERIAL 10 MM THICKNESS MILD STEEL AS PER IS:2062,
5. FINISH : HOT DIP GALVANISED AS PER IS:2629/2633
6. TOLERANCE ON THICKNESS AS PER IS:1852
7. ZINC COATING 86 MICRONS (610 GM/SQ.M.)

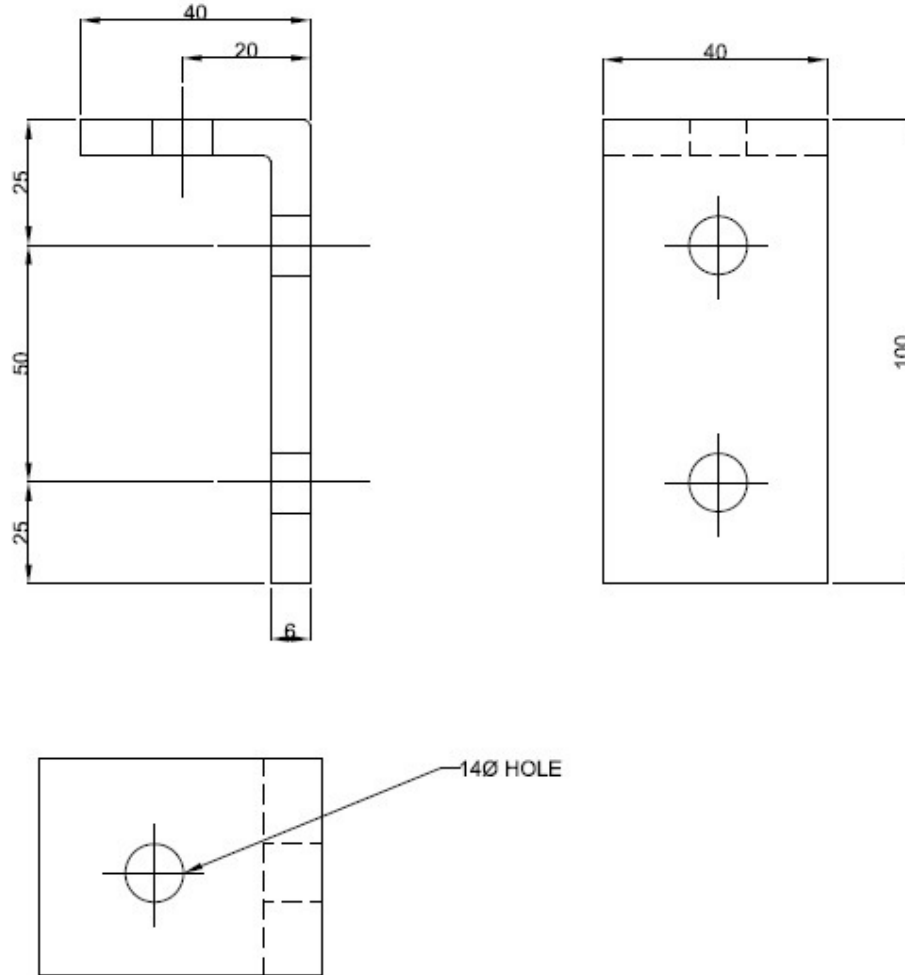


DRG NO-3 TYPICAL DETAILS OF FIXING ACCESSORIES



NOTE :

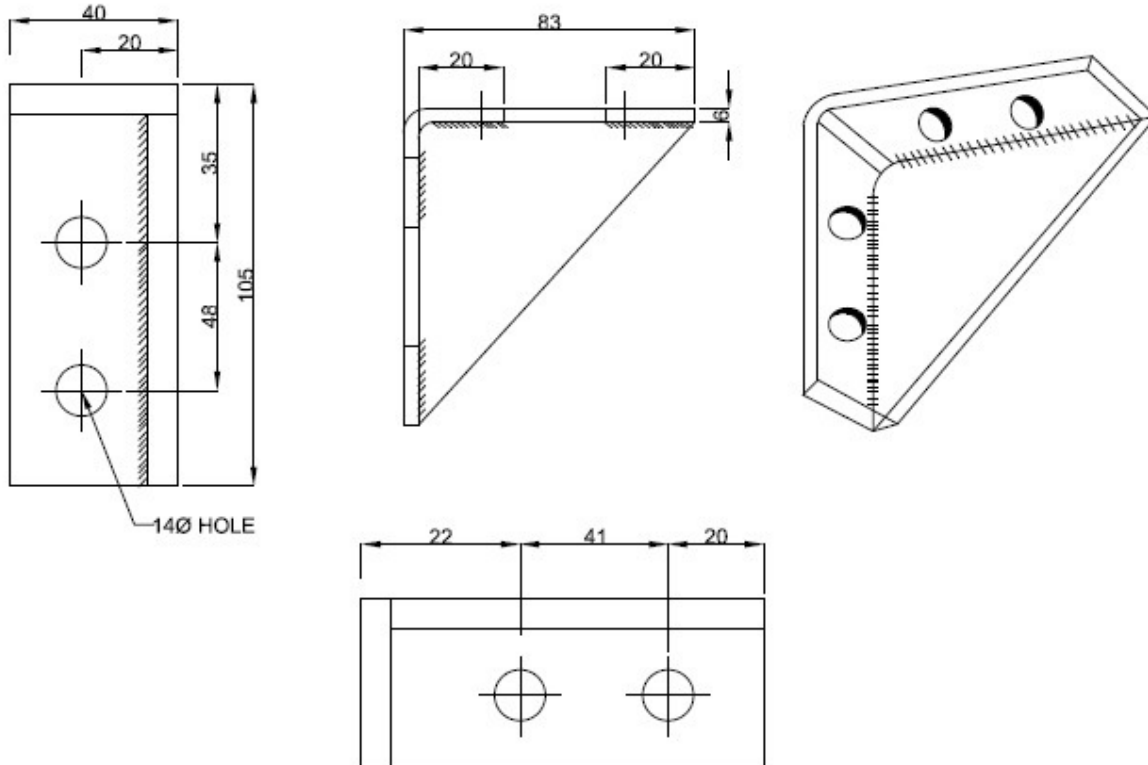
1. ALL DIMENSIONS ARE IN MM.
2. M8CHANNEL NUT DIMENSIONALLY SIMILAR TO M12.
EXCEPT HOLE DRILLED AND TAPPED TO M8 HEX HEAD SCREWS.
3. FINISH : ELECTROGALVANIZED / CADMIUM PLATED - MICRONS 20 MIN.


DRG NO-4 BRACKET RIGHT ANGLE

B1-BRACKET
NOTE :

1. ALL DIMENSIONS ARE IN MM.
2. PROFILE TOLERANCE ± 0.5 MM.
3. MATERIAL 6MM THICK MILD STEEL AS PER IS:2062.
4. FINISH : HOT DIP GALVANISED AS PER IS:2629/2633
5. TOLERANCE ON THICKNESS AS PER IS:1852
6. ZINC COATING 86 MICRONS (610 GM/SQ.M.) AS PER IS:4759




DRG NO-5 BRACKET RIGHT ANGLE HEAVY DUTY



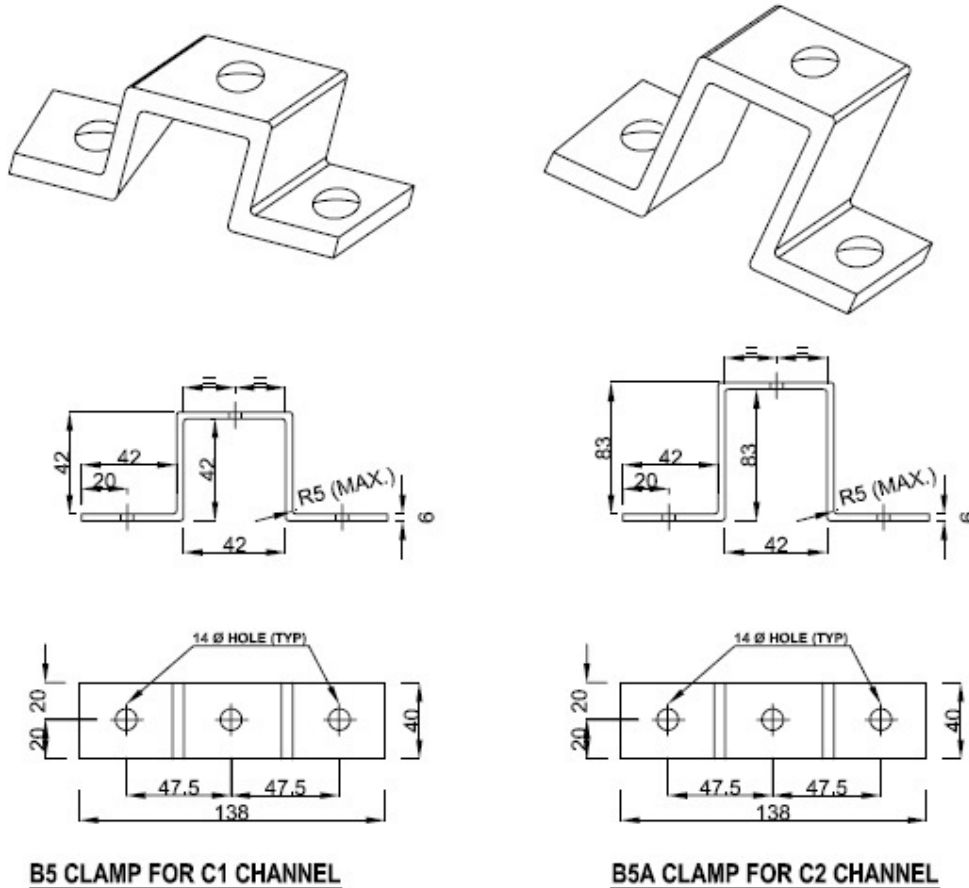
B2-BRACKET

NOTE :

1. ALL DIMENSIONS ARE IN MM.
2. PROFILE TOLERANCE ± 0.5 MM.
3. MATERIAL 6MM THICK MILD STEEL AS PER IS:2062.
4. FINISH : HOT DIP GALVANISED AS PER IS:2629/2633
5. TOLERANCE ON THICKNESS AS PER IS:1852
6. ZINC COATING 86 MICRONS (610 GM/SQ.M.) AS PER IS:4759


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DRG NO -6 C1 /C2 CHANNEL FIXING CLAMP

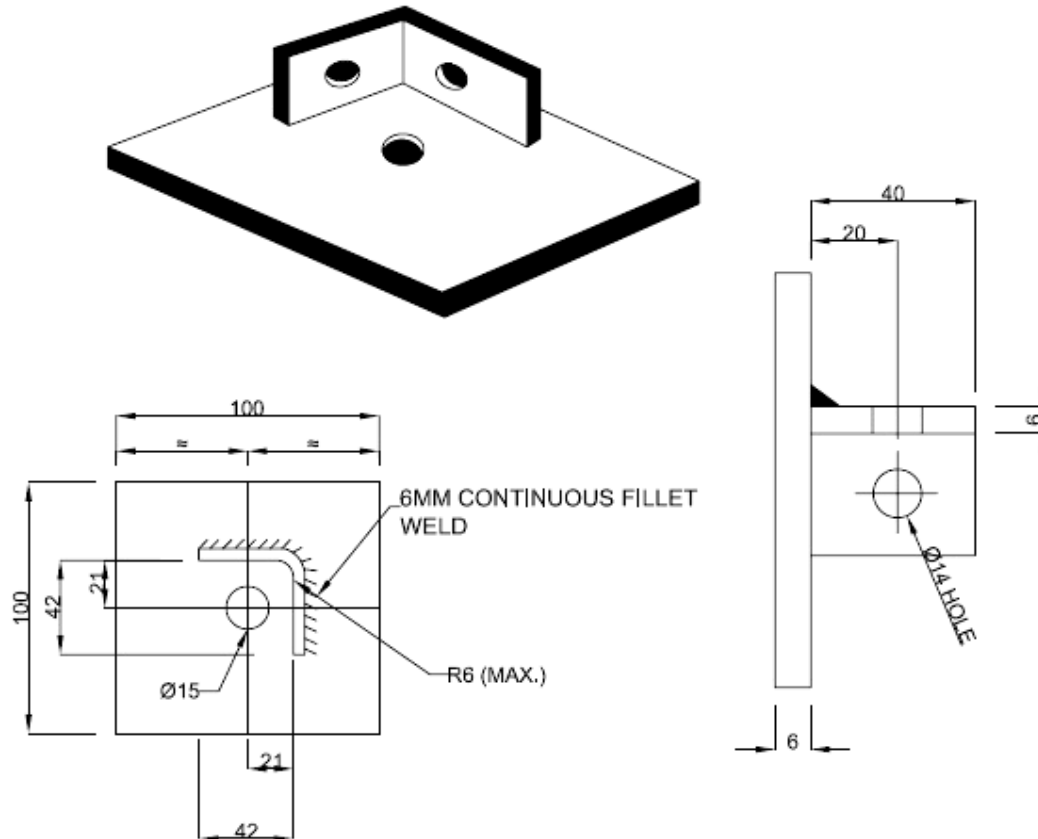


NOTE :

1. ALL DIMENSIONS ARE IN MM.
2. PROFILE TOLERANCE ± 0.5 MM.
3. MATERIAL 6MM THICK MILD STEEL AS PER IS:2062.
4. FINISH : HOT DIP GALVANISED AS PER IS:2629/2633
5. TOLERANCE ON THICKNESS AS PER IS:1852
6. ZINC COATING 86 MICRONS (610 GM/SQ.M.) AS PER IS:4759

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DRG NO-7 BRACKET FLOOR PLATE LIGHT DUTY FOR C1 CHANNEL



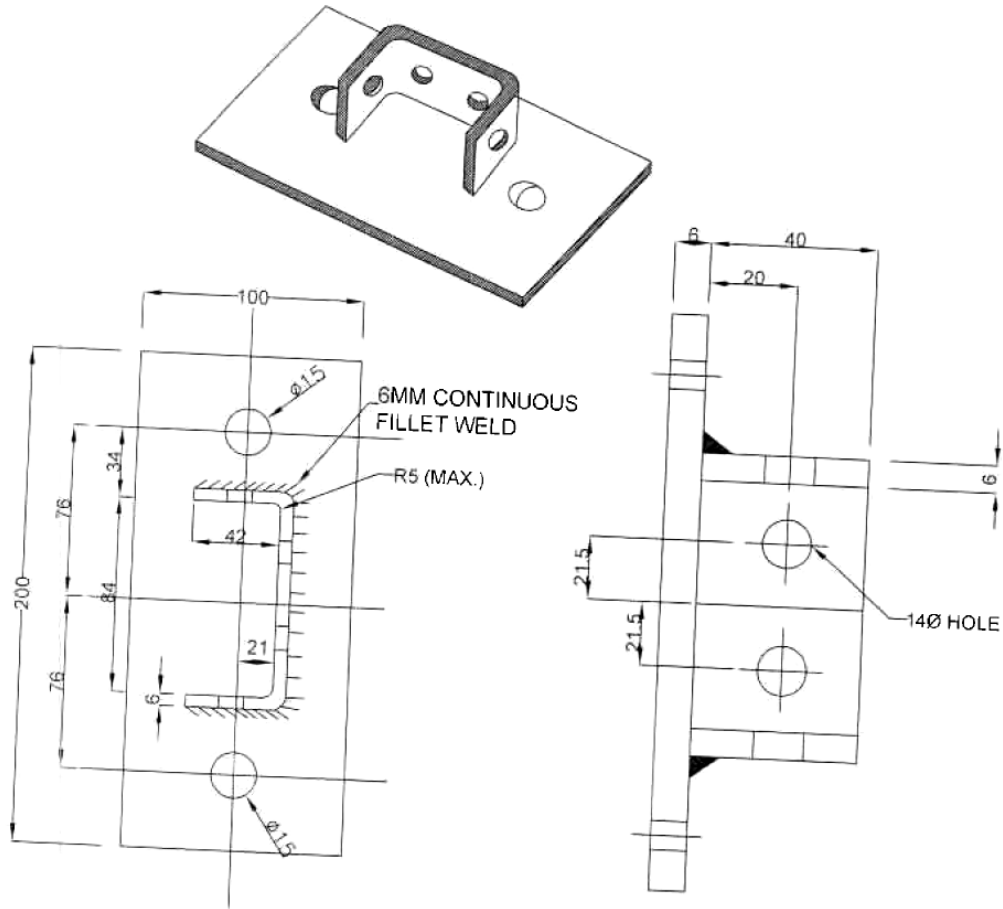
BRACKET FLOOR PLATE LIGHT DUTY - B6 (BASE PLATE FOR SINGLE CHANNEL)

NOTE :

1. ALL DIMENSIONS ARE IN MM.
2. PROFILE TOLERANCE ± 0.5 MM.
3. MATERIAL 6MM THICK MILD STEEL AS PER IS:2062.
4. FINISH : HOT DIP GALVANISED AS PER IS:2629/2633
5. TOLERANCE ON THICKNESS AS PER IS:1852
6. ZINC COATING 86 MICRONS (610 GM/SQ.M.) AS PER IS:4759

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DRG NO-8 BRACKET FLOOR PLATE HEAVY DUTY FOR C2 CHANNEL



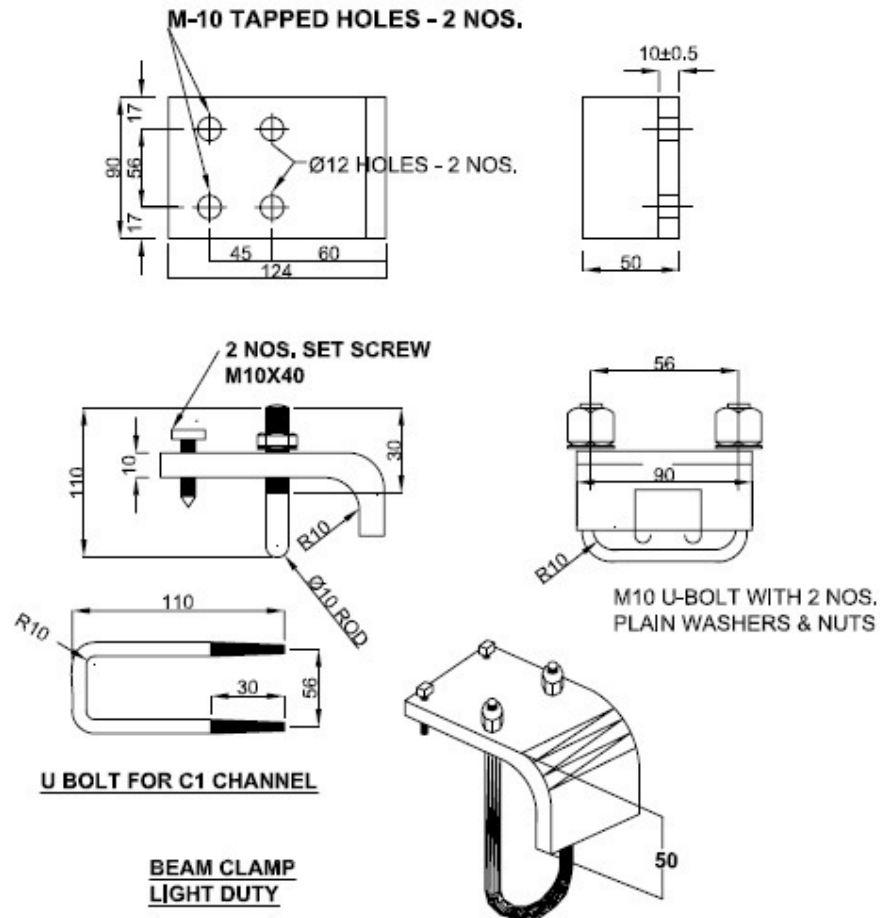
NOTE :

1. ALL DIMENSIONS ARE IN MM.
2. PROFILE TOLERANCE $\pm 0.5\text{MM}$
3. MATERIAL 6MM THICK MILD STEEL AS PER IS:2062.
4. FINISH - HOT DIP GALVANISED AS PER IS:2629/2633
5. TOLERANCE ON THICKNESS AS PER IS:1852
6. ZINC COATING 86 MICRONS (610 GM/SQ.M.) AS PER IS:4759

BRACKET FLOOR PLATE HEAVY DUTY - B7
(BASE PLATE FOR DOUBLE CHANNEL)


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DRG NO-9 TYPICAL DRAWING BEAM CLAMP (B8A) OF C1 CHANNEL

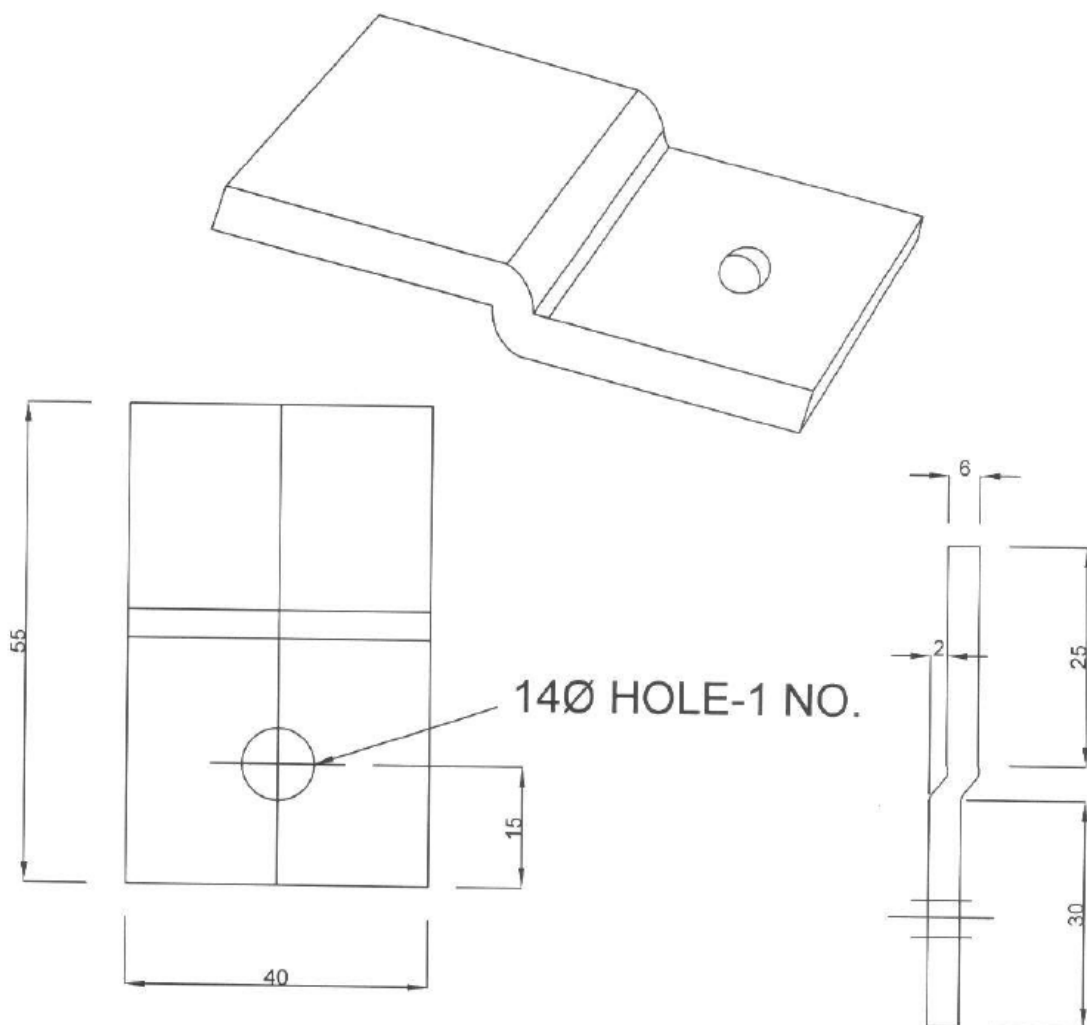


NOTE :

1. ALL DIMENSIONS ARE IN MM.
2. PROFILE TOLERANCE ± 0.5 MM.
3. MATERIAL 10MM THICK MILD STEEL AS PER IS:2062.
4. FINISH : HOT DIP GALVANISED AS PER IS:2629/2633
5. TOLERANCE ON THICKNESS AS PER IS:1852
6. ZINC COATING 86 MICRONS (610 GM/SQ.M.) AS PER IS:4759

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DRG NO-10 TRAY FIXING CLAMP TYPE-1



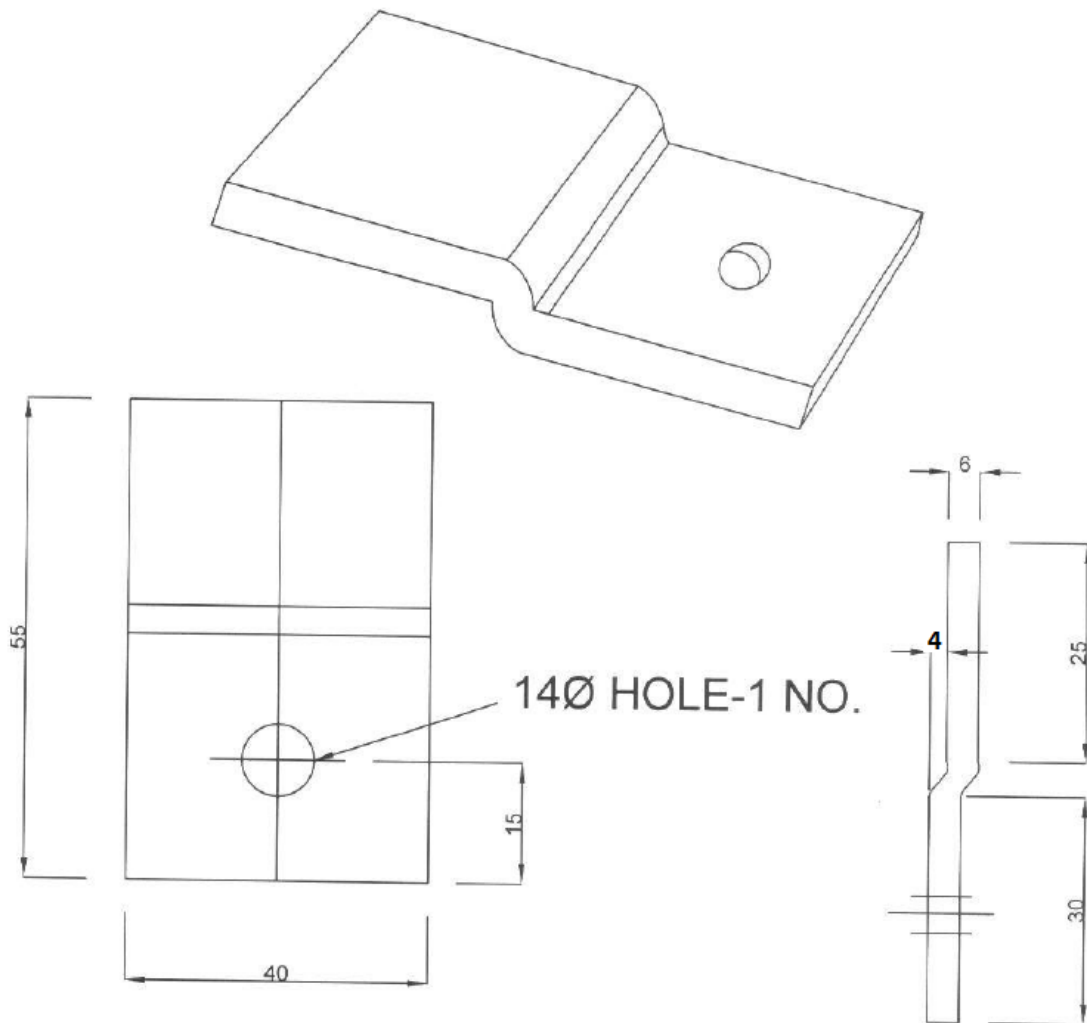
TRAY FIXING CLAMP FOR FIXING LADDER TYPE CABLE TRAY

NOTE :

1. ALL DIMENSIONS ARE IN MM.
2. MATERIAL : M.S AS PER IS:2062 GR.'A'.
3. FINISH : HOT DIP GALVANISED AS PER IS:2629
4. TOLERANCE ON THICKNESS IS AS PER IS:1852
5. ALL FABRICATION TOLERANCES ARE ± 1.0 MM.
6. ZINC COATING - 85 MICRONS (610 GM/SQ.MTR.)

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DRG NO-11 TRAY FIXING CLAMP TYPE-2



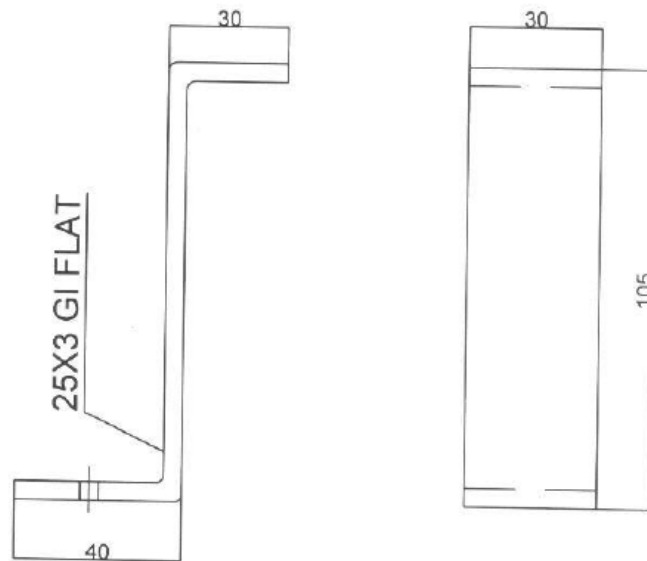
TRAY FIXING CLAMP FOR FIXING LADDER TYPE CABLE TRAY

NOTE :

1. ALL DIMENSIONS ARE IN MM.
2. MATERIAL : M.S AS PER IS:2062 GR.'A'.
3. FINISH : HOT DIP GALVANISED AS PER IS:2629
4. TOLERANCE ON THICKNESS IS AS PER IS:1852
5. ALL FABRICATION TOLERANCES ARE ± 1.0 MM.
6. ZINC COATING - 85 MICRONS (610 GM/SQ.MTR.)

<p>BHEL- ISG, BANGALORE</p> 	<p>Enquiry Specification for Flexible Cable tray Supports for AHP, CHP, LHP and GHP of 2x660MW Maitree Supercritical Power Project</p>	<p>DOCUMENT NUMBER</p>
	<p>Customer : Bangladesh-India Friendship Power Company (Pvt.) Limited (A Joint-Venture Company of NTPC Ltd., India & BPDB, Bangladesh).</p>	<p>IS-1-15-2004/FCTS2</p>


DRG NO-12 TRAY HOLDING CLAMP TYPE-1



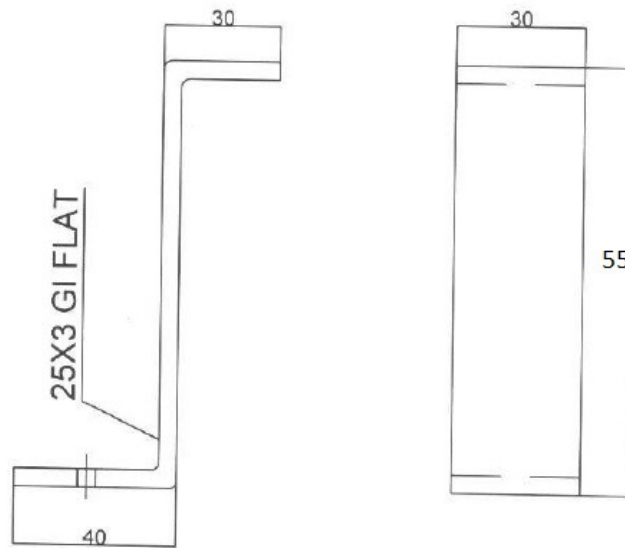
**TRAY HOLDING CLAMP SUITABLE
FOR FIXING CABLE TRAY**

NOTE :

1. ALL DIMENSIONS ARE IN MM.
2. MATERIAL : M.S AS PER IS:2062 GR. 'A'.
3. FINISH : HOT DIP GALVANISED AS PER IS:2629
4. TOLERANCE ON THICKNESS IS AS PER IS:1852
5. ALL FABRICATION TOLERANCES ARE ± 1.0 MM.
6. ZINC COATING - 85 MICRONS (610 GM/SQ/MTR.).

<p>BHEL- ISG, BANGALORE</p> 	<p>Enquiry Specification for Flexible Cable tray Supports for AHP, CHP, LHP and GHP of 2x660MW Maitree Superthermal Power Project</p>	<p>DOCUMENT NUMBER</p>
	<p>Customer : Bangladesh-India Friendship Power Company (Pvt.) Limited (A Joint-Venture Company of NTPC Ltd., India & BPDB, Bangladesh).</p>	<p>IS-1-15-2004/FCTS2</p>


DRG NO-13 TRAY HOLDING CLAMP TYPE-2



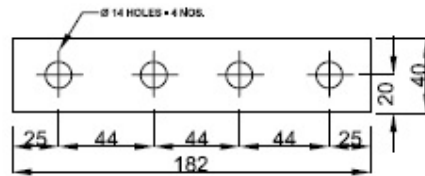
TRAY HOLDING CLAMP SUITABLE FOR FIXING CABLE TRAY

NOTE :

1. ALL DIMENSIONS ARE IN MM.
2. MATERIAL : M.S AS PER IS:2062 GR. 'A'.
3. FINISH : HOT DIP GALVANISED AS PER IS:2629
4. TOLERANCE ON THICKNESS IS AS PER IS:1852
5. ALL FABRICATION TOLERANCES ARE ± 1.0 MM.
6. ZINC COATING - 85 MICRONS (610 GM/SQ/MTR.).

<p>BHEL- ISG, BANGALORE</p> 	<p>Enquiry Specification for Flexible Cable tray Supports for AHP, CHP, LHP and GHP of 2x660MW Maitree Superthermal Power Project</p>	<p>DOCUMENT NUMBER</p>
	<p>Customer : Bangladesh-India Friendship Power Company (Pvt.) Limited (A Joint-Venture Company of NTPC Ltd., India & BPDB, Bangladesh).</p>	<p>IS-1-15-2004/FCTS2</p>


DRG NO-14 FLAT PLATE FITTING



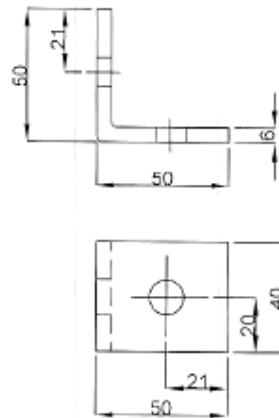
FLAT PLATE STRAIGHT FITTING (6MM THK.) (PF2)

NOTE :

1. ALL DIMENSIONS ARE IN MM.
2. PROFILE TOLERANCE ± 0.5 MM.
3. MATERIAL 6MM THICK MILD STEEL AS PER IS:2062.
4. FINISH : HOT DIP GALVANISED AS PER IS:2629/2633
5. TOLERANCE ON THICKNESS AS PER IS:1852
6. ZINC COATING 86 MICRONS (610 GM/SQ.M.) AS PER IS:4759

BHEL- ISG, BANGALORE 	Enquiry Specification for Flexible Cable tray Supports for AHP, CHP, LHP and GHP of 2x660MW Maitree Supercritical Power Project	DOCUMENT NUMBER IS-1-15-2004/FCTS2
	Customer : Bangladesh-India Friendship Power Company (Pvt.) Limited (A Joint-Venture Company of NTPC Ltd., India & BPDB, Bangladesh).	


DRG NO-15 90° ANGLE FITTING



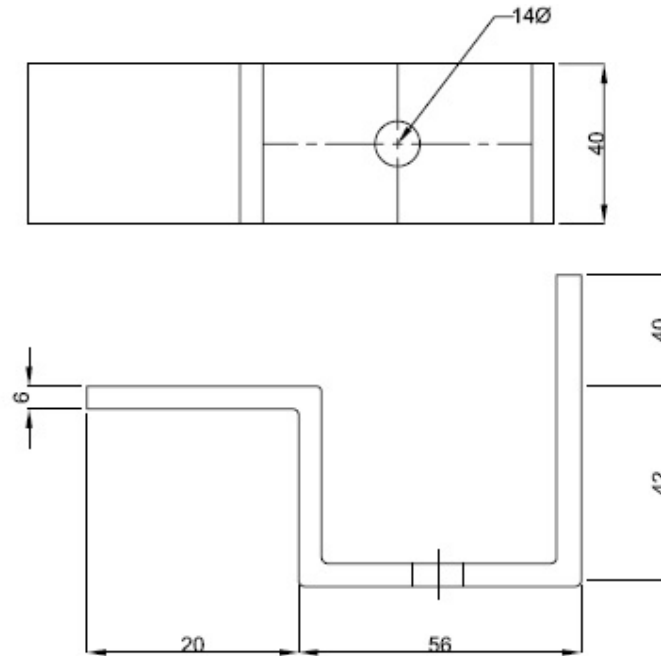
90° ANGLE FITTING LA1

NOTE :

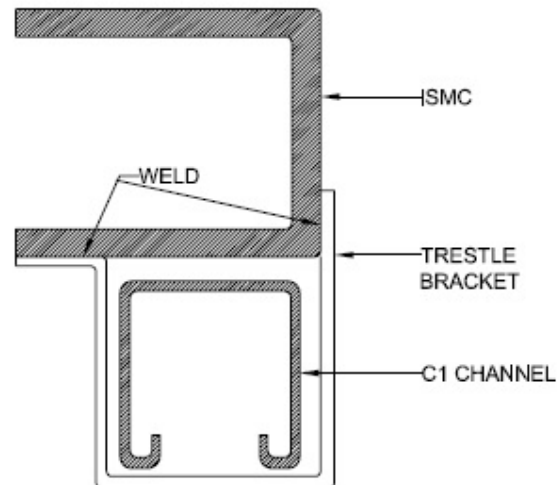
1. ALL DIMENSIONS ARE IN MM.
2. PROFILE TOLERANCE $\pm 0.5\text{MM}$.
3. MATERIAL 6MM THICK MILD STEEL AS PER IS:2062.
4. FINISH : HOT DIP GALVANISED AS PER IS:2629/2633
5. TOLERANCE ON THICKNESS AS PER IS:1852
6. ZINC COATING 86 MICRONS (610 GM/SQ.M.) AS PER IS:4759

BHEL- ISG, BANGALORE 	Enquiry Specification for Flexible Cable tray Supports for AHP, CHP, LHP and GHP of 2x660MW Maitree Superthermal Power Project	DOCUMENT NUMBER IS-1-15-2004/FCTS2
	Customer : Bangladesh-India Friendship Power Company (Pvt.) Limited (A Joint-Venture Company of NTPC Ltd., India & BPDB, Bangladesh).	

DRG NO-16 TRESTLE BRACKET



TRESTLE BRACKET



NOTE :

1. ALL DIMENSIONS ARE IN MM.
2. PROFILE TOLERANCE ± 0.5 MM.
3. MATERIAL 6MM THICK MILD STEEL AS PER IS:2062.
4. FINISH : HOT DIP GALVANISED AS PER IS:2629/2633
5. TOLERANCE ON THICKNESS AS PER IS:1852
6. ZINC COATING 86 MICRONS (610 GM/SQ.M.) AS PER IS:4759

FIXING ARRANGEMENT OF TRESTLE BRACKET

BHEL- ISG, BANGALORE



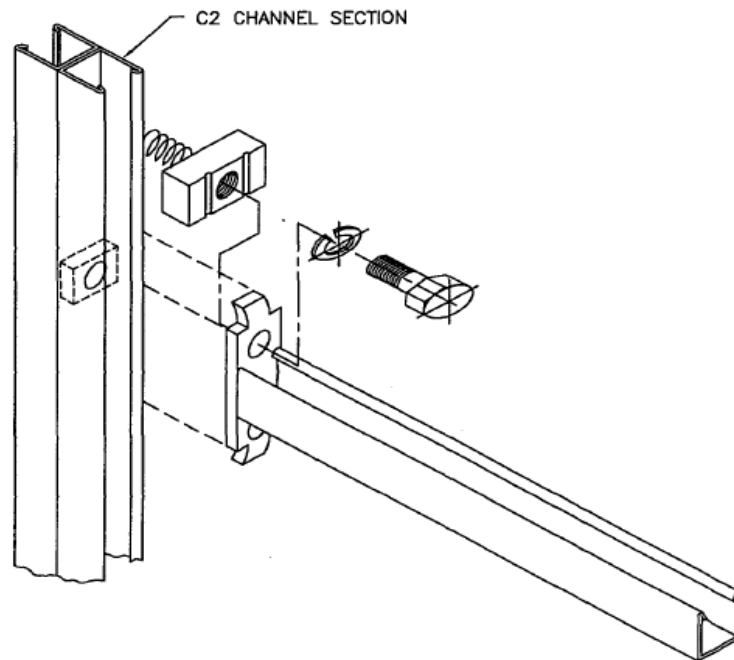
**Enquiry Specification for Flexible Cable tray Supports
for AHP, CHP, LHP and GHP of 2x660MW Maitree
Supercritical Power Project**


DOCUMENT NUMBER

**Customer : Bangladesh-India Friendship Power
Company (Pvt.) Limited
(A Joint-Venture Company of NTPC Ltd., India & BPDB,
Bangladesh).**

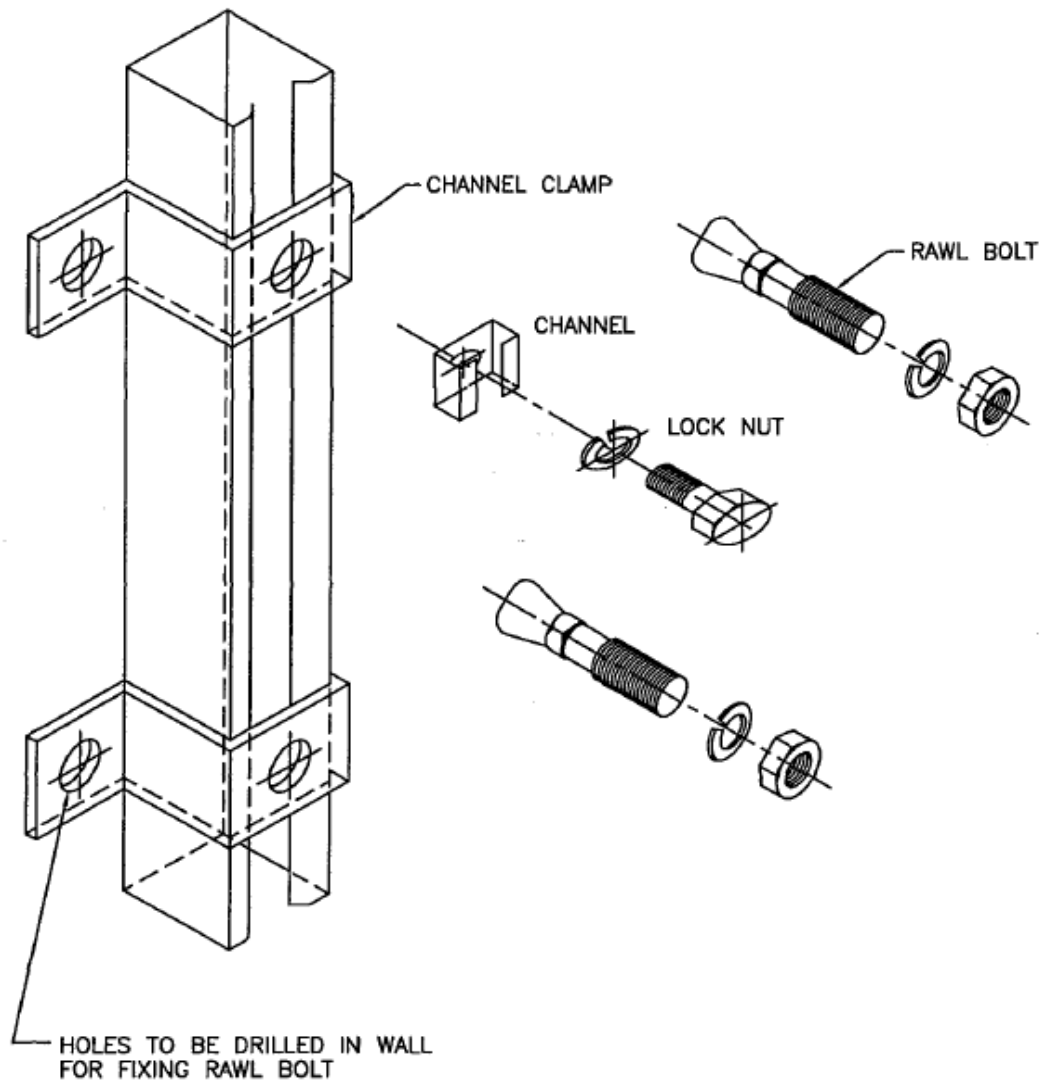
IS-1-15-2004/FCTS2


DRG NO-17 TYPICAL DETAIL OF CABLE TRAY SUPPORT SYSTEM



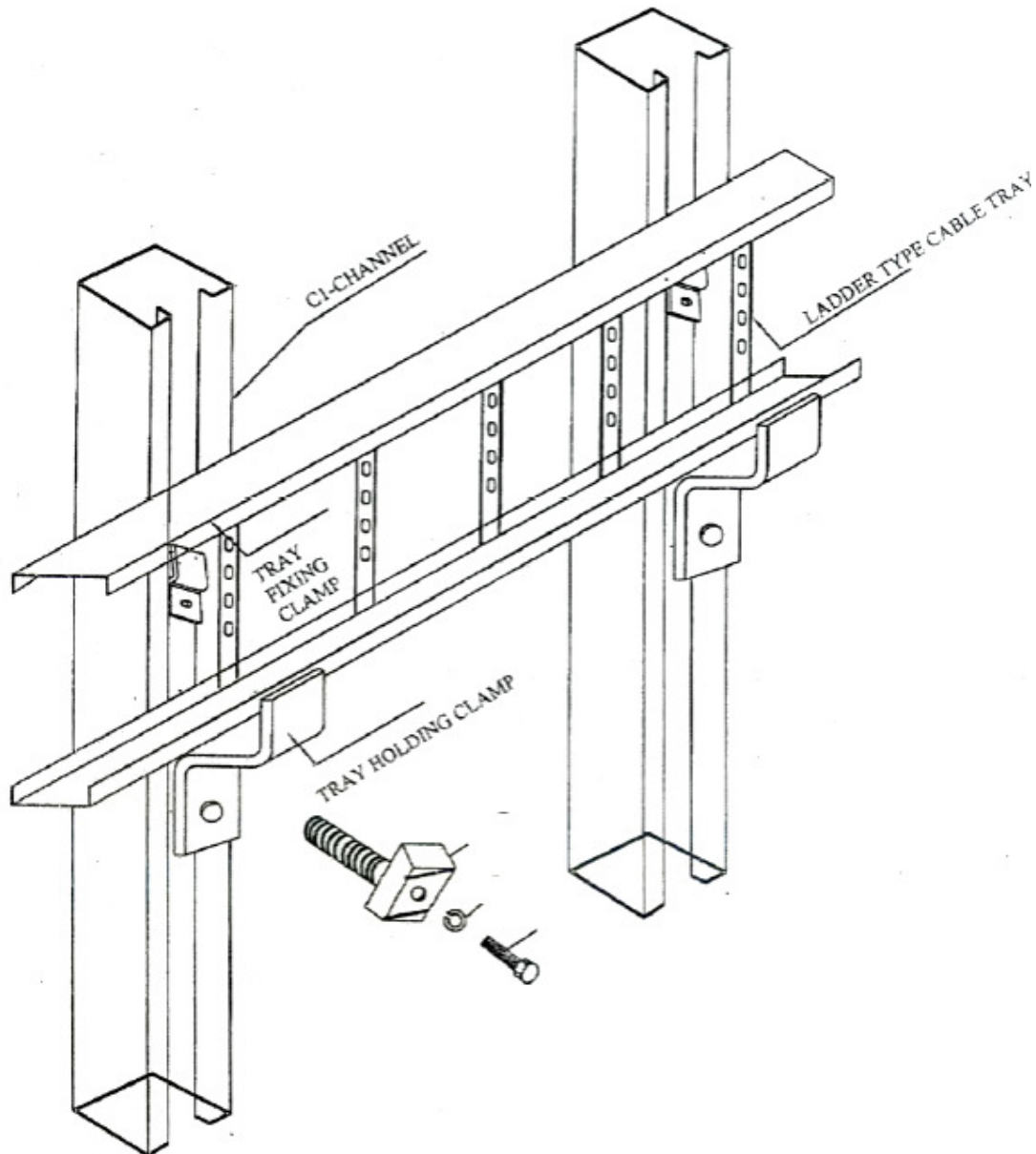
<p>BHEL- ISG, BANGALORE</p> 	<p>Enquiry Specification for Flexible Cable tray Supports for AHP, CHP, LHP and GHP of 2x660MW Maitree Supercritical Power Project</p> <p>Customer : Bangladesh-India Friendship Power Company (Pvt.) Limited (A Joint-Venture Company of NTPC Ltd., India & BPDB, Bangladesh).</p>	<p>DOCUMENT NUMBER</p> <p>IS-1-15-2004/FCTS2</p>
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DRG NO-18 FIXING OF CHANNEL IN TRENCH WALL USING B5 CHANNEL CLAMP



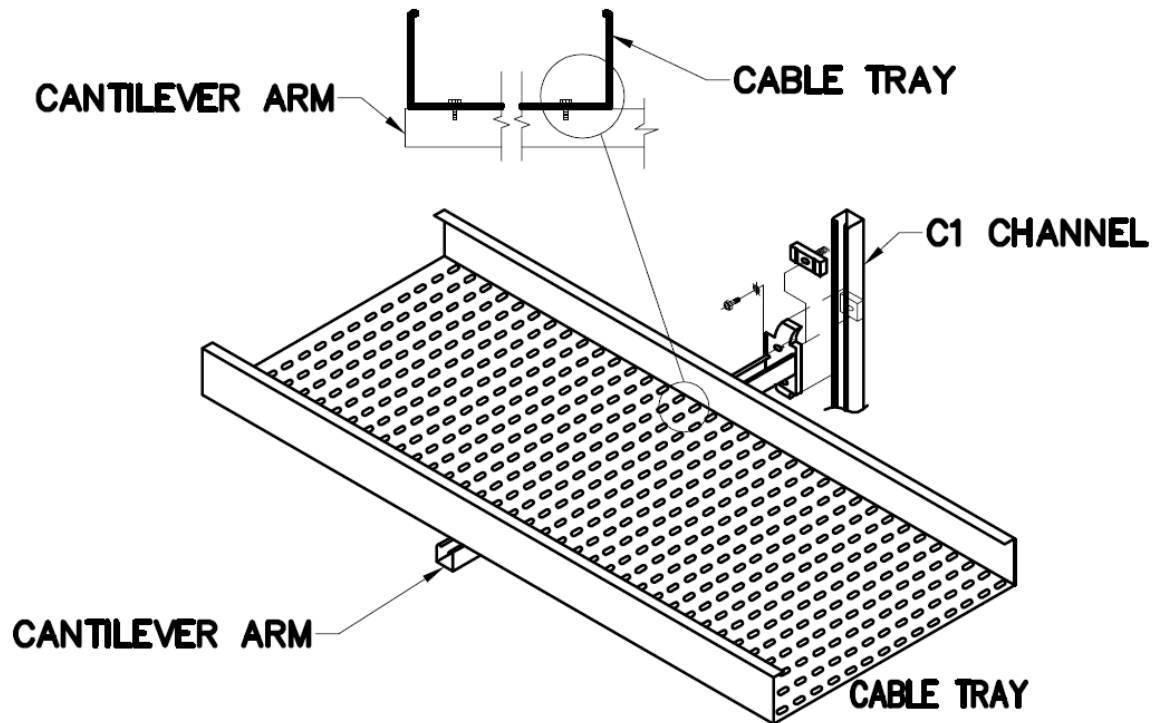
BHEL- ISG, BANGALORE 	Enquiry Specification for Flexible Cable tray Supports for AHP, CHP, LHP and GHP of 2x660MW Maitree Superthermal Power Project Customer : Bangladesh-India Friendship Power Company (Pvt.) Limited (A Joint-Venture Company of NTPC Ltd., India & BPDB, Bangladesh).	DOCUMENT NUMBER IS-1-15-2004/FCTS2
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DRG NO-19 TYPICAL ARRANGEMENT AND FIXING FOR LADDER TRAY



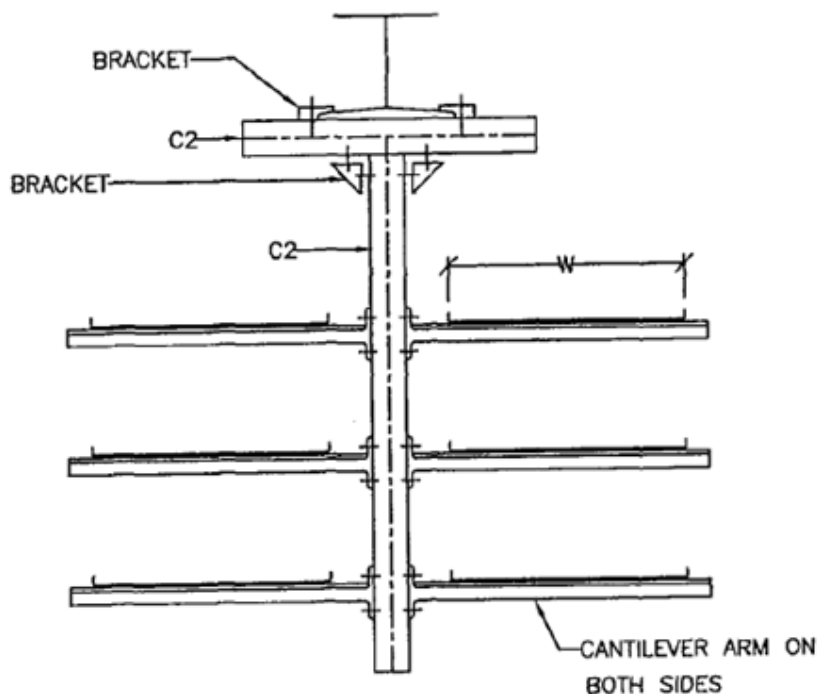



DRG NO-20 TYPICAL ARRANGEMENT AND FIXING FOR PERFORATED TYPE TRAY





DRG NO-21 TYPICAL SCHEME FOR C1/C2 CHANNELS FIXING USING BRACKETS



BHEL- ISG, BANGALORE 	Enquiry Specification for Flexible Cable tray Supports for AHP, CHP, LHP and GHP of 2x660MW Maitree Suprathermal Power Project	DOCUMENT NUMBER
	Customer : Bangladesh-India Friendship Power Company (Pvt.) Limited (A Joint-Venture Company of NTPC Ltd., India & BPDB, Bangladesh).	IS-1-15-2004/FCTS2

SECTION V INSPECTION & TESTING

5.00.00 The Cable Tray supports have to be tested at manufacturers work in presence of BHEL/ BHEL Representative / Customer/ Customer representative as per standard QAP provided with the specification. Bidder to submit MQP in customer provided format provided with the specification and shall be prepared in line with the Standard QAP. Galvanizer's name shall be mentioned in endorsement sheet. Deflection Test on cable trays and Proof Load test on cable trays support system will be as per details given in this technical specification & QAP. The above acceptance tests shall be done only on one sample from each size of offered lot. Make of all items will be subject to End User's approval. Manufacturing Quality Plan approved by BHEL/End User's shall be followed.

5.01.00 TESTS

GENERAL


- a) All equipments to be supplied shall be of type tested design. During detailed engineering, the bidder shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last ten years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.
- b) However, if the bidder is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in case the type test report(s) are not found to be meeting the specification requirements, the bidder shall conduct all such tests under this contract, at no additional cost to the Owner either at third party lab or in presence of client/owners representative and submit the reports for approval.
- c) All acceptance and routine tests as specified below and in relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.

Type Test reports shall be furnished for the following

5.02.00 **Type tests on Cable Trays support system**

Test 1: On main support channel type-C2 for cantilever arms fixed on one side only.

a) **Test 1A:** A 3.5 metre length of main support channel shall be fixed vertically at each end to a rigid structure as per the fixing arrangement as shown in the enclosed drawing. Eight (8) nos. 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:

BHEL- ISG, BANGALORE 	Enquiry Specification for Flexible Cable tray Supports for AHP, CHP, LHP and GHP of 2x660MW Maitree Suprathermal Power Project	DOCUMENT NUMBER
	Customer : Bangladesh-India Friendship Power Company (Pvt.) Limited (A Joint-Venture Company of NTPC Ltd., India & BPDB, Bangladesh).	IS-1-15-2004/FCTS2

- 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

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 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.

BHEL- ISG, BANGALORE 	Enquiry Specification for Flexible Cable tray Supports for AHP, CHP, LHP and GHP of 2x660MW Maitree Supercritical Power Project	DOCUMENT NUMBER
	Customer : Bangladesh-India Friendship Power Company (Pvt.) Limited (A Joint-Venture Company of NTPC Ltd., India & BPDB, Bangladesh).	IS-1-15-2004/FCTS2

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 bolts 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 65 NM.


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 65 NM.

Test 6 Weld Integrity Test

After deflection test as per test 1A, 1B, 2, 3, 4 & 5, weld integrity shall be checked by magnetic particle inspection to detect sub-surface cracks developed, if any

5.03.00 Routine/ Acceptance Tests

5.03.01 Routine Tests

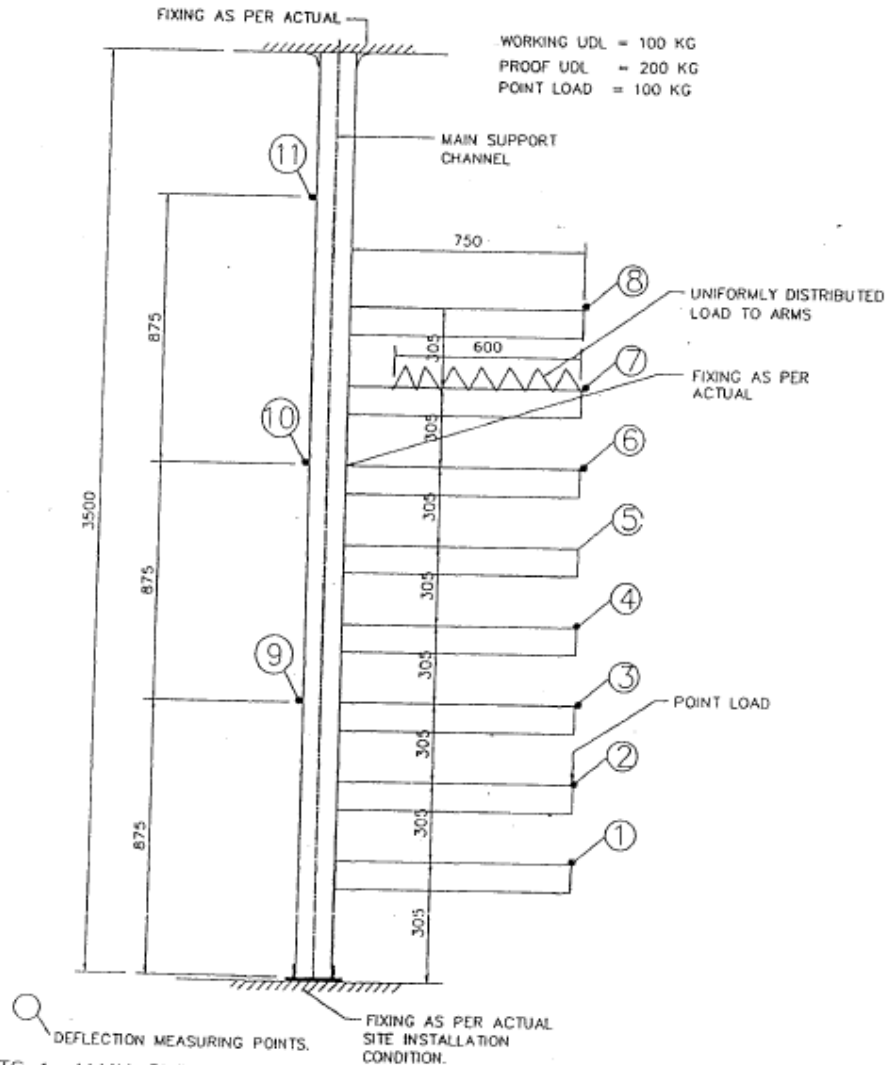
BHEL- ISG, BANGALORE 	Enquiry Specification for Flexible Cable tray Supports for AHP, CHP, LHP and GHP of 2x660MW Maitree Superthermal Power Project Customer : Bangladesh-India Friendship Power Company (Pvt.) Limited (A Joint-Venture Company of NTPC Ltd., India & BPDB, Bangladesh).	DOCUMENT NUMBER IS-1-15-2004/FCTS2
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- a) Routine tests as per specification and applicable standards shall be carried out on all equipments/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.

5.03.02 Acceptance Test

- a) Galvanizing Tests as per applicable standards
- b) Welding checks
- c) Proof load tests on cable tray support system
 - i) Tests on Main Support Channel shall be done if C1 Channel is 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
- d) Deflection tests on cable trays:

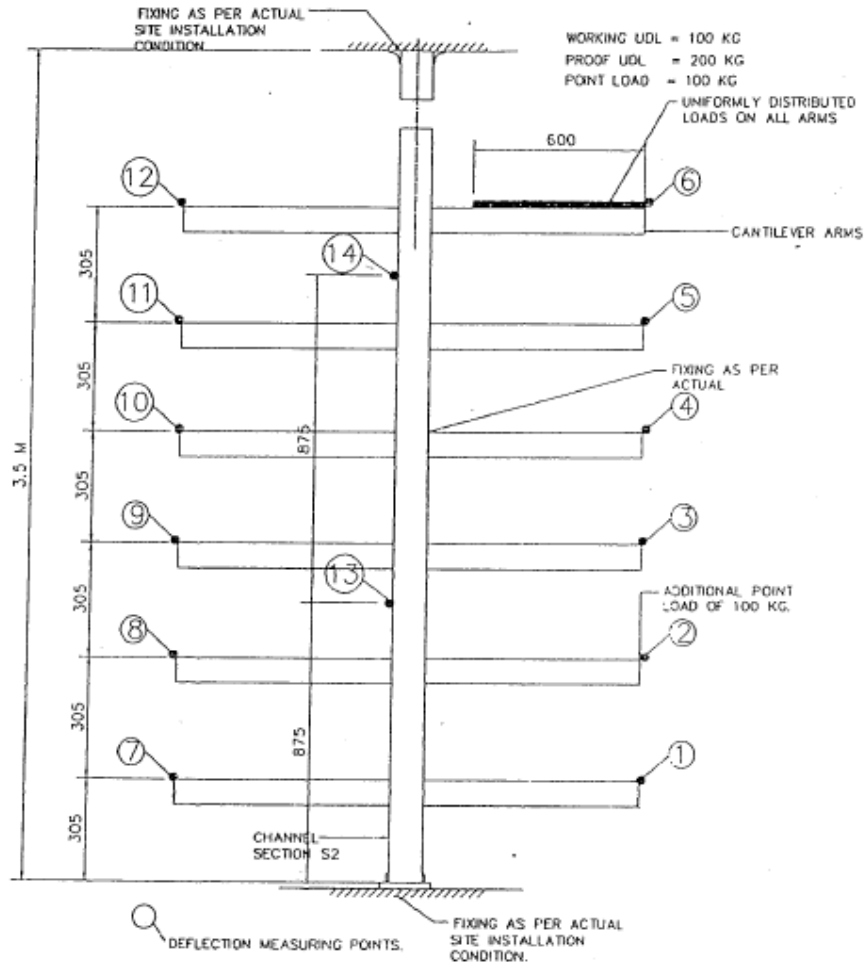
One piece each of 2.5m length of cable tray of 300mm & above shall be taken as sample from each offered lot. It shall be supported at both end & loaded with uniform load of 76 kg/meter along the length of cable tray. The maximum deflection at the mid-span of each size shall not exceed 7mm.
- e) The above acceptance tests shall be done only on one sample from each offered lot.



TESTS 1: MAIN SUPPORT CHANNEL
(CANTILEVER ARMS ON ONE SIDE)

NOTES

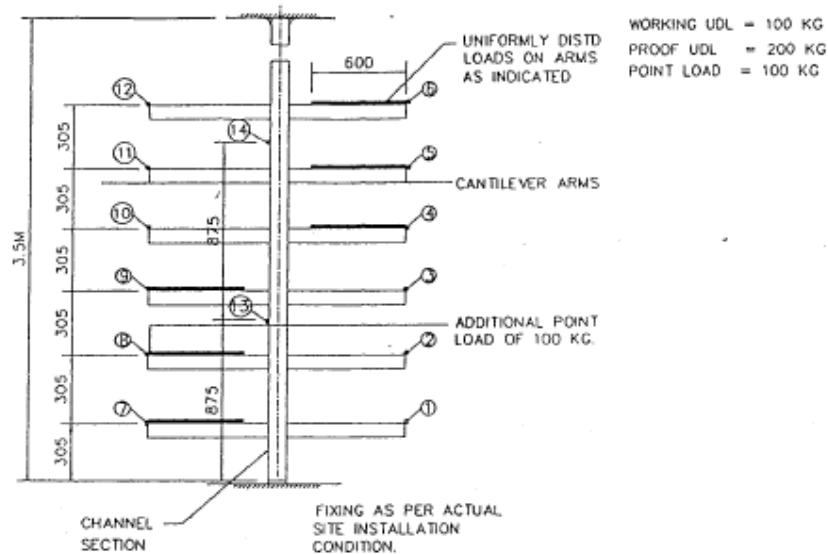
ALL DIMENSIONS ARE IN MM
(SCALE-NTS)



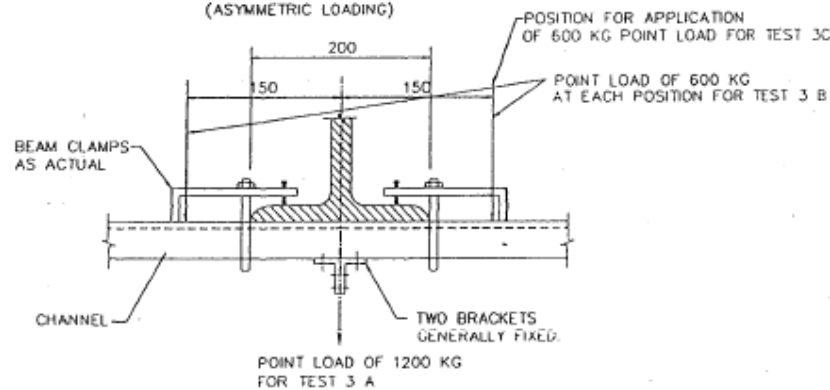
TEST 2A : MAIN SUPPORT CHANNEL
(CANTILEVER ARMS ON BOTH SIDES)

NOTES

ALL DIMENSIONS ARE IN MM
(SCALE-NTS)



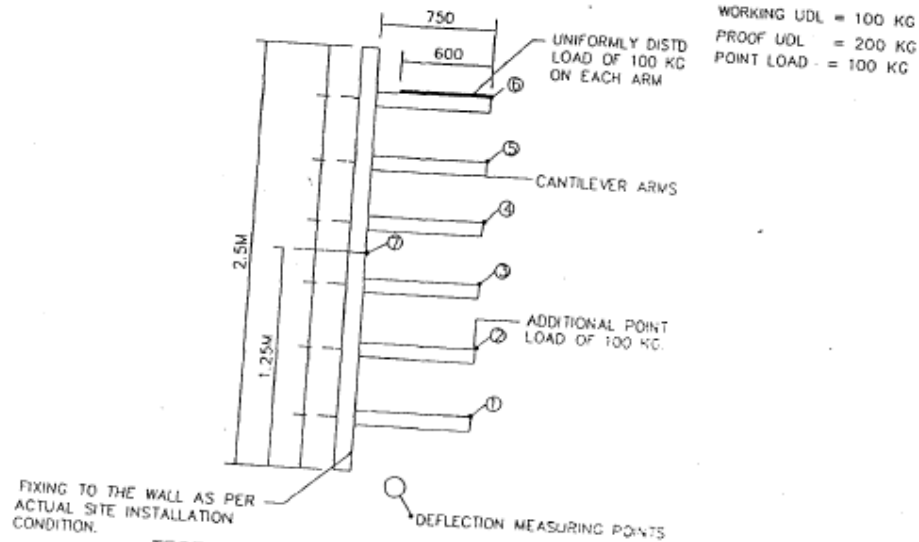
**TEST 2B MAIN SUPPORT CHANNEL
(ASYMMETRIC LOADING)**



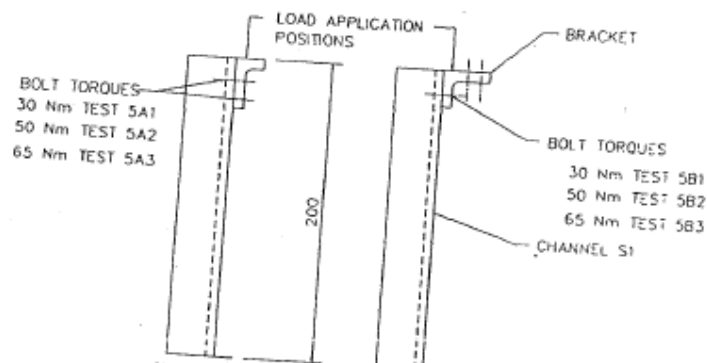
TEST 3A, 3B & 3C

NOTES

1. FIXING SHALL BE AS PER ACTUAL SITE INSTALLATION CONDITION.
2. ALL DIMENSIONS ARE IN MM (SCALE-NTS)



TEST 4 CHANNEL INSERT




TESTS 5A TESTS 5B

ASSEMBLY USING M12 x25 MM LONG
HEX. HD. SCREWS LOCK WASHERS AND
M12 CHANNEL NUT WITH SPRING

TESTS 5A 1,2,3 & 5B 1,2,3 CHANNEL NUT SLIP CHARACTERISTIC.

NOTES

ALL DIMENSIONS ARE IN MM
(SCALE-NTS)

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SECTION VI DOCUMENTATION

The following documentation shall be submitted to BHEL at different stages of the Project. In preparing and submitting the documentation, the requirements given in subsequent clauses shall be strictly adhered to


SL. NO.	TYPE OF DOCUMENTS	STATUS	TIME SCHEDULE
1	Technical Data Sheet of Cable tray supports	For Approval	Within 7 days of LOI/Order
2	DS/GA/Catalogue of Anchor fasteners	For Approval	Within 7 days of LOI/Order
3	GA Drg. of cable tray supports (Boltable type)	For Approval	Within 7 days of LOI/Order
4	Type test procedure including Typical details of type test arrangement	For Approval	Within 7 days of LOI/Order
5	Type test certificates	For Approval	Within 7 days of LOI/Order
6	Quality Plan	For Approval	Within 7 days of LOI/Order
7	BOQ of Nut Bolt, Anchor Fastener etc for lot wise ordered quantity.	For Approval	Within 7 days of LOT clearance

The GA / OGA drawing shall contain the following data for preparation of Layout drawing;

- ◆ Dimensional drawing containing Elevation, section, mounting
- ◆ Weight of the Tray support system
- ◆ Standards
- ◆ BOM
- ◆ Title of the Drawings shall be as per the requirement of customer
- ◆ Weight of the item

Notes:

1. All drawings, documents and catalogues shall be available in soft copy.
2. Soft copy in CD-ROM and reproducible tracings of all drawings / documents shall be submitted along with final / as-built submission
3. For all technical tables, diagrams, calculations, results, drawings, test data and scales adopted in the design the standard international unit system (SI) as per International

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SECTION VII PACKING

Material packing shall comply to Seaworthy Packaging (as per ANNEXURE-C). The material shall be packed to ensure protection against damage during transit, storage for prolonged periods and handling. Packing should be suitable for outdoor storage areas as per the specified site condition.

Packing shall also be suitable for easy handling (loading/ unloading) of material. Each type of Clamp shall be packed separately in crates with clear labelling and packing list. Bidder shall submit the packing procedure for BHEL's approval in line with above requirements after placement of order.

Packing list of the items shall include detailed BOQ of each item including nuts ,bolts, washer etc.

The detailed packing instructions for labelling etc. shall be provided after order placement.