

**NTPC SAIL POWER COMPANY
(P) LIMITED**

1 X 250 MW ROURKELA PP-III EXPANSION

VOLUME – IIB

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

**SPECIFICATION NO: *PE-TS-427-507-E013*
REVISION: 0**



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



1X250 MW ROURKELA PP-III EXPANSION
TECHNICAL SPECIFICATION FOR CABLE
TRAYS SUPPORT SYSTEM

SPECIFICATION NO. PE-TS- 427-507-E013

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Total nos. of sheets including cover, content & separator sheets = 60 sheets



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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 packing and delivery to site of Cable Tray Support System (Bolttable Type) conforming to this specification.
- 1.2 Technical requirements of Cable Tray Support System (Bolttable 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 No. of Section II (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
1	Technical Data Sheet	PE-V0-427-507-E051	Within one week of award of contract
2	GA Drg of cable tray supports (Bolttable type)	PE-V0-427-507-E052	Within one week of award of contract
3	Type test procedure including Typical details of type test arrangement	PE-V0-427-507-E053	Within one week of award of contract
4	Type test certificates	PE-V0-427-507-E054	Within one week of award of contract
5	Quality Plan	PE-V0-427-507-E908	Within one week of award of contract



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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: Boltable 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 [PE-DG- 427-507-E006]

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 (boltable 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.

5.0 TESTING:



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The tests shall be in accordance with appropriate Indian Standards. The extent of the tests to be performed by the supplier shall include but not be limited to the following: -

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.



**TECHNICAL SPECIFICATION FOR
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Annexure-A

STANDARD QUALITY PLAN

		QUALITY PLAN		CUSTOMER :		PROJECT TITLE : 1x250 MW ROURKELA PP-III EXPANSION		SPECIFICATION NO. PE-TS-427-507-E013				
				BIDDER/ VENDOR :		STANDARD QP NO. : PE-QP-999-507-E007, REV. 0		SPECIFICATION TITLE: 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) IS-513 (for cold rolled)	IS1079 (for hot rolled) 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) IS-513 (for cold rolled)	IS1079 (for hot rolled) 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	Welding is to be done by qualified welders in accordance with ASME SEC. IX article III. WPS , PQR & WPQ to be reviewed during inspection.
		2.WELDING QUALITY	MA	VISUAL	100%	GOOD WELDING PRACTICE	FREE FROM DEFECTS & SLAG	QC RECORD	2	-	1	
		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

		QUALITY PLAN		CUSTOMER :		PROJECT TITLE : 1x250 MW ROURKELA PP-III EXPANSION		SPECIFICATION NO. PE-TS-427-507-E013				
				BIDDER/ VENDOR :		STANDARD QP NO. : PE-QP-999-507-E007, REV. 0		SPECIFICATION TITLE: TECHNICAL SPEC FOR CABLE TRAY SUPPORT SYSTEM (BOLTABLE)				
		SHEET 2 OF 2		SYSTEM CABLING		ITEM : CABLE TRAY SUPPORT MATERIAL & ACCESSORIES (BOLTABLE)		DOC. NO. :				
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			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						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			

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 'MA' stands for major Characteristic - affecting safety of equipment and personnel 'MI' stands for minor characteristic - affecting appearance etc.
Column 5-	Type/Method of check e.g. chemical analysis tensile testing, hydraulic test, visual examination radiography etc.
Column 6-	Extent of check, such as, 100, 10, 1 percent etc.
Column 7-	Reference Documents - Documents, such as technical specification, drawings, standard specifications (IS, BS ETC.) procedure, etc. according to which check is done.
Column 8-	Acceptance Norms - Standards etc. according to which acceptability or otherwise of the characteristics being checked is decided.
Column 9-	Format of Record - Formats, log shets, reports, etc. in which the observations are recorded. Standard log sheets, reports, formats etc. of the Vendors shall be numbered and such reference numbers shall be included here.
Column 10-	Agency - The agency which performs the test/instruction shall be written in sub-column 'W' The agency which verifies test certificates/inspection records and carries out audit check of the components/operation shall be written in sub-column 'V' The agencies are codified as 1,2 & 3 '1' stands for (BHEL) '1' * means the operation shall be cleared by BHEL before the start of the next operation. '2' Stands for Vendor '3' stands for sub-Vendor of the Vendor and so on.
Example :	
Entry	'3' in column 'P' means test./inspection to be performed by sub-Vendor's QC
Entry	'2' in column 'W' means test./inspection to be witnessed by Vendor's QC
Entry	'1' in column 'V' means verification shall be done by BHEL and next stage to be started only after the hold point is cleared by BHEL
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 bgy 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 other wise 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 compiled 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 NTPC APPROVED GALVANIZERS)**

SL. NO.	ITEM	VENDOR NAME	ADDRESS
1	Galvanising	M/s M J Engg	Delhi
2	Galvanising	M/s Jamna Metal	D - 1513, DSIDC, Narela Industrial Area Delhi - 110040, India
3	Galvanising	M/s A.V.Engg	Kolkata
4	Galvanising	M/s Inar Profiles	Vishakapatnam
5	Galvanising	M/s Anand Udyog	Mumbai
6	Galvanising	M/s Techno Engg	Chandigarh
7	Galvanising	M/s Steelite Engg	Mumbai
8	Galvanising	M/s National Galvanizer	66, Barrackpore Kamarhatt Trunck Road Calcutta-700058
9	Galvanising	M/s Unistar Galvanizer	Kolkata
10	Galvanising	M/s B.P.Project	167A, Vivekananda Road Kolkata-700006
11	Galvanising	M/s Bajaj	Pune
12	Galvanising	Electrocare Industries	Mumbai
13	Galvanising	B.G.Shirke	72-76, Mundhawa, Pune - 401 036
14	Galvanising	M/s Gurpreet Galvanizer	Hyderabad
15	Galvanising	M/s Sigma	Plot No.C-169, TTC, MIDC Ind Area Navin Mumbai-400705
16	Galvanising	M/s Radhakrishnan Shetty	Chennai
17	Galvanising	M/s Karamtara	Mumbai
18	Galvanising	M/s Poona Galvanizers	Pune
19	Galvanising	M/s Neha Galvanizer, Kolkata	Jalan Industrial Estate, Gate No-1, 1st Right Choise Lane, Near N.G-6, Jangalpur, PO Domjur Howrah - 700071, West Bengal, India
20	Galvanising	M/s Unitech Galvanisers	Village- Ajab Nagar, P.O. -Molla Simlla, P.S. - Singur, Dist - Hoogly, Pin- 712223

NOTES:

1. IT SHALL BE THE RESPONSIBILITY OF THE VENDOR TO GET THE MATERIAL GALVANIZED FROM THE ABOVE LIST WITHOUT ANY COMMERCIAL IMPLICATION TO BHEL.

CATEGORY-I

 **अनुमोदित / APPROVED**
WITHOUT PREJUDICE TO
CONTRACTUAL OBLIGATIONS AND LIABILITY

Checked & Reviewed:
नाम / Name **C. MURMU** Sign: 
पदनाम / Designation **Sr.Mgr(Electrical-power)** Date: 
Verified (Design-in-Charge):
नाम / Name **A. Pandey** Sign: 
पदनाम / Designation **DGM(Electrical-Power)** Date: **09.08.2016**

Electrical (Power)
मेकॉन लिमिटेड / MECON LIMITED
रांची / Ranchi

TYPICAL INSTALLATION DETAILS FOR CABLE TRAY SUPPORT SYSTEM

					CUSTOMER	 NTPC-SAIL POWER COMPANY PVT.LTD.															
REV. 01	DATE MKM	ALTD MKM	CHD MS	APPD	CONSULTANT	 MECON LIMITED															
REVISED AS PER CUSTOMER COMMENTS					PROJECT	ROURKELA PP-II EXPANSION (1x250 MW)															
427						BHARAT HEAVY ELECTRICALS LTD. POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA															
CONTRACT																					
DISTRIBUTION																					
					<table border="1"> <tr> <td>DEPT CODE</td> <td>DRN DSGN</td> <td>NAME MKM</td> <td>SIGN</td> <td>DATE</td> </tr> <tr> <td>E</td> <td>CHD</td> <td>MS</td> <td></td> <td></td> </tr> <tr> <td></td> <td>APPD</td> <td>PD</td> <td></td> <td></td> </tr> </table>		DEPT CODE	DRN DSGN	NAME MKM	SIGN	DATE	E	CHD	MS				APPD	PD		
DEPT CODE	DRN DSGN	NAME MKM	SIGN	DATE																	
E	CHD	MS																			
	APPD	PD																			
					DRAWING NO. PE-DG-427-507-E006																
					SHEET 01 OF 37 REV. 01																

Rourkela PP-II Expansion (1x250 MW) EPC			
Installation Details of Cable tray Support System			
S.no	Customer comment	Bhel reply	Remarks
1	Dimension of MS Plate insert, Bracket, Clamp, Channel, etc shall be indicated.	Incorporated in revised drawing.	
2	Buried cable laying details indicating details of precast cover, brick, sand, soil etc to be indicated	Incorporated in revised drawing.	
3	Cable clamping trefoil arrangement of power and control cable, multicore power cable details to be included	Incorporated in revised drawing.	
4	Road crossing of buried cable & cable laying in shallow trench (indoor) shall be indicated.	Incorporated in revised drawing. Further details shall be indicated in respective detailed cabling layout drawings, as per layout of respective area.	
	following typical details shall also be included		
	a. cable route marker	Incorporated in revised drawing.	
	b. Cable Tag for power & Control cable	Incorporated in revised drawing.	
	c. buried cable entry to building or cable trench	Incorporated in revised drawing.	
	d. cable trench entry to building	Incorporated in revised drawing.	
	e. cable rack entry to building	Incorporated in revised drawing.	
	f. cable tray mounting arrangement from floor beam, from steel column, from brick wall, from concrete column. Mounting arrangement for cable shaft on brick wall.	Incorporated in revised drawing. Further details shall be indicated in respective detailed cabling layout drawings, as per layout of respective area.	
5	Typical details of structure for testing shall be included as per TS DRG MEC/11/TS/G24F/E1/E-50/51/52/53	Type test report shall be submitted against this. Same shall be part of Cable tray Support system supplier's drawings.	
6	Cable	Incorporated in revised drawing	

INDEX

SHEET NO	INSTALLATION DETAIL TYPE	DESCRIPTION OF INSTALLATION DETAIL
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04	—	TYPICAL SUPPORT SYSTEM ELEMENTS
05	SB1, SB2, SS1, SS2	SINGLE CHANNEL SUPPORT INSTALLATION, TRAYS ON SINGLE SIDE, BOTH ENDS FIXED / ONLY TOP END FIXED
06	SS3, SS4, SS5, SB3	SINGLE CHANNEL SUPPORT INSTALLATION, TRAYS ON SINGLE SIDE, ONLY BOTTOM END FIXED / BOTH ENDS FIXED
07	DB1, DB2, DB3, DB4	DOUBLE CHANNEL SUPPORT INSTALLATION, TRAYS ON BOTH SIDE, BOTH ENDS FIXED
08	DS1, DS2, DS3, DS4	DOUBLE CHANNEL SUPPORT INSTALLATION, TRAYS ON SINGLE/BOTH SIDE, ONLY TOP END FIXED
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11	OH2	TYPICAL TRAY SUPPORT ARRANGEMENT ALONG PIPERACK MORE THAN 3 TRAYS
12	OV1	TYPICAL VERTICALLY ORIENTED TRAY SUPPORT ARRANGEMENT ALONG PIPERACK TRAYS SUPPORTED FROM TOP
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14	CT1, CT2	TYPICAL DETAILS FOR CROSS TRAYS OVER TRESTLE
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16	CR1, CR2	RISER ALONG STRUCTURAL STEEL, CHANNEL FRAME WORK FOR RISER UPTO 3 TRAYS. DETAIL FOR ADDITIONAL SUPPORT TO RISER COLUMN
17	CR3	TYPICAL CHANNEL FRAME WORK FOR CABLE TRAY RISER UPTO 3 TRAYS, DETAIL FOR ADDITIONAL SUPPORT TO RISER COLUMN
18	CR4	TYPICAL CHANNEL FRAME WORK FOR CABLE TRAY RISER MORE THAN 3 TRAYS
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20	BC1, BC2, BC3 BB5, WS1,WS2	SUPPORTING ARRANGEMENT ALONG BOILER COL., ABOVE & WITHIN I-BEAMS
21	TR1, TR2	SUPPORTING ARRANGEMENT IN CABLE TRENCH
22	—	ROUTE MARKER DETAILS
23	—	BURIED CABLE DETAILS
24	—	ROAD CROSSING OF BURIED CABLE, CABLE TRAY ENTRY TO BDG/TRENCH
25	—	CABLE TRAY/RACK ENTRY TO BUILDING
26	—	CABLE CLAMPING ARRANGEMENT
27	—	GENERAL NOTES
28	—	TYPICAL DETAILS OF CABLE TRAY SUPPORT SYSTEM

TYPICAL INSTALLATION DETAILS FOR CABLE TRAY SUPPORT SYSTEMS

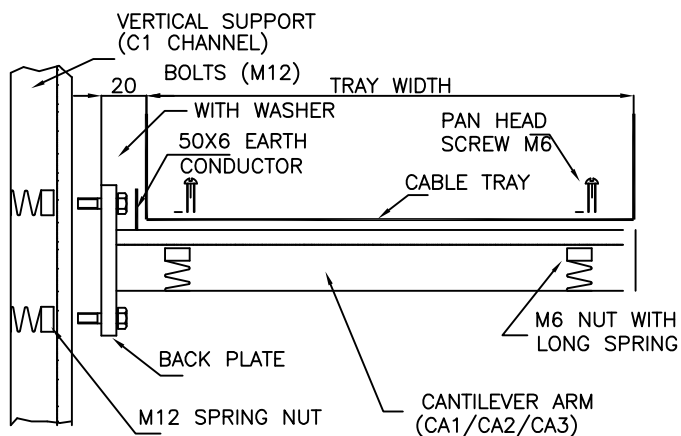
ROURKELA PP-II EXPANSION
(1x250 MW)

DRG. No.

PE-DG-427-507-E006

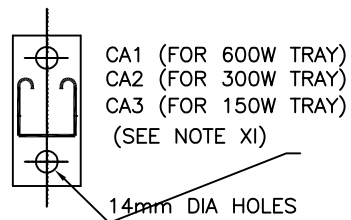
REV. 01

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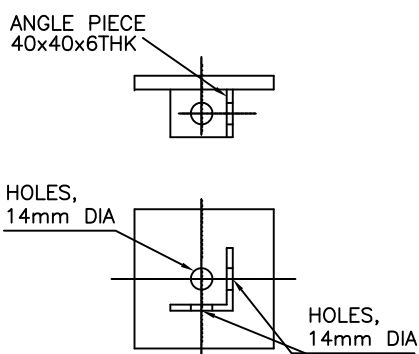


TYPICAL ASSEMBLY OF CHANNEL SUPPORTS AND CABLE TRAY

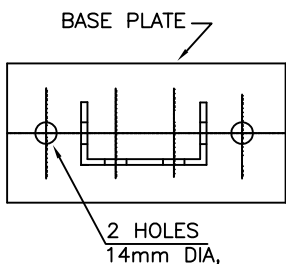
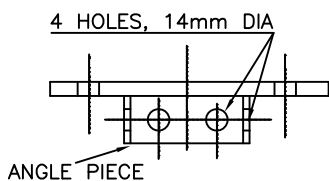
- 1) 600mm TRAY-1 TO 6 TIER -C2
- 2) 300mm TRAY-1 TO 3 TIER -C1
- 3) 300mm TRAY-4 TO 6 TIER -C2
- 4) 150mm TRAY-1 TO 6 TIER -C1



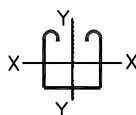
END VIEW OF CANTILEVER ARM



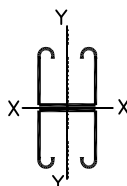
BASE PLATE FOR SINGLE CHANNEL (BP1)



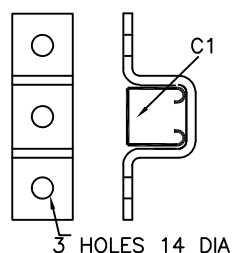
BASE PLATE FOR DOUBLE CHANNEL (BP2)



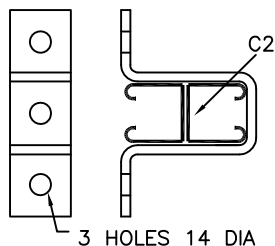
SECTION OF C1 (SINGLE CHANNEL)



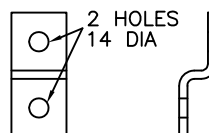
SECTION OF C2 (DOUBLE CHANNEL)



C1 CHANNEL CLAMP (CC1)



C2 CHANNEL CLAMP (CC2)



TRAY CLAMP (TC1)
(SEE NOTE VII)

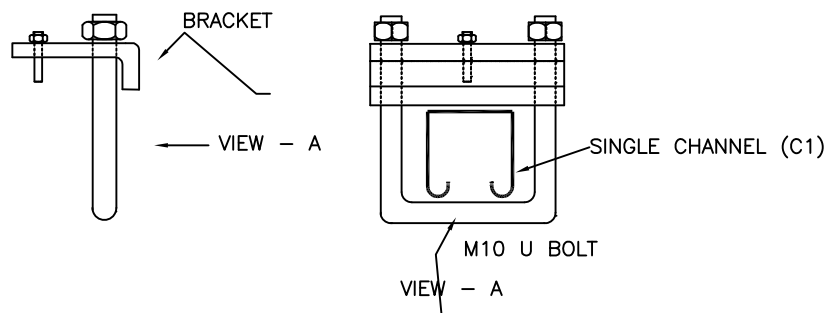
TYPICAL SUPPORT SYSTEM ELEMENTS

TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS

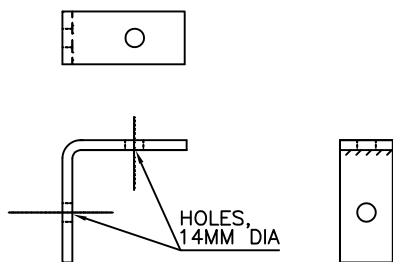
ROURKELA PP-II EXPANSION
(1X250 MW)

DRG. No.
PE-DG-427-507-E006

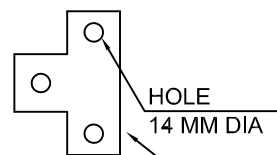
REV. 01 | **SHEET 03 OF 37**



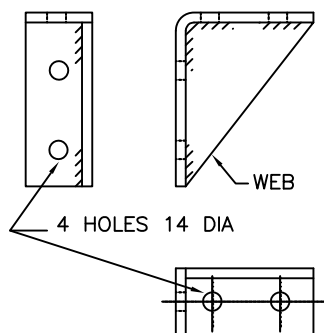
BEAM CLAMP (BC1)
(SEE FIXING DETAIL ON SHEET 19)



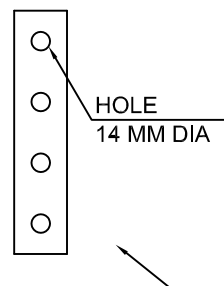
ANGLE FITTING (LA1)



FLAT PLATE TEE FITTING (PF1)



HEAVY DUTY RIGHT ANGLE FITTING HL1



FLAT PLATE STRAIGHT FITTING PF2

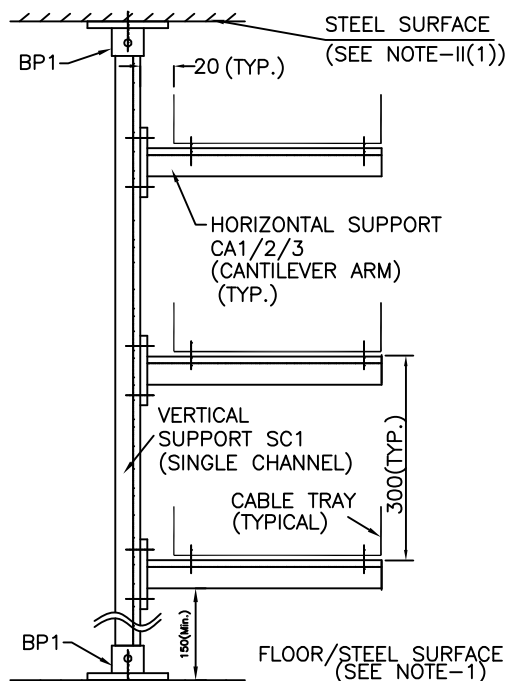
TYPICAL SUPPORT SYSTEM ELEMENTS

TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS

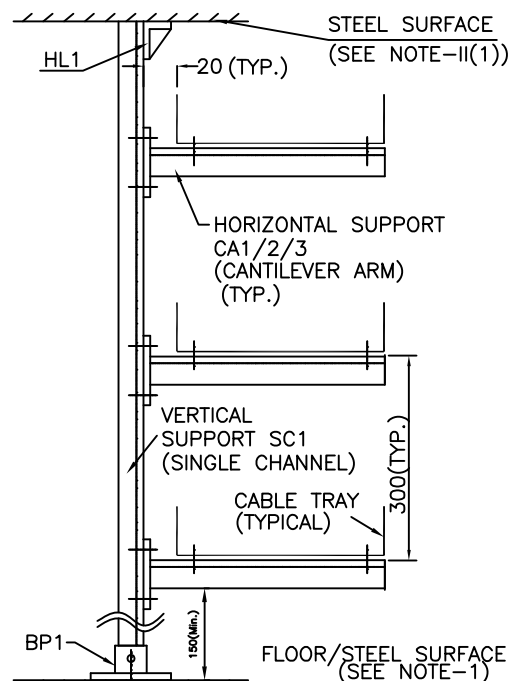
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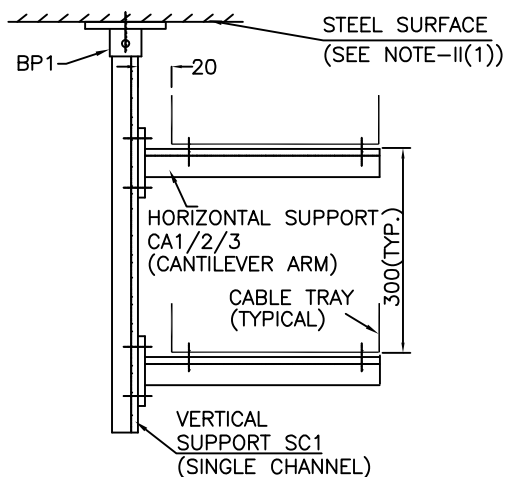
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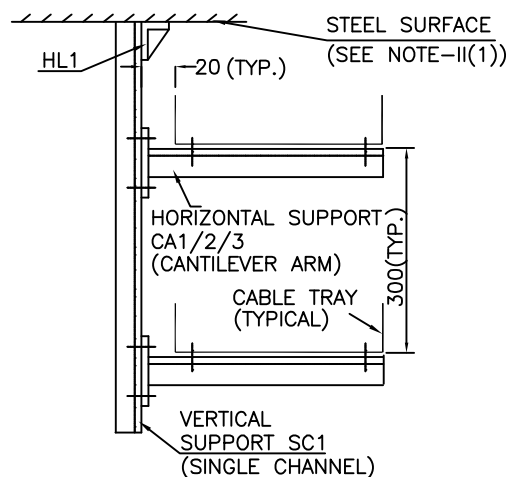
INSTALLATION DETAIL TYPE SB1:
SINGLE CHANNEL SUPPORT INSTALLATION
BOTH ENDS FIXED, TRAYS ON SINGLE SIDE
WITH BP1 AT TOP & BOTTOM
APPLICABLE FOR THREE TRAYS AND MORE
 (SEE NOTE X)



INSTALLATION DETAIL TYPE SB2:
SINGLE CHANNEL SUPPORT INSTALLATION
BOTH ENDS FIXED, TRAYS ON SINGLE SIDE
WITH HL1 AT TOP & BP1 AT BOTTOM
APPLICABLE FOR THREE TRAYS AND MORE
 (SEE NOTE X)



INSTALLATION DETAIL TYPE SS1:
SINGLE CHANNEL SUPPORT INSTALLATION
ONLY TOP END FIXED, TRAYS ON SINGLE SIDE
WITH BASEPLATE BP1 AT TOP
APPLICABLE FOR UPTO & INCLUDING TWO TRAYS
 (SEE NOTE X)



INSTALLATION DETAIL TYPE SS2:
SINGLE CHANNEL SUPPORT INSTALLATION
ONLY TOP END FIXED, TRAYS ON SINGLE SIDE
WITH ANGLE FITTING HL1 AT TOP
APPLICABLE FOR UPTO & INCLUDING TWO TRAYS
 (SEE NOTE X)

TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS

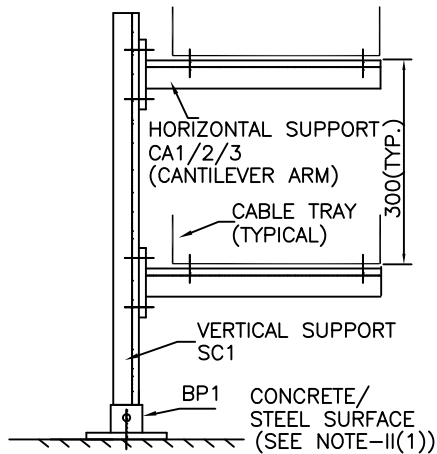
ROURKELA PP-II EXPANSION
 (1X250 MW)

DRG. No.

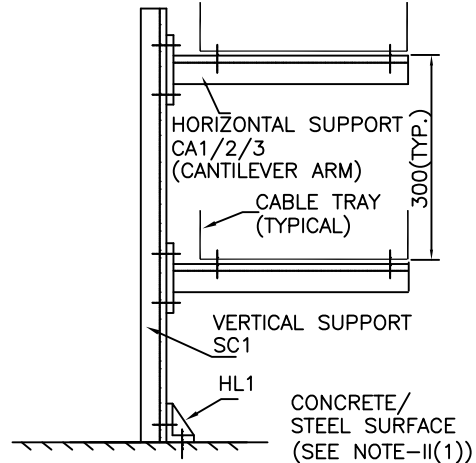
PE-DG-427-507-E006

REV. 01

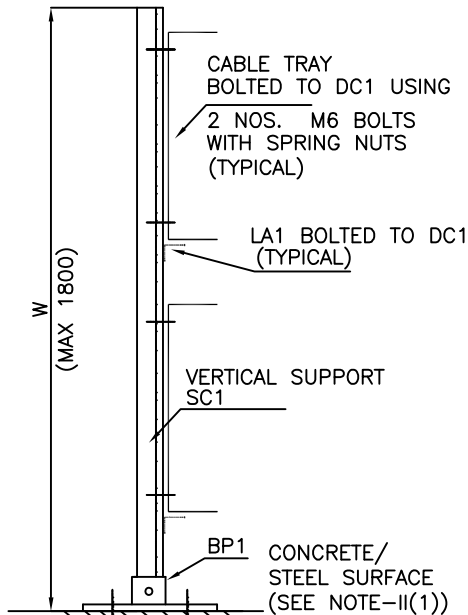
SHEET 05 OF 37



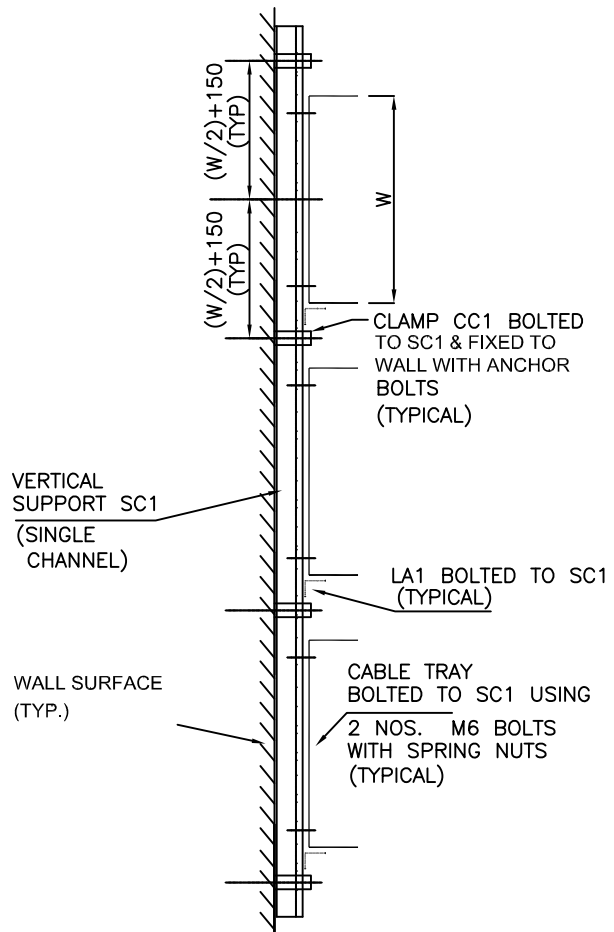
INSTALLATION DETAIL TYPE SS3:
SINGLE CHANNEL SUPPORT INSTALLATION
ONLY BOTTOM END FIXED TRAYS ON SINGLE SIDE
BASEPLATE BP1 AT BOTTOM
APPLICABLE FOR UPTO & INCLUDING TWO TRAYS



INSTALLATION DETAIL TYPE SS4:
SINGLE CHANNEL SUPPORT INSTALLATION
ONLY BOTTOM END FIXED TRAYS ON SINGLE SIDE
WITH ANGLE FITTING HL1 AT BOTTOM
APPLICABLE FOR UPTO & INCLUDING TWO TRAYS



INSTALLATION DETAIL TYPE SS5:
SINGLE CHANNEL SUPPORT INSTALLATION
ONLY BOTTOM END FIXED,
TRAYS ORIENTED VERTICALLY
BASEPLATE AT BOTTOM
APPLICABLE FOR UPTO &
INCLUDING TWO TRAYS



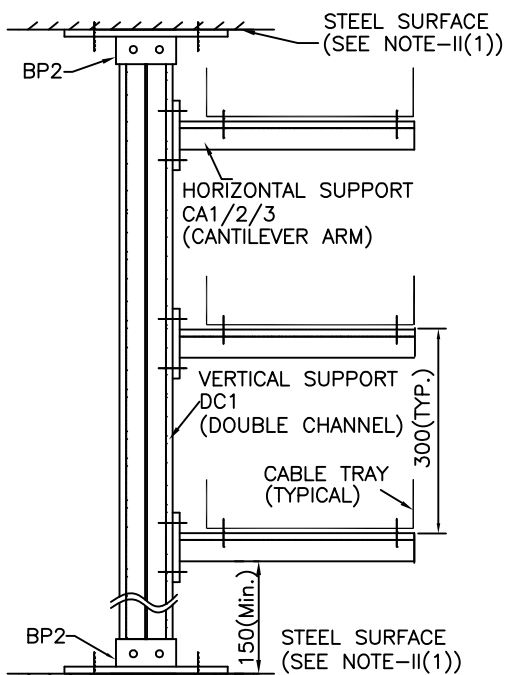
INSTALLATION DETAIL TYPE SB3:
SINGLE CHANNEL SUPPORT INSTALLATION, BOTH ENDS FIXED
TRAYS ON SINGLE SIDE, APPLICABLE FOR SUPPORTING TRAYS
IN VERTICAL ORIENTATION ALONG BUILDING WALLS

TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS

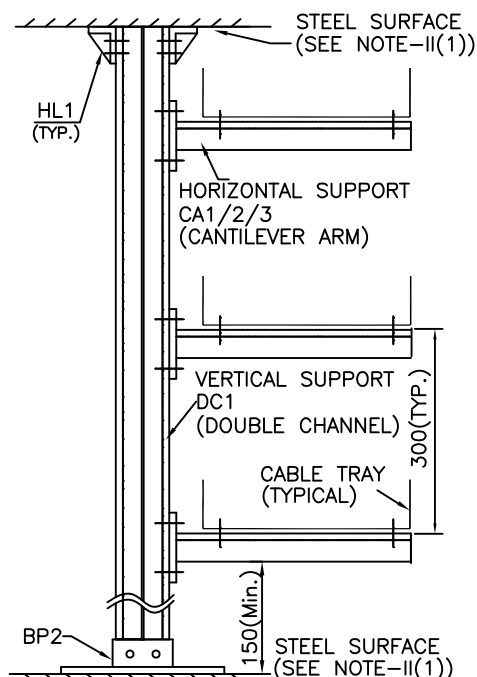
ROURKELA PP-II EXPANSION
 (1X250 MW)

DRG. No.
PE-DG-427-507-E006

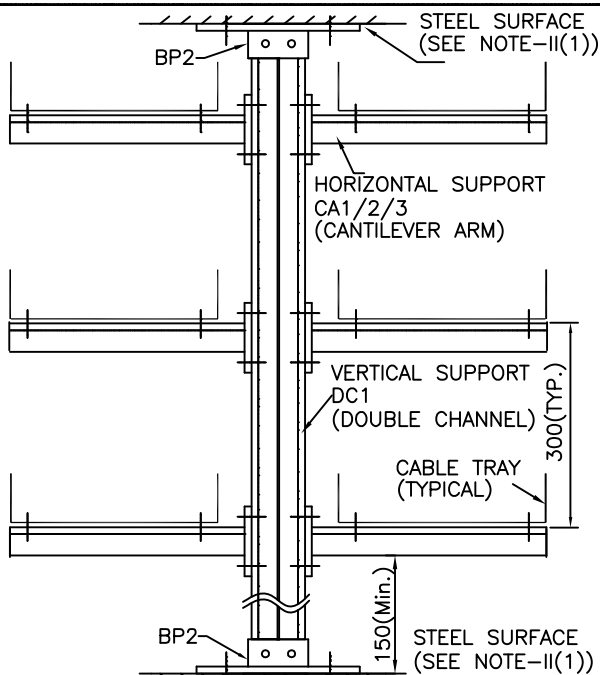
REV. 01 | **SHEET 06 OF 37**



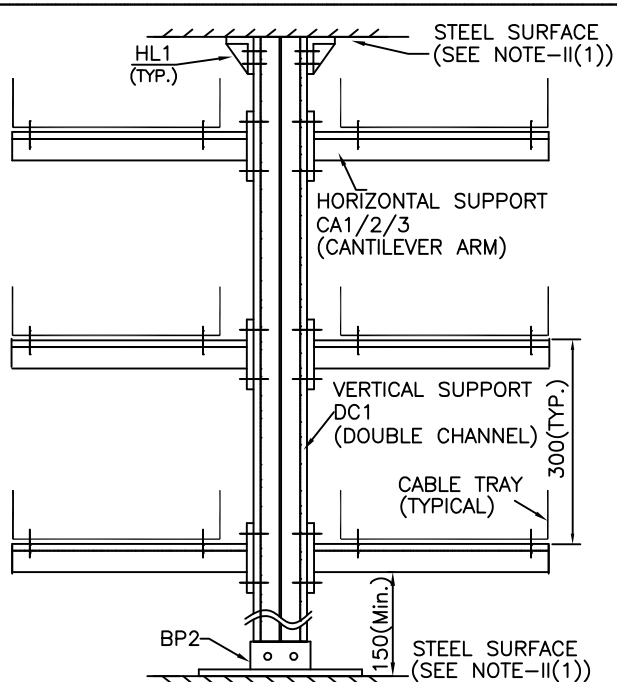
INSTALLATION DETAIL TYPE DB1:
DOUBLE CHANNEL SUPPORT INSTALLATION
BOTH ENDS FIXED, TRAYS ON SINGLE SIDE
WITH BASEPLATE BP2 AT TOP & BOTTOM
APPLICABLE FOR MORE THAN THREE TRAYS
 (SEE NOTE X)



INSTALLATION DETAIL TYPE DB2:
DOUBLE CHANNEL SUPPORT INSTALLATION
BOTH ENDS FIXED, TRAYS ON SINGLE SIDE
WITH HL1 AT TOP & BP2 AT BOTTOM
APPLICABLE FOR MORE THAN THREE TRAYS
 (SEE NOTE X)



INSTALLATION DETAIL TYPE DB3:
DOUBLE CHANNEL SUPPORT INSTALLATION
BOTH ENDS FIXED, TRAYS ON BOTH SIDES
WITH BASEPLATE BP2 AT TOP & BOTTOM
 (SEE NOTE X)



INSTALLATION DETAIL TYPE DB4:
DOUBLE CHANNEL SUPPORT INSTALLATION
BOTH ENDS FIXED, TRAYS ON BOTH SIDES
WITH HL1 AT TOP & BP2 AT BOTTOM
 (SEE NOTE X)

TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS

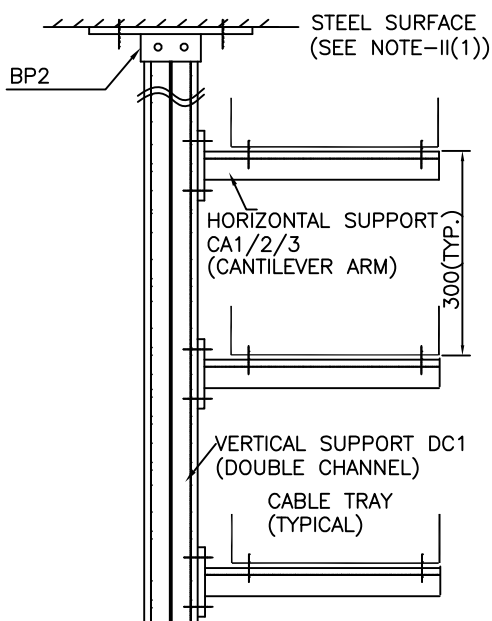
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 (1X250 MW)

DRG. No.

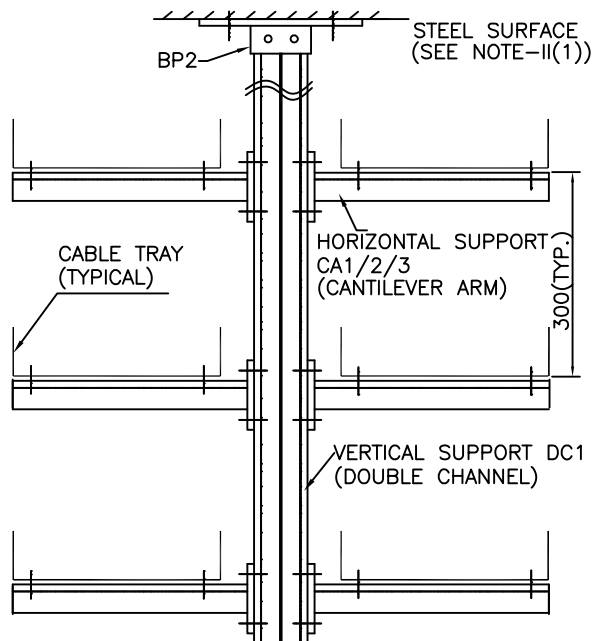
PE-DG-427-507-E006

REV. 01

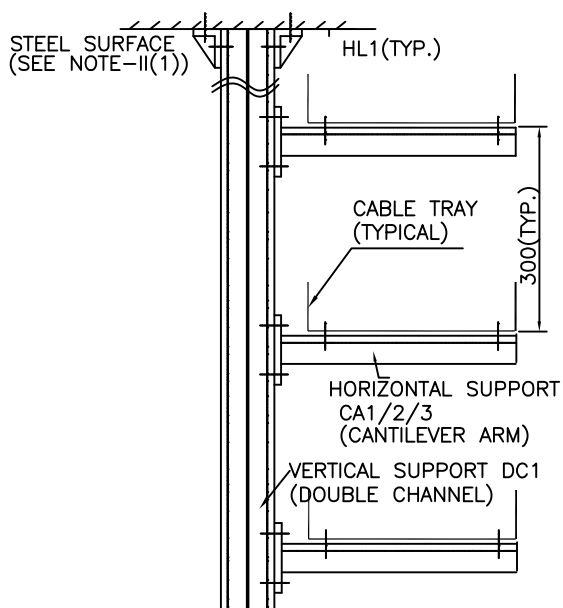
SHEET 07 OF 37



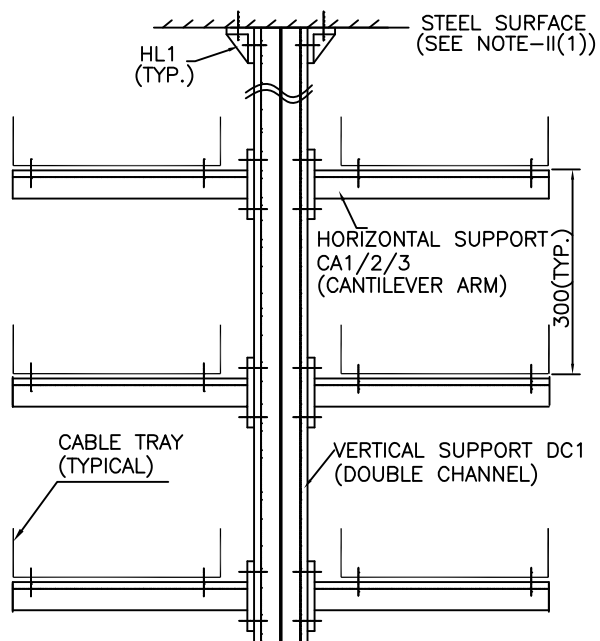
INSTALLATION DETAIL TYPE DS1:
DOUBLE CHANNEL SUPPORT INSTALLATION
ONLY TOP END FIXED
BASEPLATE AT TOP
APPLICABLE FOR THREE TRAYS ON SINGLE SIDE
 (SEE NOTE X)



INSTALLATION DETAIL TYPE DS2:
DOUBLE CHANNEL SUPPORT INSTALLATION
ONLY TOP END FIXED
BASEPLATE AT TOP
APPLICABLE FOR UPTO THREE TRAYS ON BOTH SIDES
 (SEE NOTE X)



INSTALLATION DETAIL TYPE DS3:
DOUBLE CHANNEL SUPPORT INSTALLATION
ONLY TOP END FIXED
WITH ANGLE FITTING HL1 AT TOP
APPLICABLE FOR MORE THAN TWO TRAYS
ON SINGLE SIDE
 (SEE NOTE X)



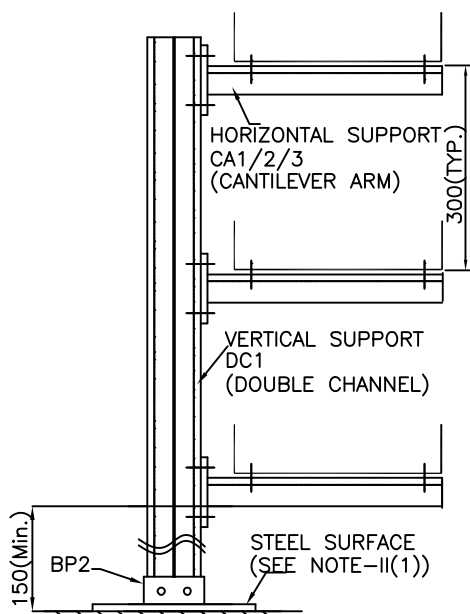
INSTALLATION DETAIL TYPE DS4:
DOUBLE CHANNEL SUPPORT INSTALLATION
ONLY TOP END FIXED
WITH ANGLE FITTING HL1 AT TOP
APPLICABLE FOR UPTO THREE TRAYS ON BOTH SIDES
 (SEE NOTE X)

TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS

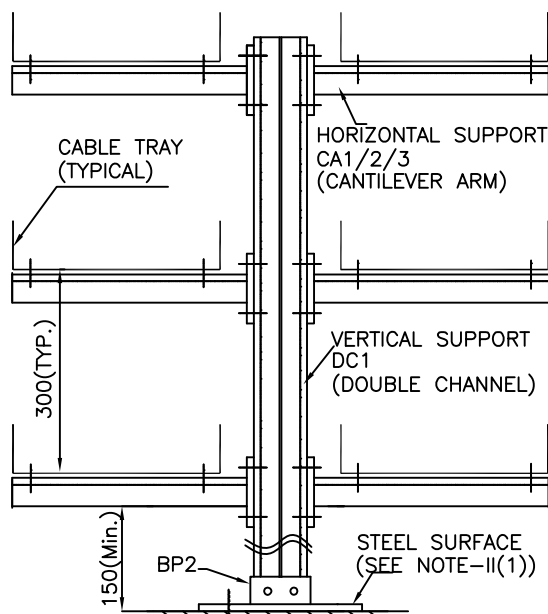
ROURKELA PP-II EXPANSION
 (1X250 MW)

DRG. No.
PE-DG-427-507-E006

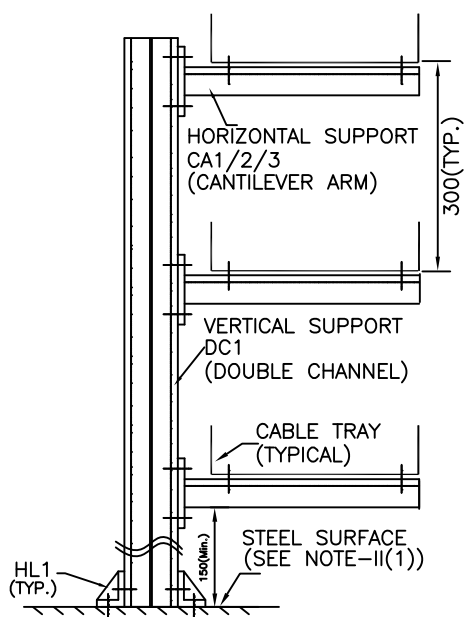
REV. 01 | **SHEET 08 OF 37**



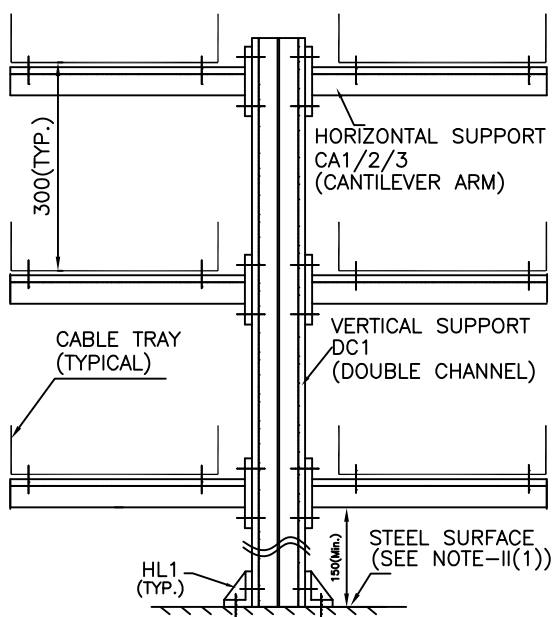
INSTALLATION DETAIL TYPE DS5:
DOUBLE CHANNEL SUPPORT INSTALLATION
ONLY BOTTOM END FIXED TRAYS ON SINGLE SIDE
BASEPLATE AT BOTTOM



INSTALLATION DETAIL TYPE DS6:
DOUBLE CHANNEL SUPPORT INSTALLATION
ONLY BOTTOM END FIXED
UPTO THREE TRAYS ON BOTH SIDES
BASEPLATE AT BOTTOM



INSTALLATION DETAIL TYPE DS7:
DOUBLE CHANNEL SUPPORT INSTALLATION
ONLY BOTTOM END FIXED TRAYS ON SINGLE SIDE
WITH ANGLE FITTING HL1 AT BOTTOM



INSTALLATION DETAIL TYPE DS8:
DOUBLE CHANNEL SUPPORT INSTALLATION
ONLY BOTTOM END FIXED
UPTO THREE TRAYS ON BOTH SIDES
WITH ANGLE FITTING HL1 AT BOTTOM

TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS

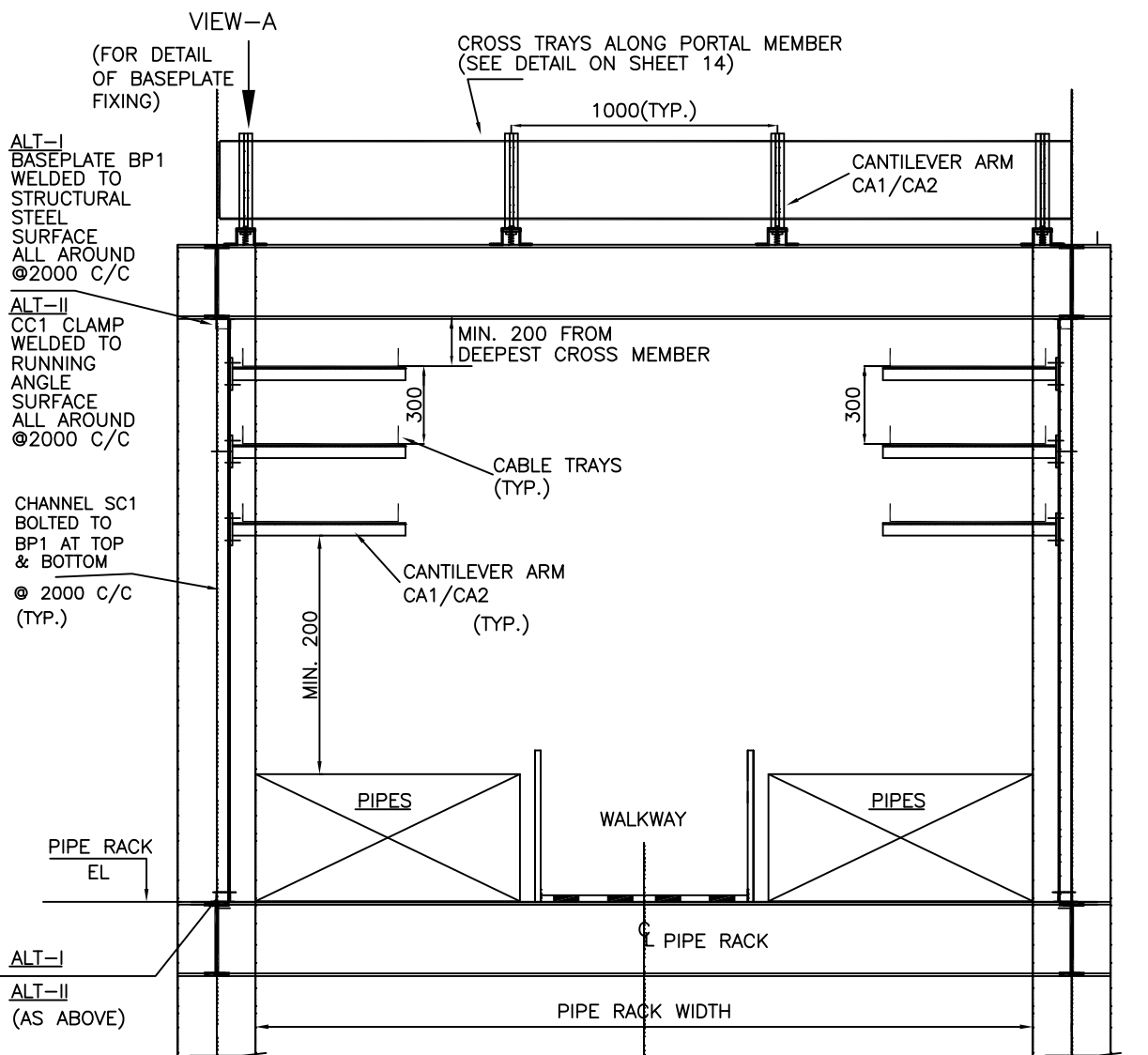
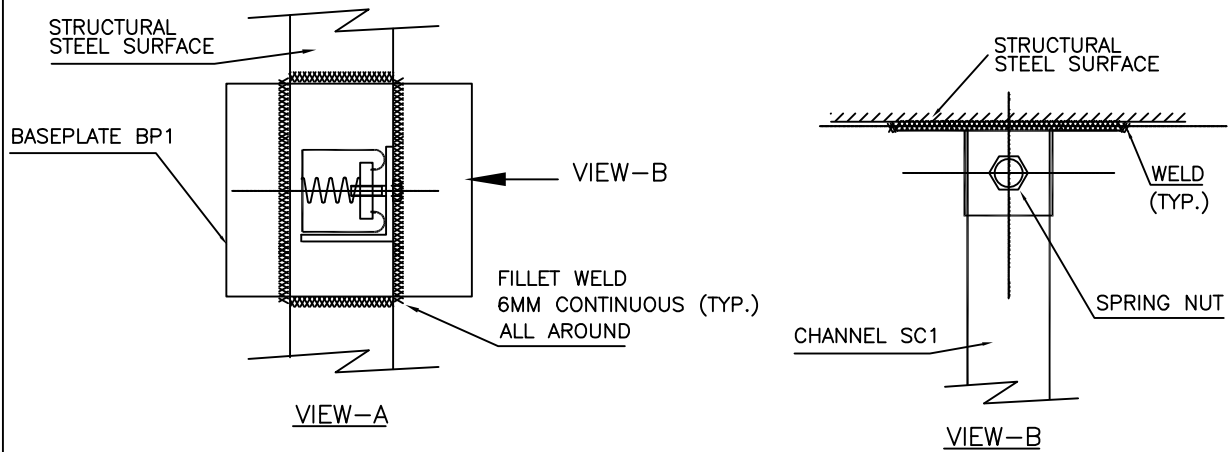
ROURKELA PP-II EXPANSION
 (1X250 MW)

DRG. No.

PE-DG-427-507-E006

REV. 01

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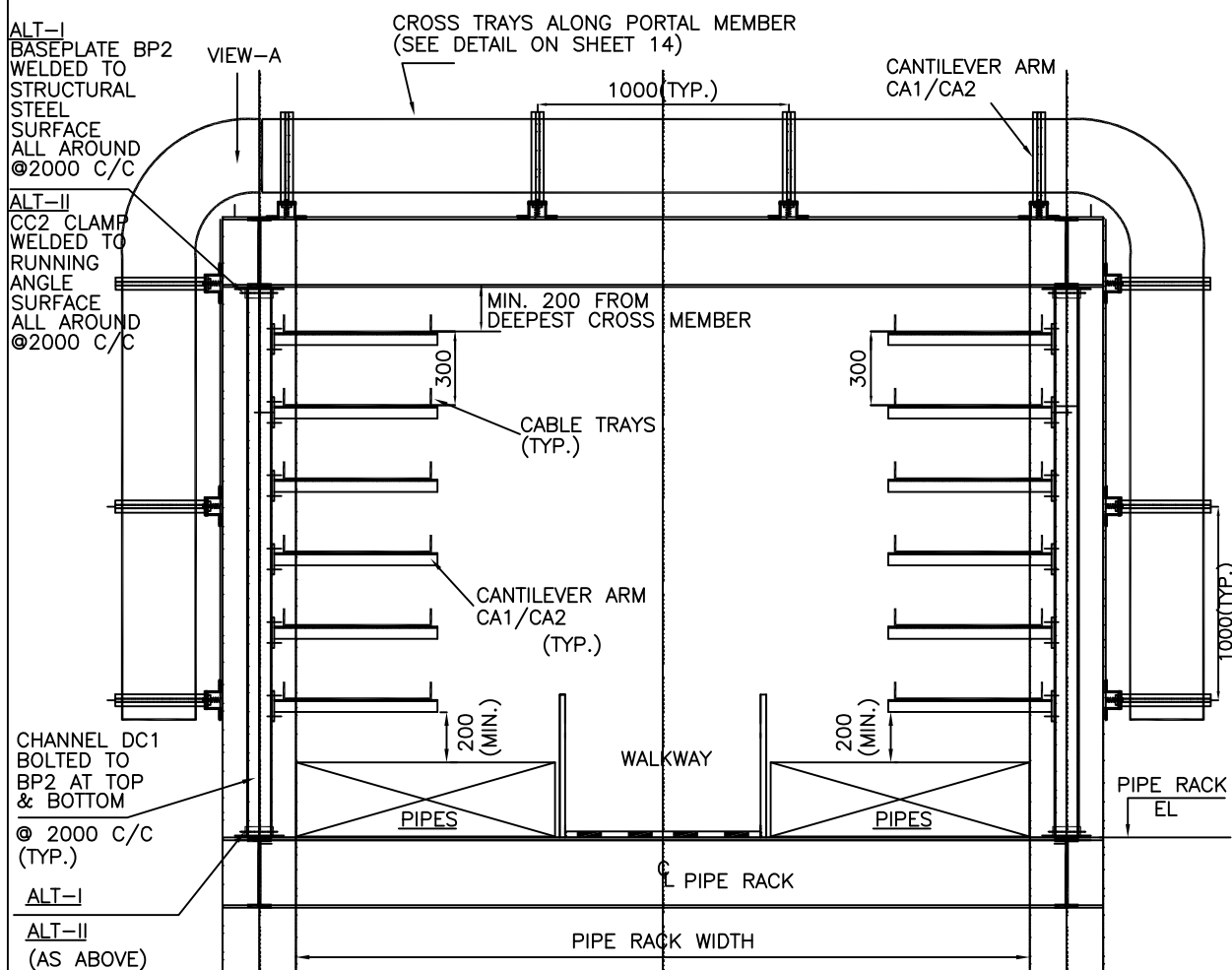
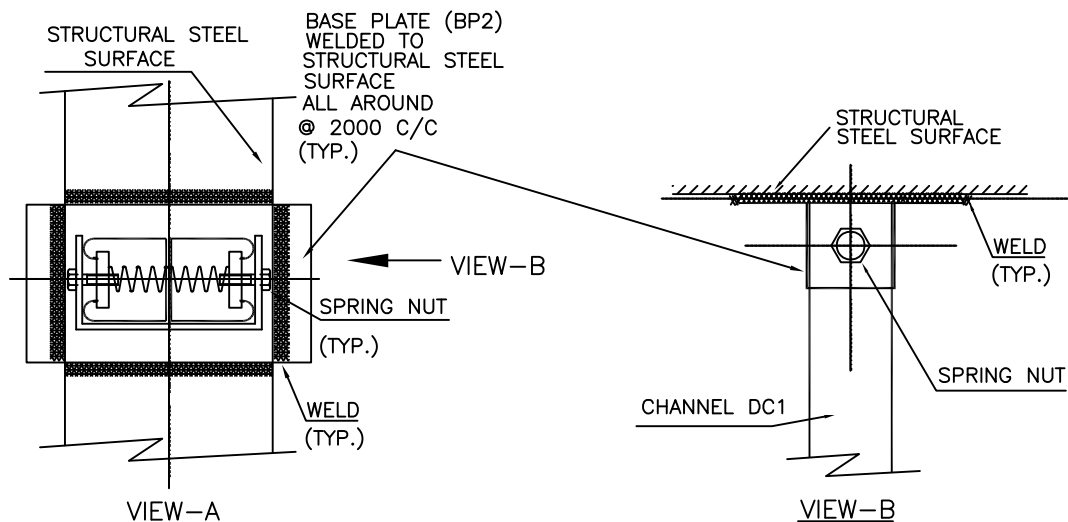
INSTALLATION DETAIL TYPE OH1:
TYPICAL TRAY SUPPORT ARRANGEMENT ALONG PIPERACK
(UPTO AND INCLUDING THREE TRAYS) (SEE NOTE X)

**TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS**

ROURKELA PP-II EXPANSION
(1X250 MW)

DRG. No.
PE-DG-427-507-E006

REV. 01 | **SHEET 10 OF 37**



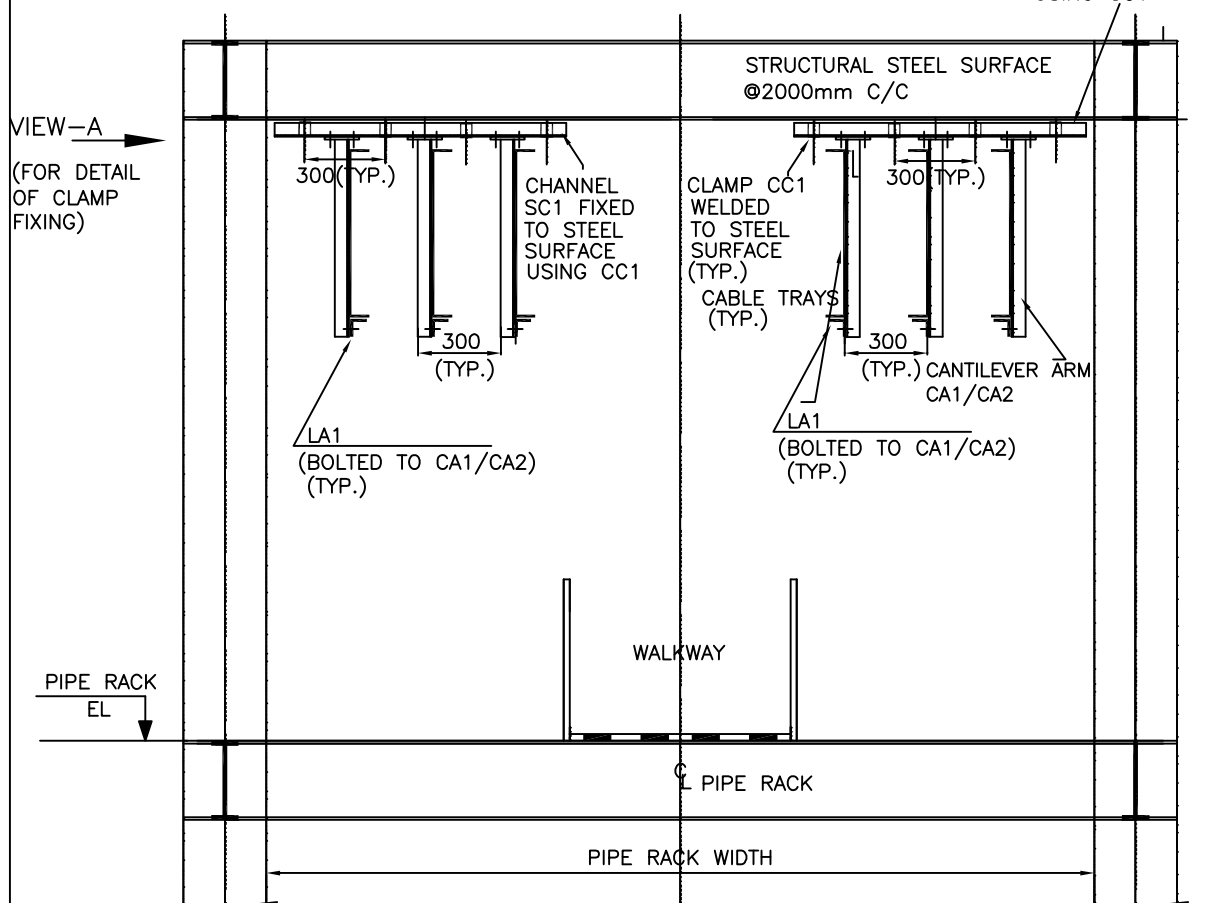
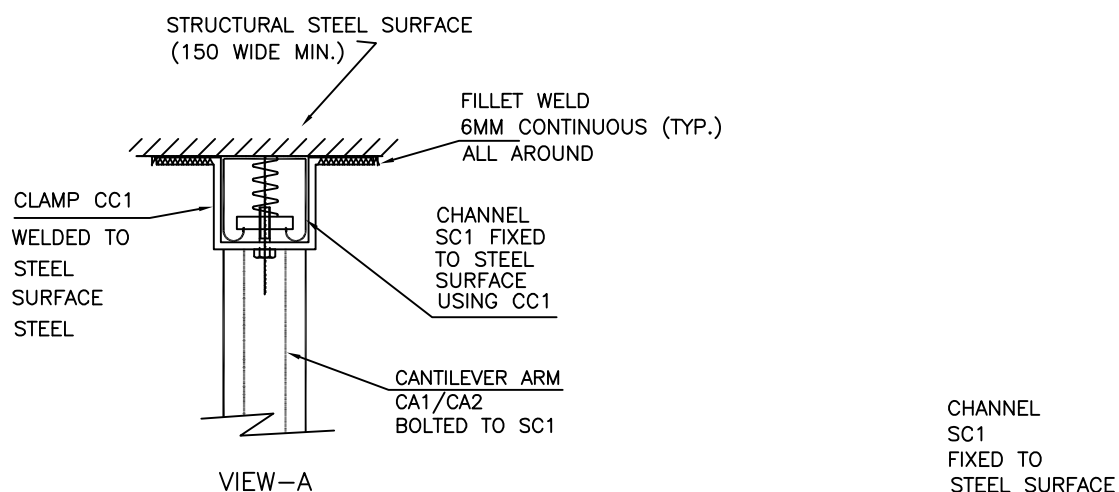
INSTALLATION DETAIL TYPE OH2:
TYPICAL TRAY SUPPORT ARRANGEMENT ALONG PIPERACK
(MORE THAN THREE TRAYS)
(SEE NOTE X)

**TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS**

ROURKELA PP-II EXPANSION
(1X250 MW)

DRG. No.
PE-DG-427-507-E006

REV. 01 SHEET 11 OF 37



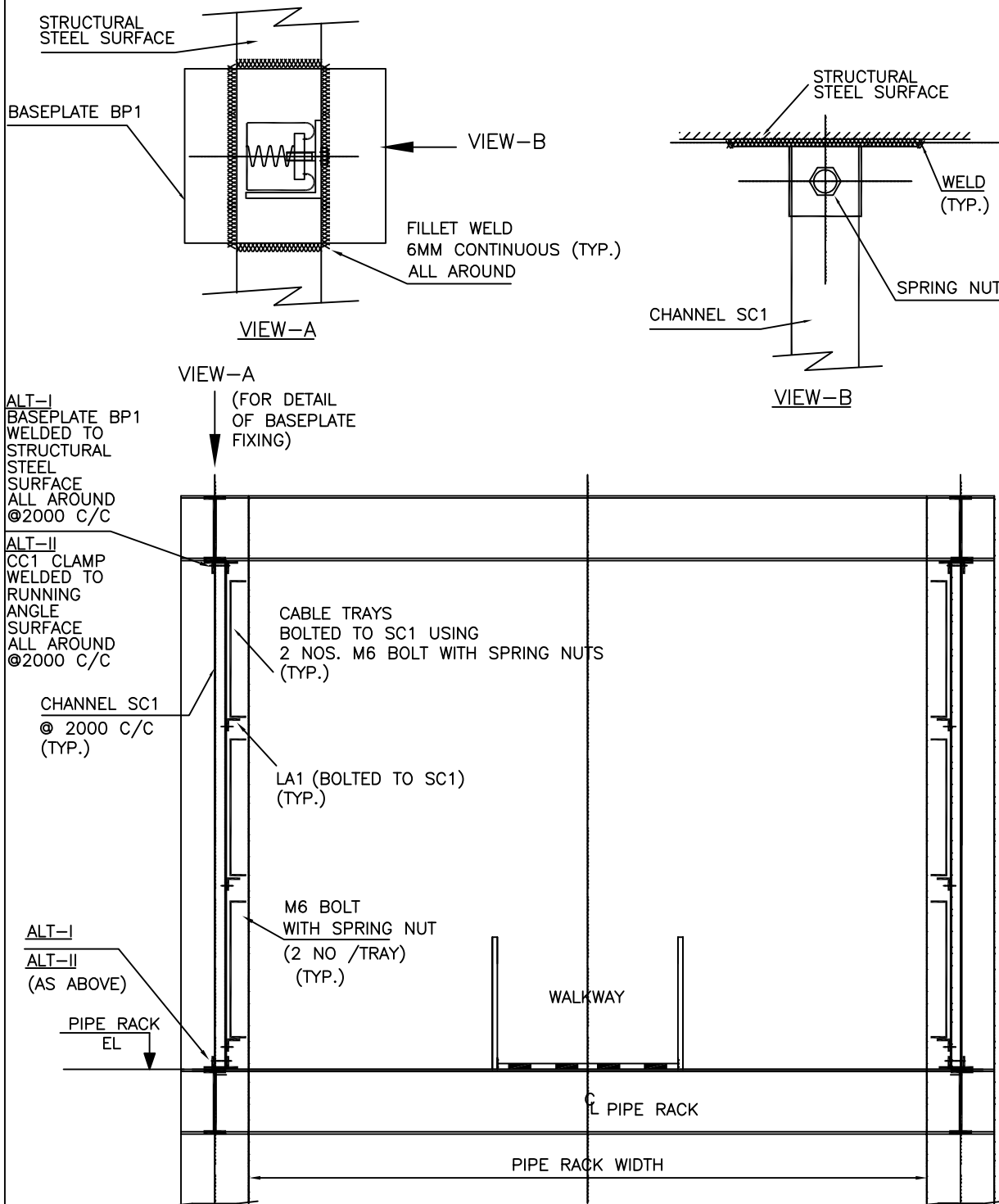
INSTALLATION DETAIL TYPE OV1
TYPICAL VERTICALLY ORIENTED TRAY SUPPORT ARRANGEMENT ALONG PIPERACK

TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS

ROURKELA PP-II EXPANSION
(1X250 MW)

DRG. No.
PE-DG-427-507-E006

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INSTALLATION DETAIL TYPE OV2:

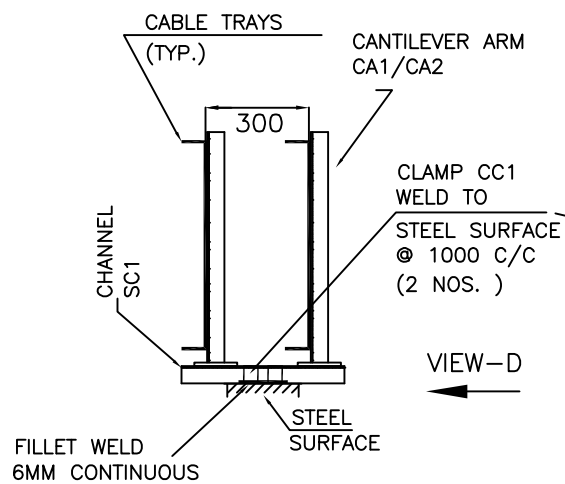
VERTICALLY ORIENTED TRAY SUPPORT ARRANGEMENT ALONG PIPERACK (USING BP1)
(SEE NOTE X)

TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS

ROURKELA PP-II EXPANSION
(1X250 MW)

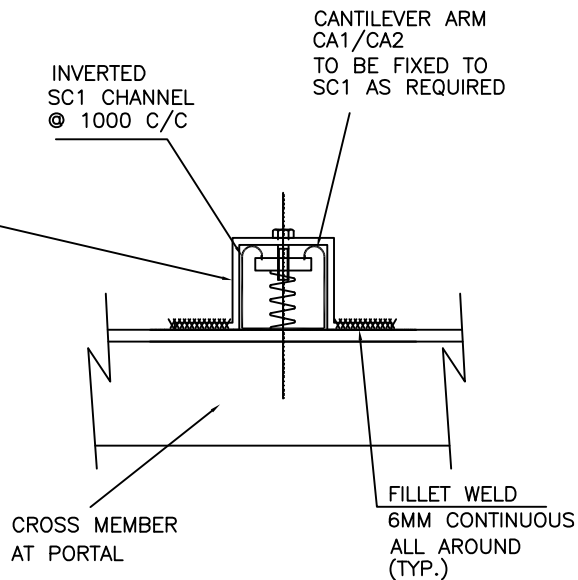
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PE-DG-427-507-E006

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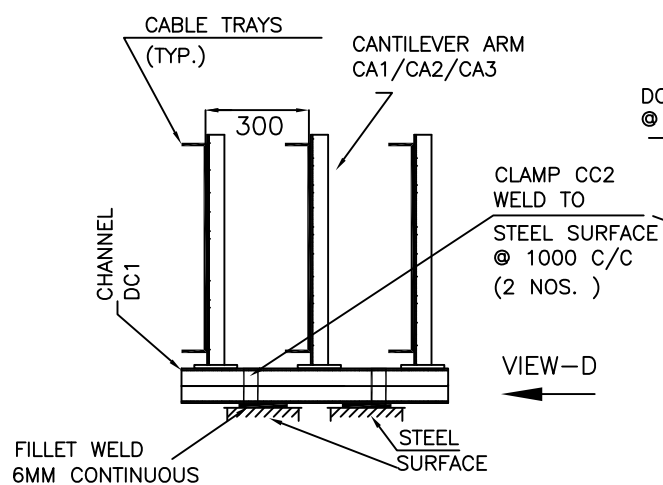


INSTALLATION DETAIL TYPE CT1:
CROSS TRAYS OVER TRESTLE

VIEW-D

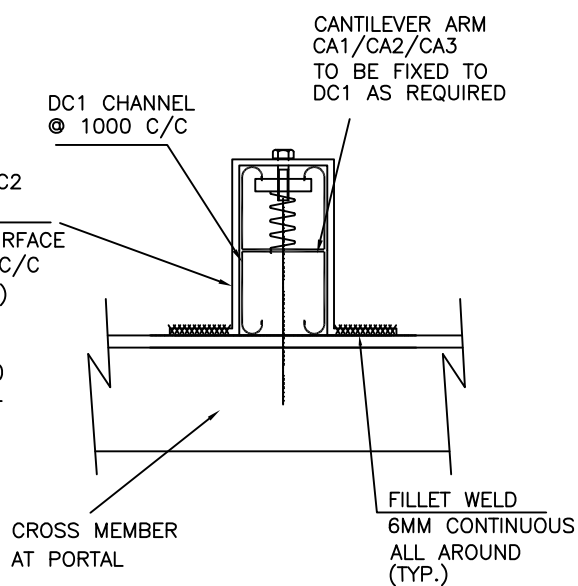


VIEW-D



INSTALLATION DETAIL TYPE CT2:
CROSS TRAYS OVER TRESTLE

VIEW-D



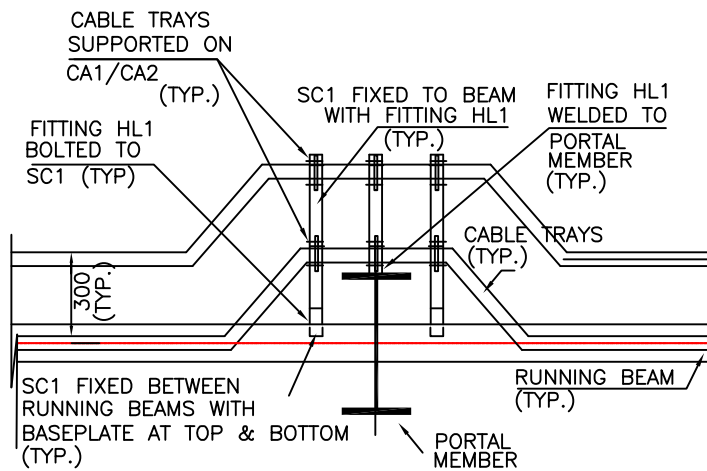
VIEW-D

TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS

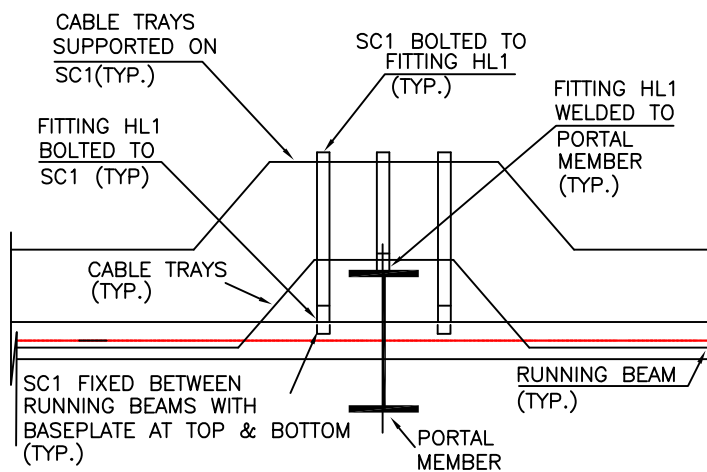
ROURKELA PP-II EXPANSION
(1X250 MW)

DRG. No.
PE-DG-427-507-E006

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INSTALLATION DETAIL TYPE PM1:
CABLE TRAYS ROUTED AROUND PORTAL MEMBER
FOR VERTICALLY ORIENTED TRAYS
(SEE NOTE-III(3))



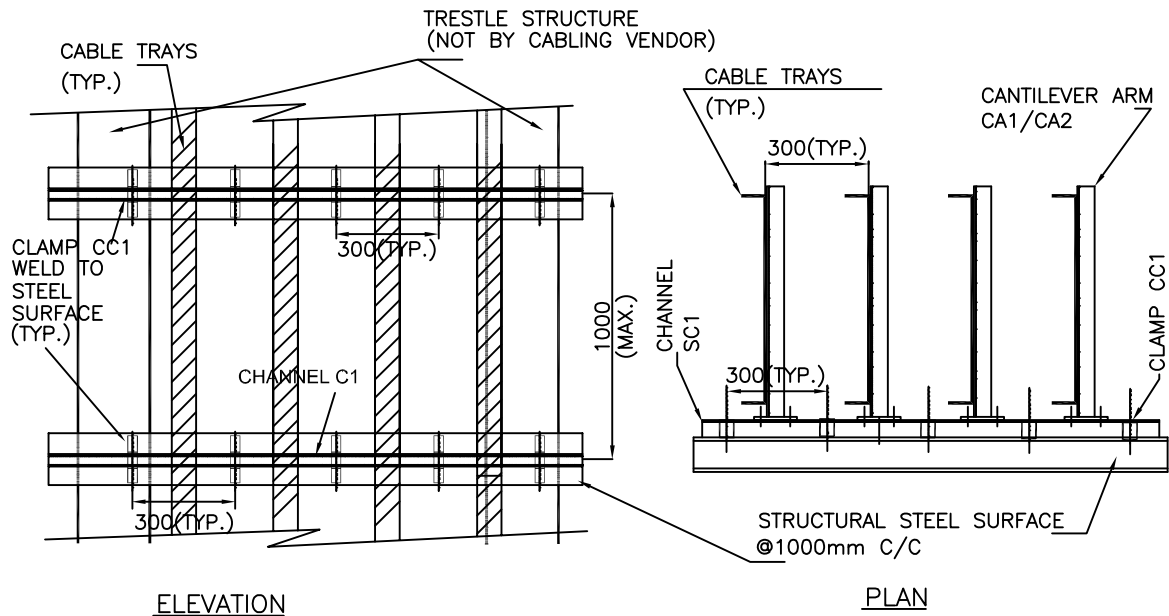
INSTALLATION DETAIL TYPE PM2:
CABLE TRAYS ROUTED AROUND PORTAL MEMBER
FOR HORIZONTALLY ORIENTED TRAYS
(SEE NOTE-III(3))

TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS

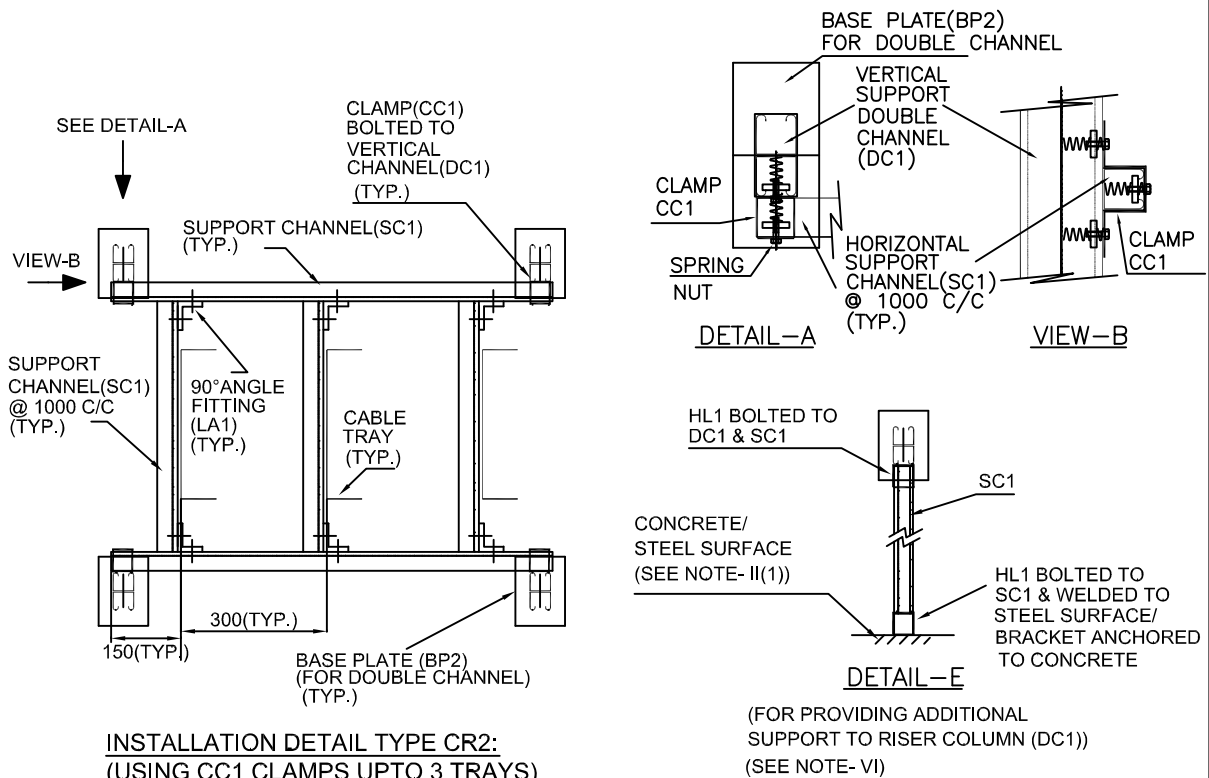
ROURKELA PP-II EXPANSION
 (1X250 MW)

DRG. No.
PE-DG-427-507-E006

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INSTALLATION DETAIL TYPE CR1:
RISER ALONG STRUCTURAL STEEL



INSTALLATION DETAIL TYPE CR2:
(USING CC1 CLAMPS UPTO 3 TRAYS)

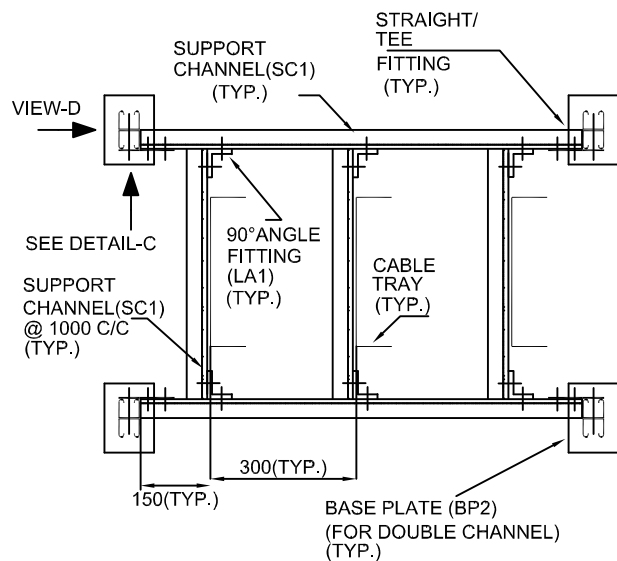
(TYPICAL CHANNEL FRAME WORK FOR CABLE TRAY RISER
UPTO & INCLUDING THREE CABLE TRAYS)

TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS

ROURKELA PP-II EXPANSION
(1X250 MW)

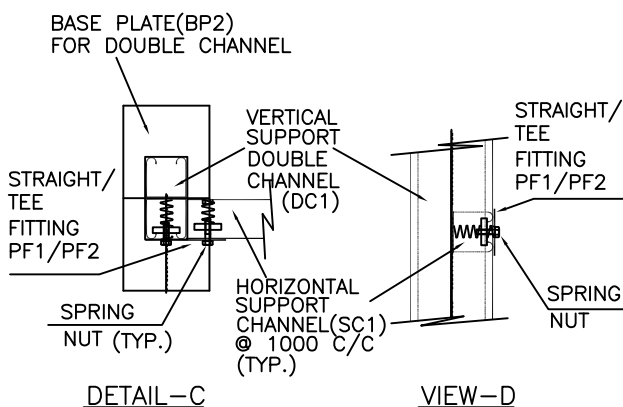
DRG. No.
PE-DG-427-507-E006

REV. 01 | **SHEET 16 OF 37**



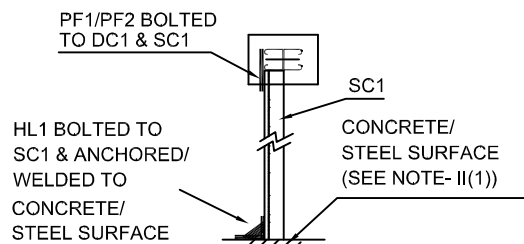
INSTALLATION DETAIL TYPE CR3:
(USING FITTINGS PF1/PF2)

(TYPICAL CHANNEL FRAME WORK FOR CABLE TRAY RISER
UPTO & INCLUDING THREE CABLE TRAYS)



DETAIL-C

VIEW-D



DETAIL-F

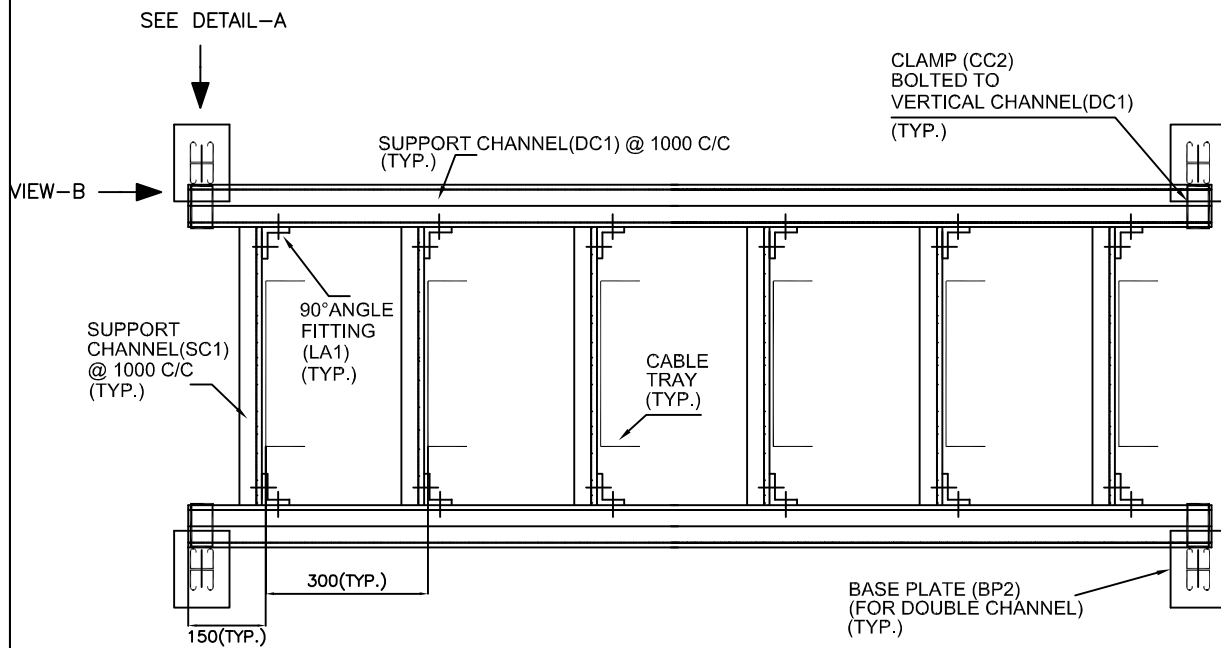
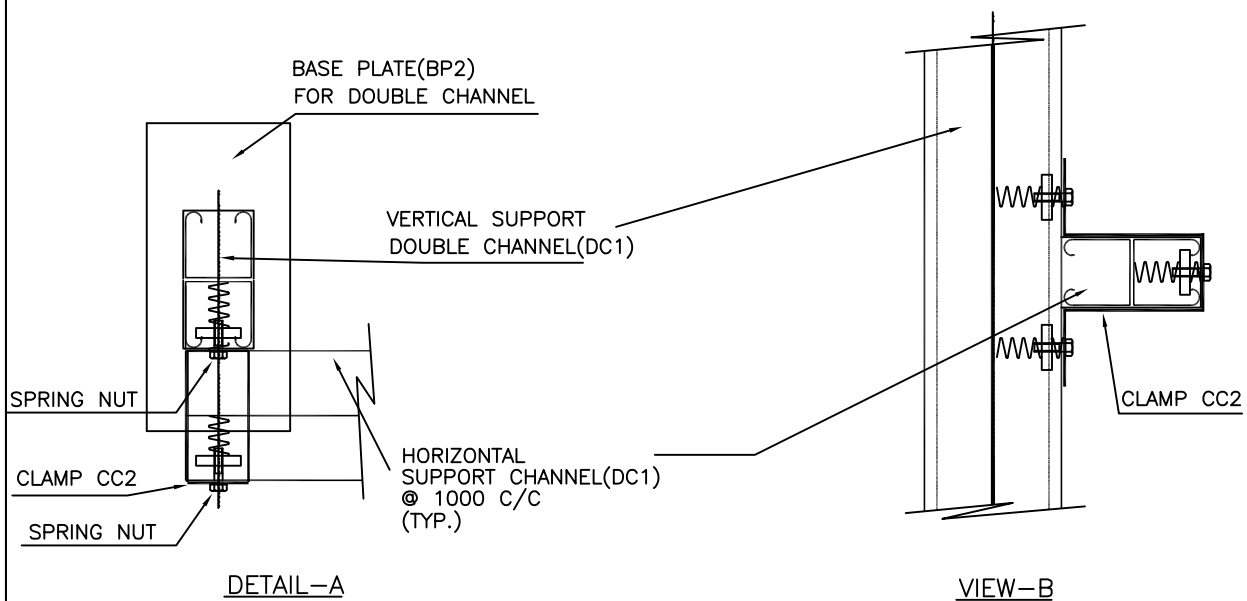
(FOR PROVIDING ADDITIONAL
SUPPORT TO RISER COLUMN (DC1))
(SEE NOTE- VI)

**TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS**

ROURKELA PP-II EXPANSION
(1X250 MW)

DRG. No.
PE-DG-427-507-E006

REV. 01 | **SHEET 17 OF 37**



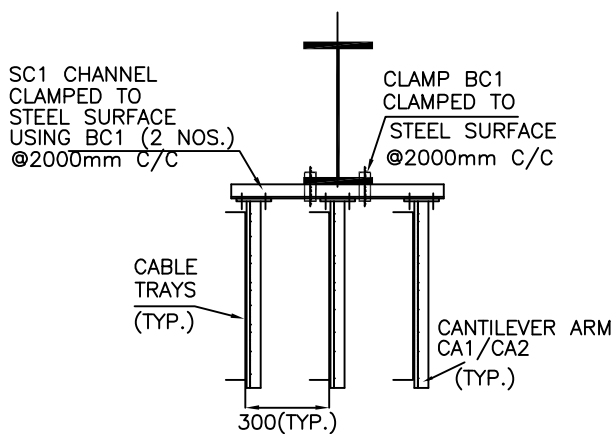
INSTALLATION DETAIL TYPE CR4:
TYPICAL CHANNEL FRAME WORK FOR CABLE TRAY RSIER
(FOR MORE THAN THREE CABLE TRAYS)

TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS

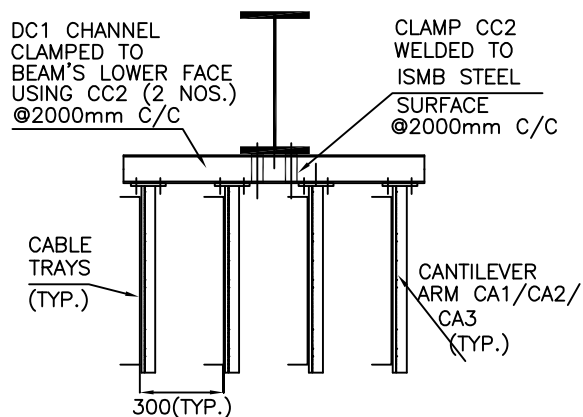
ROURKELA PP-II EXPANSION
(1X250 MW)

DRG. No.
PE-DG-427-507-E006

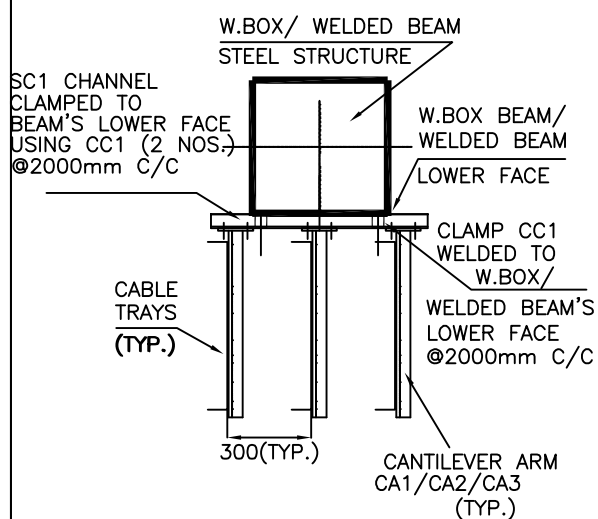
REV. 01 | **SHEET 18 OF 37**



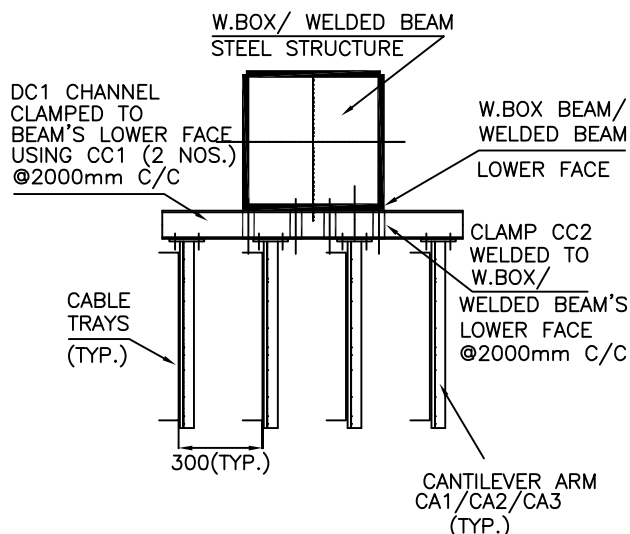
INSTALLATION DETAIL TYPE BB1:
CABLE TRAYS BELOW I-BEAMS
(UPTO & INCLUDING THREE TRAYS)



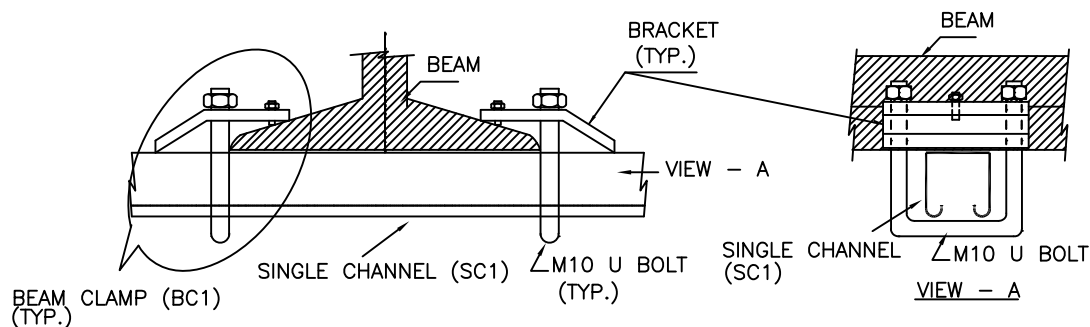
INSTALLATION DETAIL TYPE BB2:
CABLE TRAYS BELOW I-BEAMS
(MORE THAN THREE TRAYS)



INSTALLATION DETAIL TYPE BB3:
CABLE TRAYS BELOW W. BOX/
WELDED BEAM'S (APPLICABLE FOR
UPTO & INCLUDING THREE TRAYS)



INSTALLATION DETAIL TYPE BB4:
CABLE TRAYS BELOW W. BOX/
WELDED BEAM'S (APPLICABLE FOR
MORE THAN THREE TRAYS)



SINGLE CHANNEL FIXING ARRANGEMENT WITH BEAM

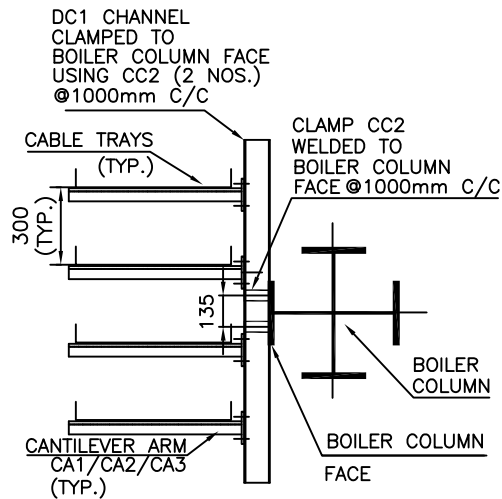
CABLE TRAYS SUPPORTING ARRANGEMENT AROUND BOILER PLATFORMS

TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS

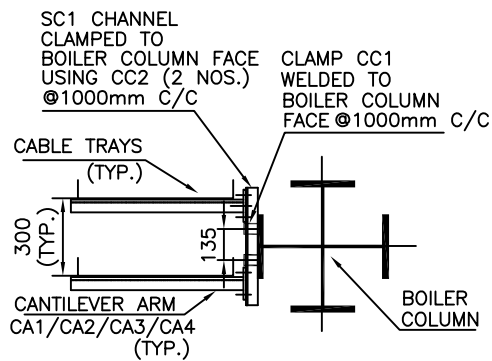
ROURKELA PP-II EXPANSION
(1X250 MW)

DRG. No.
PE-DG-427-507-E006

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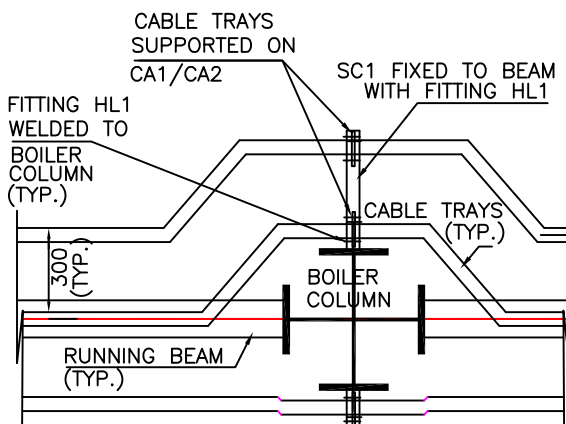


INSTALLATION DETAIL TYPE BC1:
APPLICABLE FOR 3 OR MORE TRAYS

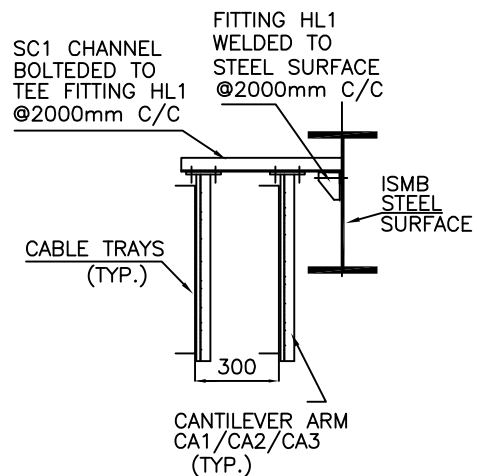


INSTALLATION DETAIL TYPE BC2:
APPLICABLE FOR LESS THAN THREE TRAYS

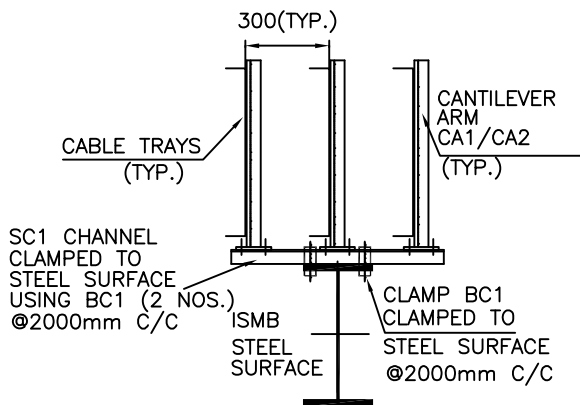
TYPICAL RISER DETAILS ALONG BOILER COLUMNS



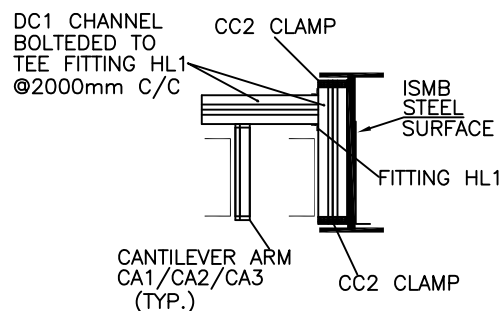
INSTALLATION DETAIL TYPE BC3:
CABLE TRAYS ROUTED AROUND BOILER COLUMN



INSTALLATION DETAIL TYPE WS1:
CABLE TRAYS SUPPORTED ON
WEB OF THE BEAM FOR
LOCAL LEVEL ADJUSTMENT FOR
HEADROOM CLEARANCES e.t.c.



INSTALLATION DETAIL TYPE BB5:
CABLE TRAYS ABOVE I-BEAMS



INSTALLATION DETAIL TYPE WS2:
CABLE TRAYS SUPPORTED WITHIN
BEAM DEPTH FOR LOCAL LEVEL
ADJUSTMENT FOR HEADROOM
CLEARANCES e.t.c.

TYPICAL INSTALLATION DETAILS FOR CABLE TRAY SUPPORT SYSTEMS

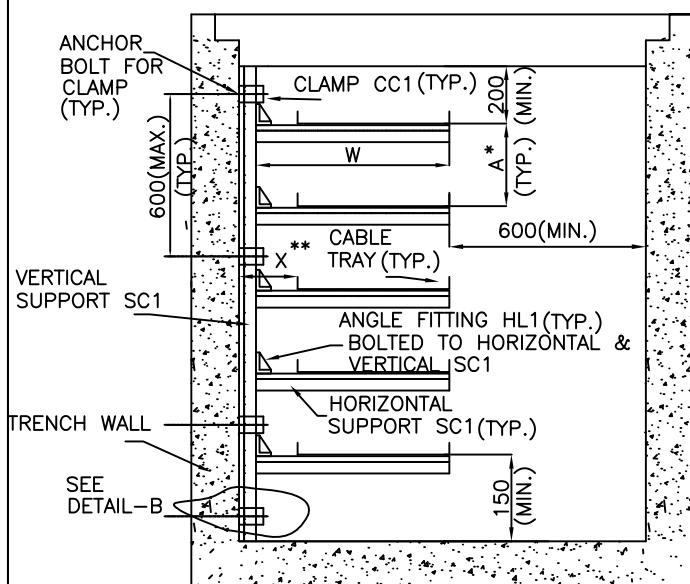
ROURKELA PP-II EXPANSION
(1X250 MW)

DRG. No.

PE-DG-427-507-E006

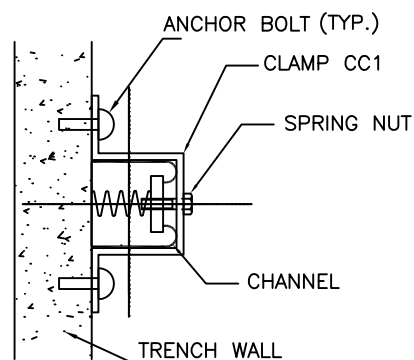
REV. 01

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* A : MIN. 300 FOR POWER CABLES
MIN. 250 FOR CONTROL & SCREENED CABLES

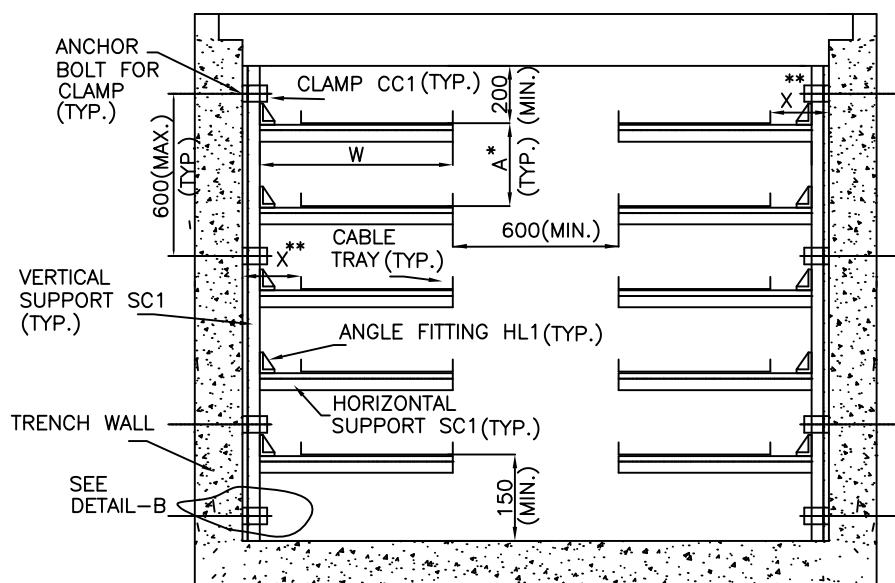
** X=100 : CLEAR GAP BETWEEN TRENCH WALL & TRAY
FOR PASSAGE OF CABLES APPLICABLE BELOW
SWITCHGEAR/ CONTROL PANELS ONLY.



DETAIL-B

INSTALLATION DETAIL TYPE TR1:

SUPPORTING ARRANGEMENT IN CABLE TRENCH, TRAYS ON SINGLE SIDE



* A : MIN. 300 FOR POWER CABLES
MIN. 250 FOR CONTROL & SCREENED CABLES

** X=100 : CLEAR GAP BETWEEN TRENCH WALL & TRAY
FOR PASSAGE OF CABLES APPLICABLE BELOW
SWITCHGEAR/ CONTROL PANELS ONLY.

TRAY WIDTH	W (MM)
600MM	750
300MM	320
150MM	170

INSTALLATION DETAIL TYPE TR2:

SUPPORTING ARRANGEMENT IN CABLE TRENCH

TRAYS ON BOTH SIDE

TYPICAL INSTALLATION DETAILS FOR CABLE TRAY SUPPORT SYSTEMS

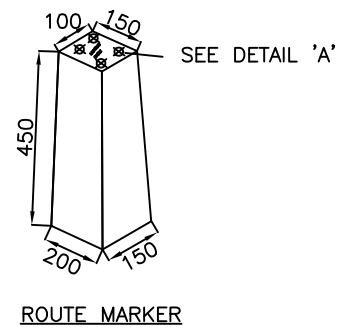
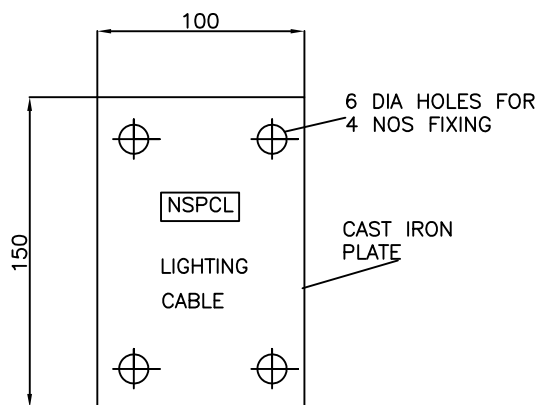
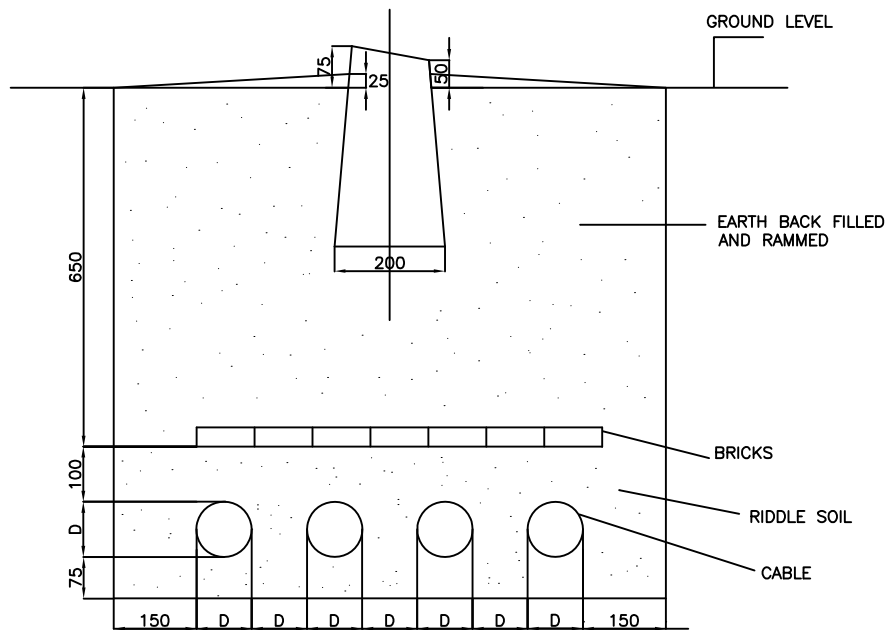
ROURKELA PP-II EXPANSION
(1X250 MW)

DRG. No.

PE-DG-427-507-E006

REV. 01

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NOTES:

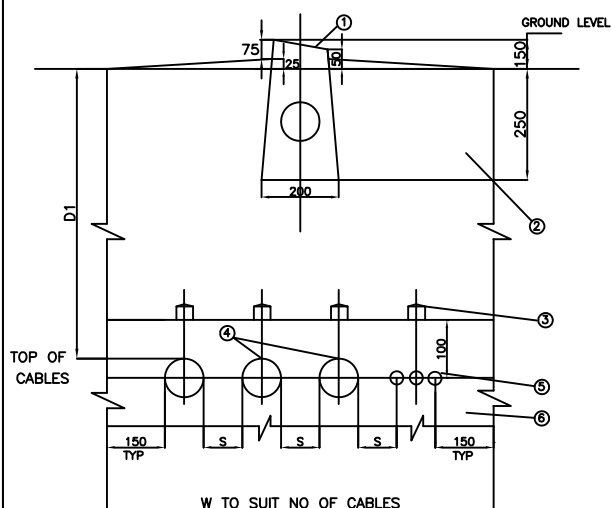
1. ALL DIMENSION ARE IN mm.
2. ROUTE MARKERS SHALL BE CONSTRUCTED OF CONCRETE WITH CAST IRON PLATE, WITH THE ROUTE INFORMATION ENGRAVED ON IT, BOLTED ON TOP OF THE CONCRETE BLOCK AS SHOWN.
3. CAST IRON PLATE SHALL BE OF MIN 6.0mm THICKNESS.

TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS

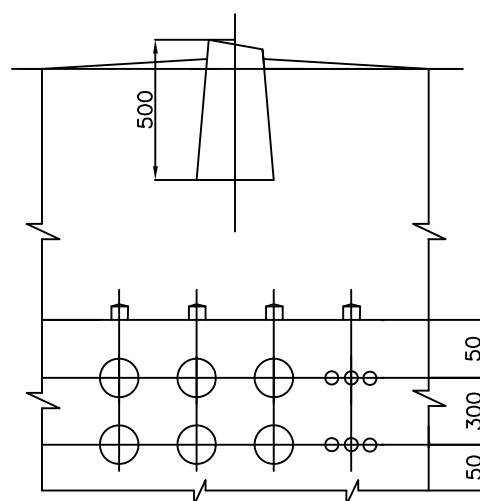
ROURKELA PP-II EXPANSION
(1X250 MW)

DRG. No.
PE-DG-427-507-E006

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DIRECTLY BURIED CABLES
IN SINGLE LAYER



DIRECTLY BURIED CABLES
IN TWO LAYER

LEGEND

- ① CABLE ROUTE MARKER
- ② EARTH BACK FILLED & RAMMED
- ③ PROTECTIVE COVERS
 - a.) BRICK FOR LOW VOLTAGE CABLES
 - b.) RCC FOR HIGH VOLTAGE CABLES WITH HOLE AT EACH END TO TIE EACH OTHER WITH G.S. WIRE
- ④ ARMoured POWER CABLE
- ⑤ ARMoured CONTROL CABLE
- ⑥ FINE SAND/RIDDLED SOIL COMPACTED

DIMENSION MIN	1100V GRADE CABLES	FOR 3.3 KV TO 11KV	ABOVE 11KV & UPTO 33KV
D1	750	900	1050
S	= d BETWEEN CABLES OF SAME CLASS = *300MM BETWEEN CABLES OF DIFFERENT CLASS = *400MM BETWEEN 1/C POWER CABLE AND COMMUNICATION CABLE = *300MM BETWEEN MULTICORE POWER CABLE & COMMUNICATION CABLE		

d= OVERALL DIAMETER OF THE BIGGER OF THE TWO CABLES

D1= MINIMUM DEPTH OF LAYING FROM GROUND SURFACE
TO TOP OF CABLES.

* = SPACING SHALL BE TAKEN BOTH HORIZONTALLY AND VERTICALLY

NOTE

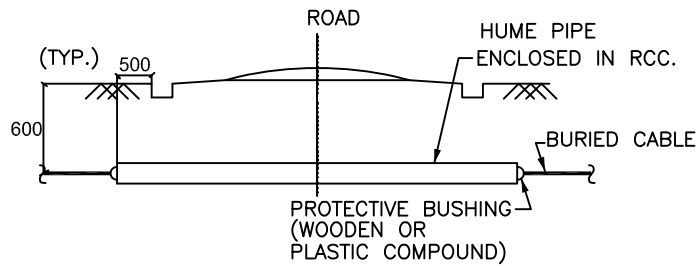
1. SINGLE CORE CABLES SHALL BE RUN IN TREFOIL FORMATION AND SHALL BE BOUND BY SELFLOCKING CABLE TIES AT EVERY 750 MM.
2. CABLE IDENTIFICATION TAG SHALL BE TIED AT BOTH ENDS OF THE CABLE
3. IF THE MINIMUM CLARENCE AS INDICATED THE ABOVE TABLE FOR CABLES OF DIFFERENT CLASSES A RE NO FEASIBLE BRICK BARRIERS SHALL BE USED BETWEEN ADJACENT CABLES.
4. G.I/HUME /HDPE PIPES SHALL BE PROVIDED FOR ROAD CROSSING AT A MINIMUM DEPTH OF 600 FROM THE GRADE LEVEL AS DECIDED FRO THE PROJECT.
5. ALL DIMENSION ARE IN MM.

TYPICAL INSTALLATION DETAILS FOR CABLE TRAY SUPPORT SYSTEMS

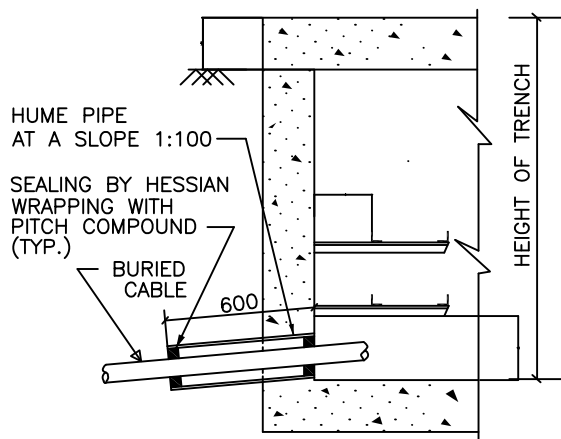
ROURKELA PP-II EXPANSION
(1X250 MW)

DRG. No.
PE-DG-427-507-E006

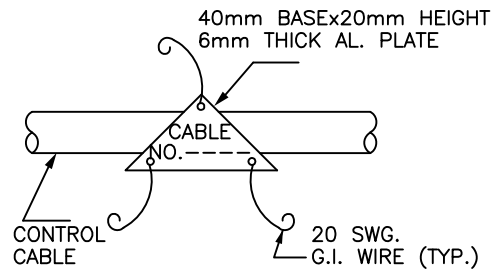
REV. 01 SHEET 23 OF 37



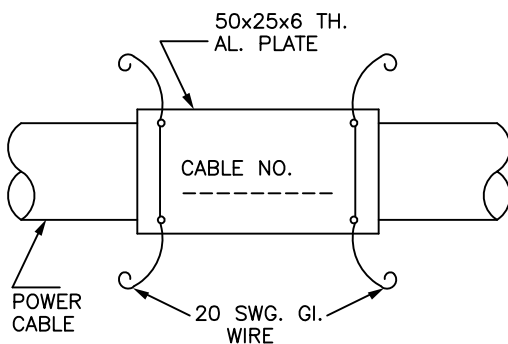
**ROAD CROSSING
OF BURIED CABLE**



**TYP. DETAILS OF BURIED CABLE
ENTRY TO BLDG. OR CABLE TRENCH**



**CABLE TAG
CONTROL CABLE**



**CABLE TAG
POWER CABLE**

NOTE:

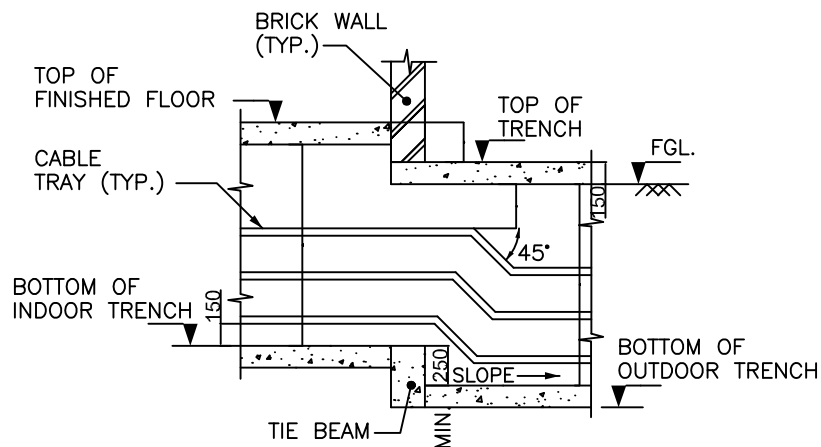
1. ALL DIMENSIONS ARE IN 'MM'.
2. BURIED CABLE DETAILS ARE SUBJECT TO CHANGE AS PER LAYOUT OF RESPECTIVE AREA.

**TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS**

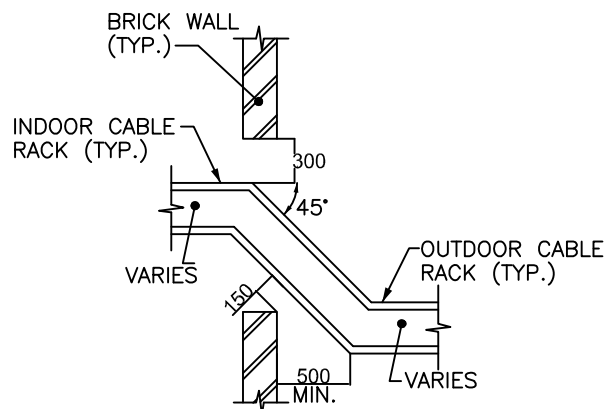
ROURKELA PP-II EXPANSION
(1X250 MW)

DRG. No.
PE-DG-427-507-E006

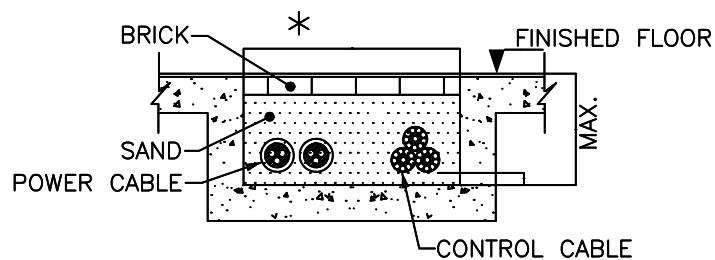
REV. 01 | **SHEET 24 OF 37**



**TYPICAL DETAILS OF CABLE TRENCH
ENTRY TO BUILDING**



**TYPICAL DETAILS OF CABLE RACK
ENTRY TO BUILDINGS**



**CABLE LAYING IN SHALLOW TRENCH
(INDOOR)**

NOTE:

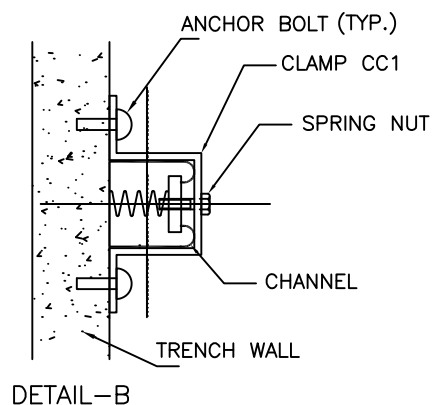
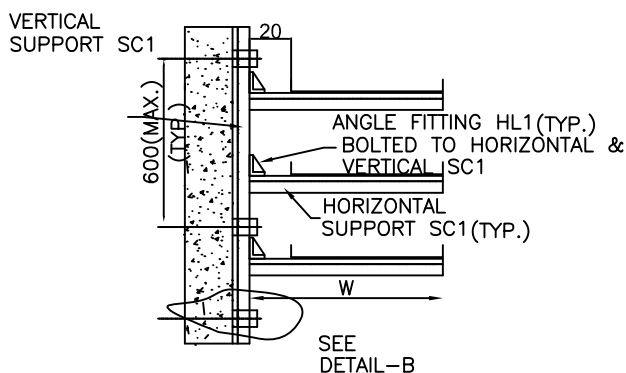
1. ALL DIMENSIONS ARE IN 'MM'.
2. ABOVE DETAILS ARE SUBJECT TO CHANGE AS PER LAYOUT OF RESPECTIVE AREA.
3. THE PORTION OF FLOOR ABOVE THE TRENCH MARKED '*', SHALL BE FINISHED WITH WEAK MORTER.

**TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS**

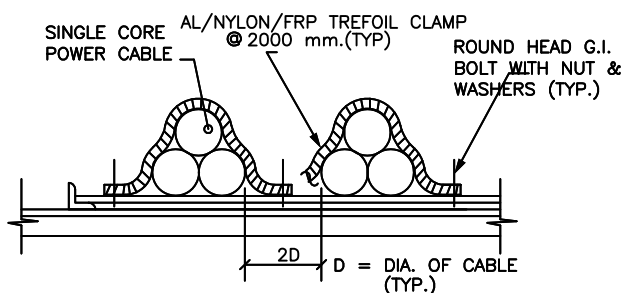
ROURKELA PP-II EXPANSION
(1X250 MW)

DRG. No.
PE-DG-427-507-E006

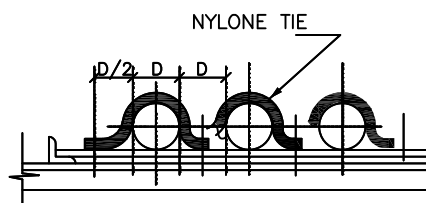
REV. 01 | **SHEET 25 OF 37**



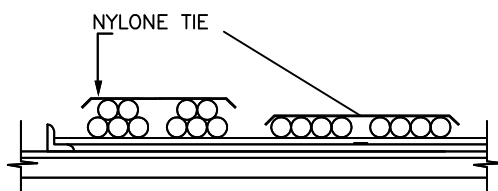
SUPPORTING ARRANGEMENT FOR BRICK OR CONCRETE WALL/COLUMN



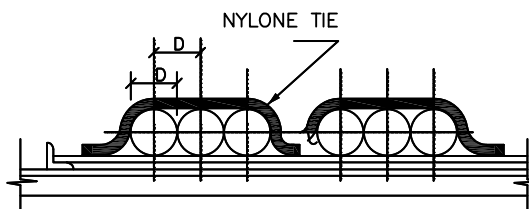
CABLE CLAMPS IN TREFOIL FORMATION
FOR SINGLE CORE POWER CABLES



CABLE CLAMPS FOR
MULTICORE POWER CABLES
(NOT TOUCHING EACHOTHER)



CLAMPING ARRANGEMENT
OF CONTROL CABLES



CABLE CLAMPS FOR
MULTICORE POWER CABLES
(TOUCHING EACHOTHER)

NOTE:

For horizontal trays arrangements, multicore power cables and control cables shall be secured at every five meter interval. For vertical tray arrangement, individual multicore power cables and control cables shall be secured at every one meter by nylon cable strap.

After completion of cable laying work in the particular vertical tray, all the control cables shall be binded to trays/supports by aluminium strips at every five meter interval and at every bend.

**TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS**

ROURKELA PP-II EXPANSION
(1X250 MW)

DRG. No.
PE-DG-427-507-E006

REV. 01 | **SHEET 26 OF 37**

NOTES:-

- I. THIS DRAWING SHALL BE REFERRED ONLY FOR INSTALLATION OF CABLE TRAY SUPPORT SYSTEM.**
- II. SUPPORTING ARRANGEMENT IN CABLE VAULTS**
1. BASEPLATES/ANGLE FITTINGS SHALL BE CONTINUOUSLY WELDED ALL ROUND TO STEEL MEMBERS/ PLATE INSERTS PROVIDED. BRACKETS/ CLAMPS SHALL BE WELDED TO STEEL SURFACE WITH CHANNEL SC1/DC1 (AS APPLICABLE) IN POSITION TO ENSURE ALIGNMENT OF CLAMPS/CHANNEL. WELD THICKNESS SHALL BE 6MM MINIMUM. IN CASE STEEL SURFACE IS NOT AVAILABLE FOR WELDING, ANCHOR BOLTS SHALL BE USED FOR FIXING THE BASEPLATE/ANGLE FITTING.
 2. MAIN SUPPORTS FOR ALL LONGITUDINAL CABLE TRAY RUNS IN THE CABLE VAULTS SHALL BE FIXED AT BOTH ENDS AT THE TOP AS WELL AS AT THE BOTTOM AS OUTLINED ABOVE, FOR MORE THAN THREE TRAYS.
 3. SINGLE CHANNEL SUPPORT SC1 WHEREVER SUPPORTED FROM TOP ONLY SHALL BE USED FOR UPTO AND INCLUDING TWO TRAYS ONLY. WHEREVER MORE THAN TWO TRAYS ARE TO BE SUPPORTED IN THIS FASHION, DOUBLE CHANNEL DC1 SHALL BE USED.
 4. GALVANISATION DAMAGED DUE TO WELDING/CUTTING SHALL BE BRUSHED & RED LEAD PRIMER, OIL PRIMER AND ALUMINIUM PAINT SHALL BE APPLIED.
- III. SUPPORTING ARRANGEMENT ALONG PIPERACK**
1. BRACKETS/CLAMPS SHALL BE WELDED TO STEEL SURFACE WITH CHANNEL C1/C2 (AS APPLICABLE) IN POSITION TO ENSURE ALIGNMENT OF CLAMPS/CHANNEL. WELD THICKNESS SHALL BE 6MM MINIMUM.
 2. GALVANISATION DAMAGED DUE TO WELDING/CUTTING SHALL BE REPAIRED WITH COLD GALVANISING PAINT.
 3. WHEREVER PORTAL MEMBERS ARE ENCOUNTERED IN THE PATH OF THE TRAYS, THE TRAYS SHALL BE BENT INWARDS SUFFICIENTLY TO CLEAR THE OBSTRUCTION. FOR THIS PURPOSE, THE CANTILEVER ARMS PRECEDING & SUCCEEDING IMMEDIATELY THE PORTAL MEMBERS SHALL BE REPLACED BY SUITABLE LENGTHS OF HORIZONTAL SC1 CHANNEL FIXED TO THE VERTICAL SUPPORT BY MEANS OF ANGLE FITTING LA1. ADDITIONAL SUPPORT ALONG PORTAL MEMBER CAN SIMILARLY BE PROVIDED USING THE SC1 CHANNEL & LA1 COMBINATION.
 4. ALONG OVERHEAD CABLE TRAY ROUTES TRAYS SHALL BE ORIENTED VERTICALLY IN AREAS PRONE TO COAL DUST/ ASH (E.G. BOILER AREA & ESP AREA). ALONG OTHER ROUTES TRAYS SHALL GENERALLY BE ORIENTED HORIZONTALLY. HOWEVER IF SO REQUIRED DUE TO LAYOUT/ AESTHETIC CONSIDERATIONS, TRAYS MAY BE ORIENTED VERTICALLY IN OTHER AREAS ALSO. EXACT ORIENTATION SHALL BE AS PER APPROVED LAYOUT DRAWINGS.
- IV. SUPPORTING ARRANGEMENT IN TRENCHES**
1. CHANNEL SUPPORT SHALL BE PROVIDED AT 2.0M SPACING & SHALL BE FIXED AGAINST TRENCH WALL FOR EVERY TWO TRAYS USING CLAMPS (SPACED AT 600MM MAX.) AS SHOWN.
 2. 2NOS.-M12, ANCHOR BOLTS & 1NO.- SPRING NUT SHALL BE USED WITH EACH CLAMP FOR THE ARRANGEMENT SHOWN.
 3. ARRANGEMENT TR1 & TR2 SHALL BE USED
- V. SUPPORTING ARRANGEMENT FOR BOILERS**
1. TRAYS SHALL BE SUPPORTED FROM STRUCTURAL STEEL MEMBERS AVAILABLE ALONG THE TRAY PATH. WHEREVER STRUCTURAL STEEL IS NOT AVAILABLE FOR LENGTHS EXCEEDING 3 METRES SUITABLE STRUCTURAL STEEL MEMBER (ISMB/ISMC) SHALL FIRST BE WELDED TO THE NEAREST AVAILABLE STRUCTURAL STEEL AND THE CABLE TRAY SUPPORTS SHALL THEN BE CLAMPED TO THESE MEMBERS. FOR LENGTHS UPTO & INCLUDING 3M, SC1/DC1 FIXED AT BOTH ENDS SHALL BE USED.
 2. CABLE SUPPORT INSTALLATION SHALL BE CARRIED OUT ONLY AFTER PIPE/ EQUIPMENT ERECTION ON BOILER PLATFORMS IS COMPLETED.
 3. WHEREVER CLAMPS/ANGLE FITTINGS/BASEPLATES/SC1/DC1 ETC. ARE WELDED TO BOILER STRUCTURE, FILLET WELD THICKNESS SHALL BE 6MM MINIMUM.
 4. GALVANISATION DAMAGED DUE TO WELDING/CUTTING SHALL BE BRUSHED & RED LEAD PRIMER, OIL PRIMER AND ALUMINIUM PAINT SHALL BE APPLIED.
- VI. CHANNEL FRAME WORK FOR RISERS**
- IN ADDITION TO THE SUPPORT FROM GROUND, THE RISER FRAMEWORK SHALL BE CONNECTED TO THE AVAILABLE BUILDING STEEL AT HIGHER ELEVATIONS WHEREVER AVAILABLE. THIS SHALL BE DONE BY USING ANGLE FITTINGS BOLTED TO THE RISER STRUCTURE ON ONE END & WELDED WITH SUITABLE STRUCTURAL STEEL MEMBER ON THE OTHER WHICH IN TURN SHALL BE WELDED TO BUILDING STEEL. IN CASE CONCRETE SURFACE IS AVAILABLE IN PLACE OF STEEL NECESSARY CONNECTION WILL BE REALISED BY USE OF BRACKETS/ CLAMPS FIXED TO CONCRETE SURFACE WITH ANCHOR FASTENERS.
- VII. CABLE TRAYS SHALL NORMALLY BE FIXED TO CANTILEVER ARMS BY MEANS OF PAN HEAD SCREW & NUT SUPPLIED AS PART OF CANTILEVER ARMS. TRAY CLAMP TC1 SHALL BE USED FOR CLAMPING THE TRAY TO CANTILEVER ARM WHEREVER DUE TO MANUFACTURING/ERECTION/SITE LIMITATIONS, THE CENTER LINES OF CANTILEVER ARM AND THE HOLES IN TRAY BOTTOMS ARE NOT MATCHED.**
- VIII. WHEREVER DIFFERENT ALTERNATIVES FOR SIMILAR SUPPORT ARRANGEMENT ARE SHOWN, SITE SHALL DECIDE THE EXACT ALTERNATIVE TO BE USED DEPENDING UPON SITE CONDITIONS.**
- IX. WHEREVER CANTILEVER ARM CANNOT BE USED FOR DIRECT SUPPORTING OF TRAYS DUE TO LAYOUT CONSTRAINTS (E.G. BENDING OF TRAYS TO AVOID OBSTRUCTION), SUFFICIENT LENGTHS OF SC1 SHALL BE USED AS DIRECT SUPPORT IN PLACE. THESE SHALL BE FIXED BY MEANS OF ANGLE FITTING LA1.**
- X. BEAM CLAMP SHALL BE USED WHEREVER STRUCTURAL BEAM OF SUITABLE SECTION & ORIENTATION IS AVAILABLE.**
- XI. FOR INSTALLATION DETAIL TYPE DB3, DB4, DS2, DS4, DS6 & DS8 WHEREVER DISSIMILAR TYPE OF CABLES ARE INSTALLED AT THE SAME LEVEL ON EITHER SIDE OF THE MAIN SUPPORT (e.g. LTP & HTP, LTP & CONTROL, CONTROL & SCREENED CABLE), MINIMUM 300MM OF HORIZONTAL CLEARANCE SHALL BE ENSURED BETWEEN SUCH TRAYS BY USING LOWER SIZE TRAYS.**
- XII. TRAY SUPPORTS SHALL BE PROVIDED @2.0M SPACING FOR HORIZONTAL RUNS AND @1.0M FOR CABLE SHAFTS/ RISERS.**

TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS

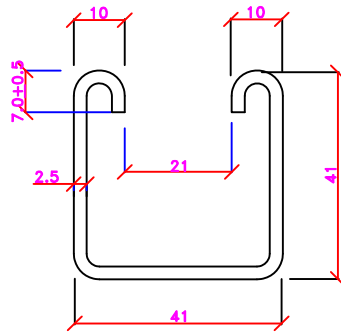
ROURKELA PP-II EXPANSION
 (1X250 MW)

DRG. No.

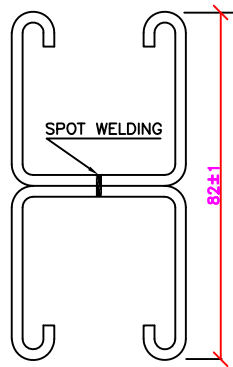
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SINGLE CHANNEL SC1



DOUBLE CHANNEL DC1

TWO LENGTHS OF SINGLE CHANNEL

SPOT WELDED BACK TO BACK

AT 75MM C/C

NOTE:

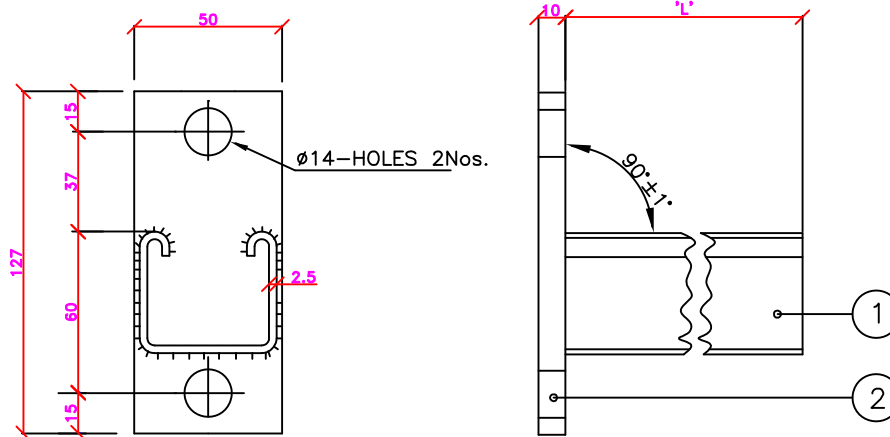
1. ALL DIMENSIONS ARE IN mm.
2. MATERIAL : 2.5MM THK MS SHEET HOT ROLLED M.S. AS PER IS: 1079.
3. FINISH : HOT DIP GALVANISED AS PER IS 2629
4. TOLERANCE ON THICKNESS IS AS PER IS 1852
5. PROFILE TOLERANCE ± 0.5 mm
6. ZINC COATING SHALL BE 610g/sq.mm

TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS

ROURKELA PP-II EXPANSION
(1X250 MW)

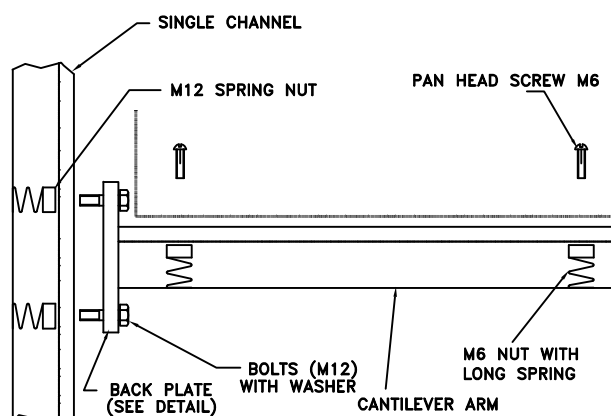
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CANTILEVER ARMS

TRAY WIDTH IN MM	CANTILEVER ARM LENGTH (IN MM) OVER HEAD TRAYS	CANTILEVER ARM LENGTH (MM) TRAYS IN TRENCH
150	170	170
300	320	320
600	620	750



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 :

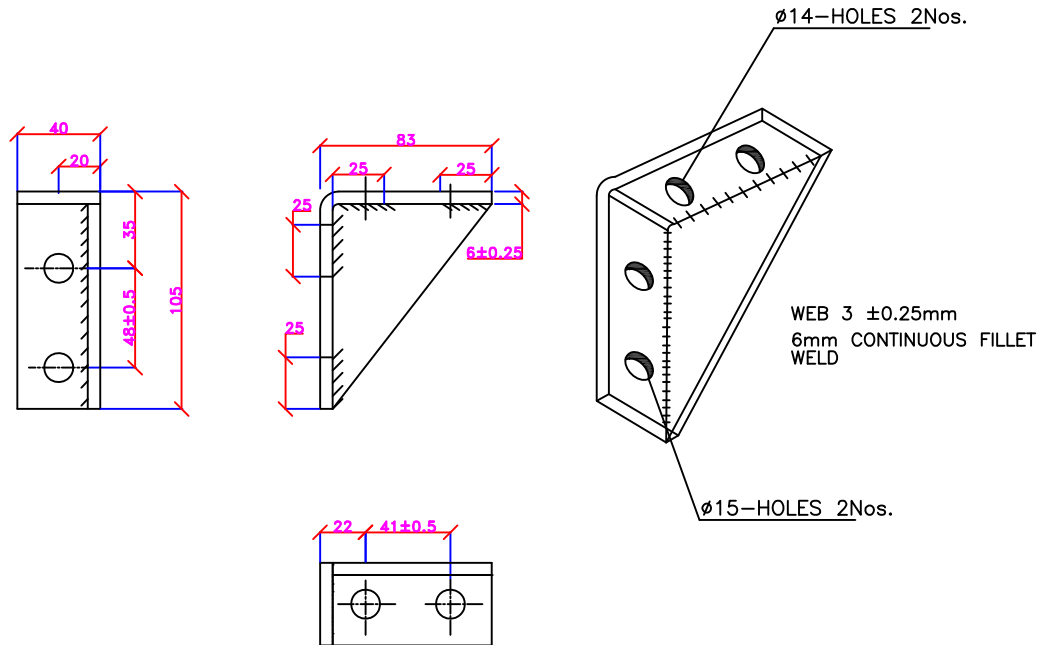
1. ALL DIMENSIONS ARE IN mm.
2. MATERIAL : 2.5MM THK MS SHEET HOT ROLLED M.S. AS PER IS: 1079.
3. FINISH : HOT DIP GALVANISED AS PER IS:2629
4. TOLERANCE ON THICKNESS IS AS PER IS:1852
5. ALL FABRICATION TOLERANCES ARE $\pm 1.0\text{mm}$
6. ZINC COATING SHALL BE 610g/sq.mm

TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS

ROURKELA PP-II EXPANSION
(1X250 MW)

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90° ANGLE FITTING HL1

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

NOTES :

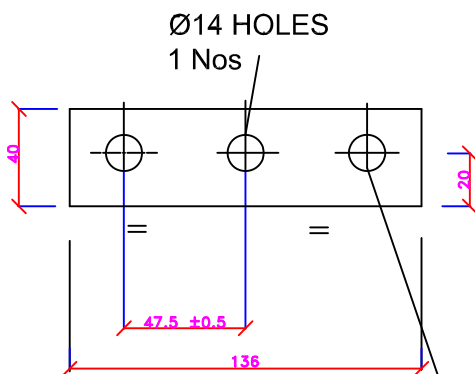
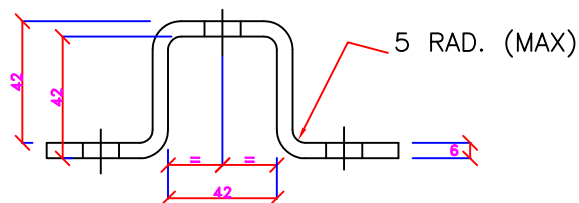
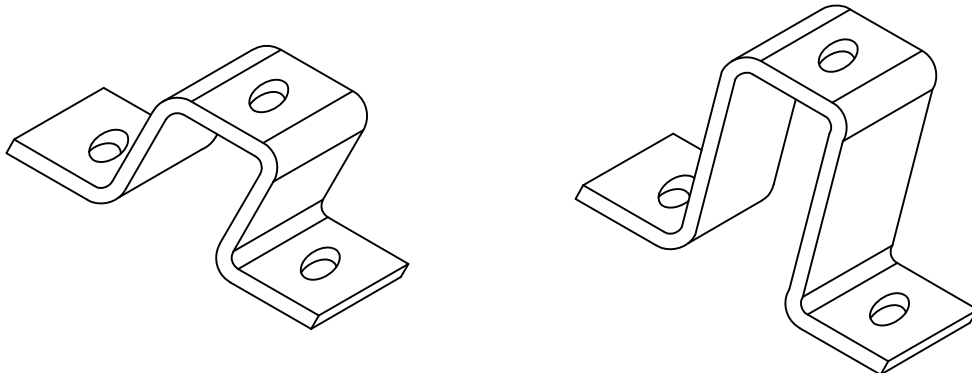
1. ALL DIMENSIONS ARE IN mm.
2. ALL FABRICATION TOLERANCES ± 1.0 mm
3. MATERIAL :MILD STEEL AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629
5. TOLERANCE ON THICKNESS AS PER IS:1852
6. ZINC COATING SHALL BE 610g/sq.mm

TYPICAL INSTALLATION DETAILS FOR CABLE TRAY SUPPORT SYSTEMS

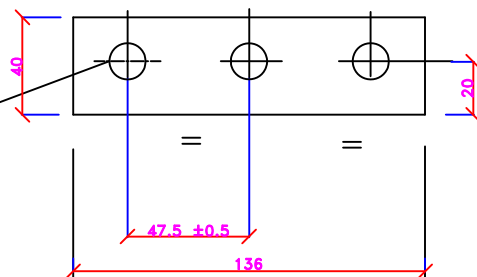
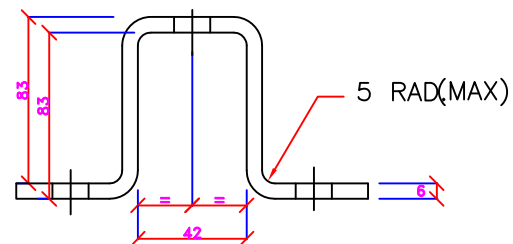
ROURKELA PP-II EXPANSION
(1X250 MW)

DRG. No.
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CLAMP FOR SINGLE CHANNEL CC1



CLAMP FOR DOUBLE CHANNEL CC2

NOTES

1. ALL DIMENSIONS ARE IN mm.
2. ALL FABRICATION TOLERANCES ± 1.0 mm
3. MATERIAL :MILD STEEL AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629
5. TOLERANCE ON THICKNESS AS PER IS:1852
6. ZINC COATING SHALL BE 610g/sq.mm

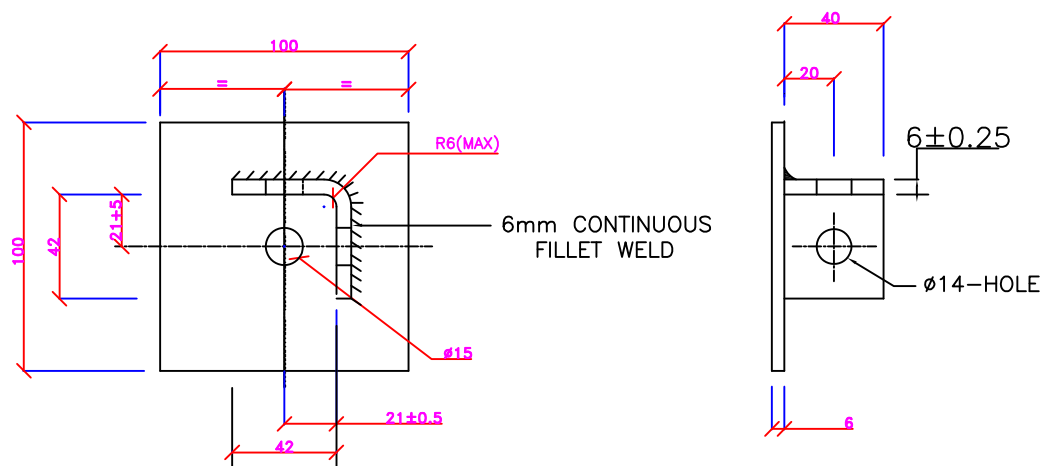
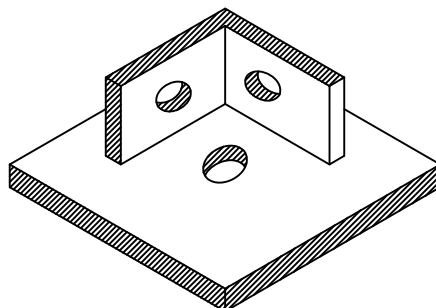
ANCHOR FASTENER-2NOs.
SPRING NUT & WASHER-1NO.

TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS

ROURKELA PP-II EXPANSION
(1X250 MW)

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BASE PLATE FOR SINGLE CHANNEL BP1

NOTE

1. ALL DIMENSIONS ARE IN MM.
2. ALL FABRICATION TOLERANCES $\pm 1.0\text{mm}$.
3. MATERIAL :MILD STEEL AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629
5. TOLERANCE ON THICKNESS AS PER IS:1852
6. ZINC COATING SHALL BE 610g/sq.mm

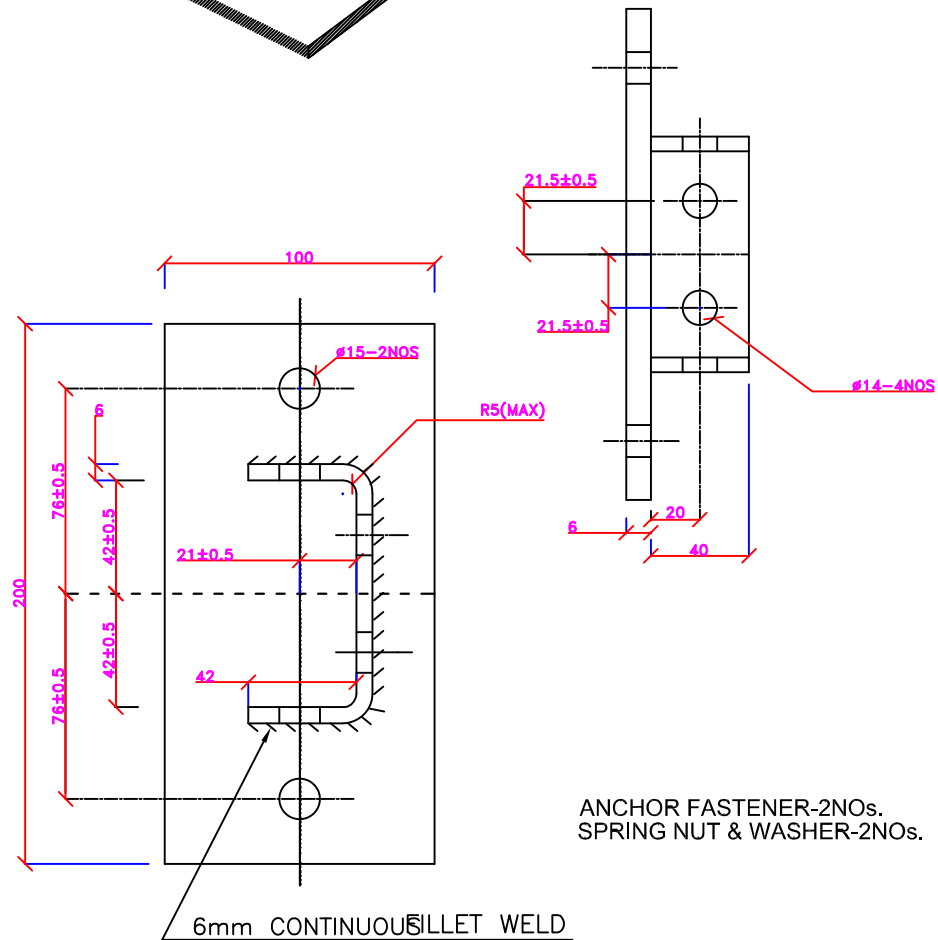
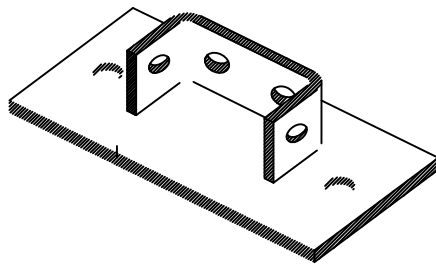
ANCHOR FASTENER-1NO.
SPRING NUT & WASHER-1NO.

TYPICAL INSTALLATION DETAILS
FOR CABLE TRAY SUPPORT SYSTEMS

ROURKELA PP-II EXPANSION
(1X250 MW)

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BASE PLATE FOR DOUBLE CHANNEL BP2

NOTES

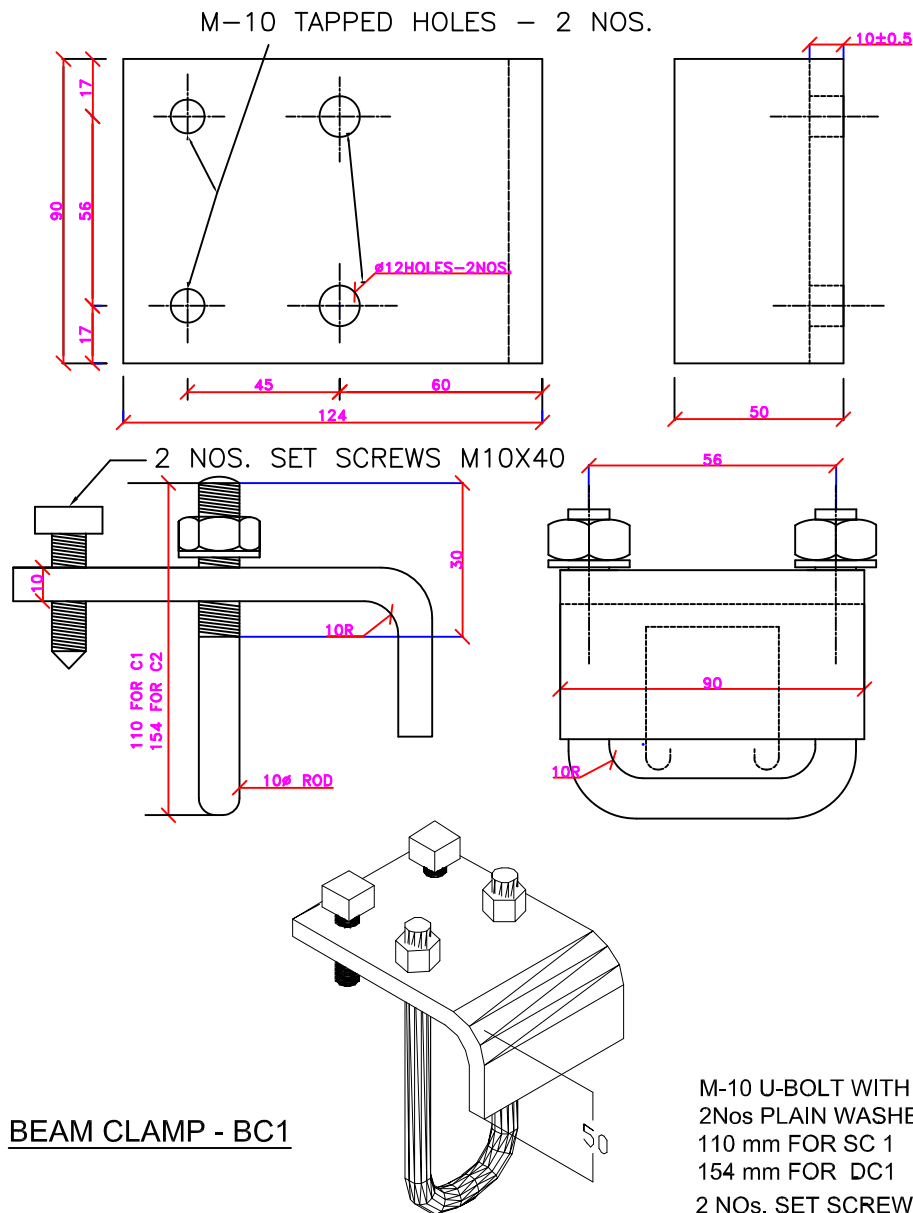
1. ALL DIMENSIONS ARE IN MM
2. ALL FABRICATION TOLERANCES ± 1.0 mm
3. MATERIAL :MILD STEEL AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629
5. TOLERANCE ON THICKNESS AS PER IS:1852
6. ZINC COATING SHALL BE 610g/sq.mm

TYPICAL INSTALLATION DETAILS FOR CABLE TRAY SUPPORT SYSTEMS

ROURKELA PP-II EXPANSION
(1X250 MW)

DRG. No.
PE-DG-427-507-E006

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NOTES

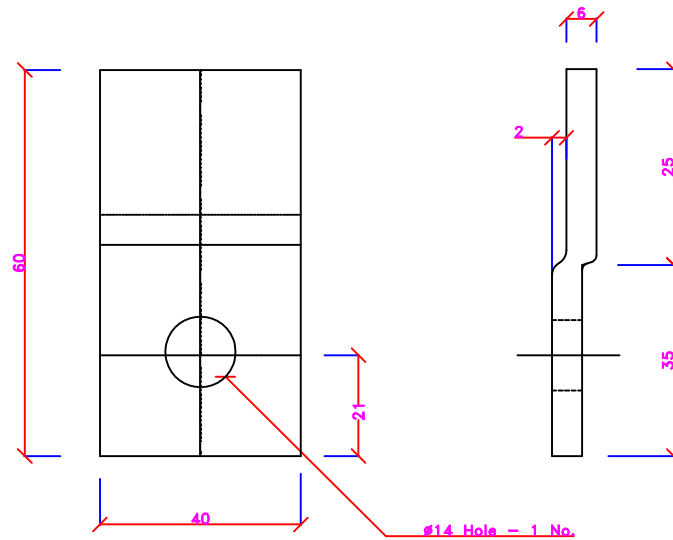
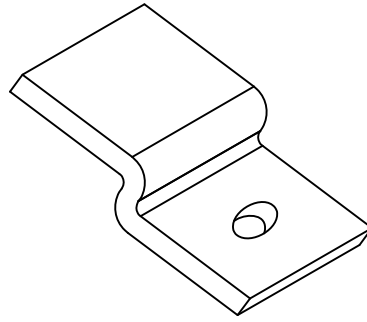
1. ALL DIMENSIONS ARE IN mm.
2. ALL FABRICATION TOLERANCES $\pm 1.0\text{mm}$
3. MATERIAL :MILD STEEL AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629
5. TOLERANCE ON THICKNESS AS PER IS:1852
6. ZINC COATING SHALL BE 610g/sq.mm

TYPICAL INSTALLATION DETAILS FOR CABLE TRAY SUPPORT SYSTEMS

ROURKELA PP-II EXPANSION
(1X250 MW)

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TRAY FIXING CLAMP - TC1

SPRING NUT & WASHER-1NO.

NOTES

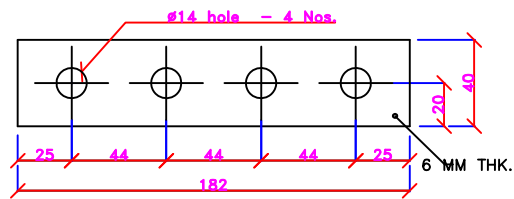
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2. ALL FABRICATION TOLERANCES : $\pm 1.0\text{mm}$
3. MATERIAL :MILD STEEL AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629
5. TOLERANCE ON THICKNESS AS PER IS:1852
6. ZINC COATING SHALL BE 610g/sq.mm

TYPICAL INSTALLATION DETAILS FOR CABLE TRAY SUPPORT SYSTEMS

ROURKELA PP-II EXPANSION
(1X250 MW)

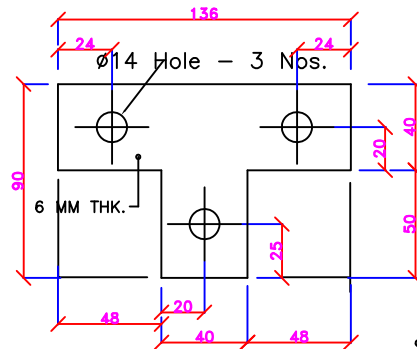
DRG. No.
PE-DG-427-507-E006

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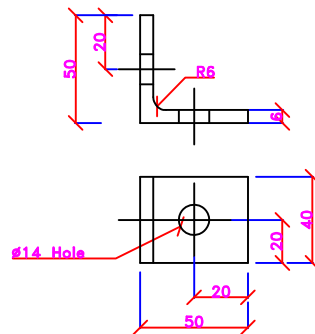
SPRING NUT & WASHER-4NOs.

FLAT PLATE STRAIGHT FITTING PF2



SPRING NUT & WASHER-3NOs.

FLAT PLATE TEE FITTING PF1



SPRING NUT & WASHER-2NOs.

90° ANGLE FITTING LA1

NOTES

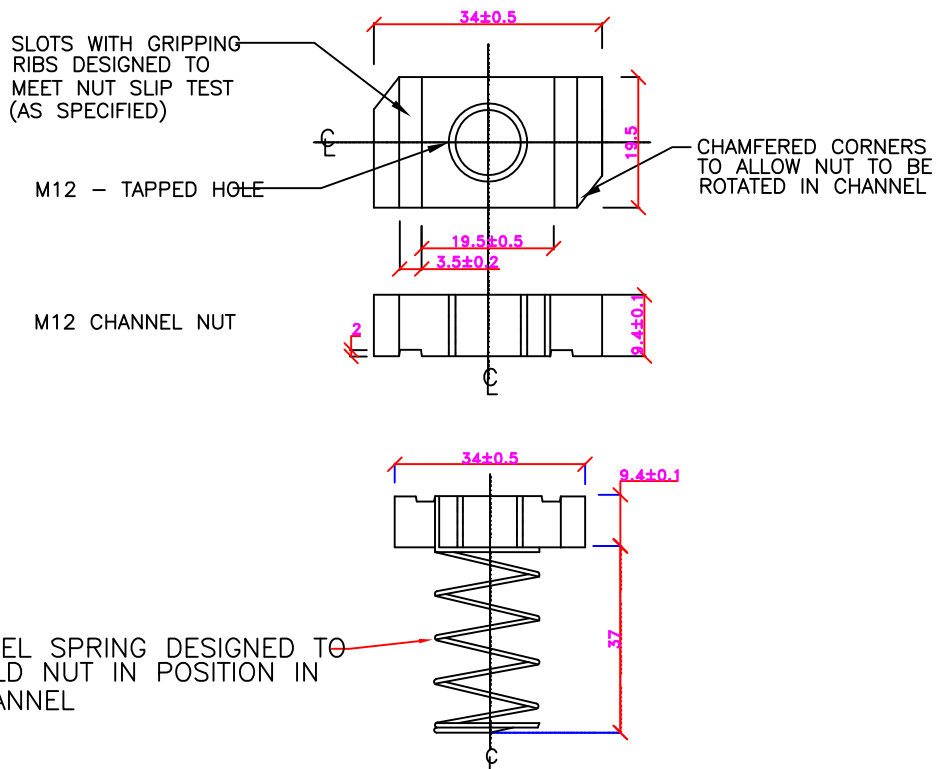
1. ALL DIMENSIONS ARE IN mm.
2. ALL FABRICATION TOLERANCES ± 1.0 mm
3. MATERIAL :MILD STEEL AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629
6. ZINC COATING SHALL BE 610g/sq.mm

TYPICAL INSTALLATION DETAILS FOR CABLE TRAY SUPPORT SYSTEMS

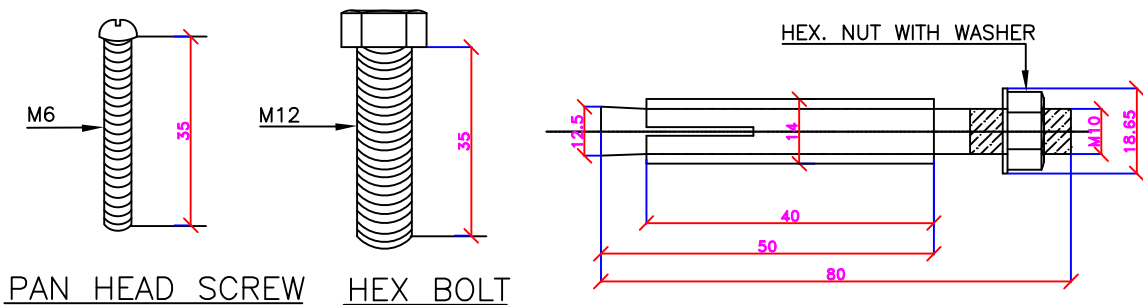
ROURKELA PP-II EXPANSION
(1X250 MW)

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SPRING NUT ASSEMBLY



PAN HEAD SCREW

HEX BOLT

ANCHOR BOLT M10

NOTES:

1. MATERIAL - MS AS PER IS - 2062.
2. M6 CHANNEL NUT DIMENSIONAL SIMILAR TO M12.
EXCEPT HOLE DRILLED AND TAPPED TO M6 PAN HEAD SCREWS.
3. TAPPED HOLE THREADING TO MATCH WITH THREADING OF BOLTS.
4. SURFACE PROTECTION ELECTROGALVANISED / CADMIUM PLATED.
5. ALL DIMENSIONS ARE IN MM.
6. ZINC COATING SHALL BE 610g/sq.mm

TYPICAL INSTALLATION DETAILS FOR CABLE TRAY SUPPORT SYSTEMS

ROURKELA PP-II EXPANSION
(1X250 MW)

DRG. No.
PE-DG-427-507-E006

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		VOLUME II B	
		SECTION - D	
		Rev. O	DATE: 12/12/2016
		SHEET 1	OF 6

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

LIST OF TESTS TO BE CONDUCTED

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 metre length of main support channel shall be fixed vertically at each end to a rigid structure as per appropriate fixing arrangement. 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 following load intervals and other necessary points:

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



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iv) Proof load + point load

v) Off load

The deflection measured at working loads shall not exceed 16 mm. 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 appropriate fixing arrangement. 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 the following load intervals and other necessary points.

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



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proof load and point load applied

- b) Test 2B:** 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 detailed below and other important points not mentioned herein.

- 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.
- 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 nut slip characteristics (what ever applicable)

Tests 4A1, 4A2, 4A3:

A length of channel C1 section 200 mm long shall have fitted bracket with the two bolts fixing.



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With loads applied at the appropriate position nut slip shall be determined with bolt torque of 30 NM, 50 NM and 65 NM No fewer than three measurements shall be made or each torque setting.

A minimum loading of 720 kg shall be obtained before nut slip with bolt torque of 65 NM.

Tests 4B1, 4B2, 4B3:

The length of channel C1 section 200 mm long shall have fitted bracket with the one bolt fixing. With loads applied at the appropriate position, 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 5 Weld Integrity Test

After deflection test as per test 1A, 1B, 2, 3 & 6 weld integrity shall be checked by magnetic particle inspection to detect sub-surface cracks developed, if any.

Test 6 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 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



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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

Routine/ Acceptance Tests**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) HV/IR as applicable.
- d) Check/measurement of thickness of paint/zinc coating/nickel-chrome plating as per specification & applicable standard.

Acceptance Test

- a) Galvanising Tests as per applicable standards
- b) Welding checks



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- 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.