

***TECHNICAL SPECIFICATION FOR
LOW VOLTAGE NSP BUSDUCT***

BHEL DOCUMENT NO. : EPD-BD-CPBG-14015, REV-0



**BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAINS DIVISION
BANGALORE – 560012**

	positioned so as to be clearly visible and shall have the device number, as mentioned in the module wiring drawings.
27.04.00	Caution name plate "Caution Live Terminals" shall be provided at all points where the terminals are likely to remain live and isolation is possible only at remote end.
28.00.00	METAL ENCLOSED NON SEGREGATED PHASE BUSDUCT(AIR INSULATED)
28.01.00	Three phase and neutral metal enclosed non segregated phase bus duct assemblies shall be supplied for incoming connections from the transformers to the switch boards and inter connecting sections between switch boards, wherever called for.
28.02.00	The enclosure shall be made of minimum 3 mm thick aluminum alloy. The section of the bus duct shall be rectangular. The design of the bus duct enclosures shall be of sturdy construction such that it will withstand the internal or external forces resulting from the various operating conditions.
28.03.00	The entire bus duct shall be designed for dust, vermin and weather proof construction. A suitable aluminum sheet flange-protection hood shall be provided to cover all outdoor bus duct enclosure joints to facilitate additional protection against rain water ingress. All horizontal runs of bus ducts shall have a suitable sloped enclosure top to prevent retention of water for both indoor and out door portion of bus ducts. Bus duct enclosure shall have a degree of protection of IP-55.
28.04.00	The inside of the bus enclosure may be treated with black paint to enable efficient heat dissipation. The matt paint used shall be suitable for temperature experienced during continuous loading of the bus conductor. The bus duct exterior paint shade shall be RAL 5012.
28.05.00	Flexible expansion joints for the enclosure shall be provided wherever deemed necessary by the Contractor. Necessary bonding shall be provided at the expansion joints if made of insulating materials.
28.06.00	Enclosures shall be provided with flanged ends with drilling dimensions to suit the flanges at the switchgear and transformer terminals. Any adapter boxes required for this purpose are in the Contractor's scope of supply. The flanges shall be provided with gaskets, nuts, bolts, etc. Details of the flanges provided on transformer ends will be furnished to the successful Contractor.
28.07.00	Suitable Inspection covers shall be provided for periodic inspection of insulators. Handle shall be provided on each inspection cover to facilitate easy lifting.
28.08.00	The EPDM / Neoprene gaskets shall be provided so as to satisfy the operating conditions imposed by temperature, weathering, durability etc. Flange gaskets shall be provided at the equipment terminal connections.

28.09.00	Necessary earthing arrangement as applicable shall be provided with clamps to receive station earthing bus. All accessories and hardware required for the earthing arrangement shall be provided by the Contractor. This shall be a GI strip of adequate size, continuously running along the bus duct and shall be earthed at both ends. Bus duct enclosures shall be bolted type.
28.10.00	The material of the conductor shall be aluminum. The minimum clearance in air between phase to phase, phase to neutral and phase to earth for the entire run of bus duct shall be 25 mm. The bus bars shall be rated in accordance with the service conditions and the rated continuous and short time current ratings calculated for specific application / specified elsewhere.
28.11.00	All steel structures required for bus duct support shall be hot dip galvanized.
28.12.00	Space heaters shall be provided in the bus duct wherever the manufacturer considers them necessary and recommends their provision for preventing harmful moisture condensation.
28.13.00	The space heaters shall be suitable for continuous operation on 240 V AC, 50 Hz single phase supply and shall be automatically controlled by thermostats. Necessary wiring upto junction boxes mounted on bus duct and from junction boxes to switch boards shall be provided by the Contractor.
29.00.00	BUS TRUNKING SYSTEM (SANDWICH TYPE BUSDUCT)
29.01.00	Three phase Bus trunking system conforming to IEC 60439 (Parts 1 & 2) / IS 8623 (Parts 1 & 2) shall be provided for connecting the Main and Standby DG sets to Unit Emergency Switchgears as indicated in the BOQ.
29.02.00	The enclosure shall be made of CRCA (1.6mm thick) / GI (1.6mm thick) / Aluminium (2.5mm thick) sheet. The design of the bus duct enclosure shall be of sturdy construction such that it will withstand the internal or external forces resulting from the various operating conditions.
29.03.00	The entire bus duct shall be designed for dust, vermin and weather proof construction. A suitable aluminium sheet flange-protection hood shall be provided to cover all outdoor bus duct enclosure joints to facilitate additional protection against rain water ingress. All horizontal runs of bus ducts shall have a suitable sloped enclosure top to prevent retention of water for both indoor and out door portion of busducts. Busduct enclosure shall have a degree of protection of IP-55.
29.04.00	The busduct exterior paint shade shall be RAL 5012.
29.05.00	Enclosures shall be provided with flanged ends with drilling dimensions to suit the flanges at the switchgear and DG terminals. Any adapter boxes required for this purpose are in the contractor's scope of supply. The flanges shall be provided with gaskets, nuts, bolts, etc.

29.06.00	EPDM / Neoprene gaskets shall be provided so as to satisfy the operating conditions imposed by temperature, weathering, durability etc. Flange gaskets shall be provided at the equipment terminal connections.
29.07.00	Necessary earthing arrangement as applicable shall be provided with clamps to receive station earthing bus. All accessories and hardware required for the earthing arrangement shall be provided by the contractor. This shall be a GI strip of adequate size, continuously running along the busduct and shall be earthed at both ends. busduct enclosures shall be bolted type.
29.08.00	The material of the conductor shall be high conductivity aluminum / copper. The busbars shall be rated in accordance with the service conditions and the rated continuous and short time current ratings specified elsewhere.
29.09.00	All steel structures required for busduct support shall be hot dip galvanized.
29.10.00	Space heaters shall be provided in the busduct wherever the manufacturer considers them necessary and recommends their provision for preventing harmful moisture condensation.
29.11.00	The space heaters shall be suitable for continuous operation on 240 V AC, 50 Hz single phase supply and shall be automatically controlled by thermostats. Necessary wiring upto junction boxes mounted on busduct and from junction boxes to switch boards shall be provided by the contractor.
30.00.00	LIGHTING / WELDING TRANSFORMERS Each AC Lighting Distribution Board (LDB) / Welding DB shall be fed from 415V / 415V, 100kVA isolating transformer. The lighting / welding transformer may, preferably, be located inside the LDB / Welding DB panel itself. Otherwise, the same shall be located by the side of respective LDB / Welding DB. Lighting / Welding transformers shall be dry type, natural air cooled with class B insulation or better. Impedance of lighting / Welding transformer shall be so selected that the fault level of lighting /Welding system shall be reduced to 3 to 5 KA. Lighting / Welding transformers shall be tested as per IS: 2026. Off-circuit tap changer with $\pm 2.5\%$ and $\pm 5\%$ tapping shall be provided. In case the transformers are not mounted inside the LDB panels, the same shall be housed in a separate 2 mm thick CR sheet steel enclosure with IP-42 degree of protection as per IS/IEC 60947. However, the transformer terminal box shall have IP-52 degree of protection.
31.00.00	PAINTING All sheet steel work shall be pretreated, in tanks, in accordance with IS: 6005. Degreasing shall be done by alkaline cleaning. Rust and scales shall be removed by pickling with acid. After pickling, the parts shall be washed in running water. Then these shall be rinsed in slightly alkaline hot water and dried. The phosphate coating shall be "Class-C" as specified in IS: 6005. The phosphated surfaces shall be rinsed and passivated. After passivation, Electrostatic Powder Coating shall be used. Powder should meet requirements of IS 13871 (Powder costing specification). Finishing paint shade for complete panels excluding end covers shall be RAL9002 & RAL5012 for extreme end covers of all boards, unless required otherwise by the owner. The paint thickness shall not be less than 50 microns. Finished parts shall be suitably packed and wrapped with protective covering to protect the finished surfaces from scratches, grease, dirt and oil spots during testing, transportation, handling and erection.

Technical Data Sheet
And
General Arrangement Drawing
For 415 Volt
4000 Amps, 3000 Amps,
2500 Amps, & 1600 Amps
Non Segregated Phase Busduct

List Of General Arrangemt For 415V, 4000A/3000A/2500A/1600A Non Segregated Phase Busduct

SHEET	REVISION	DESCRIPTION OF DRAWING
01	00	COVER SHEET FOR 415V, NON SEGREGATED PHASE BUSDUCT.
02	00	LIST OF DRAWINGS FOR 415V, NSPBD
03	00	STANDARD TECHNICAL DATA SHEET FOR 415V, NSPBD
04	00	STANDARD TYPICAL CROSS-SECTIONAL VIEW FOR 415V, NSPBD
05	00	STANDARD BUSBAR RIGID JOINT DETAILS FOR 415V, NSPBD
06	00	STANDARD BUSBAR EXPENSION JOINT DETAILS FOR 415V, NSPBD
07	00	STANDARD ACCESS DOOR ASSEMBLY & SPACE HEATER WIRING DIAGRAM DETAILS FOR 415V, NSPBD
08	00	STANDARD ENCLOSURE FLANGE DETAIL FOR 415V, NSPBD
09	00	STANDARD RUBBER BELLOW DETAILS FOR 415V, NSPBD
10	00	STANDARD WALL FRAME ASSEMBLY WITH FRP SEALING PLATE FOR 415V, NSPBD
11	00	STANDARD EARTHING JUMPER, DRAIN PLUG, SILICAGEL BREATHER & FLANGE FIXING DETAIL FOR 415V, NSPBD

Standard Technaical Data sheet for 415V, 4000A/3000A/2500A/1600A Non Segregated Phase Busduct

Sl. No.	Description	
1.0	General	
1.1	Make	
1.1	Service	Outdoor / Indoor
1.2	Cooling System	Natural Air Cool
1.3	Type of Busduct	Non Segregated Phase Busduct
1.4	System Nominal Voltage	415V 61439
1.5	Reference Standard	IEC 61435 - Part 1 & 2 IS 8623 - Part 1 & 2
1.6	System	Triple Pole & Neutral
1.7	Short Time Current Rating for One Second Withstand	50 KA (RMS)
1.8	Dynamic Current Rating	105 KA (PEAK)
1.9	Temperature Rise over the specified an ambient	50° C
	a) Busbar / Conductor	40° C
	b) Enclosure	20° C
1.10	Degree of Protection	IP - 55
1.11	Power Frequency for one minute	2.5 KV
2.0	Busbar	
2.1	Material	Al Alloy
2.2	Make	BALCO / Hindalco, Jindal & Century
2.3	Grade	63401 WP as per IS:5082 (Latest)
2.4	Shape	Flat
2.5	Type of joints	Rigid joint/Expansion joint
2.6	Busbar Joint Hardware Material	H.T.S. Electro Plated

Sl. No.	Description	
3.0	Enclosure	
3.1	Material	AL. Alloy
3.2	MAKE	BALCO / Hindalco, Jindal & Century
3.3	Grade	19000 H2 as per IS : 737
3.4	Shape	Rectangular
	a) Outdoor	Rectangular with slopping top
	b) Indoor	Rectangular with slopping top
3.5	Thickness of Enclosure	3 mm
3.6	Type of Flange Joints	With EPDM Gasket
3.7	Flange Joint Hardware Material	M.S. Electro Galvanised
4.0	Access door/Inspection cover	
4.1	Material	AL. Alloy
4.2	Grade	19000 H2
4.3	Size	As per requirement
4.4	Thickness	3 mm
4.5	Location / Position of Access door	19000 H2
	a) Outdoor	Top / Bottom
	b) Indoor	Top / Bottom
4.6	Type of Flange Joints	With EPDM Gasket
4.7	Flange Joints Hardware Material	M.S. Electro Galvanised
5.0	Busbars Supports	
5.1	Material	SMC (Polyster Glass Field)

Sl. No.	Description	
5.2	Make	
5.3	Creepage distance	25 mm (min)
5.4	Thickness	10 mm/12 mm
5.5	Type	Finger Support
6.0	Minimum Air Clearance	
6.1	Phase to Phase	25 mm. (min.)
6.2	Phase to Earth	25 mm. (min.)
7.0	Grounding Conductor (Earthing jumper)	
7.1	Material	AL. Alloy
7.2	Shape	Flat
7.3	Size	2-50x10 (Between two enclosure Joint & Both side)
8.0	Space Heater [*]	
8.1	Type	Indoor
8.2	Power	60 W
8.3	Voltage	240 V
8.4	Phase	Single
8.5	Thermostat	30-110°C
9.0	Painting	
9.1	Busbar/Elclosure Interior	Matt Black
9.3	Elclosure Exterior	PU Spray paint of RAL 5012.
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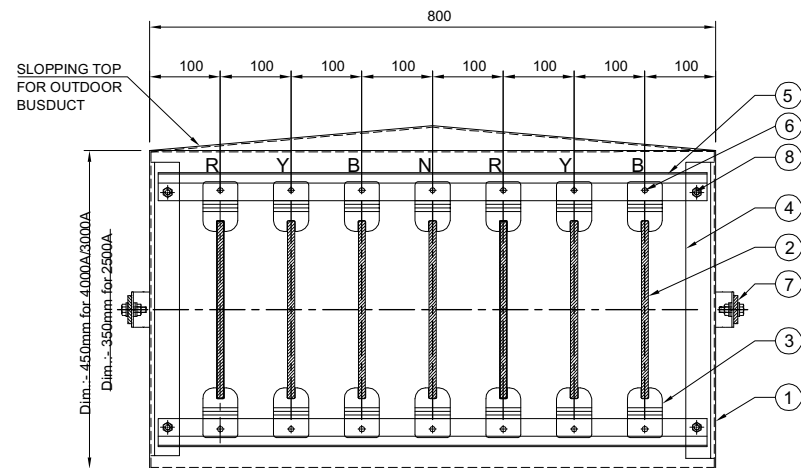
Standard Enclosure & Busbar SizeTable for 415V, 4000A/3000A/2500A/1600A Non Segregated Phase Busduct

SL. NO.	DESCRIPTION	RATING (415V)			
a	Continuous Current Rating (Amps)	4000A	3000A	2500A	1600A
b	Size (mm) for busbar	2-250x10 Thk. /Ph. 1-250x10 Thk. For Neu.	2-250x8 Thk. /Ph. 1-250x8 Thk. For Neu.	2-150x8 Thk. /Ph. 1-150x8 Thk. For Neu.	1-200x8 Thk. /Ph. 1-200x8 Thk. For Neu.
c	Cross Section Area Per Phase	5000 Sq. mm	4000 Sq. mm	2400 Sq. mm	1600 Sq. mm
d	Size of Enclosure (mm)	800x450 mm		800x350 mm	500x400 mm
e	Design Arrangement	Interleaved			Conventional
f	Average weight of Busduct per meter (Approximate)	110Kgs.	97Kgs.	73Kgs.	60Kgs.

The above mentioned details are tentative, however same shall be as per manufacturer standard and shall be of type tested design as per relevant IEC design. Vendor shall produce all ratings type tests as per IEC standard.

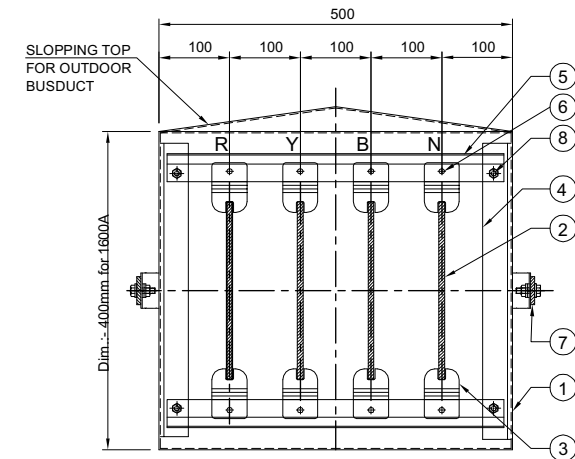
GEN. NOTES:-

1. All dimensions are in mm unless otherwise specified.
2. Tightening torque for M12 bolt = 55 Nm (Busbar joint)
3. Tightening torque for M8 bolt = 17 Nm (Enclosure Joint)



CROSS -SECTIONAL VIEW FOR 415V, 4000A/3000A & 2500A NSPB

ITEM No.	NAME OF ITEM	DESCRIPTION	MATL.
1	ENCLOSURE SIZE FOR, 4000A/3000A	800x450x3 THK.	AL ALLOY
	ENCLOSURE SIZE, FOR 2500A	800x350x3 THK.	AL ALLOY
2	BUSBAR SIZE FOR 4000A	2-250x10 THK. FLATS/PH, 1-250x10 THK. FLAT FOR NEU.	AL ALLOY
	BUSBAR SIZE FOR 3000A	2-250x8 THK. FLATS/PH, 1-250x8 THK. FLAT FOR NEU.	AL ALLOY
	BUSBAR SIZE 2500A	2-150x8 THK. FLATS/PH, 1-150x8 THK. FLAT FOR NEU.	AL ALLOY
3	BUSBAR SUPPORT INSULATOR	SMC INSULATOR	SMC (Polyster Glass Field)
4	SUPPORT ANGLE	40x40x5	AL ALLOY
5	BASE CHANNEL FOR INSULATOR MOUNTING	28x30x28x3 THK.	MS WITH MATT BLACK PAINTED
6	HEX. SCREW	M8x20+N	MS ELECTRO PLATED
7	EARTHING JUMPER	2-50X10 (BETWEEN TWO ENCLOSURE JOINT)	AL ALLOY
8	HEX. SCREW	M8x40+N+2PW+1SW	MS ELECTRO PLATED



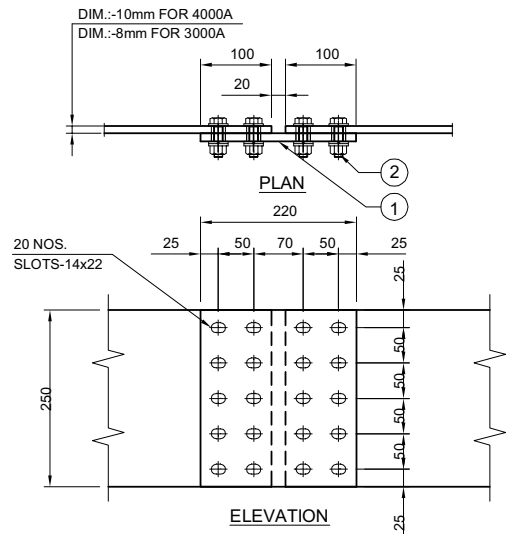
CROSS -SECTIONAL VIEW FOR 415V, 1600A NSPB

ITEM No.	NAME OF ITEM	DESCRIPTION	MATL.
1	ENCLOSURE SIZE FOR 1600A	500x400x3 THK.	AL ALLOY
2	BUSBAR SIZE FOR 1600A	1-200x8 THK. FLATS/PH, 1-200x8 THK. FLAT FOR NEU.	AL ALLOY
3	BUSBAR SUPPORT INSULATOR	SMC INSULATOR	SMC (Polyster Glass Field)
4	SUPPORT ANGLE	40x40x5	AL ALLOY
5	BASE CHANNEL FOR INSULATOR MOUNTING	28x30x28x3 THK.	MS WITH MATT BLACK PAINTED
6	HEX. SCREW	M8x20+N	MS ELECTRO PLATED
7	EARTHING JUMPER	2-50X10 (BETWEEN TWO ENCLOSURE JOINT)	AL ALLOY
8	HEX. SCREW	M8x40+N+2PW+1SW	MS ELECTRO PLATED

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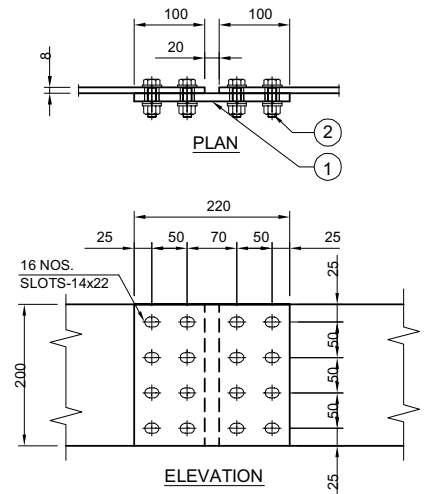
GEN. NOTES:-

- All dimensions are in mm unless otherwise specified.
- Horizontal portion of outdoor busducts shall be provided with sloping top to avoid stagnation of rain water.
- R Y B N R Y B, B Y R N B Y R, R Y B N & B Y R N, configuration will depend upon the layout of busduct or as per input drawing.
- For 3Ph, 3 wire busduct, only phase considered with same enclosure size. neutral busbar will not be provided in 3ph, 3 wire busduct.



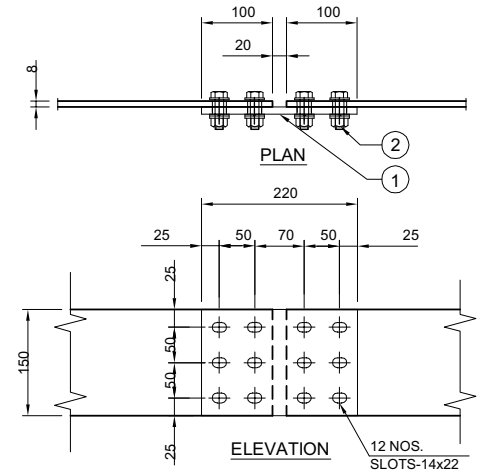
RIGID JOINT DETAIL FOR 415V, 4000A/3000A NSPB

ITEM NO.	RATING	NAME OF ITEM	DESCRIPTION	GRADE/ TYPE	MATERIAL
1	4000A	FISH PLATE FOR RIJD JOINT	1-250x220x10 Thk./Ph.	63401 WP	AL ALLOY
	3000A	FISH PLATE FOR RIJD JOINT	1-250x220x8 Thk./Ph.		
2	HEX. SCREW	M12x45+N+2PW+1SW	20 SETS	H.T.S.	---



RIGID JOINT DETAIL FOR 415V, 1600A NSPB

ITEM NO.	RATING	NAME OF ITEM	DESCRIPTION	GRADE/ TYPE	MATERIAL
1	1600A	FISH PLATE FOR RIJD JOINT	1-200x220x8 Thk./Ph.	63401 WP	AL ALLOY
2	HEX. SCREW	M12x45+N+2PW+1SW	16 SETS	H.T.S.	---

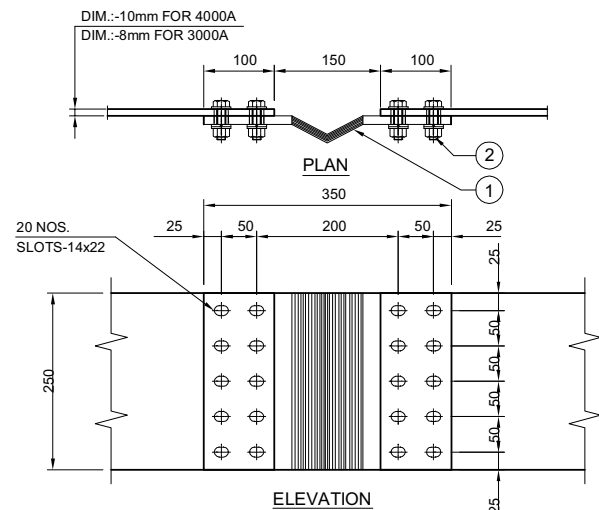


RIGID JOINT DETAIL FOR 415V, 2500A NSPB

ITEM NO.	RATING	NAME OF ITEM	DESCRIPTION	GRADE/ TYPE	MATERIAL
1	2500A	FISH PLATE FOR RIJD JOINT	1-150x220x8 Thk./Ph.	63401 WP	AL ALLOY
2	HEX. SCREW	M12x45+N+2PW+1SW	12 SETS	H.T.S.	---

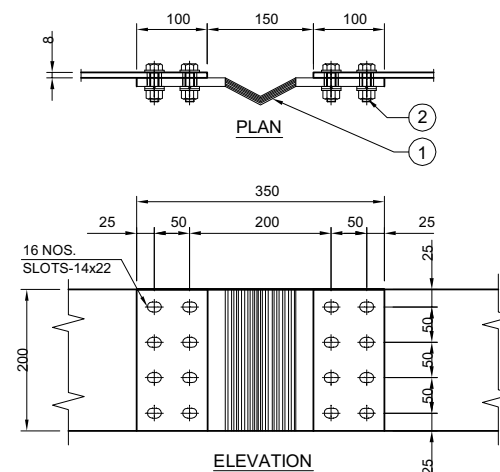
- GEN. NOTES:-**
1. All dimensions are in mm unless otherwise specified.
 2. Tightening torque for M12 bolt = 55 Nm (Busbar joint)

The above mentioned details are tentative, however same shall be as per manufacturer standard and shall be of type tested design as per relevant IEC design. Vendor shall produce all ratings type tests as per IEC standard.



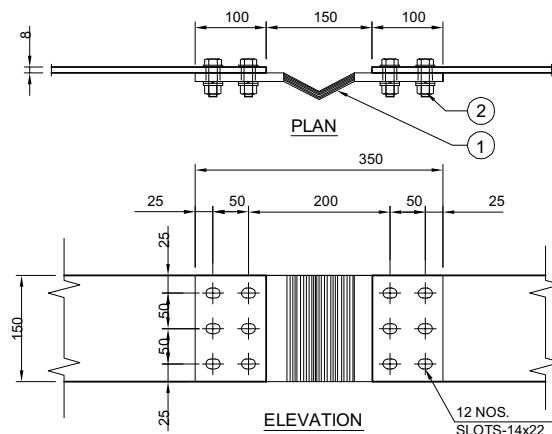
EXPANSION JOINT DETAIL FOR 415V, 4000A/3000A NSPB

ITEM NO.	RATING	NAME OF ITEM	DESCRIPTION	GRADE/ TYPE	MATERIAL
1	4000A	AL. FLEXIBLE FOR EXPANSION JOINT	1-250x350x10 Thk./Ph.	63401 WP	AL ALLOY
	3000A	AL. FLEXIBLE FOR EXPANSION JOINT	1-250x350x8 Thk./Ph.		
2	HEX. SCREW	M12x45+N+2PW+1SW	20 SETS	H.T.S.	---



EXPANSION JOINT DETAIL FOR 415V, 1600A NSPB

ITEM NO.	RATING	NAME OF ITEM	DESCRIPTION	GRADE/ TYPE	MATERIAL
1	1600A	AL. FLEXIBLE FOR EXPANSION JOINT	1-200x350x8 Thk./Ph.	63401 WP	AL ALLOY
2	HEX. SCREW	M12x45+N+2PW+1SW	16 SETS	H.T.S.	---



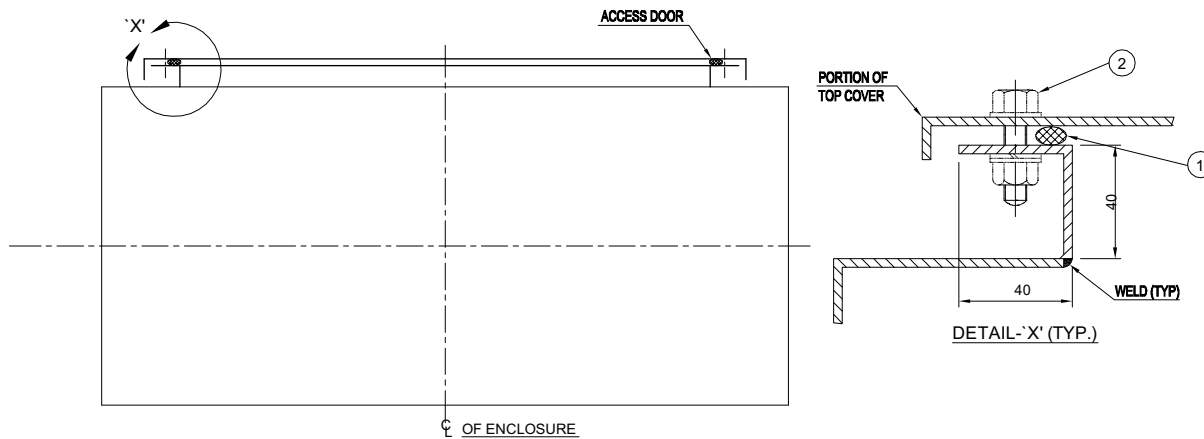
EXPANSION JOINT DETAIL FOR 415V, 2500A NSPB

ITEM NO.	RATING	NAME OF ITEM	DESCRIPTION	GRADE/ TYPE	MATERIAL
1	2500A	AL. FLEXIBLE FOR EXPANSION JOINT	1-150x350x8 Thk./Ph.	63401 WP	AL ALLOY
2	HEX. SCREW	M12x45+N+2PW+1SW	12 SETS	H.T.S.	---

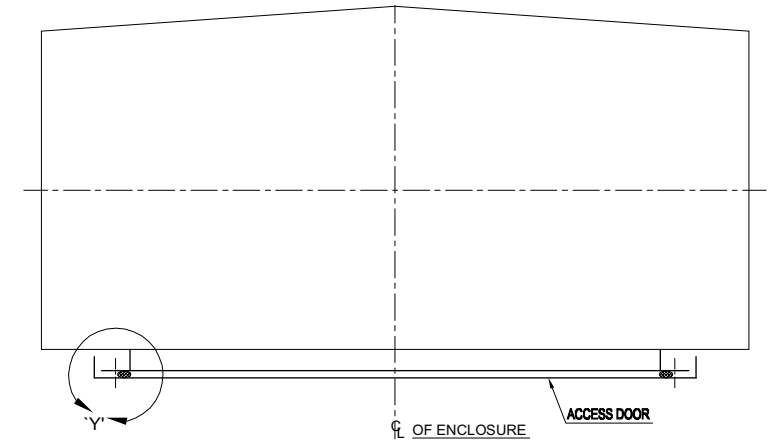
GEN. NOTES:-

1. All dimensions are in mm unless otherwise specified.
2. Tightening torque for M12 bolt = 55 Nm (Busbar joint)

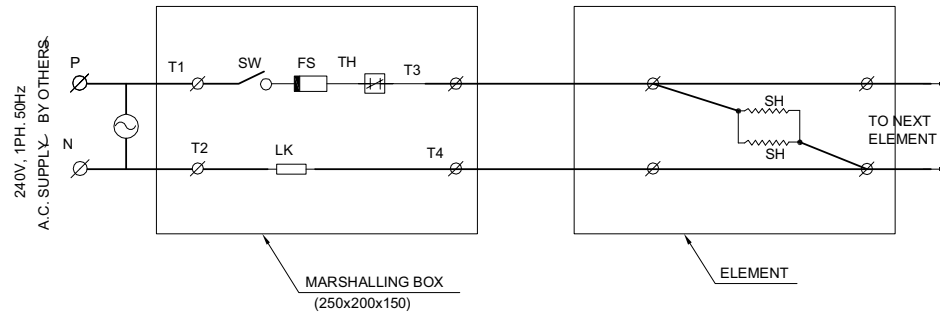
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CROSS - SECTIONAL VIEW OF WITHOUT SLOPING TOP BUSDUCT



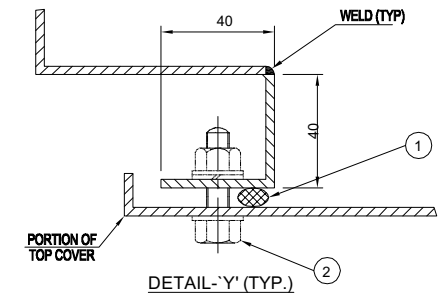
CROSS - SECTIONAL VIEW OF WITH SLOPING TOP BUSDUCT



SL. NO.	ITEM DESCRIPTION	SYMBOLS	SPECIFICATION	QTY.
1.	FUSE WITH FITTING	FS	* AMP. (AS PER REQUIRE)	1 NO.
2.	THERMOSTAT	TH	30°C-110°C TEMPERATURE	1 NO.
3.	TERMINAL BLOCK	T	CST-2.5	4 NOS./EL
4.	SPACE HEATER	SH	60 WATT, 240 VOLT.	2 NOS./EL
5.	LINK WITH FITTING	LK	15 AMP.	1 NO.
6.	SWITCH (TOGGLE TYPE)	SW	10 AMP.	1 NO.

GEN. NOTES

1. All dimensions are in mm unless otherwise specified.
2. Wiring is done with 1100v grade, 2.5 sq. mm PVC copper wire running through PVC conduits.



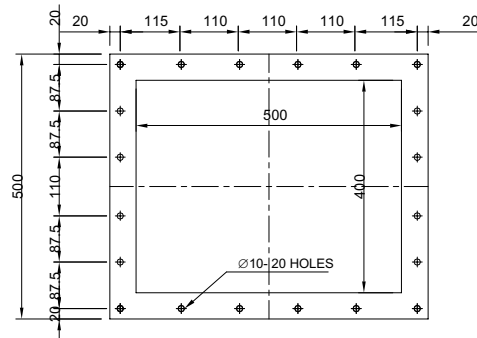
SL. NO.	DESCRIPTION	MATL.
01	15 x10 THK. MM GASKET	EPDM
02	M8 x 35B+N+2PW+1SW	MS ELECTRO PLATED

GEN. NOTES

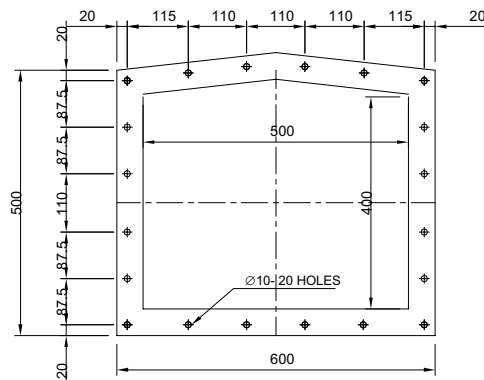
1. Tightening torque for M8 bolt = 17 Nm.

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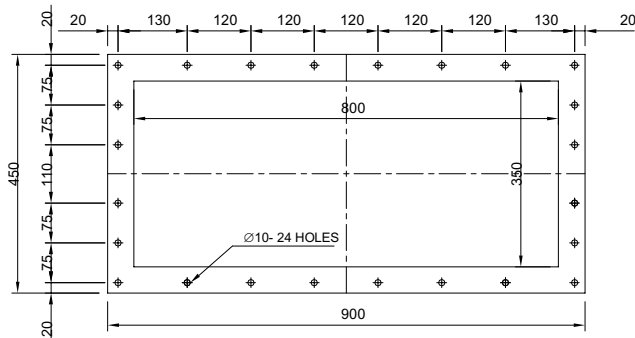
ENCLOSURE FLANGE:- 500X400 MM (WITHOUT SLOPING TOP) 1600A



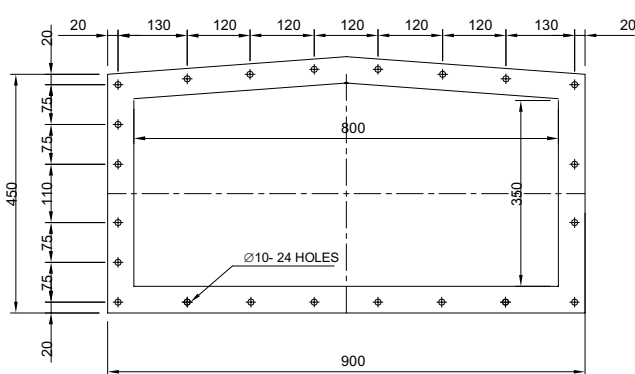
ENCLOSURE FLANGE:- 500X400 MM (WITH SLOPING TOP) 1600A



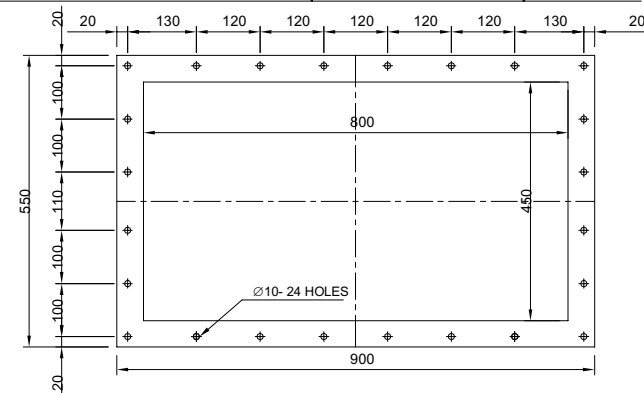
ENCLOSURE FLANGE:- 800X350 MM (WITHOUT SLOPING TOP) 2500A



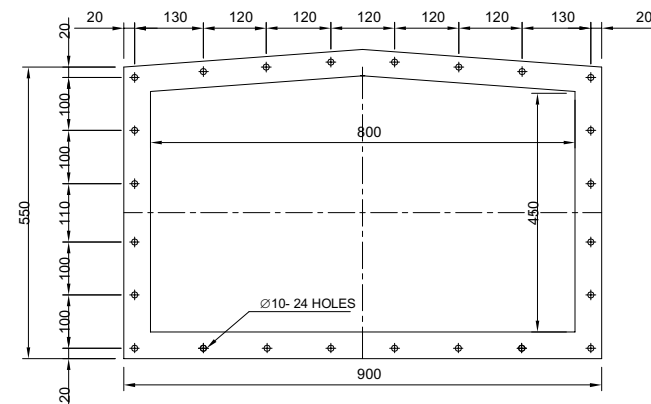
ENCLOSURE FLANGE:- 800X350 MM (WITH SLOPING TOP) 2500A



ENCLOSURE FLANGE:- 800X450 MM (WITHOUT SLOPING TOP) 4000A/3000A

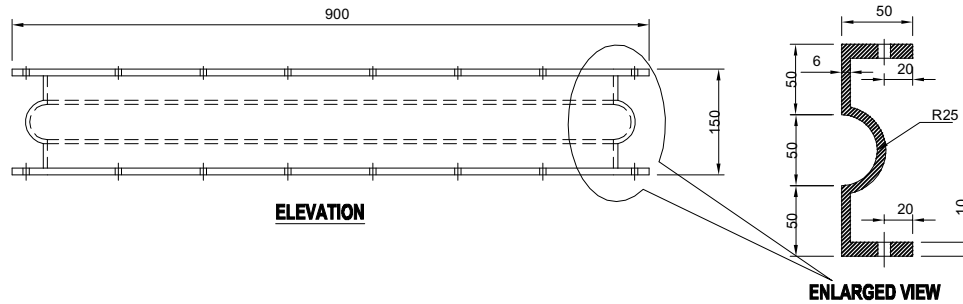
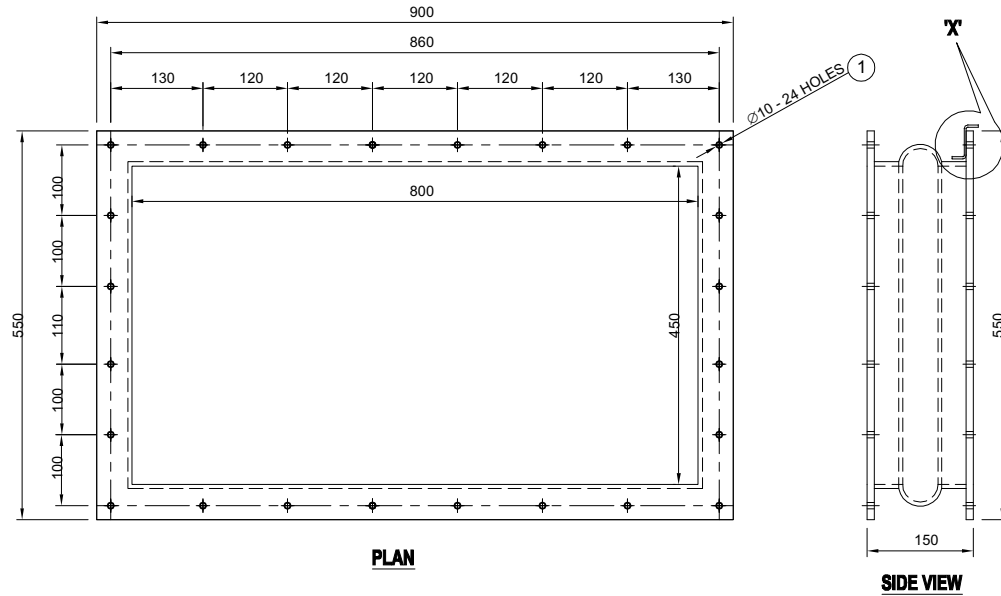


ENCLOSURE FLANGE:- 800X450 MM (WITH SLOPING TOP) 4000A/3000A



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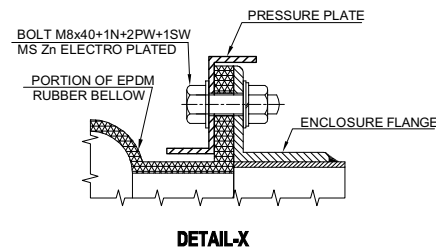
RUBBER BELLOW FOR 415V, 4000A, 3000A & 2500A



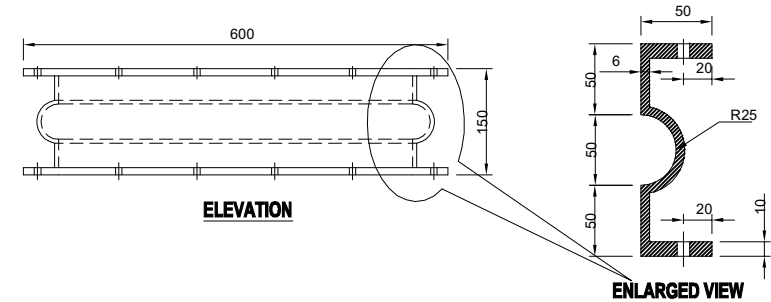
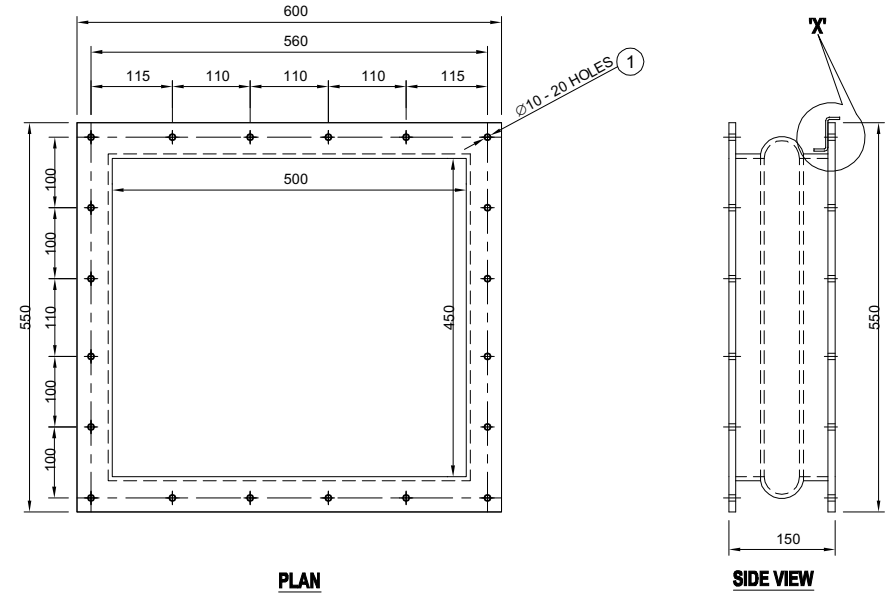
ITEM NO.	NAME OF ITEM	DESCRIPTION	QTY.	MATERIAL
1.	HEX. BOLT	M8x40+1N+2PW+1SW	24 SETS	MS. Zn. ELECTRO PLATED

TECHNICAL SPECIFICATION:-

1. MATERIAL	: EPDM
2. HARDNESS	: 40 TO 50 SHORE
3. ELONGATION AT BREAK	: 600% ~ 700%
4. TENSILE STRENGTH BEFORE AGEING	: 60 ~ 80 BAR
5. AGEING TEST	: AT 105 °C FOR 7 DAYS
6. RESISTANCE TO SHEARING	: 22 DA N/CM
7. INSULATION RESISTANCE	: 50 MEGA OHMS (WITH 1000V)



RUBBER BELLOW FOR 415V, 1600A



ITEM NO.	NAME OF ITEM	DESCRIPTION	QTY.	MATERIAL
1.	HEX. BOLT	M8x40+1N+2PW+1SW	20 SETS	MS. Zn. ELECTRO PLATED

The above mentioned details are tentative, however same shall be as per manufacturer standard and shall be of type tested design as per relevant IEC design. Vendor shall produce all ratings type tests as per IEC standard.



SL. No.	DESCRIPTION	QTY.	MATERIAL	GRADE
1.	ENCLOSURE- 800x450x3 THK. (4000A & 3000A) ENCLOSURE- 800x350x3 THK. (2500A)	----	Al ALLOY	19000 H2
2.	SEALING PLATE-10 THK.	01 SET	FRP	UP-2
3.	AL. CHANNEL 101.6X41.83X6.68	01 SET	Al ALLOY	----



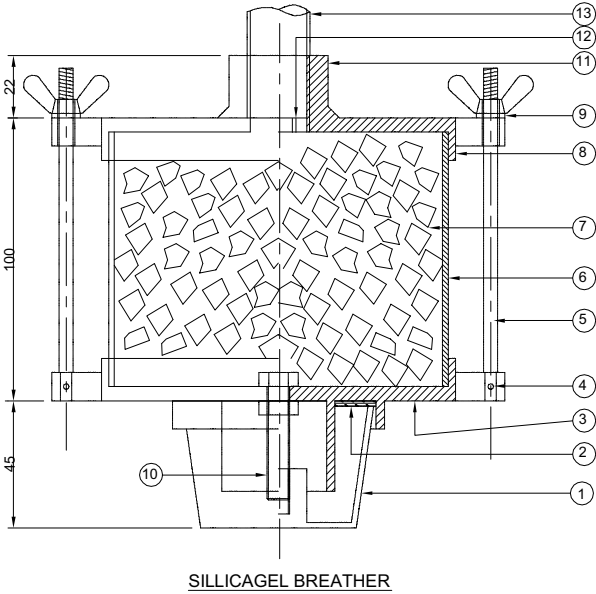
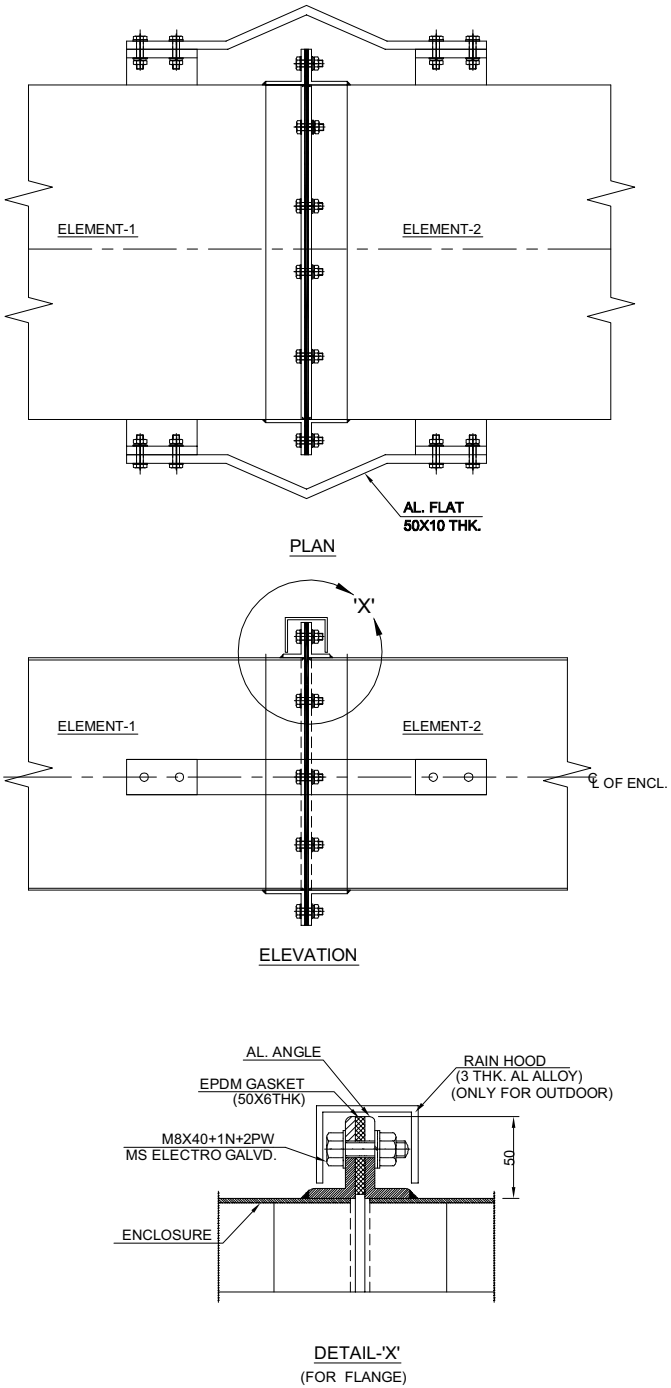
SL. No.	DESCRIPTION	QTY.	MATERIAL	GRADE
1.	ENCLOSURE- 500x400x3 THK. (1600A)	----	Al ALLOY	19000 H2
2.	SEALING PLATE-10 THK.	01 SET	FRP	UP-2
3.	AL. CHANNEL 101.6X41.83X6.68	01 SET	Al ALLOY	----



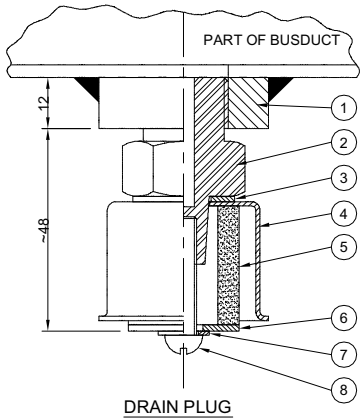
1. Wall frame channel shall be provided removable type.
2. Location wall frame assy. ref. layout of busducts.
3. Wall frame assy. has two parts, one is upper & second is lower part and these two parts are connected with hardware. when remove wall frame assy., loose hardware & remove it.

The above mentioned details are tentative, however same shall be as per manufacturer standard and shall be of type tested design as per relevant IEC design. Vendor shall produce all ratings type tests as per IEC standard.

STANDARD EARTHING JUMPER & FLANGE FIXING DETAIL



13.	1/2" G.I. PIPE	G.I.	AS RQD.	'B' CLASS
12.	SEAL	PVC.	1	
11.	SOCKET	AL.	1	
10.	HEX BOLT WITH NUT	G.I.	1	
9.	PLANE WASHER	SS.	2	
8.	TOP COVER	AL CAST	1	
7.	SILICA PIECE	SILICA	500 gm.	
6.	SHELL	PVC.	1	TRANSPARENT
5.	QUICK OPENING BOLT WITH MS. GLVD. WING NUT	SS.	2	
4.	SPLITE PIN	SS.	2	
3.	BASE PLATE	AL CAST	1	
2.	GASKET	CORK	1	
1.	OIL CUP	PVC.	1	TRANSPARENT
SL. NO.	DESPRIPTION	MATL.	QTY.	REMARK



SL. NO.	DESPRIPTION	MATL.	QTY.
1.	ALUMINIUM RING	AL.	1
2.	ALUMINIUM BLOCK	AL.	1
3.	CORK WASHER	CORK	1
4.	CANOPY FOR FILTER	AL.	1
5.	CERAMIC FILTER	CERAMIC	1
6.	PLAIN WASHER	MS	1
7.	PLAIN WASHER	MS	1
8.	SCREW	MS	1

The above mentioned details are tentative, however same shall be as per manufacturer standard and shall be of type tested design as per relevant IEC design. Vendor shall produce all ratings type tests as per IEC standard.

		REFERENCE QUALITY PLAN						TO BE FILLED IN BY NTPC						
		ITEM / EQUIPMENT LT BUSDUCT (415V)		QP NO.: BD/QC/2006 DATE : 30-08-07 PAGE : 5 OF 5		SIGN. OF MFR 		QP NO: 0000-999-QVE-P-178 REV. NO.: 1 DATE : 28-05-08 VALID UPTO: 27-05-11		REVIEWED BY A. MANDAL V. TALWAR S.D. SINGH O.P. NIRANJAN		APPROVED B.K. KHOSLA 28 MAY 2008		
SL NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK M C/N		REFERENCE DOCUMENT#	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY M C N			REMARKS	
1	2	3	4	5	6		7	8	9	D*	** 10			11
		7. Busbar joint & fish plate dim. including clearance	- do -	- do -	- do -	- do -	- do -	- do -	- do -	✓	P	W	W	
		8. Paint shade, finish thickness & adhesion	- do -	- do -	- do -	- do -	- do -	- do -	- do -	✓	P	W	W	
		9. Trail assembly (Few sections)	- do -	- do -	100%	100%	- do -	- do -	- do -	✓	P	W	W	
		Electrical Tests												
		1. HV test on busbars	Critical	Electrical	100%	100%	IS 8623 1993	IS 8623 1993	QC Record	✓	P	W	W	
		2. IR test on busbar	- do -	- do -	- do -	- do -	- do -	- do -	- do -	✓	P	W	W	
		3. Continuity test of space heater / thermostat	- do -	- do -	- do -	- do -	NTPC appd. Drg.	NTPC appd. Drg.	- do -	✓	P	W	W	
		4. HV test on space Heater wiring at 1.5kV for 1 min.	- do -	- do -	- do -	- do -	- do -	- do -	- do -	✓	P	W	W	
		5. Milli Volt drop test at 100A DC a. For flexible joint b. For rigid joint	- do -	- do -	1 sample for each rating	1 sample for each rating	IS 5561 1970	IS 5561 1970	- do -	✓	P	W	W	
4.1	MS Structure (Galvanizing to be carried out from NTPC approved source)	1. Dimension	Major	Measurement	100%	100%	NTPC appd. Drg.	NTPC appd. Drg.	- do -		P	V	V	
		2. Physical properties	- do -	Test	Sample	Sample	IS 2060 1992	IS 2060 1992	- do -		P	V	V	
		3. Galvanizing												
		a. Hammer test	- do -	Mech	IS 4759 1996	IS 4759 1996	IS 4759 1996	IS 4759 1996	- do -		P	W	V	
		b. Preece test	- do -	- do -	- do -	- do -	- do -	- do -	- do -		P	W	V	
		c. Stripping	- do -	Chemical	- do -	- do -	- do -	- do -	- do -		P	W	V	
		d. Visual	- do -	Visual	- do -	- do -	- do -	- do -	- do -		P	W	V	
		e. Check for Galv thickness	- do -	Measurement	- do -	- do -	- do -	- do -	- do -		P	W	V	

LEGEND: * RECORDS IDENTIFIED WITH 'TICK' (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.
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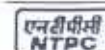
Note: # NTPC Inspection Engineer to check approval date/revision no. of reference documents at the time of inspection

		REFERENCE QUALITY PLAN					एनटीपीसी NTPC		TO BE FILLED IN BY NTPC				
		ITEM / EQUIPMENT LT BUSDUCT (415V)		QP NO.: BD/QC/2006 DATE: 30-08-07 PAGE: 4 OF 5		SIGN. OF MER 		QP NO.: 0000-999-QVE-P-178 REV. NO.: 1 DATE: 28-05-08 VALID UPTO: 27-05-11		REVIEWED BY A. MANOJAL V. TALWAR S.D. SINGH O.P. NIRANJAN		APPROVED U.K. KHOSLA	
SL NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK M G/N		REFERENCE DOCUMENT#	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY M C N			REMARKS 28 MAY 2008
1	2	3	4	5	6	7	8	9	10	11	12	13	
		3 Bolting & overlap check	- do -	- do -	- do -	- do -	- do -	- do -	- do -		P	V	-
3.4	Assembly & Busbar supporting arrangement	1 Support insulator "C" to "C" distance	Major	Measurement	100%	100%	Fabrication drawing	Fabrication drawing	QC Record		P	V	-
		2 Completeness	- do -	- do -	- do -	- do -	NTPC appd. Drg	NTPC appd. Drg	- do -		P	V	-
3.5	Aluminum Flexible	1 Marking lamination bunch after deburring	- do -	Counting	- do -	- do -	Fabrication drawing	Fabrication drawing	QC Record		P	V	-
		2 Lamination bunch bending	- do -	Visual	- do -	- do -	- do -	- do -	- do -		P	V	-
		3 Palm plate tracking	- do -	Measurement	- do -	- do -	- do -	- do -	- do -		P	V	-
		4 Quality of butt joint welding	- do -	NDT (DP) NDT (RT)	10% 2%	10% 2%	GD&D 198-79 GD&D 198-79	GD&D 198-79 GD&D 198-79	- do - - do -		P	W	W
4	Final Inspection												
	Type test	Type test clearance from NTPC Engg. To be verified by NTPC RIO											
4.1	Busduct section	Routine Tests											
		1 Check on assembly of Busduct w.r.t. a Busbar Location b Earth Bus Location c Manhole, Inspection window, Flange holes	Critical	Measurement	100%	One full run per offered Lot	NTPC appd. Drg	NTPC appd. Drg	QC Record		P	W	W
		2 Dimension, general arrangement & marking	Critical	Measurement	100%	100%	NTPC appd. Drg	NTPC appd. Drg	QC Record		P	W	W
		3 Busbar support center line distance	- do -	- do -	- do -	- do -	- do -	- do -	- do -	✓	P	W	W
		4 Busbar flexible joint DP test	- do -	Visual	At random	At random	GD&D 198	GD&D 198	- do -	✓	P	W	W
		5 Insulator tightness by torque measure	- do -	Measurement	- do -	- do -	NTPC appd. Drg	NTPC appd. Drg	- do -	✓	P	W	W
		6 Ph to Ph & Ph to earth clearance	- do -	- do -	- do -	- do -	- do -	- do -	- do -	✓	P	W	W

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Note: # NTPC Inspection Engineer to check approval date/revision no. of reference documents at the time of inspection

REFERENCE QUALITY PLAN



TO BE FILLED IN BY NTPC

ITEM/EQUIPMENT
**LT BUSDUCT
(415V)**

QP NO.: BD/QC/2006
DATE : 30-08-07
PAGE : 3 OF 5

SIGN. OF MFR



QP NO: 0000-999-QVE-P-178
REV. NO.: 1
DATE : 28-05-08

REVIEWED BY
A. MANDAL
V. TALWAR
S. D. SINGH
D. P. NIRANJAN

APPROVED BY

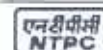


SL NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT#	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
					M	C/N				M	C	N	
1.	2.	3.	4.	5.	6.		7.	8.	9.	D*	**	10.	
2.6	Hardware												
	a) HT bolt & nut Gr. 8.8 for busbar	1. Dimension	Major	Measurement	Random	-	IS 1363, 1364 & IS 1367	IS 1363, 1364 & IS 1367	QC Record		P	-	-
	b) HT bolt & nut Gr. 4.6 for Structure	2. Threading	- do -	Visual	Sample	-	- do -	- do -	- do -		P	-	-
	c) Plan / Spring washer	3. Electroplating (Galvanizing)	- do -	Chemical	Sample	-	- do -	- do -	Mfg. TC		P	-	-
3	In-process inspection												
3.1	Welders Qualification	1. WPS	Critical	-	100%	100%	ASME-IX	ASME-IX	QW - 482		P	V	V
		2. PQR	- do -	-	- do -	- do -	- do -	- do -	QW - 483		P	V	W
		3. Welder qualification	- do -	-	- do -	- do -	- do -	- do -	QW - 483		P	V	W
3.2	Fabrication of Enclosure	1. Marking	Major	Measurement	100%	-	Fabrication drawings	Fabrication drawings	QC Record		P	-	-
		2. Cutting	- do -	- do -	- do -	-	- do -	- do -	- do -		P	-	-
		3. Bending	- do -	- do -	- do -	-	- do -	- do -	- do -		P	-	-
		4. Tacking	- do -	- do -	- do -	-	- do -	- do -	- do -		P	-	-
		5. Welding quality	Critical	DP test & RT test (circumferential Butt Joint)	DP 10% RT 2%	DP 10% RT 2%	As per GD&D 198-79	As per GD&D 198-79	- do -		P	W	W
		6. Inside painting thickness check											
	a) Primer	Major	Measurement	100%	100%		Mfr's std.	Mfr's std.	- do -		P	-	-
	b) Black paints & matt finish	- do -	- do -	- do -	- do -	-	- do -	- do -	- do -		P	-	-
	7. Drilling & dressing	- do -	Visual	100%	100%		Fabrication drawing	Fabrication drawing	- do -		P	V	-
3.3	Conductor & fish plate fabrication	1. Marking Dimension	Major	Measurement	100%	100%	Fabrication drawing	Fabrication drawing	QC Record		P	V	-
		2. Cutting & preparation	- do -	- do -	- do -	- do -	- do -	- do -	- do -		P	V	-

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REFERENCE QUALITY PLAN



TO BE FILLED IN BY NTPC

ITEM / EQUIPMENT
**LT BUSDUCT
(415V)**

QP NO.: BD/QC/2006
DATE: 30-08-07
PAGE 2 OF 5

SIGN. OF MFR



QP NO.: 0000-999-QVE-P-178
REV. NO.: 1
DATE: 28-05-08

REVIEWED BY
A. MANDAL
V. TALWAR
S.D. SINGH
U.P. NIRANJAN

APPROVED BY

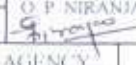


VALID UPTO: 27-05-11

Sl. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT#	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY		
					M	C/N					M	C	N
1.	2.	3.	4.	5.	6.		7.	8.	9.	10.	11.		
2.2	Thermostat	1. Rating Plate	Major	Visual	100%	-	NTPC appd. Drg. & data sheet	NTPC appd. Drg. & data sheet	QC Record		P	-	-
		2. Operational test	- do -	Elect.	- do -	-	Mfr Std	Mfr Std	- do -		P	-	-
2.3	EPDM Bellow / Synthetic rubber / Neoprene gasket	1. Dimension & make	Major	Measurement	10%	10%	NTPC Spec	NTPC Spec	Mfr's TC		V	V	V
		2. Surface finish	- do -	Visual	100%	100%	No crack & mfg defect	No crack & mfg defect	- do -		V	V	V
		3. Shore hardness	- do -	Mech.	1 sample per lot	1 sample per lot	IS - 3400 (II) : 1995 / IS 11149	IS - 3400 (II) : 1995 / IS 11149	- do -		V	V	V
		4. Aging test	- do -	- do -	- do -	- do -	- do -	- do -	- do -		V	V	V
		a. Tensile strength before & after ageing	- do -	- do -	- do -	- do -	- do -	- do -	- do -		V	V	V
		b. Shore hardness before & after ageing	- do -	- do -	- do -	- do -	- do -	- do -	- do -		V	V	V
2.4	Paint	1. Type & grade of paint	Major	Verify	100%	100%	IS 101 : 1964	IS 101 : 1964	Mfr's TC		V	V	-
		2. All routine test i.e. flash point, viscosity etc	- do -	Chem / Visual	1 Sample / lot	1 Sample / lot	- do -	- do -	- do -		V	V	-
		3. Shade & make	- do -	Verify	100%	100%	IS - 5 : 1994 / NTPC appd Drg	IS - 5 : 1994 / NTPC appd Drg	QC Record		P	V	-
2.5	Busbar support insulator (FRP)	1. Tensile strength	Major	Mech.	1 sample per lot	1 sample per lot	IS - 10192 : 1982	IS - 10192 : 1982	Mfr's TC		V	V	V
		2. Cross breaking strength	- do -	- do -	- do -	- do -	- do -	- do -	- do -		V	V	V
		3. Compressive strength	- do -	- do -	- do -	- do -	- do -	- do -	- do -		V	V	V
		4. Comparative tracking index	- do -	- do -	- do -	- do -	IS - 2824 : 1975	IS - 2824 : 1975	- do -		V	V	V
		5. HV test (flatwise & edgewise)	- do -	Elect.	5 sample per lot	5 sample per lot	IS - 10192 : 1982	IS - 10192 : 1982	- do -		V	V	V
		6. IR test	- do -	- do -	- do -	- do -	- do -	- do -	- do -		V	V	V
		7. Dimension	- do -	Measurement	- do -	- do -	NTPC appd. Drg	NTPC appd. Drg	NTPC appd. Drg		P	V	V
		8. Surface finish	- do -	Visual	- do -	- do -	No mfg. defect	No mfg. defect	NTPC appd. Drg		P	V	V

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SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK M C/N		REFERENCE DOCUMENT#	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY M C N			
1	2	3	4	5	6		7	8	9	10	11		12

Note # 1. Makes of bought out items will be as agreed for specific package / project with NTPC QA.
2. Documents identified in the QP for NTPC verification will be maintained. However, other documents i.e. QC records & supplier's TC's mentioned in the QP will also be maintained by the Manufacturer, which NTPC may verify on surveillance basis at the time of final inspection.

1 Raw Material													
1.1	Aluminum Sheet	1. Aluminum grade	Major	Visual	100% per lot	100% per lot	NTPC appd. Drg. & data sheet	NTPC appd. Drg. & data sheet	Mfr's TC		V	V	V
		2. Chemical composition	- do -	Chemical	1 sample per lot	1 sample per lot	IS: 737: 1986	IS: 737: 1986	- do -		V	V	-
		3. Tensile strength	- do -	Mech	1 sample per lot	1 sample per lot	IS: 1816: 1979	IS: 1816: 1979	- do -		V	V	-
		4. % of elongation	- do -	- do -	- do -	- do -	IS: 1816: 1979	IS: 1816: 1979	- do -		V	V	-
		5. Bend test	- do -	- do -	Sample as per IS 737	Sample as per IS 737	IS: 737: 1986	IS: 737: 1986	- do -		V	V	-
		6. Surface finish	- do -	Visual	1 sample per lot	1 sample per lot	No manufacturing defect	No manufacturing defect	QC Record		P	V	-
		7. Dimension check	- do -	Measurement	- do -	- do -	Mfr Standard	Mfr Standard	- do -		P	V	-
1.2	Aluminum Busbar (Channel / Flat)	1. Aluminum grade	Major	Visual	100% per lot	100% per lot	NTPC appd. Drg. & data sheet	NTPC appd. Drg. & data sheet	Mfr's TC		V	V	V
		2. Chemical composition	- do -	Chemical	1 sample per lot	1 sample per lot	IS: 5082: 1998	IS: 5082: 1998	- do -		V	V	-
		3. Tensile strength	- do -	Mech	- do -	- do -	IS: 1816: 1979	IS: 1816: 1979	- do -		V	V	-
		4. % of elongation	- do -	- do -	- do -	- do -	IS: 1816: 1979	IS: 1816: 1979	- do -		V	V	-
		5. Bend test	- do -	- do -	Sample as per IS 737	Sample as per IS 737	IS: 5082: 1998	IS: 5082: 1998	- do -		V	V	-
		6. Surface finish	- do -	Visual	1 sample per lot	1 sample per lot	No manufacturing defect	No manufacturing defect	QC Record		P	V	-
		7. Dimension check	- do -	Measurement	- do -	- do -	NTPC appd. Drg. & data sheet	NTPC appd. Drg. & data sheet	- do -		P	V	-
		8. Conductivity	- do -	Elect	- do -	- do -	IS: 5082: 1998	IS: 5082: 1998	QC Record / Mfr's TC		P	V	V
2 Components													
2.1	Space Heater	1. Voltage / wattage rating	Major	Visual	10%	-	NTPC appd. Drg. & data sheet	NTPC appd. Drg. & data sheet	QC Record		P	-	-
		2. HV test at 1.5 KV for 1 min.	- do -	Elect	100%	-	IS: 8623	IS: 8623	- do -		P	-	-
		3. Functional test	- do -	- do -	- do -	-	Mfr Std	Mfr Std	- do -		P	-	-

LEGEND: * RECORDS, IDENTIFIED WITH 'TICK' (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.
** M: MANUFACTURER/SUB-SUPPLIER C: MAIN SUPPLIER, N: NTPC, P: PERFORM, W: WITNESS AND V: VERIFICATION, AS APPROPRIATE. CHP: NTPC SHALL IDENTIFY IN COLUMN 'N' AS 'W'.

Note # NTPC Inspection Engineer to check approval date/ revision no. of reference documents at the time of inspection.