

REQUEST FOR QUOTATION



BHARAT HEAVY ELECTRICALS LIMITED
Electronics Division
PB No. 2606, Mysore Road Bangalore - 560026
INDIA

RFQ NUMBER:
SAKM000003

RFQ DATE :
[REDACTED]

Due Date/Day [REDACTED]
Time [REDACTED]
Tender Box [REDACTED]

MM:PU:RF:003

(address for communication) :

(for all correspondence)

Purchase Executive : Santosh Kumar
Phone : 8004939865
Fax :
E-mail: kumar.santosh@bhel.in

Sl No.	Description	Qty	Unit	Delivery qty	Delivery Date
1	CN9080238015 3Thk LH Gusset bracket * HSN/SAC : 7610 3Thk LH Gusset bracket HRCS 50(W)X80(H) as per Item no.01 of BHEL drawing 36539510013	1,950	NO	1,950	[REDACTED]
2	CN9080238023 3Thk RH Gusset bracket * HSN/SAC : 7301 3Thk RH Gusset bracket HRCS 50(W)X80(H) as per Item no.02 of BHEL drawing 36539510013	1,950	NO	1,950	[REDACTED]
3	ED9060000234 U Bracket for Rack Fixing * HSN/SAC : 9032 U-Bracket for Rack Fixing as per IT01 in BHEL Drg No 46944300006	1,950	NO	1,950	[REDACTED]
4	ED9060000862 3mm THK BOTTOM COVER FRONT & REAR PIECE * HSN/SAC : 9032 3mm thick 618mm(W)X225mm(L) CRCS Front & Rear Piece for bottom cover as per Item No. 01 in BHEL Drg no.36992100766. Finish: Powder Coating	7,800	NO	7,800	[REDACTED]
5	ED9060000870 M6 HEX SPACER (127mm LENGTH) * HSN/SAC : 9032 Bright Steel M6 Spacer 13mmA/F X 127mm(L) as per BHEL drawing no. 46765410431. Finish: Zinc Plated with passivation	2,860	NO	2,860	[REDACTED]
6	ED9060000889 2mm THK FAN FIXING BRACKET * HSN/SAC : 9032 3mm thick 65mm(W)X125mm(L) CRCS Fan Fixing Bracket as per BHEL Drg no.46765410496 Finish: Powder Coating	2,600	NO	2,600	[REDACTED]
7	ED9060000897 3mm THK BOTTOM COVER MIDDLE PIECE * HSN/SAC : 9032 3mm thick 618mm(W)X196mm(L) CRCS Middle Piece for	3,900	NO	3,900	[REDACTED]

TWO PART BID - SUBMIT TECHNICAL AND PRICE BID IN SEPARATE SEALED COVERS

NOTES:

1. This RFQ is governed by:

a) INSTRUCTIONS TO BIDDERS/SELLERS and GENERAL CONDITIONS OF CONTRACT FOR PURCHASE available at <http://edn.bhel.com> (RFQ-PO Terms & Conditions)

b) Any other specific Terms and Conditions mentioned.

2. Bidders / Representatives who would like to be present during opening of offers are required to furnish authorization letter for the same.

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For and On behalf of BHEL.

Santosh Kumar
Control Equipment

1 OF 4

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Sl No.	Description	Qty	Unit	Delivery qty	Delivery Date
	bottom cover with weld studs as per VAR No. 00 in BHEL Drg no.36992100767. Finish: Powder Coating				
8	ED9060001087 2tk 748X934 Welded canopy * HSN/SAC : 9032 Test Certificate Welded assembly of 2thick CRCS 748(W)X934(H) Top Canopy as per VA00 in BHEL drawing 36594300551	260	NO	260	
9	ED9060001095 2THKx490x917 Canopy Centre piece * HSN/SAC : 9032 Test Certificate 2thick CRCS 490(W)X917(H) Canopy Centre piece as per VA00 in BHEL drawing 36594300579	585	NO	585	
10	ED9060001109 2THKx243.5x921 Canopy EXTENSION PLATE * HSN/SAC : 9032 Test Certificate Welded assembly of 2thick CRCS 243.5(W)X921(H) Extension plate for Canopy as per BHEL drawing 36594300580	585	NO	585	
11	ED9060001117 2THKx60x798 SIDE PLATE * HSN/SAC : 9032 2thick CRCS 60(W)X798(H) Canopy side Plate as per ITEM No.1 in BHEL drawing 46594300290	520	NO	520	
12	ED9060001125 2THKx328x921 Canopy Intermediate Plate * HSN/SAC : 9032 2thick CRCS 328(W)X921(H) Canopy Centre piece as per BHEL drawing 46594300296	260	NO	260	
13	ED9060001370 3Thk 15x278 CRCS Bracket * HSN/SAC : 9032 3Thk 15x278 CRCS Bracket for BusBar Mounting	2,210	NO	2,210	

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Due Date/Day: [REDACTED]
Time : [REDACTED]
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MM:PU:RF:003

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(for all correspondence)

Purchase Executive : Santosh Kumar
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SI No.	Description	Qty	Unit	Delivery qty	Delivery Date
	as per BHEL drawing 46562100232				
14	ED9060001389 3thk 20x164 L bracker * HSN/SAC : 9032 3thk 20x164 CRCS L bracker for cable support as per BHEL drawing 46562100420	1,430	NO	1,430	[REDACTED]
15	ED9060001397 3thk power socket plate * HSN/SAC : 9032 3thick 130x130 CRCS plate for power socket as per BHEL drawing 46562100099	2,600	NO	2,600	[REDACTED]
16	ED9060001400 2Thk 36 x 490 CRCS Sheet * HSN/SAC : 9032 36 x 490 2Thk CRCS Sheet for Channel support as per BHEL drawing 46594403644	2,340	NO	2,340	[REDACTED]
17	ED9060001419 3Thk 40x100 CRCS L-Bracket * HSN/SAC : 9032 3 Thick L-Bracket as per item no.02 of BHEL drawing 46532110939	1,950	NO	1,950	[REDACTED]
18	ED9060001427 5Thk 40x40x32 L-bracket * HSN/SAC : 9032 5Thk 40x40x32 L-bracket as per BHEL drawing 46992102019	1,950	NO	1,950	[REDACTED]
19	ED9060001435 3thk 240x240 Gland Plate * HSN/SAC : 9032 3thk 240x240 Gland Plate as per Item no.01 of BHEL Drawing 36532111762	2,600	NO	2,600	[REDACTED]
20	ED9060001443 5THK 50x166 STR. ST. plate * HSN/SAC : 9032 5 Thick 50x166 STR. ST. plate as per BHEL drawing 46539810427	780	NO	780	[REDACTED]

TWO PART BID - SUBMIT TECHNICAL AND PRICE BID IN SEPARATE SEALED COVERS

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Purchase Executive : Santosh Kumar
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Sl No.	Description	Qty	Unit	Delivery qty	Delivery Date
21	ED9060001451 5thk 35(W)X450(L) Side Bracket weld Assy * HSN/SAC : 9032 Welded assembly of 5thick STR. ST. 35(W)X450(L) Side Bracket as per VA00 of BHEL drawing 36612170006	910	NO	910	[REDACTED]
22	ED9060001460 3thk 240x440 Gland Plate * HSN/SAC : 9032 3thk 240x440 Gland Plate as per Item no.02 of BHEL Drawing 36532111762	1,300	NO	1,300	[REDACTED]
23	ED9060001478 2Thk 290x748 Facelift Rack plate * HSN/SAC : 9032 2Thk 290x748 Facelift module Fixing rack plate with top fan as per item no.01 of BHEL Drawing 36592100191	6,500	NO	6,500	[REDACTED]
24	ED9060001486 2 thick max rack mounting plate * HSN/SAC : 9032 U-Bracket for Rack Fixing as per IT01 in BHEL Drg No 46592100040	7,800	NO	7,800	[REDACTED]

Total Number of Items - 24

- 1.
- 2.

TWO PART BID - SUBMIT TECHNICAL AND PRICE BID IN SEPARATE SEALED COVERS

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For and On behalf of BHEL.

Santosh Kumar
Control Equipment

4 OF 4

SPECIFICATIONS FOR FABRICATION ITEMS (24 NOS) AS RATE CONTRACT FOR ONE YEAR:

The Technical specifications for the list of fabrication items shall be as below.

1. The bidder shall have requisite working personal, manufacturing facility, testing and inspection facility, loading and storing facility etc. The bidder shall submit these details as part of technical bid.
2. The fabrication items in the list (24 Nos) shall be fabricated as per the drawing given at the time of P.O. The raw material used shall be of Good quality CRCS sheet as per standard ED10199 Rev.3. Pre shipment inspection after powder coating/ zinc plating is applicable.
3. The fabrication items in the list (24 Nos) shall be powder coated/ zinc plated after production. The pretreatment, powder coating/ zinc plating shall be done as applicable as per following BHEL standards.
 - a. Pretreatment- ED0673694 – Revision 06.
 - b. Powder coating – ED0851799– Revision 10
 - c. Zinc Plating – ED0673692 Revision 00
4. Bidder shall confirm to manufacture items in the list (24 Nos) as per drawings/ P.O. and to powder coat/ zinc plate as per BHEL standards. In case of non-availability of powder coating/ zinc plating facility, the bidder shall do the powder coating/ zinc plating after production at the approved vendors' place as below:
 - a. Powder Coaters:
 - i. TASKA FIBRES PRIVATE LIMITED., Rajajinagar, Bangalore
 - ii. INDUSTRIAL ORGANIC FINISHERS, Mysore Road, Bangalore
 - iii. SUMUKHA ENGINEERING PVT. LTD., Jigani, Bangalore
 - iv. DURGASHREE COATERS PVT. LTD., Hegganahalli, Bangalore
 - v. NANDINI NATURA COATINGS, Bangalore
 - vi. NIHAR TECHNOCRAFTS PVT. LTD., Kamakshipalya, Bangalore
 - vii. ASSOCIATED COMMERCIAL ENTERPRISES, Mahadevapura, Bangalore
 - viii. MPP TECHNOLOGIES PVT. LTD., Peenya, Bangalore
 - ix. DEVI ENGINEERING, Electronics city, Bangalore
 - x. Any other approved vendor at the time of order placing
 - b. Zinc Plating:
 - i. Anand Industries, Bangalore
 - ii. Arun Electroplaters & Engg. Works, Kamakshipalya
 - iii. Balambiga Metal Finishers, Balambiga
 - iv. Bharath Electro Chem, Rajajinagar
 - v. ITI Ltd, Bangalore
 - vi. Sharada Electro Chem, Attibele, Bangalore.
 - vii. Any other approved vendor at the time of order placing

In case the bidder does not submit details mentioned in above clauses or meet the requirements of technical specifications, offers will be summarily rejected and bidder's offers/ proposals will not be evaluated.

5. Packing shall be done by the bidder to avoid any transit damages after powder coating/ zinc plating. Items shall be packed in packs of minimum quantity of each item for ease of handling.


ಪ್ರೀತಮ್ ವೈ., ವೀಕ್ಷಣೆ ಕಾರ್ಯದರ್ಶಿ / ಸೀ.ಇ.ಪಿ.ಸಿ.ಎ.
PREETHAM V., SENIOR MANAGER / CE-PPC
BHEL-EDN, MYSURU ROAD, BANGALURU-560 026

SPECIFICATIONS FOR FABRICATION ITEMS (24 NOS) AS RATE CONTRACT FOR ONE YEAR:

The General instructions to the bidders shall be as below:

1. ALL REQUIRED DOCUMENTS AGAINST THIS RFQ SHALL BE SUBMITTED IN ENGLISH ONLY.
2. In case of non-registered bidders with BHEL, the bidder shall submit duly-filled source request form (SRF), which shall be downloaded by bidder from our website”.
3. Whenever required during the evaluation of technical bid, the bidder is required to be present at BHEL Electronic Division, Mysore Road, Bangalore, for discussions.
4. BHEL shall visit vendor's work for verification of facilities offered and BHEL's decision on suitability of facility is final and binding.
5. BHEL Shall initially open bidder's PQC bid for review and acceptance. Only after the acceptance of PQC bid and subsequently technical bid, the bidder will be further evaluated for registration as a vendor with BHEL
6. The price bid shall be opened after acceptance of the technical bid.

The PQC requirement for the list of fabrication items shall be as below:

1. Bidder shall have a fabrication facility to carry out the work at their workshop. Bidder shall have punching press machines & bending machines to fabricate sheet metal items in their workshop to carry out the work. Bidder to provide documentary evidence for the same along with rating of all machinery available in the bidder's works.
2. The Purchase Order will be placed on part quantities based on BHEL project requirements, vendor will have to deliver the part quantities as per PO terms to BHEL-Electronics Division, Mysore Road, Bangalore timely to avoid any penalty charges. The bidder should have his/her workshop facility within periphery of 100 KMs. (Hundred kilometers) from the location of BHEL-Electronics Division, Mysore Road, Bangalore. The bidder shall submit documentary evidence to this effect.
3. Bidder should have executed at least one P.O./ Work order for sheet metal/ CRCS items pertaining to the similar works in last 3 years of a minimum value ₹40 Lakh.
4. The bidder should have achieved a minimum annual average financial turnover of ₹1,00,00,000 (Rupees One Crore only) in last three financial years i.e. 2022-23, 2023-24 and 2024-25. The bidder shall submit the balance sheets for all the three years.


ಪ್ರೀತಮ್ ವೈ., ಸೀನಿಯರ್ ಮ್ಯಾನೇಜರ್ / ಸಿ.ಇ.ಒ.ಸಿ.
ಪ್ರೀತಮ್ ವೈ., ಸೀನಿಯರ್ ಮ್ಯಾನೇಜರ್ / ಸಿ.ಇ.ಒ.ಸಿ.
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BHEL-EDN, MYSURU ROAD, BANGALURU-560 026

**SPECIFICATIONS FOR FABRICATION ITEMS (24 NOS) AS RATE CONTRATC
FOR ONE YEAR:**

The commercial terms and conditions for the RFQ shall be as below.

1. The vendor shall quote unit rate for each item per No. in Rupees which include material cost, fabrication, painting/ zinc plating, packing, loading, unloading, transportation and others if any considering the RFQ quantity.
2. The pre-shipment inspection (PSI) for manufactured items shall be raised by the bidder & dispatch shall be done post inspection clearance by BHEL.
3. The PO is to be placed on TWO vendors in the ratio of 60:40.
4. The penalty is applicable for late supplies. The delivery shall be 06 weeks from PO. The PSI call date after powder coating shall be the deemed delivery date.
5. The price evaluation shall be done based on the L1 price for the complete package (Total of 24 Nos.).
6. The bidder shall comply general terms and conditions of the RFQ.


ಪ್ರೀತಮ್ ಎ. ವೀರೇಂದ್ರಪ್ಪ / ಸೀ.ಇ.ಎಸ್.ಸಿ.
ಪ್ರೀತಮ್ ವೀ., ಸೀನಿಯರ್ ಮ್ಯಾನೇಜರ್ / ಸೀ.ಇ.ಎಸ್.ಸಿ.
PREETHAM V., SENIOR MANAGER / CE-PPC
BHEL-EDN, MYSURU ROAD, BENGALURU-560 026

ALL DIMENSIONS ARE IN mm

ALL DIMENSIONS ARE IN mm

DRAWING NO. 3 656 21 00601

Copyright and Confidential

3 656 21 00601

SIGN & DATE

INVENTORY NO.

REV.	DATE	ALTERED	PM
03	03.07.17	CHECKED	YJ
		APPROVED	BNM
	VIEW 'B' ALTERED		

REV.	DATE	ALTERED	PM
05	20.03.18	CHECKED	YJ
		APPROVED	BNM

DIMN. 435 & 372 WAS 433 & 370 IN TABULAR COLUMN.

REV:	DATE	ALTERED	AVL
04	20.08.17	CHECKED	ANJUL
		APPROVED	SLN
	ITEM 03 ADDED.		

DEPT. SGC	FOR UNSPECIFIED- TOLERANCES	SC N
CODE 410	REFER ID 0230499	

TITLE

NTCHG & FRMG DTU

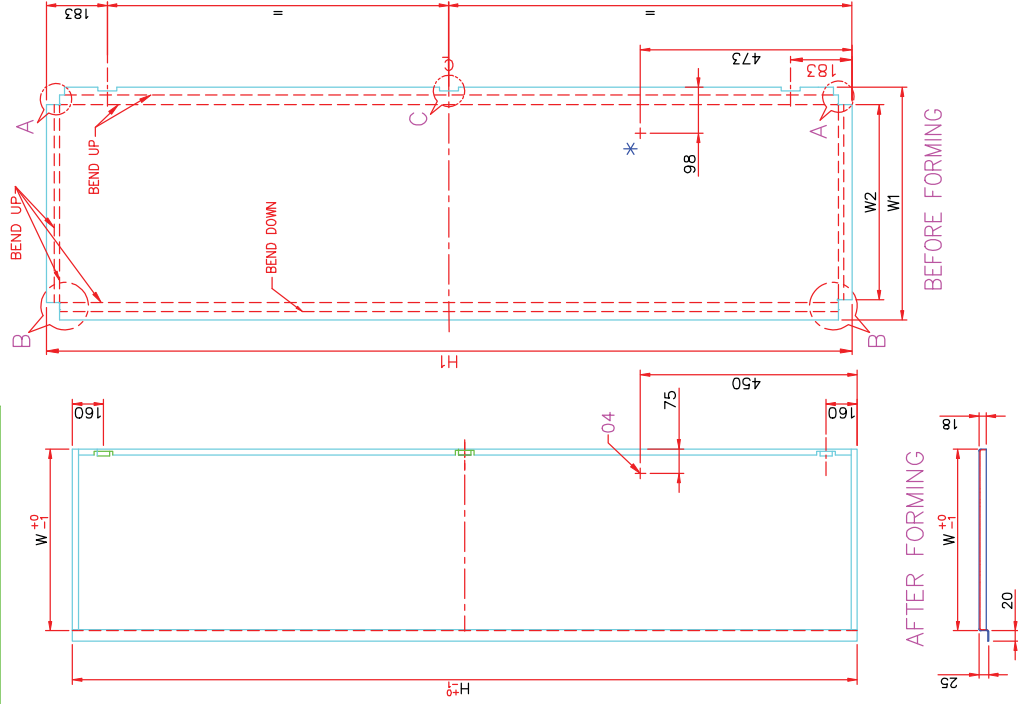
DBL DOOR-LH

SALE	WEIGHT(Kg)	REF. TO ASSY.	DRG.	REV.	NO. OF SHEETS	NO. OF ITEM
ITS		3 656 21	00602	01	01	
DRAWING NO.				REV.		
3 656 21 00601				05		

TITLE	NTCHG & FRMG DTL FOR DBL DOOR-LH	
	DRAWING NO.	3 656 21 00601
SHEET NO. 01		NO. OF SHEETS 01

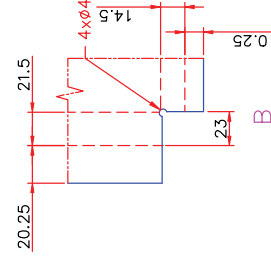
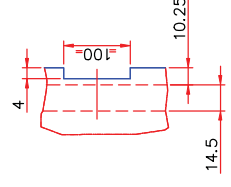
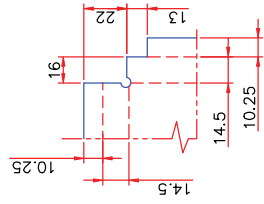
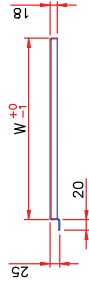
REV. 05

FORM No. A3-01



AFTER FORMING

BEFORE FORMING



NOTE: —

1. NOTCHED SHT ,MUST BE WITH IN DIMENSIONS, AND FREE FROM TWISTING AND BOWING.
2. FOR FURTHER OPERATIONS REFER MID FOR ADDITIONAL CUTOUTS
3. * PUNCH MARK FOR STUD WELDING.

NOTE TO DRAFTSMAN: -

GIVE RELATIVE REFERENCE OF ITEM NO. FROM THIS DRAWING FOR ADDITIONAL CUTOITS TO BE MADE FOR THE PARTICULAR M.O.

FINISH: — NATURAL

QTY.	ITEM No.	DESCRIPTION	DRAWING NO.	ITEM No.	MATERIAL CODE	UT.Wt. (kgs)
		2 THK. WT x H1 Lg CRCS SHEET			AA1011715112	
					AA10115	
					MATERIAL SPECN.	QTY.

CARD TYPE 2 ← CARD TYPE 1

TYPE OF PRODUCT OR
NAME OF CUSTOMER/PROJECT

 BHARAT HEAVY ELECTRICALS LIMITED, ELECTRONICS DIVISION, BANGALORE		NAME	SIGN.	DATE	No. of VAR
	DRN	CRS		22.03.16	
	CKD	YJ		22.03.16	
	APPD	RNM		27.03.16	

DEPT. - SGC	FOR UNSPECIFIED - TOLERANCES	SCALE	WEIGHT(Kg)	REF. TO ASSY. DRG.	ITEM NO.	No. OF ITEM
CODE 410	REFER ED 0230499	 NTS		3 656 21 00602	01	01

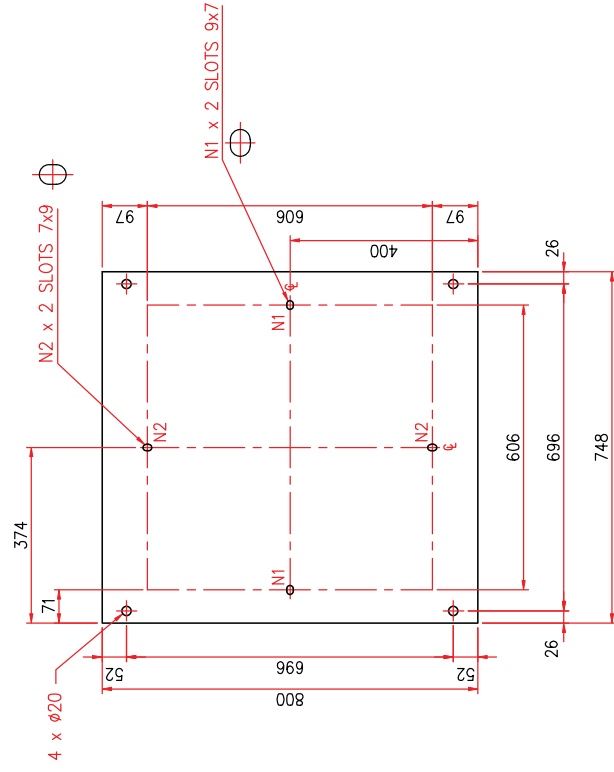
TITLE	DRAWING NO.		REV.
	3 656 21 00601		05
NTCHG & FRMG DTL FOR DBL DOOR-LH		SHEET NO. 01	NO. OF SHEETS 01

8	7	6	5
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1

ALL DIMENSIONS ARE IN mm

DRAWING NO. 3 656 21 00620



FINISH :-
AS PER EES - EXTERIOR.

NOTE :-

1. COVERS MUST BE FLAT & FREE FROM TWIST, BOWING OR WAVINESS .
AFTER CUTTING & PUNCHING.

NOTE TO STORE :-
THESE COVERS MUST STORED HORIZONTALLY ONE ON THE TOP OF THE OTHER ON A PLAIN SURFACE WITH SUPPORT UNDER THE FULL AREA.
THESE COVERS MUST BE STORED IN SUCH A PLACE THAT NOTHING WILL BE KEPT ON THEM EXCEPT THE SAME COVERS. NO BODY SHOULD WALKOVER OR STAND ON THEM. NO ITEM SHOULD FALL ON THEM.
THESE CARE SHOULD NECESSARY TO AVOID THE FORMING BY DENTS OF BENDING etc. ON COMPLETED COMPONENTS.

	2TK. x 748 x 800 CRCS SHEET			AA 1011715112	9.4
ITEM NO.	DESCRIPTION	DRAWING NO.	ITEM NO.	MATERIAL CODE	UNT. Wt.(kg)
			VARI	MATERIAL SPECN.	QUANTITY

TYPE OF PRODUCT OR
NAME OF CUSTOMER/PROJECT

BHARAT HEAVY ELECTRICALS LIMITED: ELECTRONICS DIVISION, BANGALORE		NAME	SIGN.	DATE	No. of VAR
	DRN	PM		20.06.16	
	CKD	YJ		20.06.16	
	APPD	RNM		20.06.16	

DEPT. SGC	SCALE	WEIGHT(kg)	REF. TO ASSY. DRG.	ITEM NO.	NO. OF ITEM
CODE 410	FOR UNSPECIFIED-TOLERANCES REFER ED 0230499	NTS	36562100619VA00	01	

TITLE	PLAIN TOP COVER FOR SUITE OF ONE (IP-42)	DRAWING NO.	3 656 21 00620	REV.	02
		SHEET NO. 01	NO. OF SHEETS 01		

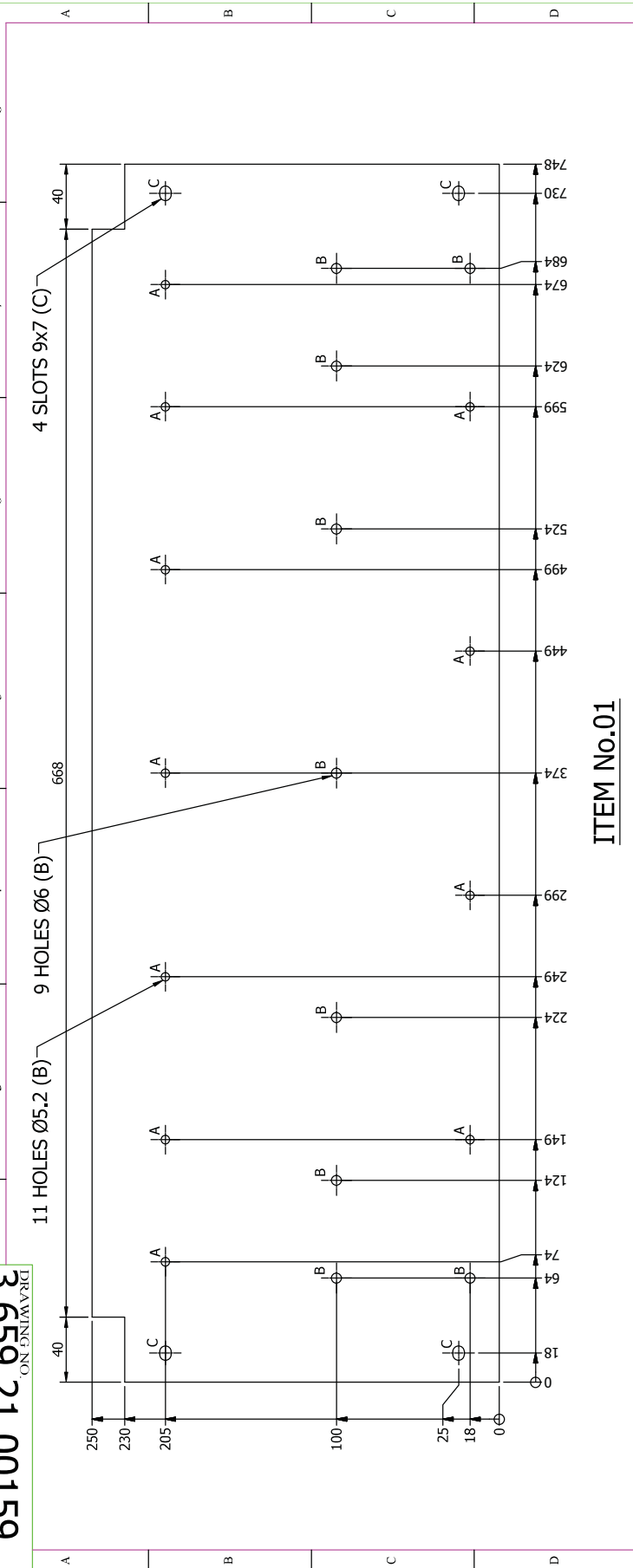
FORM No. A3-01

A3 SIZE

FIRST ANGLE PROJECTION

65100 12 659 3
DRAWING NO.
ON DRAWING

ALL DIMENSIONS ARE IN mm



ITEM No.01

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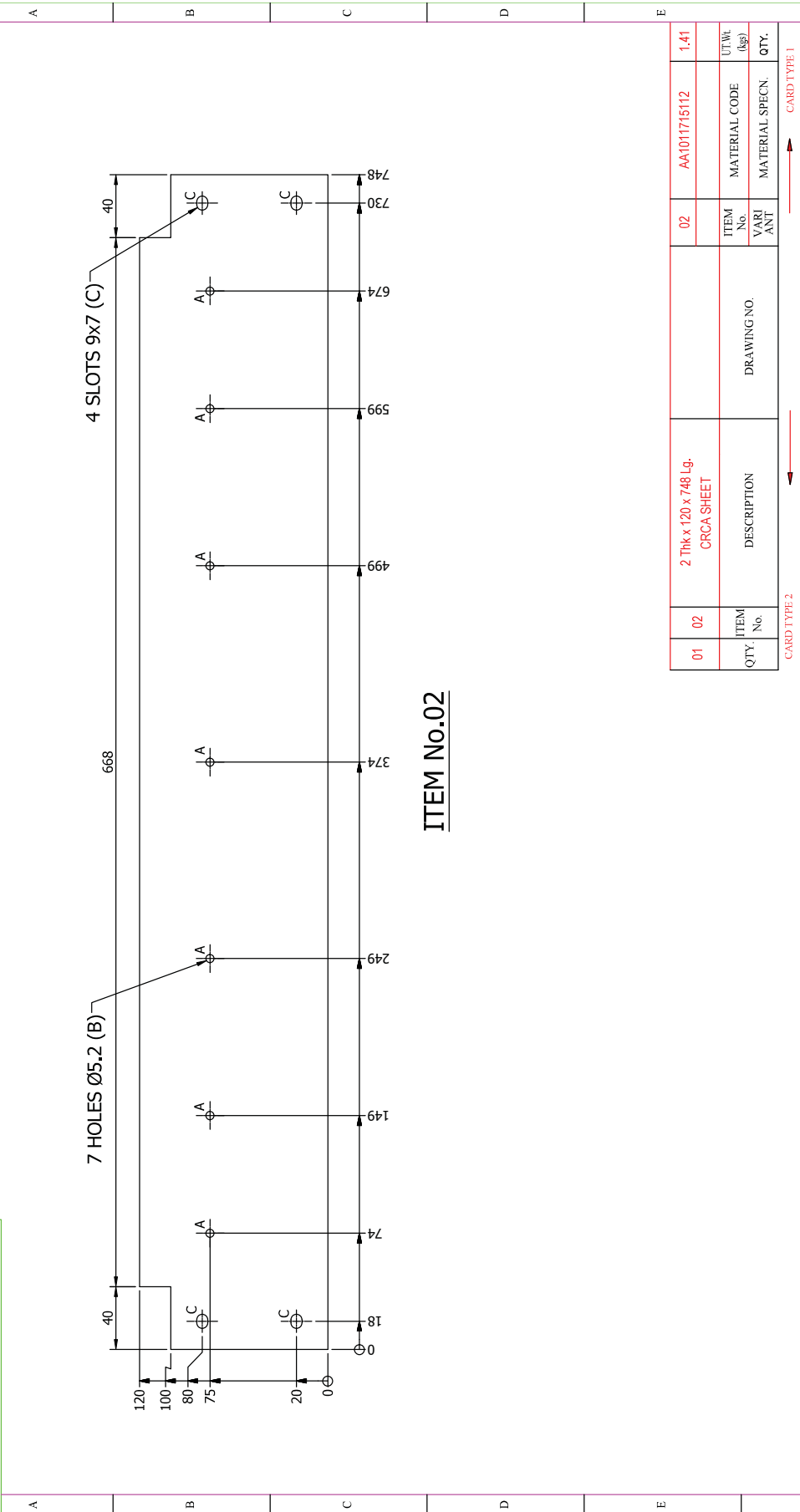
01	01	2 Thk x 250 x 748 Lg. CRCA SHEET		01	AA1011715112	2.94
QTY.	ITEM No.	DESCRIPTION	DRAWING NO.	ITEM No.	MATERIAL CODE	UTWL (kg)
				VARI ANT	MATERIAL SPECN.	QTY.
CARD TYPE 2			CARD TYPE 1			
BHARAT HEAVY ELECTRICALS LIMITED, ELECTRONICS DIVISION, BANGALORE			DRN	NAME	SIGN.	DATE
			MBK			24.11.2021
			CKD	SD		24.11.2021
			APPD	SKB		24.11.2021
FOR UNSPECIFIED TOLERANCES REFER ED 0230499			WEIGHT (kg)		REF. TO ASSY. DRG.	ITEM NO.
SCALE 1:6						No. OF 1
DEPT. BOP CODE 415			DRAWING NO.		REV.	
DETAIL OF POWER SUPPLY MOUNTING PLATE FOR VALMET			3 659 21 00159		00	
SHEET NO. 01			NO. OF SHEETS 02			

FINISH: POWDER COATED TO LIGHT GREY TO SHADE 631 OF IS:5 SEMI GLOSSY.

FIRST ANGLE PROJECTION

DRAWING NO. 65100 12 659 3

ALL DIMENSIONS ARE IN mm



ITEM No.02

01	02	ITEM No.	DESCRIPTION	DRAWING NO.	ITEM No.	02	AA1011715112	1.41
QTY.	ITEM No.	DESCRIPTION	DRAWING NO.	ITEM No.	UT Wt. (kg)			
					MATERIAL SPECN.			
					QTY.			

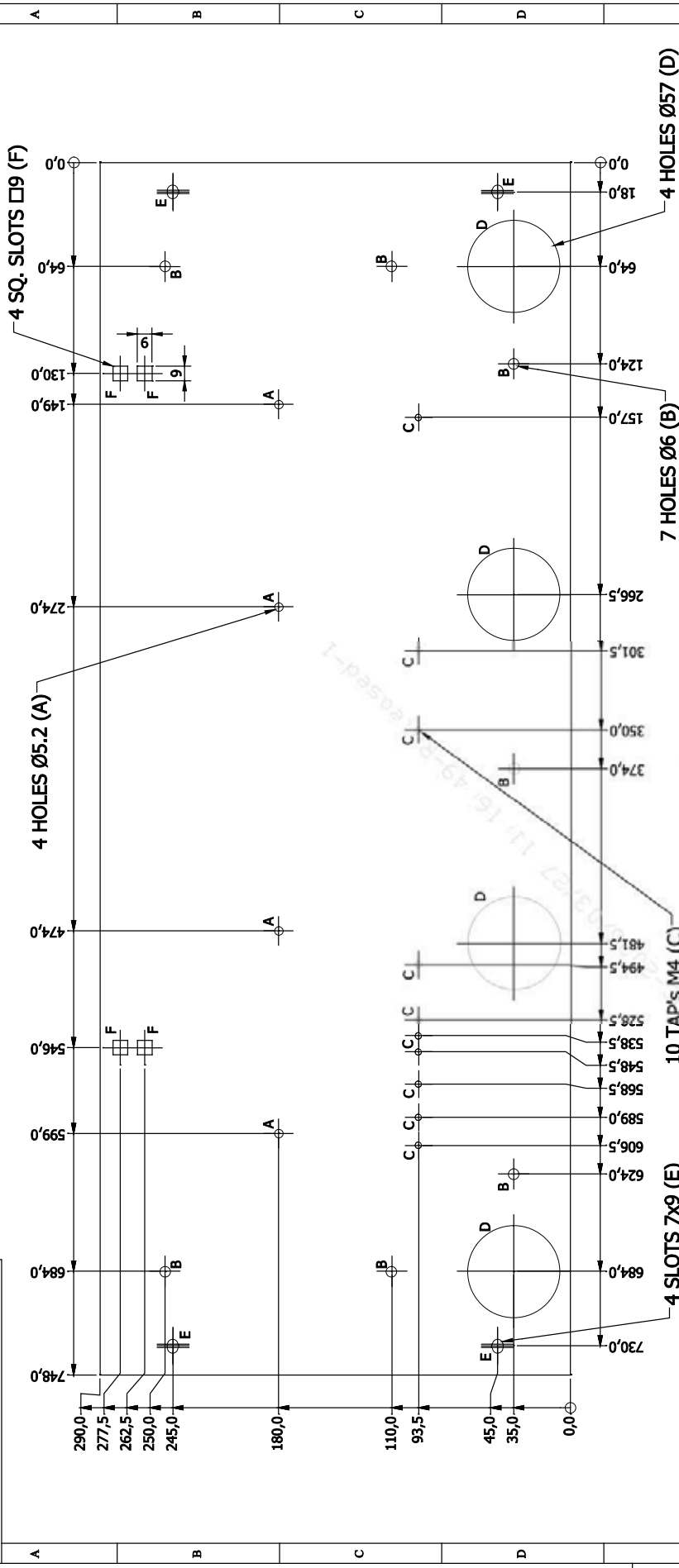
DEPT. BOP CODE 415	FOR UNSPECIFIED TOLERANCES REFER ED 0230499	SCALE 1:2.5	WEIGHT (kg)	REF. TO ASSY. DRG.	ITEM NO.	24.11.2021	DATE	24.11.2021	NO. OF

TITLE	DRAWING NO.	REV.
DETAIL OF POWER SUPPLY MOUNTING PLATE FOR MAX	3 659 21 00159	00
	SHEET NO. 02	NO. OF SHEETS 02

FINISH: POWDER COATED TO LIGHT GREY TO SHADE 631 OF IS:5 SEMI GLOSSY.

ALL DIMENSIONS ARE IN mm

DRAWING NO. 3 659 21 00191



ITEM No.01

01	01	2 Tnk x 290 x 748 Lg. CRCA SHEET		01	AA1011715112	3.4
	ITEM QTY.	DESCRIPTION	DRAWING NO.	ITEM No.	MATERIAL CODE	UT.Wt. (kg)
				VARI ANT	MATERIAL SPECN.	QTY.

CARD TYPE 2

[illegible]

FINISH: POWDER COATED TO LIGHT GREY TO SHADE 631 OF IS:5 SEMI GLOSSY.

F	FINISH: POWDER COATED TO LIGHT GREY TO SHADE 631 OF IS:5 SEMI GLOSSY.									
	REV.		DATE	ALTERED CHECKED	REV.	DATE	ALTERED CHECKED	DATE	REV.	DATE
				APPROVED		13.02.25	APPROVED	SD		
G	9No M4 TAP HOLE (C) REVISED TO 10No M4 TAP HOLE (C) BASED ON ENGG. REDESIGN									
	REV.		DATE	ALTERED CHECKED	REV.	DATE	ALTERED CHECKED	DATE	REV.	DATE
				APPROVED			APPROVED	SD		
 BARAT HEAVY ELECTRICALS LIMITED, ELECTRONICS DIVISION, BANGALORE DRN MH CED SD APPD SD WEIGHT(Kg) SCALE FOR UNSPECIFIED- TOLERANCES REFER ED 0230499 1:6  DEPT. BOP CODE 415 DRAWING NO. 3 659 21 00191 REV. 01 ITEM NO. 1 REF. TO ASSY. DRG. NO. OF SHEETS 01 8 7 6 5 4 3 2 1										

FORM No. A3-01

A3 SIZE

93000 92 659 3

DRAWING NO.

ALL DIMENSIONS ARE IN mm

87

8

FIRST ANGLE PROJECTION

3

4

5

6

7

8

ITEM No.01

668

730,0

684,0

600,0

583,0

525,0

482,0

450,0

374,0

298,0

266,0

223,0

165,0

148,0

64,0

18,0

0,0

35

35

40

2 Thk

12

40

17,5

2 SLOTS 7x9 (C)

6 HOLES Ø5.2 (A)

7 HOLES Ø6 (B)

ITEM No.01

668

748

UP 90,00° R2,00

ISOMETRIC VIEW

ITEM No.01

DEVELOPMENT DETAIL

ITEM No.01

FINISH: POWDER COATED TO LIGHT GREY TO SHADE 631 OF IS-5 SEMI GLOSSY.

01	01	2 Thk x 48.5 x 748 Lg. CRCA SHEET			01	AA1011715112	0.5
QTY.	ITEM No.	DESCRIPTION	DRAWING NO.	ITEM No.	MATERIAL CODE	MATERIAL SPECN.	QTY.
CARD TYPE 2				CARD TYPE 1			

DRN	NAME	SIGN.	DATE	No. OF
MBK			15.09.2021	
CKD	SD		15.09.2021	
APPD	SKB		15.09.2021	
WEIGHT (kg)			REF. TO ASSY. DRG.	ITEM NO.
1:6				1
FOR UNSPECIFIED TOLERANCES REFER ED 0230499				
DEPT. BOP CODE 415				
TITLE			DRAWING NO.	
VERTICAL DIN			3 659 26 00036	
SUPPORT PLATE DETAIL			REV. 00	
SHEET NO. 01			NO. OF SHEETS 01	

INVENTORY NO.

SIGN & DATE

REF. DRG. NO.

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1

2

3

4

5

6

7

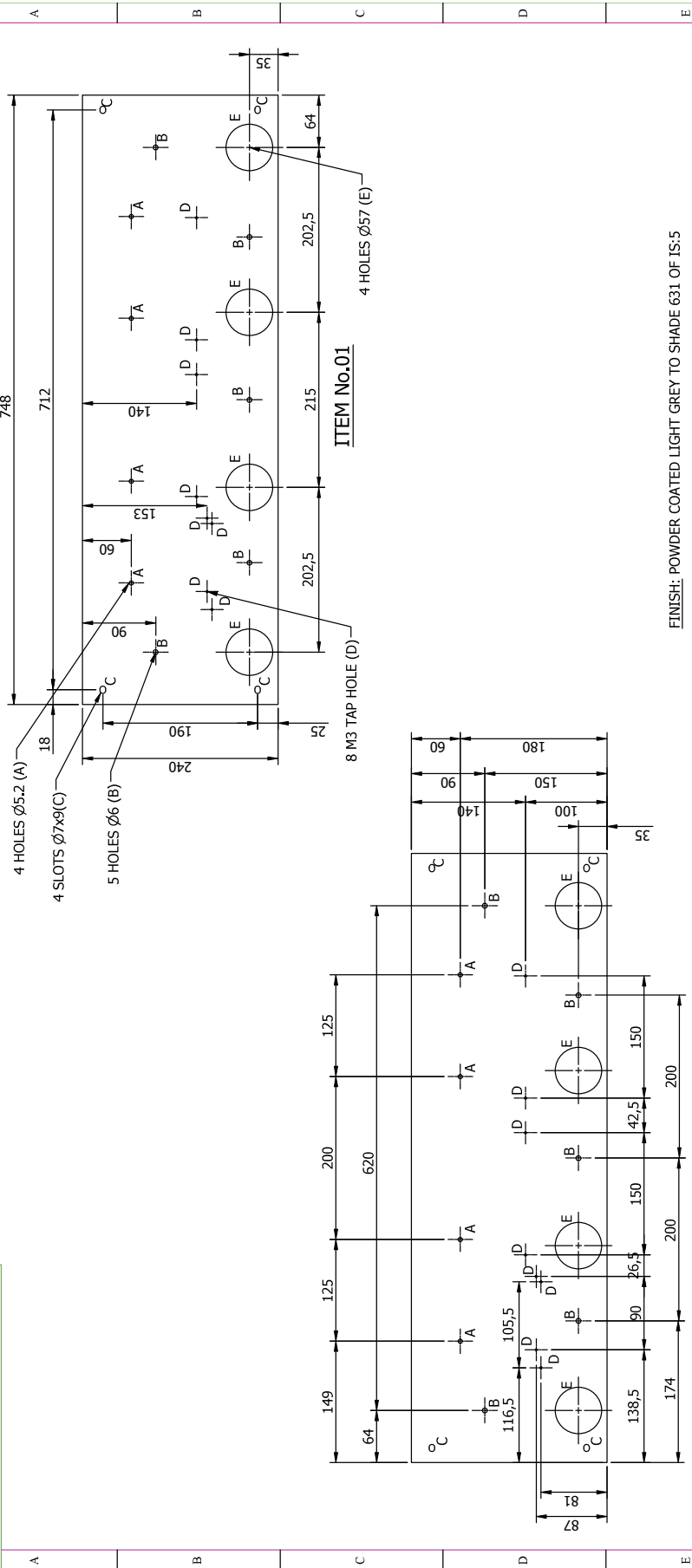
8

A3 SIZE

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN mm

DRAWING NO.
3 659 43 01663



FINISH: POWDER COATED LIGHT GREY TO SHADE 631 OF IS:5

01	01	2 Thk x 240 x 748 Lg. CRCA SHEET		01	AA1011715112	2.8
QTY.	ITEM No.	DESCRIPTION	DRAWING NO.	ITEM No.	MATERIAL CODE	UTWL (kg)
				VARI ANT	MATERIAL SPECN	QTY.

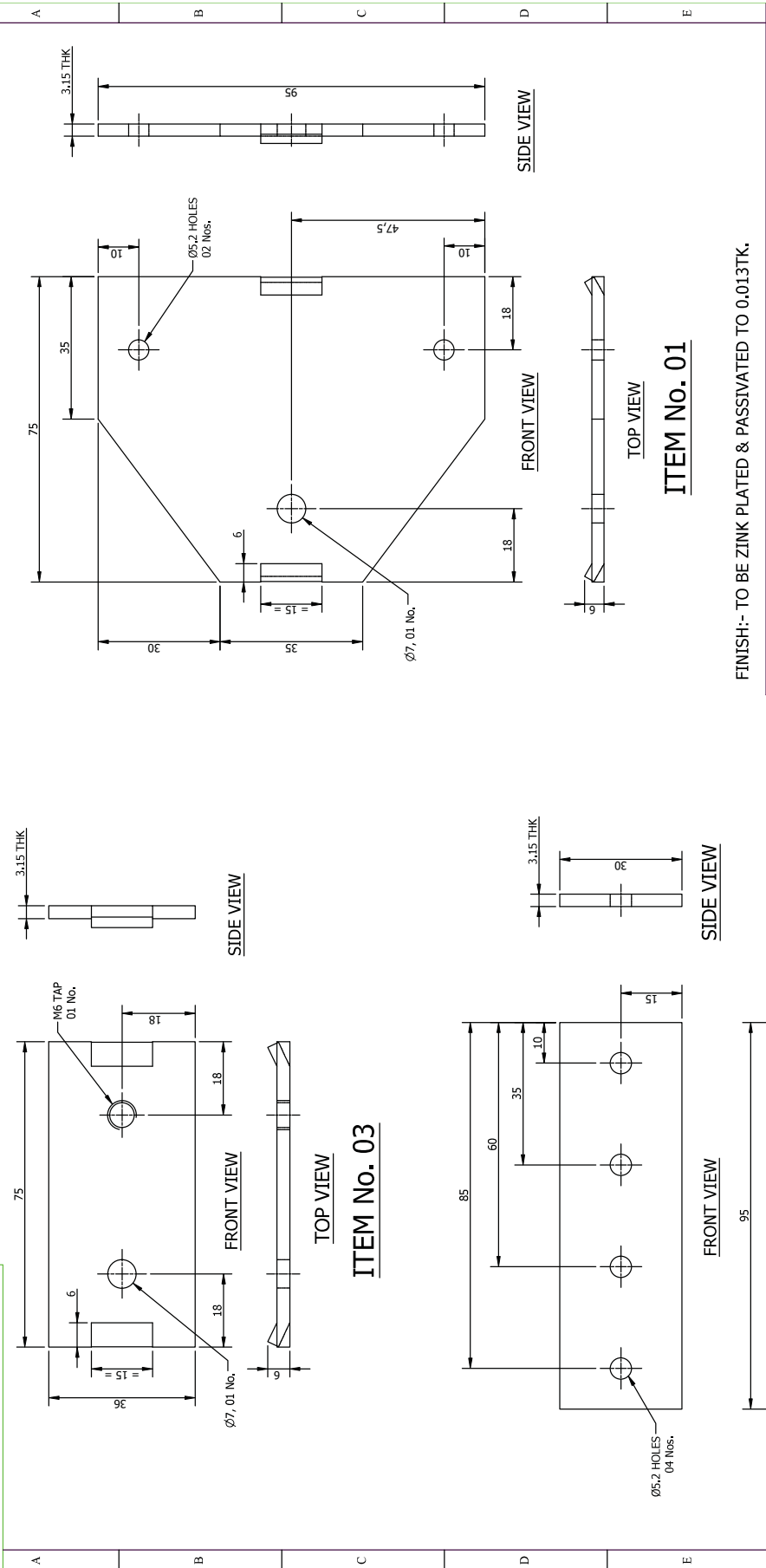
CARD TYPE 1		CARD TYPE 2	
NAME	SIGN.	DATE	No. OF
MBK		16.01.15	
CKD	RR	16.01.15	
APPD	RR	16.01.15	
REF TO ASSY. DRG.		ITEM NO.	No. OF
36594301662		01	1
SCALE	WEIGHT (kg)		
1:5			
FOR UNSPECIFIED TOLERANCES REFER ED 0230499			
DEPT. BOP CODE 415			
TITLE		DRAWING NO.	
DETAIL OF RECK FIXING PLATE. METSO DNA		3 659 43 01663	
REV. 01		REV. 01	

REV.	DATE	ALTERED	CHECKED	APPROVED	PM
01	13.02.18				
8 M3 TAP HOLE (D) WAS 6 M3 TAP HOLE (D). DIMN. 81, 105.5 & 116.5 ADDED.					

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN mm

DRAWING NO.
3 659 43 02291



FINISH:- TO BE ZINK PLATED & PASSIVATED TO 0.013TK.

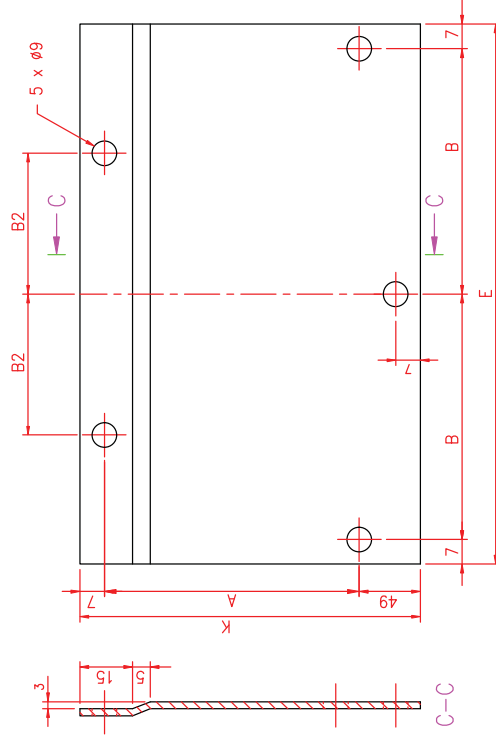
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT		NAME		SIGN.	DATE	No. OF VAR
BHARAT HEAVY ELECTRICALS LIMITED. ELECTRONICS DIVISION, BANGALORE		DRN	MBK		04.01.2019	
		CKD	SD		04.01.2019	
		APPD	KBD		04.01.2019	
FOR UNSPECIFIED TOLERANCES REFER ED 0230499		SCALE	1:1	WEIGHT(Kg)	REF. TO ASSY. DRG.	No. OF ITEM NO.
DEPT. BOP CODE 415						
TITLE BRACKETS FOR DIN RAIL FIXING FOR DCS PANELS		DRAWING NO. 3 659 43 02291		REV. 00		
INVENTORY NO.		SHEET NO. 01		NO. OF SHEETS 01		

ALL DIMENSIONS ARE IN mm

AWING NO. 3 699 21 00766

DRAWING NO. 700

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NOTE TO D/MAN :-

$$E = (\text{FRAME WIDTH} - 160) + 28$$

$$B = (E - 14) / 2$$

$$B2 = B / 2$$

$$K = (\text{FRAME DEPTH} - 160) / 3 + 28 \quad A = K - 56$$

1. IN CASE $(D-160)/3$ CONTAINS A FRACTION THEN REMAINDER IS TO BE ADJUSTED AS BELOW
2. IF REMAINDER OF $(D-160)/3$ IS ONE THEN IT IS TO BE ADJUSTED IN THE CENTRE PIECE OF THE CUBICLE
3. IF REMAINDER OF $(D-160)/3$ IS TWO THEN IT IS TO BE ADJUSTED IN THE END PIECES 1mm EACH

FINISH :- POWDER COATING (BRILLIANT WHITE)

NOTE TO MFG. :-

1. COVER MUST BE TRUE AND SQUARE FREE FROM BENDS, TWISTING, BOWING AFTER CUTTING AND BENDING AFTER PAINTING COVER MUST BE FREE FROM SCRATCHES AND DENTS ETC.
2. THESE COVER MUST BE STORED IN SUCH A WAY BENDING, SCRATCHING ETC. ARE TO BE AVOIDED ON FINISHED COVER. NO WEIGHT WILL BE LIKELY TO FALL ON OR NOBODY WILL CLIMB ON TO THEM.

REF. DRG.NO. 0076

SIGN & DATE _____

INVENTORY NO.

[illegible]

~~FINISH WAS AS PER M.O~~

DEPT. Engg.	FOR UNSPECIFIED- TOLERANCES REFER ED 0230499
CODE 402	

SCALE	WEIGHT
N.T.S	

Kg)	REF. TO ASSY. DRG.	ITEM NO.	No. OF ITEM
	3 699 21 00768	01	

Kg)	REF. TO ASSY. DRG.	ITEM NO.	No. OF ITEM
	3 699 21 00768	01	

Kg)	REF. TO ASSY. DRG.	ITEM NO.	No. OF ITEM
	3 699 21 00768	01	

TITLE

BTLE
BOTTOM COVER FRONT
& REAR PIECE (3.15tk)

DRAWING NO.

DRAWING NO. 699 21 00766

REV.

REV. 08

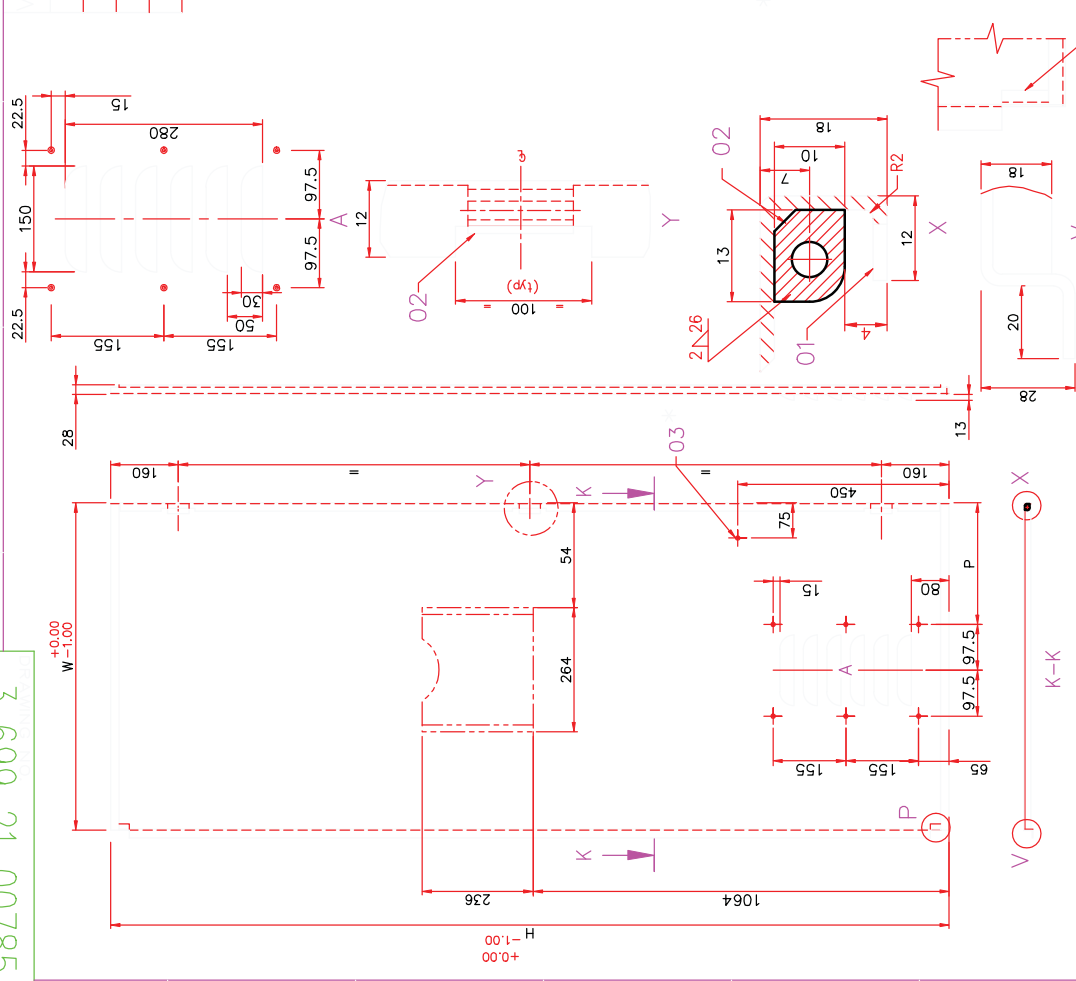
SHEET NO. 01	NO. OF SHEETS 01
7	8

FORM No. A3-01

A3 SIZE

REV.	DATE	ALTERED	PM	REV.	DATE	ALTERED	DS	REV.	DATE	ALTERED	WALLIKARJUN
12	26-05-17	CHECKED	YJ	11	27-03-14	CHECKED	YJ	13	21.12.21	CHECKED	VIN
		APPROVED	BNM			APPROVED	BNM			APPROVED	ARAVIND
2 WELD STUD INTRODUCED AT 155mm IN FRONT VIEW.				1. NOTE-3 MODIFIED DRAWING POCKET FIXING DIMENSIONS ADDED.				DIMN 160 MM WAS 130 MM AND ITEM NO.02 TYPE AND QTY. CHANGED.			

DEPT. ENGG.	SCALE N.T.S.	WEIGHT(Kg)	REF. TO ASSY. DRG.	ITEM NO.	No. of ITEM
WELDING DETAIL FOR					
DBL DOOR-LH (MAX PNL)					
3 699 21 00785			REV.		13
SHEET NO. 01			No. of SHEETS 01		



VAR	W	H	P	X	Y	UNIT PRICE	REMARKS
00	372	2228	88.5	-	-	750	2230 15.50 WITH POCKET
01	372	2228	88.5	-	-	750	2230 15.50 WITHOUT POCKET

1. WELD ONE STUD WELD M6 NEARER TO THE HINGE SIDE, FOR EARTHING.
2. DOOR BENDING SHOULD BE 90°±5° THRO OUT FROM BOTTOM TO TOP
3. DRAWING POCKET SHALL BE FIXED BY USING SELF ADHESIVE AS PER MID1.

FINISH: — NATURAL

TYPE OF PRODUCT OR
NAME OF CUSTOMER/PROJECT

भारत भार
BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

DEPT. ENGG.	FOR UNSPECIFIED- TOLERANCES REFER ED 0230489		SCALE N.T.S.
----------------	--	---	-----------------

WELDING DETAIL FOR
DBL DOOR-LH (MAX PNL)

3 699 21 00786

COPY WRIGHT AND CONFIDENTIAL

00786001

REF. DRG.NO.

SIGN & DATE

INVENTORY NO.

REV.	DATE	ALTERED	MALLIKARJUN	REV.
06	21.12.21	CHECKED	VIN	05
		APPROVED	ARAVIND	

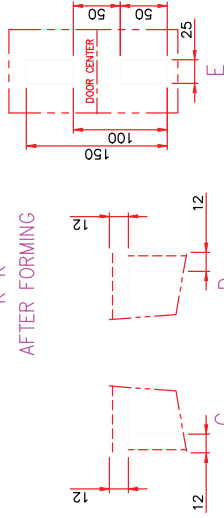
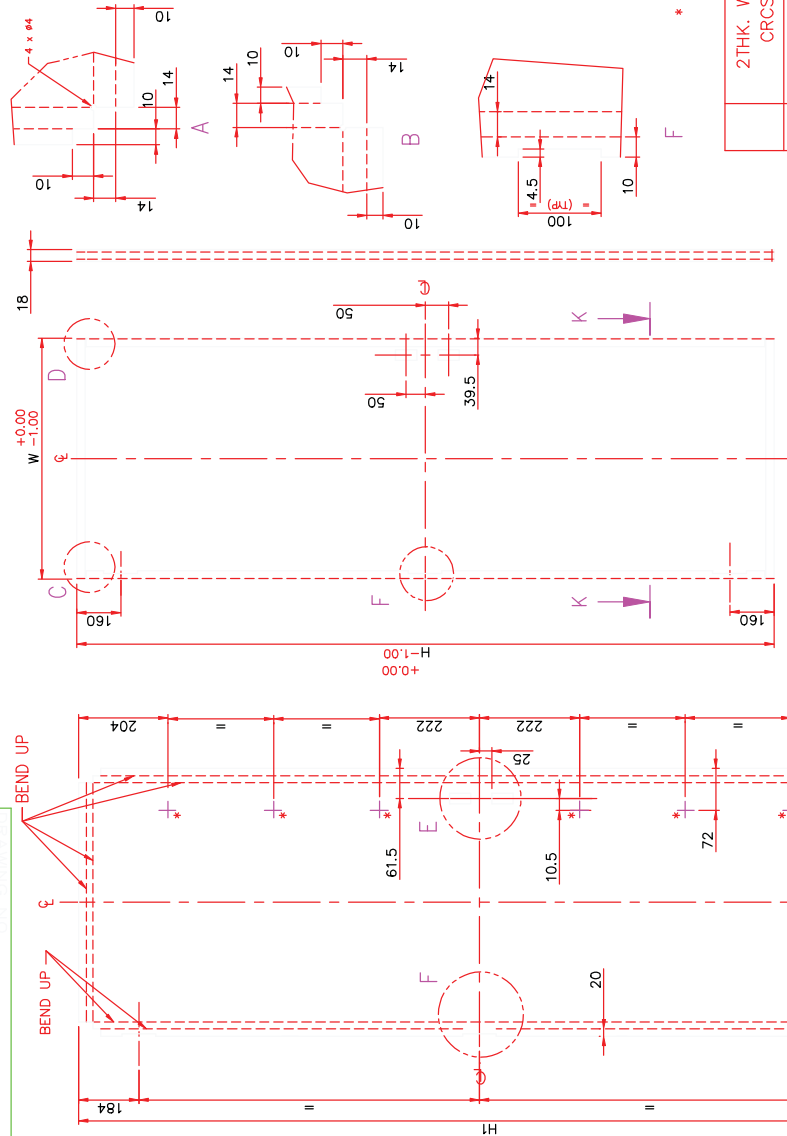
DIMN 184 MM WAS 154 MM AND
DETAIL 'F' AT 3 PLACES WAS 5 PLACES.

DATE	ALTERED	S.N.Murthy
01-09-10	CHECKED	A.Louis
	APPROVED	A.Louis

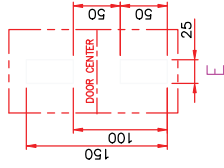
~~DIM 72 WAS 74~~

REV	DATE	ALTERED	S.N.Murthy
04	17-02-07	CHECKED	Narendra
		APPROVED	K.Sairam

~~DIM 61.5 WAS 63.5~~



AFTER FORMING



4

1. NOTCHED SHIT MUST BE NDIMENSIONS, AND FREE FROM TWISTING AND BOWING.
 2. FOR FURTHER OPERATIONS REFER MID FOR ADDITIONAL CUTOUTS
- NOTE TO DRAFTSMAN: —
- GIVE RELATIVE REFERENCE OF ITEM NO. FROM THIS DRAWING FOR ADDITIONAL CUTOUTS TO BE MADE FOR THE PARTICULAR M.O.

NOTE TO DRAFTSMAN: -

GIVE RELATIVE REFERENCE OF ITEM NO. FROM THIS DRAWING FOR
ADDITIONAL CUTOUTS TO BE MADE FOR THE PARTICULAR M.O.

FINISH: — NATURAL

* THIS ARE PUNCHING MARKS FOR STUD WELDING.

ITEM NO.	DESCRIPTION	DRAWING NO.	ITEM NO.	AA 10115112	UNIT. WT.(kg)	QUANTITY
	2THK. W1 x H1 Lg CRCS SHEET			AA 10115	MATERIAL CODE	
					MATERIAL SPECN.	

CARD TYPE 2

CARD TYPE 1

TYPE OF PRODUCT OR

BHARAT HEAVY ELECTRICALS LIMITED, ELECTRONICS DIVISION, BANGALORE		NAME	DESIGN	DATE	No. of VAR
		S.N.Murthy	sd/-	26.04.05	
		Narendra	sd/-	30.04.05	
		Narendra	sd/-	30.04.05	

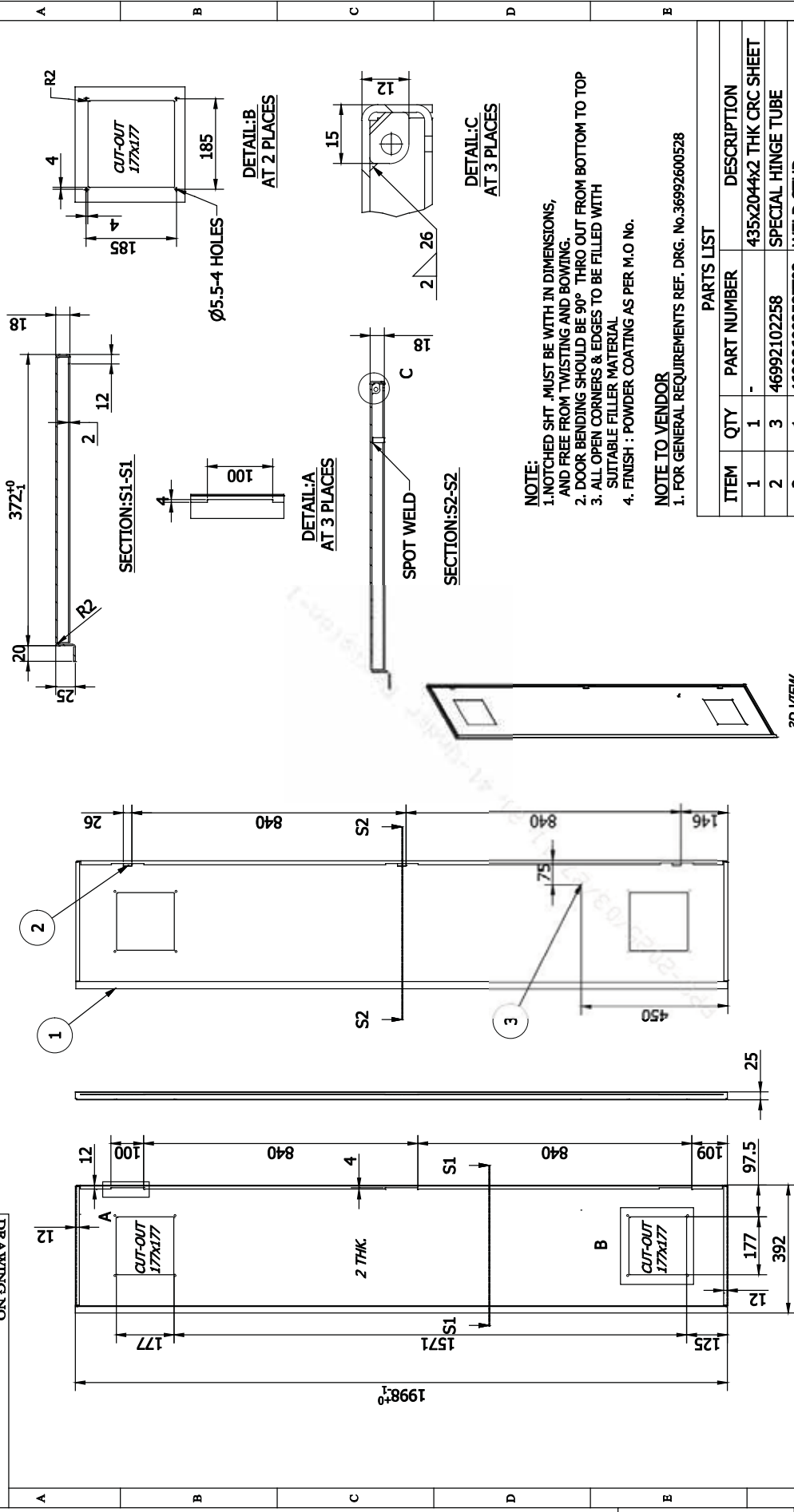
DEPT. ENGG.	SCALE	WEIGHT(Kg)	REF. TO ASSY. DRG.	No. OF ITEM
CODE 402		N.T.S	3 699 21 00787	01

NTCHG & FRMG DTL FOR
DBL DOOR-RH (MAX PNL)

DRAWING NO.	REV.
3 699 21 00786	06

NO. OF SHEETS	
01	

1



NOTE:

1. NOTCHED SHIT .MUST BE WITH IN DIMENSIONS, AND FREE FROM TWISTING AND BOWING.
2. DOOR BENDING SHOULD BE 90° THRO OUT FROM BOTTOM TO TOP
3. ALL OPEN CORNERS & EDGES TO BE FILLED WITH SUITABLE FILLER MATERIAL
4. FINISH : POWDER COATING AS PER M.Q No.

NOTE TO VENDOR

NOTE TO VENDOR
1. FOR GENERAL REQUIREMENTS REF. DRG. No.36992600528

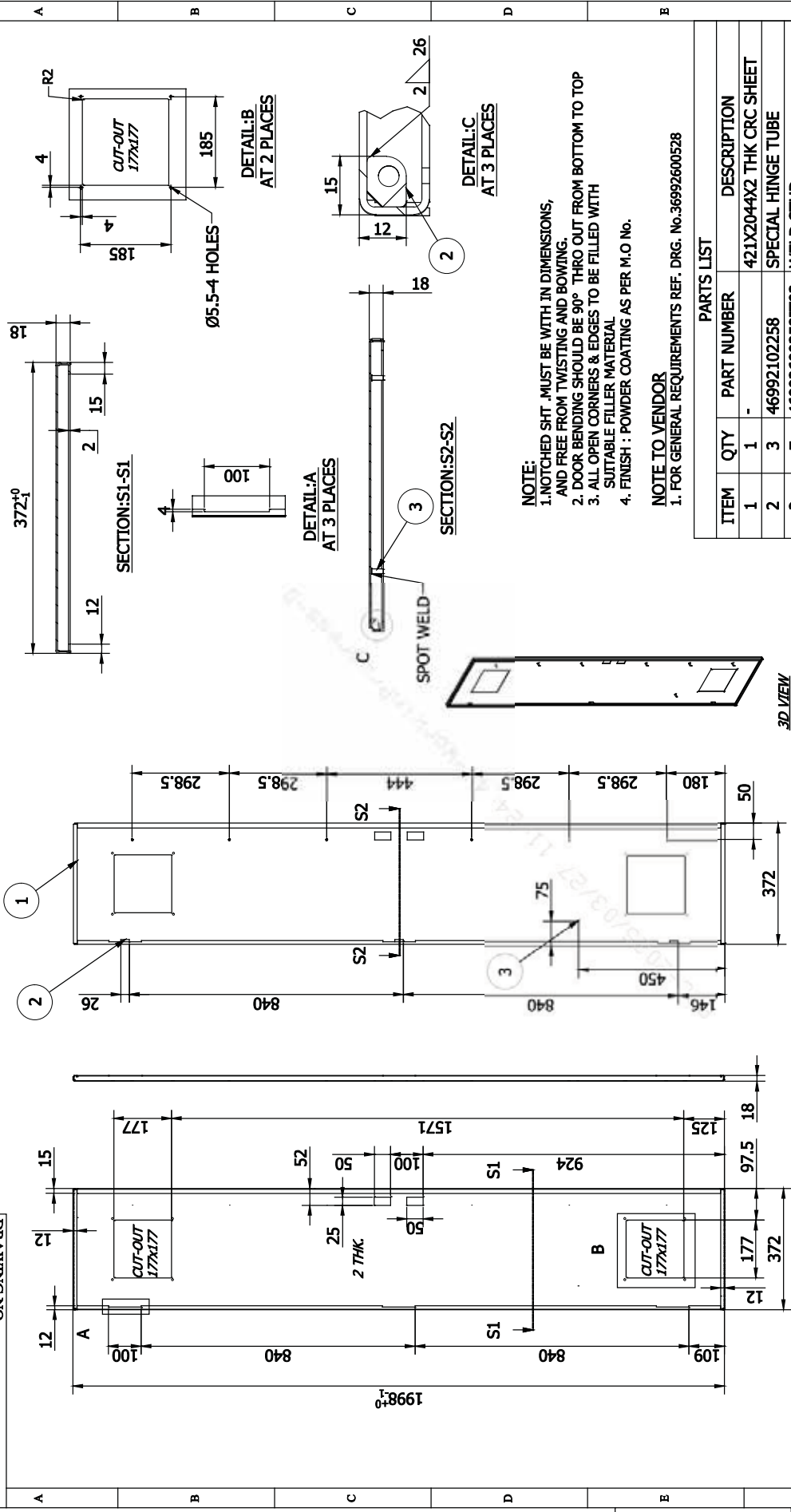
PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	-	435x2044x2 THK CRC SHEET
2	3	46992102258	SPECIAL HINGE TUBE
3	1	469926002581T02	WELD STUD

[illegible]

FIRST ANGLE PROJECTION

DRAWING NO.
3 699 21 00991

ALL DIMENSIONS ARE IN mm



3D VIEW

BENDING & FORMING DETAILS

WELDING DETAILS

[illegible]

FORM No. A3-01

A3 SIZE

(ALL DIMENSIONS ARE IN MM)

[illegible]

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN MM)

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHECKED			CHECKED			CHECKED
		APPROVED			APPROVED			APPROVED
			02	01.10.15	PRADEEP SN MURTHY SUSHEEL	01	29.10.13	PRADEEP KBR AL
			DIMENSION 67,11&12 WERE 64,10&12.5 RESPECTIVELY,REVISED AS PER SHOP FEEDBACK,			MATERIAL WAS AL.ALLOY SHT. ITEM NO.3 ADDED, REVISED & REDRAWN.		

FINISH : ZINC PLATED & PASSIVATED TO 0.013THK.

REF. DRG.NO.	03	3THK. CRCS SHEET 35 x 85 Lg.		AA1011715120			
	02	2THK. CRCS SHEET 35 x 85 Lg.		AA1011715112			
	01	1THK. CRCS SHEET 35 x 85 Lg.		AA1011715074			
	QTY.	ITEM NO.	DESCRIPTION	DRAWING No.	ITEM VAR.	MATERIAL CODE MATERIAL SPECN.	A C

SIGN & DATE		BHARAT HEAVY ELECTRICALS LIMITED ELECTRONICS DIVISION, BANGALORE	DRN	NAME	SIGN.	DATE	No. OF VAR	
			CKD	PRADEEP		01.01.13		
			APPD	KBR		01.01.13		
			A.LOUIS		01.01.13			
INVENTORY NO.	DEPT. GHC	FOR UNSPECIFIED TOLERANCES REFER ED 0230499		SCALE NTS	WEIGHT (Kg)	REF. TO ASSY. DRG.	ITEM NO.	No. OF ITEM —
	CODE 408							
TITLE			DRAWING NO.				REV.	
SHIM FOR CRCS HINGE BRACKET			4 653 21 11298					02
			SHEET NO.		01	NO. OF SHEETS		01

A4 SIZE

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN MM)

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			CHECKED			CHECKED	01	29.02.16	CHECKED	SURESH
			APPROVED			APPROVED			APPROVED	SURESH
							DIMNS. 53,113,148 & 166 WAS 58,118,158 & 176 RESPECTIVELY.			
FINISH:- POWDER COATED TO SHADE LIGHT GREY TO 631 OF IS:5										
REF. DRG.NO.	01	5TH x 50 x 166 LG STR. ST. PLATE				AA1011808013				
	QTY.	ITEM NO.	DESCRIPTION	DRAWING No.		ITEM	MATERIAL CODE	A	UNIT Wt. (Kgs.)	
						VAR.	MATERIAL SPECN.	C	QTY.	
SIGN & DATE			BHARAT HEAVY ELECTRICALS LIMITED. ELECTRONICS DIVISION, BANGALORE		DRN	NAME	SIGN.	DATE	No. OF VAR	
					CKD	ShahuL		25.02.16		
					APPD	Suresh		25.02.16		
					APPD	Suresh		25.02.16		
INVENTORY NO.	DEPT. GHCE	FOR UNSPECIFIED TOLERANCES REFER ED 0230499			SCALE	WEIGHT (Kg)	REF. TO ASSY. DRG.	ITEM NO.	No. OF ITEM	
	CODE 408				1 : 2					
	TITLE				DRAWING NO.		REV.			
		PLATE		4 653 98 10427		01				
				SHEET NO. 01		NO. OF SHEETS 01				

A4 SIZE

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN MM)

REV.	DATE	ALTERED	PM	REV.	DATE	ALTERED	SSB	REV.	DATE	ALTERED	PRM
		CHECKED	YJ			CHECKED	SSB			CHECKED	BNM
		APPROVED	BNM			APPROVED	BNM			APPROVED	BNM
08	12.01.17			07	06/01/15			06	09.11.11		
5 HOLES M4 WAS 4 HOLES M4.				ARROW MARK INDICATED FOR DIMENSION 10				2 HOLES Ø7 WAS Ø6 AS PER SUGGESTION 1011-425			

FINISH :- POWDER COATED TO LIGHT GREY SHADE 631 OF IS:5

REF. DRG.NO.	46562100099	QTY.	ITEM NO.	DESCRIPTION	DRAWING No.	ITEM	MATERIAL CODE	A	UNIT Wt. (Kgs.)
						VAR.	MATERIAL SPECN.	C	QTY.

SIGN & DATE	DEPT. ENGG. CODE 409	FOR UNSPECIFIED TOLERANCES REFER ED 0230499	SCALE 1 : 2	WEIGHT (Kg)	NAME	SIGN.	DATE	No. OF VAR
					K.SAI	-sd-	8/10/96	
					VMY	-sd-	8/10/96	
					DA	-sd-	8/10/96	

INVENTORY NO.	TITLE	PANEL FOR POWER SOCKET	DRAWING NO.	REV.	
			4 656 21 00099		08
			SHEET NO. 01		NO. OF SHEETS 01

A4 SIZE

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN MM)

REV.	DATE	ALTERED	CRS	REV.	DATE	ALTERED	CRS	REV.	DATE	ALTERED	VIN
03	15.12.17	CHECKED	YJ	02	09.12.17	CHECKED	YJ	01	25.01.16	CHECKED	SSB
		APPROVED	BNM			APPROVED	BNM			APPROVED	BNM

AS PER FABRICATION FEEDBACK HOLE DIM. Ø8 CHANGED TO Ø7	DIM. SLOT 7 x 12 WAS 8 x 12	DIMENSION 150,278 & 147 WAS 140,268 & 137 RESPECTIVELY. MATERIAL CODE AA1011715120 WAS CN1011715996 REVISED BASED ON SUGGESTION No. SUG-1516-465
--	-----------------------------	--

DEVELOPED VIEW

FINISH:- LIGHT GREY TO SHADE 631 OF IS:5 SEMIGLOSSY POWDER COATED

QTY.	ITEM NO.	DESCRIPTION	DRAWING No.	ITEM	MATERIAL CODE	A	UNIT Wt. (Kgs.)
1	01	3 THK. x 15 x 278LG CRCS SHEET		01	AA1011715120		0.129
				VAR.	MATERIAL SPECN.	C	QTY.

INVENTORY NO.	DEPT. ENGG. CODE 409	FOR UNSPECIFIED TOLERANCES REFER ED 0230499	SCALE 1:2	WEIGHT (Kg)	SIGN & DATE			No. OF VAR		
					SIGNATURE	DATE	No. OF VAR			
									Bharat Heavy Electricals Limited	
									ELECTRONICS DIVISION, BANGALORE	
TITLE BRACKET					DRAWING NO. 4 656 21 00232			REV. 03		
SHEET NO. 01					NO. OF SHEETS 01			A4 SIZE		

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46562100232
REF. DRG.NO.

SIGN & DATE



BHARAT HEAVY ELECTRICALS LIMITED
ELECTRONICS DIVISION, BANGALORE

DRN
CKD
APPD

NAME	SIGN.	DATE	No. OF VAR
SSB		14/12/05	
BNM		14/12/05	
BNM		14/12/05	

REF. TO ASSY. DRG.	ITEM NO.	No. OF ITEM
4 656 21 00230	01	2

DRAWING NO.
4 656 21 00232

REV.
03

SHEET NO. 01 NO. OF SHEETS 01

A4 SIZE

REV.03DATE24/08/12ALTEREDCHECKEDMNSBNM

REV.05DATE30.08.21ALTEREDCHECKEDVINVIN

REV.04DATE30.04.14ALTEREDCHECKEDVINPD

4 HOLES Ø5.2 (A) WAS Ø5

DIMENSION 146.5,271,471 & 596 MADE AS 149,274,474 & 599 RESPECTIVELY FOR SYMMETRY, BASED ON PRODUCTION FEEDBACK.

2 HOLES Ø57 DIM 68 & 680 WERE 63 &685 RESPECTIVELY.

6 SLOTS 7x9

16 x Ø6 (B)

748

386

366

340

250

203

155

60

40

20

0

18

63

68

124

149

224

274

374

474

524

599

624

680

685

730

406

4xØ5.2(A)

2xØ57

FINISH: – POWDER COATED LIGHT GREY TO SHADE 631 OF IS: 5

1	01	2THK x 406 x 748 LG. CRCS SHEET		AA1011715112	4.2
QTY.	ITEM NO.	DESCRIPTION	DRAWING No.	ITEM MATERIAL CODE	UNIT Wt. (Kgs.)
				VAR. MATERIAL SPECN.	QTY.

	BHARAT HEAVY ELECTRICALS LIMITED		DRN	NAME	SIGN.	DATE	No. OF VAR
	ELECTRONICS DIVISION, BANGALORE		CKD	SSB		22/02/08	
			APPD	BNM		22/02/08	

DEPT. ENGG.	FOR UNSPECIFIED TOLERANCES REFER ED 0230499		SCALE 1:5	WEIGHT (Kg)	REF. TO ASSY. DRG.	ITEM NO.	No. OF ITEM
CODE 409					4 656 21 00255	01	1

TITLE

PLATE FOR 8 LEVEL TB

DRAWING NO. 4 656 21 00256

REV. 05

SHEET NO. 01

NO. OF SHEETS 01

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4 656 21 00256 REF. DRG.NO.

SIGN & DATE

INVENTORY NO.

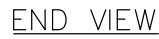
ALL DIMENSIONS ARE IN MM

A4 SIZE

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FINISH: – POWDER COATED LIGHT GREY TO SHADE 631 OF IS:5

1	01	2THK x 80 x 85 LG. CRCS SHEET			AA1011715112		
QTY.	ITEM NO.	DESCRIPTION	DRAWING No.	ITEM	MATERIAL CODE	A	UNIT Wt. (Kgs.)
				VAR.	MATERIAL SPECN.	C	QTY.

	BHARAT HEAVY ELECTRICALS LIMITED, ELECTRONICS DIVISION, BANGALORE	DRN	NAME	SIGN.	DATE	No. OF VAR
			Srikanth		28.02.13	
		CKD	YJ		28.02.13	
		APPD	YJ		28.02.13	

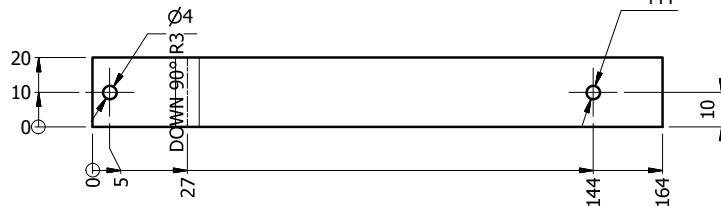
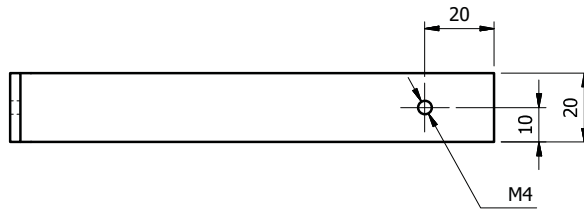
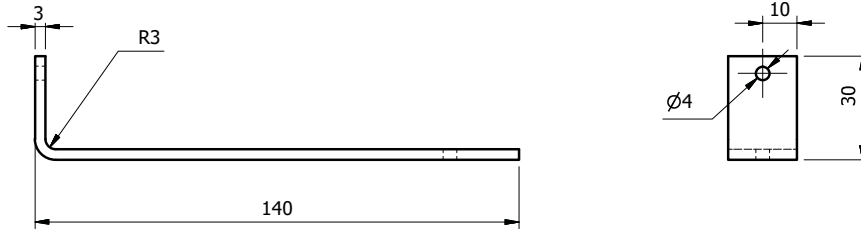
DEPT. ENGG.	FOR UNSPECIFIED TOLERANCES		SCALE	WEIGHT (Kg)	REF. TO ASSY. DRG.	ITEM NO.	No. OF ITEM
CODE 410	REFER ED 0230499		1: 2				
TITLE L-BRACKET (FOR DOOR SWITCH)			DRAWING NO.				REV.
			4 656 21 00313				00
			SHEET NO. 01		NO. OF SHEETS 01		

FIRST ANGLE PROJECTION

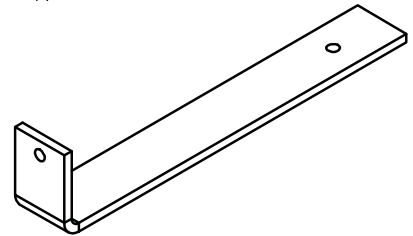
(ALL DIMENSIONS ARE IN MM)

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REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHECKED			CHECKED			CHECKED
		APPROVED			APPROVED			APPROVED



DEVELOPED VIEW



FINISH:- POWDER COATED LIGHT GREY TO SHADE 631 OF IS:5 SEMIGLOSSY

REF.	DRG.NO.	3Thk x 20 x 164 CRC STEEL SHEET	AA10117151120	0.077 Kg
QTY.	ITEM NO.	DESCRIPTION	DRAWING No.	ITEM MATERIAL CODE
				VAR. MATERIAL SPECN.



BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

DRN	NAME	SIGN.	DATE	No. OF VAR
CKD	BNM		17.01.18	
APPD	BNM		17.01.18	

INVENTORY NO.	DEPT. ENGG CODE 409	FOR UNSPECIFIED TOLERANCES REFER ED 0230499	SCALE 1:2	WEIGHT (Kg)	REF. TO ASSY. DRG. 3 65621 00681	ITEM NO. 02	No. OF ITEM 3
TITLE L-BRACKET FOR CABLE SUPPORT					DRAWING NO. 4 656 21 00420		REV. 00
SHEET NO. 01					NO. OF SHEETS 01		

A4 SIZE

REV.

DATE

ALTERED

CHECKED

APPROVED

REV.

DATE

ALTERED

CHECKED

APPROVED

REV.

DATE

ALTERED

CHECKED

APPROVED

01

12.08.24

MBK

SD

DEVELOPED

REVISION

BASED ON

FEEDBACK

266

18

122

157

20

R2

FRONT VIEW

ITEM No.01

2,00 Thk

157

20

R2

SIDE VIEW

266

18

70

90

70

18

173

155

122

38

57

76

57

4 SLOTS 7x14

DOWN 90° R2

□ HOLE 9x9

04 Nos.

DEVELOPED VIEW

ITEM No.01

BRACKET WITHOUT HOLES

FINISH:- POWDER COATED LIGHT GREY TO SHADE 631 OF IS:5

1

01

2.0 THK x 173 x 266 LG. CRCS SHEET

01

AA1011715112

0.76

QTY.

ITEM NO.

DESCRIPTION

DRAWING No.

ITEM

MATERIAL CODE

A

UNIT Wt. (Kgs.)

VAR.

MATERIAL SPECN.

C

QTY.

DEPT. BOP

CODE 415

FOR UNSPECIFIED TOLERANCES

REFER ED 0230499

DRN

CKD

APPD

NAME

MBK

SD

SKB

SIGN.

DATE

29.05.2024

29.05.2024

29.05.2024

No. OF VAR

INVENTORY NO.

TITLE

DEPT. BOP

CODE 415

FOR UNSPECIFIED TOLERANCES

REFER ED 0230499

SCALE

1:5

WEIGHT (Kg)

REF. TO ASSY. DRG.

3 659 21

00183VA00

ITEM NO.

01

No. OF ITEM

02

DRAWING NO.

4 659 21 00040

REV.

01

SHEET NO.

01

NO. OF SHEETS

02

REF. DRG.NO.

SIGN & DATE

INVENTORY NO.

1

01

2.0 THK x 173 x 266 LG. CRCS SHEET

01

AA1011715112

0.76

QTY.

ITEM NO.

DESCRIPTION

DRAWING No.

ITEM

MATERIAL CODE

A

UNIT Wt. (Kgs.)

VAR.

MATERIAL SPECN.

C

QTY.

DEPT. BOP

CODE 415

FOR UNSPECIFIED TOLERANCES

REFER ED 0230499

SCALE

1:5

WEIGHT (Kg)

REF. TO ASSY. DRG.

3 659 21

00183VA00

ITEM NO.

01

No. OF ITEM

02

DRAWING NO.

4 659 21 00040

REV.

01

SHEET NO.

01

NO. OF SHEETS

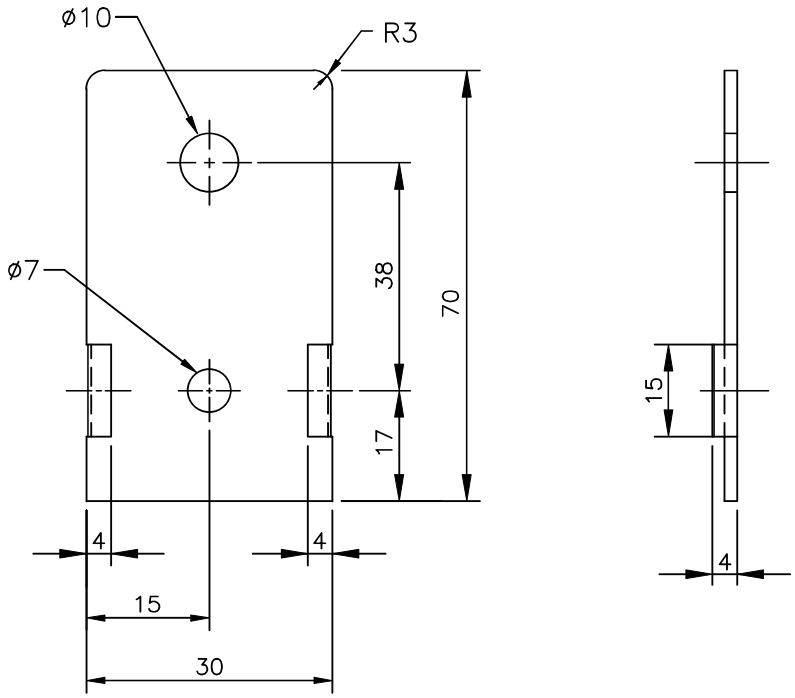
02

PPC-2025/03/27 11:31:59-Released-1

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN MM)

REV.	DATE	ALTERED	MBK	REV.	DATE	ALTERED	SN	REV.	DATE	ALTERED	HDH
		CHECKED	SD			CHECKED	SS			CHECKED	SS
		APPROVED	KBD			APPROVED	SS			APPROVED	SS
03	20.09.17			02	07.12.2004			01	12.10.2001		
CHAMFER 3x45° REMOVED AND FILLET R3 ADDED. BASED ON FABRICATION MAIL Dtd.20.09.17				DIA 10 WAS DIA 9.5				MATL.DESCRPTION WAS 2Tkx32x70Lg.			



FINISH:— POWDER COATED TO LIGHT GRAY SHADE 631 OF IS:5

REF. DRG.NO.	01	2THKx30x70LG. CRCS SHEET		CN1011715112	0.04
QTY.	ITEM NO.	DESCRIPTION	DRAWING No.	ITEM	MATERIAL CODE
				VAR.	MATERIAL SPECN.

SIGN & DATE		BHARAT HEAVY ELECTRICALS LIMITED. ELECTRONICS DIVISION, BANGALORE	DRN	NAME	SIGN.	DATE	No. OF VAR
			CKD	HDH		24-08-2001	
			APPD	SS		24-08-2001	
			SS		24-08-2001		

INVENTORY NO.	DEPT. ENGG.	FOR UNSPECIFIED TOLERANCES		SCALE	WEIGHT (Kg)	REF. TO ASSY. DRG.	ITEM NO.	No. OF ITEM
	CODE 415	REFER ED 0230499		1 : 1		46562100163	01	

TITLE		DRAWING NO.	REV.
BRACKET (FOR WRIST BAND SOCKET)		4 659 43 00278	
SHEET NO. 01		NO. OF SHEETS 01	

A4 SIZE

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FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN MM)

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHECKED			CHECKED	01	29.09.14	CHECKED RR
		APPROVED			APPROVED			APPROVED RR

ITEM No.02 ADDED FOR 550 DEPTH CUB.					
-------------------------------------	--	--	--	--	--

ITEM No.01

ITEM No.02

FINISH: -AS PER M.O EXTERIOR

QTY.	ITEM NO.	DESCRIPTION	DRAWING No.	ITEM	MATERIAL CODE	A	UNIT Wt. (Kgs.)
	01	2THKx60x'L' LG. CRCS SHEET			AA1011715112		0.8
				VAR.	MATERIAL SPECN.	C	QTY.

SIGN & DATE	REF. DRG.NO.

INVENTOR	DESIGN	SCALE	WEIGHT (Kg)	REF. TO ASSY. DRG.	ITEM NO.	No. OF ITEM
415	FOR UNSPECIFIED TOLERANCES REFER ED 0230499	1 : 5		46594300303	01	-

DRAWING NO.	REV.
4 659 43 00290	01

SHEET NO.	NO. OF SHEETS
01	01

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Technical drawing of a rectangular plate with the following dimensions and features:

- Overall width: 630
- Overall height: 328
- Top-left corner: R2
- Top-right corner: 60°
- Bottom-left corner: 21
- Bottom-right corner: 21
- Bottom edge: 70.5
- Bottom edge: 15
- Bottom edge: 298
- Bottom edge: 328
- Bottom edge: 390
- Bottom edge: 460
- Bottom edge: 921
- Bottom edge: 2x ϕ 8
- Bottom edge: 6 SLOTS 9x14
- Bottom edge: BEND DOWN
- Bottom edge: DEVELOPED VIEW

* FINISH POWDER COATING SHALL BE AS PER EDN PLANT STANDARD ID0851799

- * POWDER COATING COLOUR SHALL BE AS PER PO.
- * POWDER COATING SHALL BE DONE AT BHEL

EDN APPROVED SOURCE, ANY NEW SOURCE
SHALL BE AUDITED BY BHEL BEFORE SUPPLIES

REF. DRG.NO.SIGN & DATEINVENTORY NO.

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN MM)

REV.	DATE	ALTERED MBK		REV.	DATE	ALTERED HDH		REV.	DATE	ALTERED HDH	
		CHECKED RR				CHECKED SS				CHECKED SS	
		APPROVED RR				APPROVED SS				APPROVED SS	
BEND DOWN/UP RADIUS CHANGED TO R7 FROM R2 BASED ON FAB, FEEDBACK				Dimn. 166 was 149 Matl was 3.15 Thk.				PITCH FOR 9x9 SLOTS WAS 45			

DEVELOPED VIEW FINISH-POWDER COATED TO LIGHT GREY SHADE 631 OF IS:5

REF. DRG.NO.	01	2THKx80x195 Lg. CRCS SHEET		AA1011715112	0.24
QTY.	ITEM NO.	DESCRIPTION	DRAWING No.	ITEM	MATERIAL CODE
				VAR.	MATERIAL SPECN.

SIGN & DATE		BHARAT HEAVY ELECTRICALS LIMITED. ELECTRONICS DIVISION, BANGALORE		DRN	NAME	SIGN.	DATE	No. OF VAR
				CKD	HDH		25-06-2003	
				APPD	SS		26-06-2003	
				SS		26-06-2003		
INVENTORY NO.	DEPT. ENGG. CODE 415	FOR UNSPECIFIED TOLERANCES REFER ED 0230499		SCALE 1 : 2.5	WEIGHT (Kg)	REF. TO ASSY. DRG.	ITEM NO.	No. OF ITEM
	TITLE Z BRACKET FOR SMOKE DETECTOR				DRAWING NO. 4 659 43 00299		35	—
				SHEET NO. 01		NO. OF SHEETS 01		REV. 03

A4 SIZE

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Technical drawing of a mechanical part showing dimensions and features:

- Top view dimensions:
 - Overall width: 150
 - Distance from left edge to center of first hole: 127
 - Distance between centers of first two holes: 64
 - Distance from left edge to center of third hole: 18
- Side view dimensions:
 - Overall height: 35
 - Distance from top edge to center of first hole: 17,5
- Features:
 - Two holes labeled $2 \times \phi 7(A)$.
 - One hole labeled $\phi 6$.
 - Section line A-A passing through the first two holes.

REF. DRG.NO.

SIGN & DATEINVENTORY NO.A4 SIZE

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN MM)

REV. 03	DATE 22.12.12	ALTERED MBK	REV. 05	DATE 30.08.21	ALTERED MBK	REV. 04	DATE 10.04.13	ALTERED MBK
		CHECKED RR			CHECKED SD			CHECKED RR
		APPROVED RR			APPROVED SKB			APPROVED RR
4 HOLES $\phi 57$ ADDED FOR CABLE ROUTING			DIMENSION 146.5 MADE AS 149 FOR SYMMETRY BASED ON PRODN FEEDBACK			REVISED AS PER MAIL Dtd 05/4/13 FROM FABN, $\phi 57$ HOLES DISTANCE CHANGED FROM 30 TO 35.		

4 HOLES $\phi 57$

4 SLOTS 7x9

8x $\phi 5.2$ (A)

17x $\phi 6$ (B)

FINISH:-POWDER COATED LIGHT GREY TO SHADE 631 OF IS:5

REF. DRG.NO.	1	01	2 THK x 265 x 748 LG. CRCS SHEET		AA1011715112	3.12
QTY.		ITEM NO.	DESCRIPTION	DRAWING No.	ITEM MATERIAL CODE	UNIT Wt. (Kgs.)
					VAR. MATERIAL SPECN.	QTY.

SIGN & DATE		BHARAT HEAVY ELECTRICALS LIMITED. ELECTRONICS DIVISION, BANGALORE	DRN	NAME	SIGN.	DATE	No. OF VAR
			SS			26-04-2004	
			CKD	SS		28-04-2004	
			APPD	SS		28-04-2004	
INVENTORY NO.	DEPT. ENGG. CODE 415	FOR UNSPECIFIED TOLERANCES REFER ED 0230499	SCALE 1 : 5	WEIGHT (Kg)	REF. TO ASSY. DRG.	ITEM NO.	No. OF ITEM
	TITLE PL.FOR DIN RAIL/CHNL ASSY.(2ROWS OF TB'S)			DRAWING NO. 4 659 43 00309		REV. 05	
				SHEET NO. 01	NO. OF SHEETS 01		

A4 SIZE

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN MM)

REV.	DATE	ALTERED MBK		REV.	DATE	ALTERED MBK		REV.	DATE	ALTERED NST													
		CHECKED SD				CHECKED RR				CHECKED GS													
		APPROVED SKB				APPROVED RR				APPROVED JK													
03				23.08.21				02				23.08.12				04				02.01.24			
DIMENSION 146.5 MADE AS 149 FOR SYMMETRY BASED ON PRODN FEEDBACK								HOLE DIA (A) CHANGED TO 5.2 FROM 5 mm. AS PER PRODUCTION FEEDBACK.								IT-02 ADDED.							

IT-01

IT-02

FINISH:-POWDER COATED LIGHT GREY TO SHADE 631 OF IS:5

REF. DRG.NO.	1	02	2 THK x 35 948 LG. CRCS SHEET		AA1011715112	0.52	
	1	01	2 THK x 35 x 748 LG. CRCS SHEET		AA1011715112	0.41	
QTY.	ITEM NO.	DESCRIPTION	DRAWING No.	ITEM	MATERIAL CODE	A	UNIT Wt. (Kgs.)
				VAR.	MATERIAL SPECN.	C	QTY.

SIGN & DATE		BHARAT HEAVY ELECTRICALS LIMITED. ELECTRONICS DIVISION, BANGALORE	DRN	NAME	SIGN.	DATE	No. OF VAR
			SS			16-07-2004	
			CKD	SS		16-07-2004	
			APPD	SS		16-07-2004	

INVENTORY NO.	DEPT. ENGG.	FOR UNSPECIFIED TOLERANCES REFER ED 0230499		SCALE 1 : 5	WEIGHT (Kg)	REF. TO ASSY. DRG.	ITEM NO.	No. OF ITEM —
	CODE 415							
TITLE PL.FOR DIN RAIL/CHNL ASSY.						DRAWING NO. 4 659 43 00311		REV. 04
SHEET NO. 01						NO. OF SHEETS 01		

A4 SIZE

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FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN MM)

REV. 03	DATE 30.08.21	ALTERED MBK	REV. 02	DATE 23.08.12	ALTERED MBK	REV. 01	DATE 30.05.07	ALTERED SN
		CHECKED SD			CHECKED RR			CHECKED SS
		APPROVED SKB			APPROVED RR			APPROVED SS
DIMENSION 146.5 MADE AS 149 FOR SYMMETRY BASED ON PRODN FEEDBACK			HOLE DIA (A) CHANGED TO 5.2 FROM 5 mm. AS PER PRODUCTION FEEDBACK.			Slot & 'B' Row Locating Dimns. 28 & 35 Were 35 & 34		

4 SLOTS 7x9 4xØ5.2(A) 9xØ6(B)

64 60 100 150 150 100 60

28 45 35 50 115 18

149 125 200 125 748

A B

FINISH:--POWDER COATED LIGHT GREY TO SHADE 631 OF IS:5

REF. DRG.NO.	1	01	2 THK x 115 x 748 LG. CRCS SHEET		AA1011715112		1.35
QTY.		ITEM NO.	DESCRIPTION	DRAWING No.	ITEM	MATERIAL CODE	UNIT Wt. (Kgs.)
					VAR.	MATERIAL SPECN.	QTY.

SIGN & DATE		BHARAT HEAVY ELECTRICALS LIMITED. ELECTRONICS DIVISION, BANGALORE	DRN	NAME	SIGN.	DATE	No. OF VAR
			CKD	SS		06-03-2006	
			APPD	SS		06-03-2006	

INVENTORY NO.	DEPT. ENGG.	FOR UNSPECIFIED TOLERANCES REFER ED 0230499		SCALE 1 : 5	WEIGHT (Kg)	REF. TO ASSY. DRG.	ITEM NO.	No. OF ITEM
	CODE 415							
TITLE						DRAWING NO.	REV.	
PL.FOR DIN RAIL AND CHNL ASSY.						4 659 43 00330	03	
SHEET NO. 01						NO. OF SHEETS 01		

A4 SIZE

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FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN MM)

REV.	DATE	ALTERED	MBK	REV.	DATE	ALTERED	MBK
		CHECKED	SD	01	06.02.15	CHECKED	RR
		APPROVED	SKB			APPROVED	RR

2 HOLES Ø57
ADDED.

DIMENSION
748 WAS
MISSING.

64

25

65

18

149

125

200

125

64

748

620

85

15

57,5

115

2Thk

2xØ57(C)

4xØ5.2(A)

4xØ6(B)

4 SLOTS 7x9

A

B

C

ITEM No.01

FINISH:- POWDER COATED LIGHT GREY TO SHADE 631 OF IS:5

1	01	2 THK x 115 x 748 LG. CRCS SHEET		AA1011715112	1.35
QTY.	ITEM NO.	DESCRIPTION	DRAWING No.	ITEM MATERIAL CODE	UNIT Wt. (Kgs.)
				VAR. MATERIAL SPECN.	QTY.

BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

DRN	NAME	SIGN.	DATE	No. OF VAR
CKD	MBK		08.03.2013	
APPD	RR		09.03.2013	

DEPT. BOP	FOR UNSPECIFIED TOLERANCES		SCALE 1:5	WEIGHT (Kg)	REF. TO ASSY. DRG.	ITEM NO.	No. OF ITEM
CODE 415	REFER ED 0230499				4 659 43 00366	01	01

TITLE

**DETAIL OF PLATE FOR
DIN RAIL & C-PRFL ARRGT**

DRAWING NO.

4 659 43 00365

SHEET NO. 01

NO. OF SHEETS 01

REV.

02

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A4 SIZE

REV.01

DATE09.01.16

ALTERED

CHECKED

APPROVED

RB

YJA / GK

PRS

REV.

DATE

ALTERED

CHECKED

APPROVED

REV.

DATE

ALTERED

CHECKED

APPROVED

REVISD TO SUIT DIFFERENT ENCLOSURES
(STRIP LENGTH WAS 500mm MODIFIED TO 490mm)

2 SLOTS 7x9 (TYP)

82.5

100.0

125.0

100.0

12.5

18

36

2

465

490

4 HOLES Ø6

SIDE VIEW

FRONT VIEW

PLAN

FINISH : POWDER COATED LIGHT GREY TO SHADE 631 OF IS:5

REF. DRG.NO.	QTY.	ITEM NO.	DESCRIPTION	DRAWING No.	ITEM	MATERIAL CODE	A	UNIT Wt. (Kgs.)
					VAR.	MATERIAL SPECN.	C	QTY.
1	01		36 x 490 x 2 THK CRCS SHEET.		01	AA1011715112		0.35

SIGN & DATE	DEPT. ENGG. CODE	FOR UNSPECIFIED TOLERANCES REFER ED 0230499	SCALE 1 : 5	WEIGHT (Kg)	DRN	NAME	SIGN.	DATE	No. OF VAR
					CKD	RB		26.11.2015	
					APPD	YJA / GK		26.11.2015	
					PRS			26.11.2015	

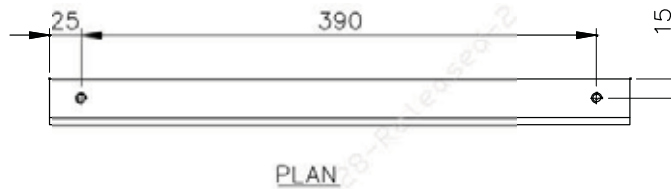
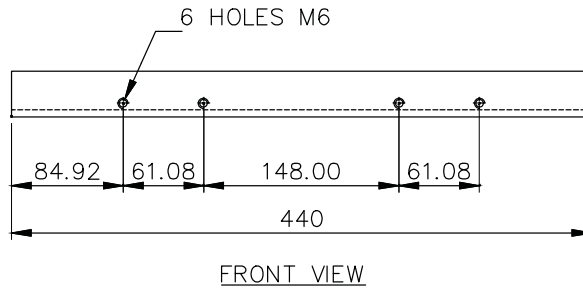
INVENTORY NO.	TITLE	DRAWING NO.	SHEET NO.	NO. OF SHEETS	REV.
	490 LG STRIP	4 659 44 03644	01	01	01

A4 SIZE

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4 661 21 70006

SIGN & DATE

BHARAT HEAVY ELECTRICALS LIMITED
ELECTRONICS DIVISION, BANGALORE

INVENTORY NO.A4 SIZE

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN MM)

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	03	16.05.19	CHECKED	SURESH	04	05.09.19	CHECKED	SURESH										
			APPROVED	SURESH			APPROVED	SURESH										
	REVISED & REDRAWN				DIMN. 14.5 ADDED.													
<table border="1"> <thead> <tr> <th>ITEM NO</th> <th>A</th> <th>CUB. WIDTH</th> </tr> </thead> <tbody> <tr> <td>01</td> <td>60</td> <td>680</td> </tr> <tr> <td>02</td> <td>95</td> <td>750</td> </tr> </tbody> </table>										ITEM NO	A	CUB. WIDTH	01	60	680	02	95	750
ITEM NO	A	CUB. WIDTH																
01	60	680																
02	95	750																
FINISH :- NATURAL.																		
REF. DRG.NO.	01		5 THK x 60 x A Lg STRU. STEEL		AA10118508013													
	REMARKS	ITEM NO.	DESCRIPTION		STD.	MATERIAL CODE	A	UNIT	UNIT Wt.(Kg)									
						MATERIAL SPECN.	C		QUANTITY									
SIGN & DATE	BHARAT HEAVY ELECTRICALS LIMITED. ELECTRONICS DIVISION, BANGALORE				DRN	NAME	SIGN.	DATE	No. OF VAR									
					CKD	DAYAL		23.11.91										
					APPD	MVK		23.11.91										
					REF. TO ASSY. DRG.													
INVENTORY NO.	DEPT. PES	FOR UNSPECIFIED TOLERANCES REFER ED 0230499		SCALE NTS	WEIGHT (Kg)	ITEM NO.		No. OF ITEM —										
	CODE 402																	
TITLE PLATE					DRAWING NO. 4 661 21 70007					REV. 04								
SHEET NO. 01					NO. OF SHEETS 01					A4 SIZE								

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN MM)

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	18	04.03.16	CHECKED	SURESH	17	29.03.06	CHECKED	Sairam	15	20.06.03	CHECKED	S.N.Murthy
			APPROVED	SURESH			APPROVED	Sairam			APPROVED	K.Sairam
NOTE 9 ADDED.				RAW MATL CODE ADDED AS PER PPC FEED BACK				REVISED AS PER FEED BACK FROM PROD. & P&TS DEPTS.				
NOTE: 1. ALL INTERNAL RADII (R2) SHOULD NOT BE MORE THAN 2mm. 2. SUITABLE ANTI CORROSION TREATMENT SHALL BE APPLIED SO AS TO PROTECT THE SECTION AGAINST CORROSION TILL THE FINAL PAINTING. 3. THE MATERIAL USED FOR THIS PROTECTIVE COATING SHOULD BE EASILY REMOVABLE BY ANY OF PREPAINTING TREATMENT. 4. TWIST SHOULD NOT BE MORE THAN 1.7mm/METER LENGTH. 5. BEND SHOULD NOT EXCEED 3mm OVER THE ENTIRE LENGTH . 6. EDGES SHALL BE BURR FREE. 7. MATERIAL SHALL BE SUPPLIED IN LENGTH OF 2.2 Mts. 8. THE MARKED SURFACE SHOULD BE FLAT THROUGH OUT THE LENGTH & THE CONCAVITY ON THIS SURFACE SHOULD NOT EXCEED MORE THAN 0.3mm 9. PACKING & BUNDLE WEIGHT :- SUPPLY SHALL BE IN TERMS OF BUNDLES & BUNDLE WEIGHT SHALL BE 25 TO 30 Kgs. EACH BUNDLE SHALL BE WRAPPED WITH PLASTIC SHEET & COVERED WITH GUNNY CLOTH.												
ORDERING LENGTH: - 2200mm. CODE No.: - CN9087533012												
REF. DRG.NO.	QTY.	ITEM NO.	DESCRIPTION		DRAWING No.		ITEM	MATERIAL CODE		A	UNIT Wt. (Kgs.)	
			2 THK CRCS SHEET 2200mm Length				VAR.	MATERIAL SPECN.		C	QTY.	
SIGN & DATE			BHARAT HEAVY ELECTRICALS LIMITED. ELECTRONICS DIVISION, BANGALORE			DRN	NAME	SIGN.	DATE	No. OF VAR		
						CKD	Simon	sd/-	05.02.78			
						APPD	P.K.G.N	sd/-	05.02.78			
						P.K.G.N	sd/-	05.02.78				
INVENTORY NO.	DEPT. ENGG.	FOR UNSPECIFIED TOLERANCES REFER ED 0230499		SCALE	WEIGHT (Kg)	REF. TO ASSY. DRG.		ITEM NO.	No. OF ITEM			
	CODE 402			2:1								
TITLE						DRAWING NO.				REV.		
C - PROFILE						4 661 98 01001				18		
SHEET NO. 01						NO. OF SHEETS 01						

A4 SIZE

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN MM)

REV.	DATE	ALTERED	MNS	REV.	DATE	ALTERED	CRS	ADDITIONAL INFORMATION	
		CHECKED	YJ			CHECKED	YJ		
		APPROVED	BNM			APPROVED	YJ		
		DIMENSION TABLE & ITEM-02 ADDED. REVISED AND REDRAWN.				DIMENSION 111 & 127 WERE 108 & 124 RESPECTIVELY IN ITEM-01			
STATUS OF DRAWING				DISTRIBUTION OF PRINTS					

ITEM NO	DIMENSIONS			
	A	B	D	L
01	111	20	M6	127
02	85	20	M6	101

FINISH :- ZINC PLATED TO 0.005 THICK AND PASSIVATED.

REMARKS	ITEM NO.	DESCRIPTION	STD.	MATERIAL CODE	A	UNIT	UNIT Wt.(Kg)
				MATERIAL SPECN.	C		QUANTITY

SIGN & DATE		BHARAT HEAVY ELECTRICALS LIMITED. ELECTRONICS DIVISION, BANGALORE	DRN	NAME	SIGN.	DATE	No. OF VAR
				SGR	-SD-	05.06.00	
			CKD	BNM	-SD-	08.06.00	
			APPD	CA	-SD-	09.06.00	

INVENTORY NO.	DEPT. ENGG CODE 410	FOR UNSPECIFIED TOLERANCES REFER ED 0230499		SCALE N.T.S	WEIGHT (Kg)	REF. TO ASSY. DRG.	ITEM NO.	No. OF ITEM
	TITLE SPACER				DRAWING NO. 4 676 54 10431		REV. 03	

SHEET NO.	01	NO. OF SHEETS	01
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A4 SIZE

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4 676 54 10431

REF. DRG.NO.

SIGN & DATE

INVENTORY NO.

REV.

DATE

ALTERED

CHECKED

APPROVED

REV.

DATE

ALTERED

CHECKED

APPROVED

02

20.12.17

PM

YJ

BNM

REV.

DATE

ALTERED

CHECKED

APPROVED

REV.

DATE

ALTERED

CHECKED

APPROVED

01

27.05.17

PM

YJ

BNM

DRAWING REVISED & REDRAWN

3 SLOTS 9 x 13 WAS
2 SLOTS 9 x 13.

65

55

2 HOLES $\phi 5$

SLOT 9x13

62.5

62.5

105

125

10

10

FINISH: – BRILLIANT WHITE GLOSSY

1

01

2THK x 65 x 125 LG.
CRCA SHEET

QTY.

ITEM NO.

DESCRIPTION

DRAWING No.

AA1011715112

0.20

ITEM

MATERIAL CODE

A

UNIT Wt.
(Kgs.)

VAR.

MATERIAL SPECN.

C

QTY.

SIGN & DATE

DEPT. ENGG.

CODE 410

FOR UNSPECIFIED TOLERANCES
REFER ED 0230499

DRN

CKD

APPD

NAME

CRS

YJ

YJ

SIGN.

DATE

20.06.16

20.06.16

20.06.16

No. OF VAR

INVENTORY NO.

TITLE

36592110046VA00

01

DRAWING NO.

4 676 54 10496

REV.

02

SHEET NO.

01

NO. OF SHEETS

01

A4 SIZE

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN MM)

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	06	20.11.10	CHECKED	AL	07	11.12.17	CHECKED	BNM	-SD-	05	27.10.05	CHECKED	SS	-SD-
			APPROVED	AL			APPROVED	BNM	-SD-			APPROVED	SS	-SD-
	4 SLOTS 7x12 WAS 9x14 REVISED & REDRAWN				4 SLOTS 7x14 WAS 7x12. REVISED AS PER PRODUCTION FEEDBACK E-MAIL DT.7.12.17				2-M4 Deleted. Powder Coating Spec. Added					

DEVELOPED VIEW

FINISH:-POWDER COATED LIGHT GREY TO SHADE 631 OF IS:5
AS PER SPEC. ED0851799

REF. DRG.NO.	-	01	3.15 x 203 x 266LG CRCS SHEET		CN1011715996		1.3
QTY.	ITEM NO.	DESCRIPTION	DRAWING No.	ITEM	MATERIAL CODE	A	UNIT Wt. (Kgs.)
				VAR.	MATERIAL SPECN.	C	QTY.

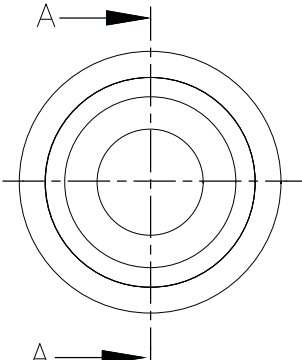
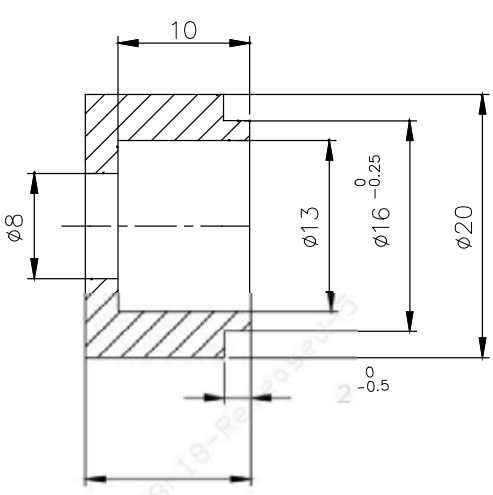
SIGN & DATE		BHARAT HEAVY ELECTRICALS LIMITED.		DRN	NAME	SIGN.	DATE	No. OF VAR
		ELECTRONICS DIVISION, BANGALORE		CKD	VEENA V	-SD-	01-09-03	
		APPD	M S RAJ	-SD-	01-09-03			
					A.LOUIS	-SD-	01-09-03	

INVENTORY NO.	DEPT. GHCE	FOR UNSPECIFIED TOLERANCES REFER ED 0230499		SCALE NTS	WEIGHT (Kg)	REF. TO ASSY. DRG.	ITEM NO.	No. OF ITEM
	CODE 408							
TITLE 'U' BRACKET						DRAWING NO. 4 694 43 00006		REV. 07
SHEET NO. 01						NO. OF SHEETS 01		

A4 SIZE

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN MM)

REV. 04	DATE 21.08.98	ALTERED P.I.SIVADASAN'	REV. 05	DATE 12.09.00	ALTERED P.I.SIVADASAN	ADDITIONAL INFORMATION	
		CHECKED S.N.M.			CHECKED S.N.MURTHY		
		APPROVED S.H.G.			APPROVED NARANDRA		
	DRAWING RE DRAWN (AUTO CAD)			COMPONANT CODE WAS CN 980025011			STATUS OF DRAWING
						DISTRIBUTION OF PRINTS	
  FINISH: — NATURAL CODE No. CN 980025011							
REF. DRG.NO.		01	ø20 x 12.5 Lg. BRT.ST.BAR		AA 1010212095		0.05
					AA 10112		
REMARKS		ITEM NO.	DESCRIPTION		STD.	MATERIAL CODE	UNIT Wt.(Kg)
						MATERIAL SPECN.	QUANTITY
SIGN & DATE		Bharat Heavy Electricals Limited Electronics Division, Bangalore		DRN	NAME	SIGN.	DATE
				CKD	M.H.S.	sd\—	20.05.76
				APPD	P.K.G.	sd\—	26.08.76
INVENTORY NO.		DEPT. ENGG.	FOR UNSPECIFIED TOLERANCES REFER ED 0230499	SCALE 2:1	WEIGHT (Kg)	REF. TO ASSY. DRG.	ITEM NO.
CODE 402							
TITLE BUSH					DRAWING NO. 4 699 21 00007		REV. 05
					SHEET NO. 01		NO. OF SHEETS 01

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Technical drawing of a mechanical part, showing three views: front, top, and side.

Front View: A square profile with a width of 40 mm and a height of 40 mm. A horizontal flange of thickness 5 mm is attached to the top edge. The base of the part is 40 mm wide.

Top View: A rectangular profile with a width of 32 mm and a height of 22 mm. A central circular hole has a diameter of 16 mm. The hole is positioned 5 mm from the top and bottom edges and 5 mm from the left and right edges. The corner radius of the hole is R5.

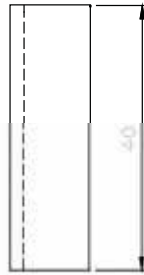
Side View: A rectangular profile with a width of 16 mm and a height of 25 mm. The hole is centered vertically and horizontally within this view.

REF. DRG.NO.

SIGN & DATEINVENTORY NO.A4 SIZE

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PPC-2025/03/27 14:00:06-9a1e4a4d-0

[illegible]

DEPT. ENGG.	FOR UNSPECIFIED TOLERANCES		SCALE 1 : 1	WEIGHT (Kg)	REF. TO ASSY. DRG.	ITEM NO.	No. OF ITEM
CODE 402	REFER ED 0230499			—	—	—	

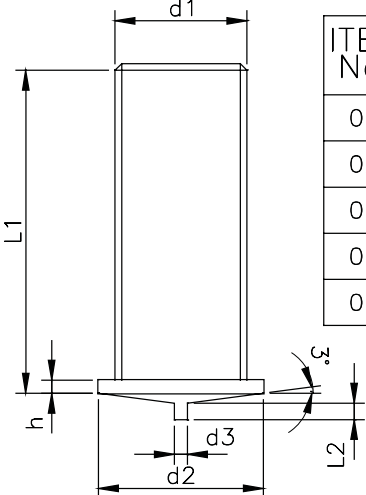
2025/03/27 11:00:00 Released 0 A4 SIZE

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN MM)

REV.	DATE	ALTERED	S.N.Murthy	REV.	DATE	ALTERED	Satish	REV.	DATE	ALTERED	S.N.Murthy
03	11.01.99	CHECKED	S.H.G.Rao	05	18.02.05	CHECKED	S.N.Murthy	04	20.09.04	CHECKED	Narendra
		APPROVED	K.SAiram			APPROVED	Narendra			APPROVED	Narendra

REVISED & REDRAWN (AUTOCAD)	DIM 'h' IN TABULAR COLOUMN TOLERANCE DIM WAS NOT ON	UNDER CUT OF RADIUS 0.5mm DELETED AS PER F.B FROM CE-FABN 119/001/04-05
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ITEM No.	d1	d2	d3	L1	L2	n	h	MATERIAL CODE
01	M4	4.5	0.65	25	0.55	1.5	0.7-1.4	CN 9087867026
02	M6	7.5	0.75	16	0.80	2.0	0.8-1.4	CN 9087867018
03	M6	7.5	0.75	20	0.80	2.0	0.8-1.4	
04	M8	8.5	0.90	25	0.90	2.2	0.8-1.4	
05	M5	6.5	0.75	20	0.80	2.0	0.8-1.4	CN 9087867034

NOTE :-

- MATERIAL : C10 AS PER 1S:4432
- FINISH : COPPER COATED TO 0.005mm THK.
- APPLICATION : FOR CAPACITOR DISCHARGE STUD WELDING
- TOLERANCE : ± 0.05
- TO BE PACKED TO AVOID DAMAGE

QTY.	ITEM NO.	DESCRIPTION	DRAWING No.	ITEM	MATERIAL CODE	A	UNIT Wt. (Kgs.)
				VAR.	MATERIAL SPECN.	C	QTY.

SIGN & DATE	DEPT. ENGG.	FOR UNSPECIFIED TOLERANCES REFER ED 0230499	SCALE N.T.S	WEIGHT (Kg)	NAME			SIGN.	DATE	No. OF VAR
					DRN	CKD	APPD			
	402				DRN	K.M.G	sd/-	06.09.93		
					CKD	K.PARTHIBAN	sd/-	06.09.93		
					APPD	R.S	sd/-	06.09.93		

INVENTORY NO.	DEPT. ENGG.	FOR UNSPECIFIED TOLERANCES REFER ED 0230499	SCALE N.T.S	WEIGHT (Kg)	REF. TO ASSY. DRG.	ITEM NO.	No. OF ITEM
					-	-	-

TITLE WELD STUD	DRAWING NO. 4 699 26 00258	REV. 05
SHEET NO. 01	NO. OF SHEETS 01	

SI No	Product / Drg No	Material Code	Description	SUB DRW QNTY
1	36612170006VA00	ED9060001451	5thk 35(W)X450(L) Side Bracket weld Assy	
		46612170006IT01	SIDE BRACKET	1
		46612170007IT01	PLATE	1
2	36594300579VA00	ED9060001095	Canopy Centre Piece	
		46992600258IT01	STUD WELD M6 X 16 (46992600258 02)	6
3	36594300551VA00	ED9060001087	Welded Assy of Top Canopy	
		36594300552IT01	FOLDING & DRILLING DETAIL FOR TOP CNPY.	1
		46594300291IT01	GUSSET PLATE (FOR CANOPY)	4
		46992600258IT01	STUD WELD M6 X 16 (46992600258 02)	16
4	36992100767va00	ED9060000897	3mm THK BOTTOM COVER MIDDLE PIECE	
		46992600258IT01	STUD WELD M6 X 16 (46992600258 02)	4
5	36992100785VA01	ED9060000544	LH Door (height 2230 mm)	
		36992100784IT01	NTCHG&FRMG DTL FOR DBL DR L.H 750W*2230H	1
		46992600258IT01	STUD WELD M6 X 16 (46992600258 02)	5
		46992102252IT01	BRACKET FOR DOUBLE DOOR L.H	2
6	36992100787VA00	ED9060000536	RH Door (height 2230 mm)	
		36992100786IT01	NTCHG&FRMG DTL FOR DBL DR R.H 750W*2230H	1
		46992600258IT01	STUD WELD M6 X 16 (46992600258 02)	13
7	26992100008VA02	ED9060000528	Folded End Cover (height 2230 mm)	
		26992101007IT03	END COVER DETAILS OF NOTCHG.PUNCHG & FLD	1
8	36562100602VA00	ED9060000510	2thick 372X1998 - Welded LH Door	
		36562100601IT01	NTCHG & FRMG DTL FOR DBL DOOR- LH	1
		46992600258IT01	STUD WELD M6 X 16 (46992600258 02)	13
9	36562100604VA00	ED9060000501	2thick 372X1998 - Welded RH Door	
		36562100603IT01	NTCHG & FRMG DTL FOR DBL DOOR- RH	1
		46992600258IT01	STUD WELD M6 X 16 (46992600258 02)	19
10	26992100008VA19	ED9060000498	2thick 800X2000- Folded End Cover	
		26992101007IT18	FLD END CVR NTCHG. & FRMG 750D * 2000H	1
		26992600002IT87	SINGLE 'C' PROFILE 783 mm	2
11	46592100040IT01	ED9060001486	2 thick max rack mounting plate	
12	36592100191IT01	ED9060001478	FACELIFT MODULE RACK FIXING PL (VALMET)	
13	36532111762IT02	ED9060001460	3thk 240x440 Gland Plate	
14	46539810427IT01	ED9060001443	5THK 50x166 STR. ST. plate	
15	36532111762IT01	ED9060001435	3thk 240x240 Gland Plate	
16	46992102019IT01	ED9060001427	5Thk 40x40x32 L-bracket	
17	46532110939IT02	ED9060001419	3Thk 40x100 CRCS L-Bracket	
18	46594403644IT01	ED9060001400	2Thk 36 x 490 CRCS Sheet	
19	46562100099IT01	ED9060001397	3thk power socket plate	
20	46562100420IT01	ED9060001389	3thk 20x164 L bracker	
21	46562100232IT01	ED9060001370	3Thk 15x278 CRCS Bracket	
22	46594300296IT01	ED9060001125	2THKx328x921 Canopy Intermediate Plate	
23	46594300290IT01	ED9060001117	2THKx60x798 SIDE PLATE	
24	36594300580IT01	ED9060001109	LH/RH Extension Plate for Canopy	
25	46765410496it01	ED9060000889	2mm THK FAN FIXING BRACKET	
26	46765410431it01	ED9060000870	M6 HEX SPACER (127mm LENGTH)	
27	36992100766it01	ED9060000862	3mm THK BOTTOM COVER FRONT & REAR PIECE	
28	36992100991IT01	ED9060000811	2thick 372X1998 - RH DOOR WITH CUTOUT	
29	36992100990IT01	ED9060000803	2thick 372X1998 - LH DOOR WITH CUTOUT	
30	26992100105IT03	ED9060000560	Plain End Cover (height 2230 mm)	
31	26992100105IT26	ED9060000552	2thick 750X2000- Plain End Cover	
32	36562100249IT01	ED9060000480	3.2 thick X 530 X 25 Earthing Cu Busbar	
33	36562100568IT01	ED9060000471	6 thick X 490 X 25 Earthing Cu Busbar	
34	46944300006IT01	ED9060000234	U Bracket for Rack Fixing	
35	36539510013IT02	CN9080238023	Gusset Bracket LH	
36	36539510013IT01	CN9080238015	Gusset Bracket RH	

	PLANT STANDARD	ED0673692 REV NO 00 PAGE 1 OF 8
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REVISION HISTORY SHEET

REV NO.	DATE	NATURE OF CHANGE	REASONS	CHANGED BY	APPROVED BY
00	07.11.18	FIRST ISSUE		SJ	SKR

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REV-00	APPROVED: Ranganath S K PREPARED: Jothish S ISSUED By: Engg Services
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	PLANT STANDARD	ED0673692 REV NO 00 PAGE 2 OF 8
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ZINC PLATING WITH TRIVALENT PASSIVATION SPECIFICATION

- 1.0 Scope:** This procedure will explain the pre-treatment process before plating, process of zinc plating and heat treatment after electroplating on the cold rolled steel sheet of grade IS513 and IS2062.
- 2.0 Purpose:** This document defines the work instructions for start-up of the zinc plating process with trivalent passivation of steel components & fasteners.
- 3.0 Important Terminology Used In the Process:**
- 3.1 Accelerated Process:** A process in which the phosphoric solution is of the metal phosphate or phosphoric acid type but contains additions that accelerate the coating formation, such as water soluble oxidizing agents, as for example, nitrates, chlorates, and hydrogen peroxide.
- 3.2 Unaccelerated Process:** A process on which the phosphate solution is of the metal phosphate or phosphoric acid type without additions that accelerate the coating formation.
- 3.3 Organic Coating:** An organic coating of drying or non-drying oil, grease, lacquer, varnish, paint or any other organic material applied after phosphate to complete the protective scheme.
- 3.4 Pointage:** A conventional industrial measure of the strength of a phosphate solution. The pointage of a phosphatizing bath is the number of millimetre of N/10 sodium hydroxide solution (4.0g NaOH per litre) required to neutralize 10 ml of the phosphate solution, using phenolphthalein as indicator.
- 3.5 Sealing:** It is the application of any organic coating to a phosphate surface.
- 3.6 Staining:** It is the application of a colour or dye, dissolved in spirit, so as to impregnate a phosphate surface of cabinets uniformly.

	PLANT STANDARD	ED0673692 REV NO 00 PAGE 3 OF 8
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- 3.7 Significant Surface: Desired surfaces for serviceability to electroplate.
- 3.8 Minimum Average Thickness: This is the average of thicknesses at a number of points at the significant surfaces.
- 3.9 Iridescent Passivation: When a stable and adherent chromate coating is formed over zinc electro deposits by reaction with an acidified dichromate solution under suitable PH and duration of passivation, producing more than one or two intermingling colour, the passivation is termed as iridescent passivation.
- 3.10 Lustre: It is measured for the quality of the surface finish and for grade of brightness and dullness.
- 3.11 Toner Titration: It is the number of millilitres of 0.1 N potassium permanganates required to titrate 50 ml of the bath cycle to a pink end point.
- 4.0 Standards followed in the process: IS 6005, IS 1573, IS 3618, IS 6911, IS 253, IS 3203, IS 9844 etc.

5.0 Product Specification:

- 5.1 Process (Accelerated/Unaccelerated): Accelerated.
- 5.2 Finish and appearance: The surface is free from blisters, pits, roughness, nodules, cracks, burning, shall not be stained or discoloured and un-plated area (or as per standard and customer requirement).
- 5.3 Supplementary treatment: Yellow Iridescent 0.5 to 1.5 g/m²
- 5.4 Thickness: 10 to 17 microns.
- 5.5 Minimum local thickness: 10 microns.
- 5.6 Minimum average thickness: 13 microns.

	PLANT STANDARD	ED0673692 REV NO 00 PAGE 4 OF 8
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- 5.7 Lustre: Semi-bright.
- 5.8 Coloured coatings: Yes (test by neutral salt spray test IS-9844)
- 5.9 Colourless coatings: No (or as per customer requirement)
- 5.10 Cleaning of basis metal: Followed pre-treatment method as per the standard.
- 5.11 Heat treatment: N.A
- 5.12 Stress-relief before plating: N.A
- 5.13 Heat treatment after plating to relieve hydrogen embrittlement: N.A
- 5.14 Activation treatment: By immersion in acid solution.
- 5.15 Service life achievable: 20 years (minimum with design assumptions).
- 5.16 Service grade (I-IV): I, II and III

6.0 Required Equipment:

- Plating Vat: It is made of mild steel lined with rubber or PVC.
- Barrel: It is constructed by polypropylene material.
- Rinsing Tanks: It is made of mild steel lined with rubber/PVC or FRP.
- Acid Dipping Tank: It is made of mild steel lined with rubber/PVC/FRP lead.
- Anode Bags: Cotton /Terylene suitable for keeping in anode.
- Heating Elements (For Electrical Heating System): Silica cased immersion heaters.
- Temperature Regulator: Thermostatic controller having temperature range of 0-1000C
- Filter Pump: Made of acid resistant material.
- Buffing Machine with Mop: As per work requirement.

	PLANT STANDARD	ED0673692 REV NO 00 PAGE 5 OF 8
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7.0 Work instruction to achieve desired specification:

7.1 Initial process in the plating shop:

- 7.1.1 All lighting facilities/equipment shall be switched ON before starting the process.
- 7.1.2 The concentration levels of plating baths shall be checked and maintained at operating levels.
- 7.1.3 The material/component to be plated is checked visually for rust, damage, dent marks and burs, etc.

7.2 Soak degreasing:

- 7.2.1 Procedure for degreasing is as per Para 9.0 and related supervening para of IS6005.

7.3 Rust and scale removal:

- 7.3.1 Procedure for rust and scale removal shall be as per Para 10.2.1.C and related ensuring para of IS6005.

7.4 Rinse stage-I & II

- 7.4.1 The rinsing of the components in fresh water (TDS < 500 ppm) shall be carried out to remove acid/chemical traces from the surface of the material.
- 7.4.2 Second immersion shall be carried out in the fresh water tank to completely remove the chemicals.

7.5 Acid pickling

- 7.5.1 Immerse the components in the HCL / H₂SO₄ acid bath (100±20 gms/litres) for about 5 minutes.

	PLANT STANDARD	ED0673692 REV NO 00 PAGE 6 OF 8
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7.5.2 Further details to be followed as per Para of 10.2.2.1 of IS6005.

7.6 Rinse stage-I & II

7.6.1 The rinsing of the components in D.M. water (TDS< 500 ppm) shall be carried out to remove acid/chemical traces from the surface of the material.

7.6.2 Second immersion shall be carried out in the D.M. water tank to completely remove the chemicals.

7.7 Neutralizing

7.7.1 Dip the components in bath of NaOH (5%) for about 1 min. Further procedures to be followed as per para 9.1.3 of IS6005.

7.8 Removal of miscellaneous contaminants

7.8.1 It shall be carried out as per para 11.0 and succeeding paragraph of IS6005.

7.9 Alkaline zinc plating

7.9.1 Use D.M. water and prepare the solution by adding calculated amount of NaOH and dissolve zinc anode.

7.9.2 Check for concentration, maintain temperature at $20 \pm 5^{\circ}\text{C}$ and electroplate at about 40 ± 5 min.

7.10 Plating thickness checking

7.10.1 Check the zinc plating thickness for 13 microns.

7.10.2 If thickness not satisfactory continue plating till the specified thickness is achieved.

7.11 Drag out, D.M. rinse I & II

	PLANT STANDARD	ED0673692 REV NO 00 PAGE 7 OF 8
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7.11.1 Rinse the finished component in D.M. water for 1 min. in separate tanks and in three stages.

7.11.2 P^H of the water shall be maintained at 7.

7.12 Bright dipping

7.12.1 Add nitric acid (0.5% to 1%) in D.M. water bath and dip the component for 30 Seconds.

7.13 D.M. water rinse

7.13.1 Rinse the finished component in D.M. water for 1 min. in separate tanks and in three stages.

7.14 Supplementary treatment: Passivation-Trivalent Yellow

7.14.1 Use D.M. water to add required amount of chemicals to maintain sufficient concentration dip for about 90 seconds.

7.14.2 P^H shall be maintained at 1.8 to 2.2, temperature around 50°C.

7.15 D.M. water rinse

7.15.1 Rinse the finished component in D.M. water for 1 min. in separate tanks and in three stages.

7.15.2 P^H shall be maintained between 6 - 7 in all stages of dipping.

7.16 Spin drying

7.16.1 Place the components in spin drier and rotate for 5 minutes for small size parts.

7.16.2 Bigger parts may be dried in drying oven accordingly.

7.17 Inspection

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- 7.17.1 Visual check parts for pin holes, blister, nodules, and pit marks.
- 7.17.2 100% coverage of plating with even thickness and shining.
- 7.17.3 100% free from patches and water marks.
- 7.17.4 Achievement of specified thickness of plating.

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REVISION HISTORY SHEET

Rev No:	DATE	NATURE OF CHANGE	REASONS	PREPARED BY	APPROVED BY
00	31/03/92	--	--	KP, SHG	N. J
01	03/03/93	--	--	VS, MRV, AV	N. J
02	06/05/93	CL 5.2	Int. review	SHG	N. J
03	17/06/93	Totally Revised	Feedback from QC	SHG	N. J
04	17/10/94	Totally Revised	Feedback from QC	SHG	N. J
05	18/05/98	Totally Revised	Feedback from Shop and QC	VS, RS	NS
05	10/01/22	Reaffirmation	-	M S KABIR	SANJAY R GODBOLE
06	25/03/22	Nano- Ceramic Process added in Cl. No.4 & Cl. No.8 deleted.	Technology upgradation	VINOD KUMAR VERMA	RUKMANI R

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APPROVED:
RUKMANI R

PREPARED
VINOD KUMAR VERMA

ISSUED: DATE
ENGG SERV: 20/04/22

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PROCESS FOR PRETREATMENT OF COMPONENTS BY IMMERSION PROCESS
BEFORE PAINTING

1. General: This standard details the pretreatment to be followed for metallic surfaces before painting.
2. Scope: Applicable for pretreatment of metallic parts of control equipments such as Doors, Side/ End Covers, Panels, Bottom frame etc., and energy meter components such as cover, base etc., done by hot and/ or cold immersion process.
3. Precautions:
 - 3.1. The components to be degreased shall not have excess oil or grease. If excess oil or grease is found, components shall be wiped off using cloth prior to immersion.
 - 3.2. The components to be deoxidized/ derusted shall not have excessive rust scaling. If excessive rust/scale is present they shall be removed by emerying or items shall be segregated and treated separately considering immersion time and concentration of the bath.
 - 3.3. For components and assemblies which cannot go into pre treatment tanks, the process for pretreatment shall be carried out as per the procedure given in clause 7.
 - 3.4. Initially, when the fresh bath is prepared, use the bath for 2 to 3 hours using clean dummy loads so that the bath is stabilized/ aged.
 - 3.5. Fresh chemicals shall be added to the bath after titration check to maintain specified concentration. Titration shall be done periodically according to the loading to ensure concentration.
 - 3.6. Remove the sludge at the bottom of the tank periodically.
 - 3.7. The piece part shall be immediately dried after passivation using dry compressed air blast.

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4. PROCESS DETAILS: The components to be treated shall be immersed in the tanks made of steel with suitable lining with chemicals, temperature and dipping time as given below. Suitable chemicals as per applicable Purchase specification from time to time shall be used according to the process).

Sr. No.	PROCESS See Note 3	CONCENTRATION (CHEMICAL IN WATER)	POINTAGE	BATH TEMP (DEG C)	DIPPING TIME
01	DEGREASING (if hot)	3-5 % WT/VOL	27-45	80-90	10-15 MINUTES
	DEGREASING (if cold)	10-15 % WT/VOL	80-90	ROOM TEMP	10-15 MINUTES
02	RINSING IN COLD RUNNING WATER TANK WITH OVERFLOW ARRANGEMENT				
03	DERUSTING (Cold)	20-40% VOL/VOL	20-40	ROOM TEMP	10-20 MINUTES
04	RINSING IN COLD RUNNING WATER TANK WITH OVERFLOW ARRANGEMENT				
05	PHOSPHATING (Cold) See Note 1	5-6 % VOL/VOL	25-30	ROOM TEMP	20-30 MINUTES
06	RINSING IN COLD RUNNING WATER TANK WITH OVERFLOW ARRANGEMENT				
07	PASSIVATION (if hot)	0.1-0.2% VOL/VOL	Free acid: 0.1-0.2 ml per 25 ml; Total acid: 2.5 ml max per 25 ml	80-90	30-45 MINUTES
	PASSIVATION (if cold)	Same as above	Same as above	ROOM TEMP	2-3 MINUTES

NOTE:

1. Nano ceramic coating as an alternative to Cold Phosphating may be adopted by supplier's subject to approval of the process by BHEL based on process audit & acceptance of type test results indicated in

a) ED0674198 i.e. "Painting of control panels with chemical resistant stoving epoxide-single pack system paints after chemical pre-treatment"

OR

b) ED0851799 i.e. "Process for Powder coating of Control panel and its components".

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2. Concentration of Nano-ceramic bath shall be maintained as per manufacturer's data sheet.

3. Process parameters:

- a) The values are indicative. The chemical concentration, temperature (hot or cold), dipping time are to be maintained as given by the manufacturer of the chemical and the nature of oil/soil/rust on the component.
- b) Pointage: is the Value of the titrate (chemical used for titration) of a given strength, when a sample (whose concentration is to be checked) of 10 ml is taken for titration. (for convenience of titration, add 100 ml water, value will not be different if water is added or not). For example, when a 10 ml of degreasing solution is titrated using 0.1 N Hydrochloric acid, if the titrate value is 25 ml, then the pointage of degreasing solution is 25.

5. ANALYSIS OF PRETREATMENT BATHS:

- 5.1. Take 10 ml of sample solution + 100 ml water + 6 to 8 drops of indicator given. Pour into a 250 ml conical flask and shake well.
- 5.2. Titrate against the chemical given and observe for the change in colour. Note the value of titrate used. That is the pointage, which shall be as per the process details given earlier.

Rev No:	Solution	Indicator	Titrate with	Turning Point
a)	Degreasing	Phenolphthalin	0.1 N Hyd.chl.acid	Pink to Clear
b)	Derusting	Methyl Orange	1.0 N Sod.hydroxide	Orange to yellow
c)	Phosphating	Phenolphthalin	0.1 N Sod.hydroxide	Colourless/slight yellowish to pink at least for 10 seconds.
	Toner concentration Checking : Dip starch Iodide paper for one minute in solution , observe the change in colour			
	Colour Change		Inference	
i)	Remain white		Toner insufficient	
ii)	Turns blue		Toner sufficient	
iii)	Turns dark blue		Toner excess	

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5.3 Passivation solution Titration Analysis (Not applicable for Nano-ceramic Coating).

For Free Acid strength: Take 25 ml sample in a measuring flask and pour into 100 ml conical flask. Add 6 to 8 drops of Bromocresol green solution. See the colour remains yellow. If it turns blue or green, free acid is nil. When solution remains yellow, titrate using 0.1 N sodium hydroxide until colour changes to green or blue. Note the value of standard solution.

For Total Acid strength: Continue titration adding Phenolphthalein indicator to 0.1 N sodium hydroxide until solution changes to purple. Note the volume of sodium hydroxide.

6. INSPECTION: (This Acceptance criteria for phosphating only)

6.1. Visual: (to check all treated surfaces as routine check): Phosphated surface shall be grey in colour, free from loose adhering powder, reasonably smooth in finish without uncovered areas, uneven deposits, scratches, pits and residues of processing solutions, free from rusty and rough surfaces. Scrape a small area of phosphated surface with a blunt knife/ blade. The surface shall yield whitish streak/ powder.

6.2. Coating weight: (to be done periodically as process check): The phosphate coating weight shall be a minimum weight of 4.3 grams per square meter of area treated (ref:IS: 3618, Class B). This shall be checked on a test sample processed along with the treated items as per the method given below.

6.2.1. The phosphated test panel shall be of suitable size (approx. 50x100 mm), it shall be numbered/ identified before weighing and shall be thoroughly degreased/ cleaned with spirits. The panel after drying shall be weighed to the nearest 0.1 mg and this weight shall be recorded as 'X' grams.

6.2.2. The test panel shall then be immersed in a freshly prepared solution of concentrated hydrochloric acid in which antimony trioxide has been dissolved as an inhibitor in the proportion of 20 grams per 100 ml of acid. The temperature of this bath shall be maintained between 25 and 35 deg C.

6.2.3. Immerse the test sample in the above bath for stripping of phosphate coating. When the coating has dissolved off (a period of 5 minutes is normally sufficient), the test panel shall be removed from the acid, washed for 30 seconds in running water, and any nonadherent matter shall be removed with a soft wet brush. The panel shall then be dried with a clean absorbent material (like lambswool), placed in a dessicator for 10 minutes and reweighed to

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the nearest 0.1 mg. This weight shall be recorded as 'Y' grams.

6.2.4. The above step shall be repeated until two successive weighing do not differ by more than 0.5 mg. The final weight 'Y' grams shall be used to calculate coating weight as given below:

Coating weight = $(X - Y) / \text{Total coated area (in sq. meter)}$

where X is initial weight in grams, Y is final weight in grams.

The total panel area shall include both sides of the panel, if both sides were coated.

7. Method of pretreatment of welded/ assemblies and components which can not be dipped in pretreatment tanks.
 - 7.1. Prior to welding, the individual items of a particular welded assembly shall be pretreated as per the Process Details.
 - 7.2. After welding, the welded portion/ areas of the assembly shall be cleaned free from slugs and other imperfections.
 - 7.3. The welded portions/ areas and the pretreated areas of the individual items which are affected due to handling shall be cleaned with white spirit or trichloroethylene using a clean cotton cloth.
 - 7.4. All piece parts which cannot be dipped into the pretreatment tanks shall be wiped off with trichloroethylene to remove grease, oil and rust.

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REVISION HISTORY SHEET

Rev No:	DATE	NATURE OF CHANGE	REASONS	PREPARED BY	APPROVED BY
00	02/04/1992	Supersedes CN 45024	--	KGH, HSS, AV	N.J
01	01/04/1997	REAFFIRMATION	--	MRV, SHG	N.S
02	29/09/1998	CL 6.2 CHANGED, NOTE 2 ADDED	FOR BETTER CLARITY	SHG	N.S
03	18/07/2001	TOTALLY REVISED	CORPORATE TASK FORCE RECOMMENDATION	SHG	N.S
04	10/08/2001	ANNEXURE 4.0 INCLUDED & CL 4.0 & 7.3.6 MODIFIED	FEEDBACK FROM QS	SHG	N.S
05	01/10/2001	CL 4.0, 7.2 MODIFIED	AS PER THE MEETING HELD IN AGM(P) ON 30/09/2001	K. SAI	KJR
06	24/04/2006	CL 7.0 ONWARDS MODIFIED	AS PER THE FEEDBACK, BVQI AUDIT REPORT ON 19/04/2006	K.SAI	URS
07	22/01/2018	CL- 3, 5.3, 5.4, 5.5, 6.4, 7.0, Log sheets updated.	Generally revised.	MSK, CRC	KMG, BKD
08	20/03/2018	Scope has been revised	Feedback from Corp Quality	MSK, CRC	KMG, BKD
09	28/03/2022	Type Test Added	For Validation of Nano Ceramic Coating, Sl. No. 6.5 added	VINOD KUMAR VERMA	RUKMANI R
10	23/01/2025	Abrasive Blasting included in CL-4.0	Alternate pre-treatment method for powder coating	JOTHISH S	AGM

APPROVED :
A G MURALIDHARA

PREPARED
JOTHISH S

ISSUED: DATE
ENGG SERV: 05/02/25

1. General:

2. Scope:

3. Material:

- #### 4. Surface preparation/ Pretreatment

5. Process of Powder Coating:

- 5.1. After the pretreatment, the job has to be dried in air jet and has to be thoroughly wiped off for dust particles, before taken up for powder coating.
- 5.2. Spraying has to be done in a closed chamber with one side opening, only through a 90 KV terminal.
- 5.3. The spray booth should be large enough for the work piece to be located, not less than 600mm from the wall of the booth, all-round.
- 5.4. The ambient air humidity should be around 50 to 80%. The air temperature around the job should not be less than 15 °C.
- 5.5. Curing / baking: The curing/baking temperature and time should be as per the recommendation of the powder manufacturer.

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6.0 Inspection and testing:

6.1. Visual: The finished painted items shall be checked visually and or comparison with the approved specimen piece. They shall be of required gloss, uniform in shade, uniform in finish, free from various paint film defects such as wrinkle, over flow or blistering.

6.2 Adhesion: The adhesion test will be carried out to Grade 3B (min) on the painted surface by cross cut tape as per ASTM D-3359/ IS101-1988 on sample basis.

6.3 Colour Finish and Gloss: - Colour Finish and Gloss of the painted surface shall be matched with specified shade card and approved sample piece.

6.4 Coating thickness: The total paint thickness rang is 60-160 micron, however it shall confirm to the specified thickness in the Purchase Order / Drawing for the specific contract requirements.

6.5 TYPE TESTS:

To be conducted on painted/powder coated sample

- 7.1 Bend(Flexibility) test
- 7.2 Scratch Hardness test
- 7.3 Cross cut adhesion test
- 7.4 Impact resistance test
- 7.5 Protection against corrosion test

Acceptance criteria is as per IS 13871:1993 & test method as per IS 101:1988 as mentioned in table 1 of IS 13871:1993.

7.0 Rework and touch up of powder coating:

In case of any rejections, the items have to be reworked. If the damage is significantly more, and requiring repairing, then existing coat shall be completely stripped, followed by pretreatment and painting as per this standard.

8.0 The Supplier has to maintain the Log sheet as per format in page 04 and 05 of this standard, for surface preparation and parts, is enclosed herewith.

9.0 Revalidation:

Once in a year BHEL will revalidate the process followed by the supplier. Corrective action shall be initiated by the supplier in case of deviation/non-conformances within a specified time as intimated by BHEL.

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Log Sheet for Surface Preparation				
Drg No:		Item Description:		P.O. No:
Report No:			Date:	
Customer:				
Bath Cleaned On:				
Bath Concentration Checked On:				
Tank Number	Bath Temperature	Start Time With Date	End Time With Date	Status
1				
2				
3				
4				
5				
6				
7				
Inspected By:			Approved By:	

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Log Sheet for Powder Coating					
Drg No:		Item Description:		P.O. No:	
Report No:				Date:	
Customer:					
Powder Make:		Shade & Finish:		Purchased On:	
Quantity:		TC No:		Expiry date:	
Start Time & Date:				Finish Time & Date:	
Baking Temperature:				Baking Time:	
Baking Oven Calibration		From		To	
Sample Inspection					
Instrument Used:				Calibration:	
Interior Surface			Exterior Surface		
SL No:	Coating Thickness	SI No:	Coating Thickness		
1		1			
2		2			
3		3			
4		4			
5		5			
6		6			
7		7			
8		8			
9		9			
10		10			
Result:					
Inspected By:		Approved By:			