BHEL Tender Enquiry	::	**15E00 35 Dt: 21.05.2015 Due On: 16.06.2015**
BHEL NIT No	::	**_____ Dt _____**
Tender Item	::	**"SPBD FABRICATION ON JOB WORK BASIS"**

TENDER COVER PAGE (CHECK LIST)

This Tender consists of **42 pages** as below:

42 pages

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बी एच ई एल

भारत हेवी इलेक्ट्रिकल्स लिमिटेड

(भारत सरकार का उपक्रम)

BHARAT HEAVY ELECTRICALS LIMITED

(A Govt. Of India Undertaking)

Component Fabrication Plant, Rudrapur - 263153

Distt. Udham Singh Nagar (Uttarakhand)

Tel: (05944) 257221/257205, Fax: (05944)243605

E-mail: shilanand@bhel.in / shyamb@bhel.in

ANNUAL FRAME WORK AGREEMENT FOR

I. **FABRICATION OF SEGREGATED PHASE (SP) BUS DUCTS (ALUMINIUM) ON JOB WORK BASIS)**

OPEN TENDER ENQUIRY NO.:15E0035 dt: 21.05.15 due on: 16.06.15

BHEL NIT No.:_____dt:_____

II. **SILVER PLATING**

OPEN TENDER ENQUIRY NO.:15E0____ dt: __.05.15 due on: __.06.15

BHEL NIT No.:_____dt:_____

Sealed tenders in two bids are invited from reputed suppliers for "**Annual Frame Work Agreement for above notified enquiries.** Detailed tender documents can be obtained from the office of the undersigned either in person or can be downloaded from BHEL website www.bhel.com or CPP portal www.eprocure.gov.in. Fully completed offers must reach BHEL RUDRAPUR office not later than 1400 Hrs on tender due date on __.06.15 and techno-commercial bid shall be opened on __.06.15 at 1500 hours. All corrigenda, addenda, amendments, time extensions, clarifications etc. if any to the tender will be hosted on BHEL website (www.bhel.com) & CPP portal www.eprocure.gov.in only. Bidders should regularly visit website(s) to keep themselves updated.

DGM (MM/CS)

6cm.

6cm.

Page 2 of 42

S.B. Jaiswal
Engg (Mat Mang)
BHEL Rudrapur
Uttarakhand-263153

By Courier/Regd. Post/Speed Post

BHEL	**TENDER ENQUIRY** (Supplier's Copy)	Enquiry no. & Date	Due date for Quotation
To,		15E0035 21.05.15	16.06.15
OPEN TENDER ENQUIRY		**Bharat Heavy Electricals Ltd.** **(A Govt. of India Under Taking)** **Rudrapur - 263153 Distt. Udham Singh Nagar (Uttarakhand) India** **Phone no.- 05944-241400/242326** **Fax no. 05944-243605** **e-mail : shilanand@bhel.in** **manoher@bhel.in**	

Sl.No.	Description	Unit	Req. Qty.	Delivery Schedule
	ANNUAL FRAME WORK AGREEMENT FOR FABRICATION OF SPBD ON JOB WORK BASIS	MT	900	AS MENTIONED IN ANNX
	Terms & Conditions			
1	List of Scope of Work (Including GCC,SCC & TCC) as given in Annexure A,B,C.			
2	QAP for SPBD fabrication			
3	**Offer shall be invited in Two Bid System containing:** **A)** Techno-commercial bid consisting of: i) Technical Offer ii) Unconditional Signed Copies of BHEL Terms & Conditions (GCC,SCC & TCC) and qualifying criteria as per **Annexure-E** iii) Un-priced Copy of Price Bid in **Annexure-I(A).** iv) Quantity as per **Annexure-I(A).** **B) Price Bid as per Annexure-I(B)**			
4	To go for REVERSE AUCTION EVENT subsequent to techno-commercial suitability of offers.			
5	Late & Delayed offers shall not be considered even if post by speed/regd. Post before due date.			
6	Validity of offer shall be 03 months from the date of opening of tenders			
7	Bidder shall immediately contact for any conflicting & contradicting terms, if any and get it clarified the doubts, if any.			

S.B. Jaiswal
Engg.(Mat. Mang.)
BHEL Rudrapur

Dear Sir,

Please submit your lowest quotation, subject to our terms and conditions written overleaf for the above mentioned items so as to reach us on or before the due date by 2.00 P.M.

Enquiry No. & Due Date should be superscribed on the envelope containing the quotation

FOR BHARAT HEAVY ELECTRICALS LTD.
(SIGN. & NAME)

PART-(A) BID

Qualifying Criteria : 01 Page

Technical Bid : GCC, SCC, TCC & Documents/ Standards/Drawing/Procedures etc.

Un Price Bid : 01 Page

Please submit all the above in an envelope SUPERSCRIBED as "TECHNO COMMERCIAL BID".

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Qualification Criterion **Annexure-E**

Sl. No.	Qualifying Criteria (ESSENTIAL)	Documents in support of Qualifying Criteria
1	Bidder should have qualified aluminium welder. (Please submit certificate from NTPC, Lloyd's Register or any reputed / recognized agency as per standard)	Agency certificates attached
2	Bidder should have done busduct / bus bar fabrication work of 10 MT during last year or have done average fabrication of 10 MT (EC Grade AL Sheet/Plate of thickness NOT less than 3.15 mm) during past 3 years. (Please attach copy of PO's with scope of work)	PO and certificates attached
3	Against above SL NO 01 & 02, bidder has to submit the documentary proof of the experience, along with supply invoice/challan. Failing to provide the required information shall be treated as disqualification of their offer.	Experience Certificate and PO/Invoice
Note:-	1. If required BHEL will do the inspection / assesment of works of Non PMD bidders before clearance of their technical bid. After successful qualification their offer will be considered for further processing. In case of disqualification their offer will not be considered for further action. 2. Bidder who fails to qualify any one of the above conditions from sl. no. 1 to 3, his offer shall be rejected without assigning any reasons whatsoever.	
		Signature of Bidder (with office seal)

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GENERAL CONDITIONS OF CONTRACT (GCC):

1.	SECURITY OF THE RAW MATERIALS ISSUED TO THE BIDDER: Only the required raw materials will be issued by BHEL under the BHEL's Special Contingency Policy (at present Policy No. 31180021120200000018 dated 01-June-2012) to the Contractor on loan basis (by weight) as per Central Excise rules, for which the contractor shall give the receipt. However, BHEL's special contingency policy does not absolve the contractor from the responsibility of safe custody and use of its material at their end. These raw materials will be returned by the contractor to BHEL, Rudrapur as finished goods (enclosure, conductor and other part items etc.), scrap, fresh material if any etc. by weight after taking into consideration 2% process loss as indicated at cl. 18 below. Before entering in to Framework Agreement (FA), Bank Guarantee shall be submitted by the bidder towards the raw material issued by BHEL, valid till completion of FA period. In case of failure of party to renew the BG, the amount towards BG value will be recovered from their dues. **Amount of Bank Guarantee shall be Rs. 2 lakhs.**
2.	BG will be returned after successful completion of all POs against framework agreement. Any deposit against FA will not carry any interest.
3.	Payment terms : 100% payment after receipt of finished material by BHEL with documents like TC/GC, delivery challan for fabrication and silver plating if any and original bills, within 45 days subject to acceptance from BHEL quality till 90% of the PO value is paid. The balance 10% of the PO value shall be paid on submission of Excise Challan, submission and acceptance of material accountal statement by BHEL each PO-wise and clearance of any quality deficiency (like packing) in the supplied lot. In case of reduction of PO quantity or balance PO value is less than 10%, the difference shall be recovered from any other dues of the BIDDER to complete retention money equal to 10 % of PO value. Payment shall be made based on Drawing weight. In no case interest for overdue period shall be borne by BHEL if there is delay on the part of BIDDER in submitting, necessary documents / accountal statement to the BHEL. Any deviation in payment terms will be loaded @ SBI prime lending rate (as applicable on the date of price bid opening) +6% annual interest for comparing standing.
	Late Delivery Penalty: The delivery of goods shall be made strictly as per time limit specified in delivery schedule. Failure to supply within this period will make the supplier liable to a penalty of ½% (half percent) of the total order value per week of delay or part thereof subject to a maximum of 10% of the total order value for the reasons attributable to the party.

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5. BHEL reserves the following rights:

(a) Loading criteria shall be decided by BHEL as per BHEL's policy and the same shall be final & binding on BIDDER(s).

	DISTRIBUTION OF TENDER QUANTITY (%)								
Slab	**L-1**	**L-2**	**L-3**	**L-4**	**L-5**	**L-6**	**L-7**	**L-8**	
08 bidders	28	21	11	10	9	8	7	6	100
07 bidders	30	24	14	10	9	7	6		100
06 bidders	32	26	15	11	9	7			100
05 bidders	35	27	18	12	8				100
04 bidders	40	30	20	10					100
03 bidders	50	30	20						100
02 bidders	60	40							100
01 bidder	100								100

(b) "Essence of this tender, subsequent commitment is in-time delivery meeting to ultimate customer(s) & plan requirement of BHEL. Main parameter of loading is the desired output within time frame suitable for project/plan requirements. Therefore, loading to each BIDDER will be reviewed by a committee of BHEL from time to time & the decision of BHEL with regard to loading to each BIDDER keeping these factors in mind will be final & binding on the BIDDER(S)" irrespective of value given in (a) above.

(c) To go for reverse auction without opening the sealed "Price Bids".

(d) To reject or accept any or all price bids or part thereof without assigning any reasons thereof.

(e) To extend the FA period by 03 / 06 / 09 / 12 months with mutual acceptance of all successful BIDDER(S).

(f) To terminate the FA by giving a notice of 15 days if the performance of the BIDDER is found to be unsatisfactory.

6 Framework Agreements shall be entered into for ordering up to 12 months and for supplies up to 2 month after that.

7. Inspection shall be done by BHEL QLY Deptt. OR customer/ third party nominated by BHEL at BIDDER(s) works before dispatch. In the case of inspection by NTPC, the charges shall be **payable extra @4.95%** of basic fabrication rate. BIDDER should give the inspection call in writing at least one week in advance. BIDDER shall provide Test Certificates of Al. filler wire/spool used in TIG/MIG welding, and should have proper Identification Tags/Slips mentioning Order No., Item No., Material code & Qty. / Contents. No extra charges shall be payable for inspection by customers other than NTPC.

8. No further subcontracting of BHEL job work shall be allowed beyond the premises of BIDDER. If at any point of time during the currency of FA, it is found by BHEL that further subcontracting is being done by

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	the BIDDER(s), the FA with said BIDDER(s) will be terminated with immediate effect & BHEL will delist such BIDDER(s).
9.	Delivery of the material shall have to be done at BHEL Rudrapur in two month's time or as per the time mentioned in Purchase Order from the date of receipt of raw material.
10.	The Offered Bids against tender must reach at our office on or before due date. Late offers shall not be considered received after due date even if posted by speed/registered post before due date.
11.	Details & total quantity of work shall be given through the format of Annexure – I against this tender.
12.	The whole FA can be short closed / terminated without mentioning any reasons thereof.
13.	In addition to above terms and conditions, provision of public procurement policy of MSEs order 2012 shall also apply as per Annexure-'D'.
14.	2% process loss shall be allowed as a non-refundable scrap without any deduction and 98 % finished material with remaining off cuts or raw material shall be returned to BHEL Rudrapur. Chips, turning & Granules / Powder generated during drilling, cutting and welding etc. shall be treated as non-refundable process loss. Such items shall not be accepted if returned as off cuts. Deduction will be made if off-cuts generated are not returned to BHEL.2% process loss shall be calculated on drawing weight of finished items.
15.	**BHEL reserves the right to decide the successful bidder on the basis of Reverse Auction (RA) process**. In such case all qualified bidders will be intimated regarding procedure / modality for RA process prior to Reverse Auction and price will be decided as per the rules for Reverse Auction. However, if reverse auction process is unsuccessful as defined in the RA rules/ procedures, or for whatsoever reason, then the sealed 'PRICE BIDs' will be opened for deciding the successful bidder. BHEL's decision in this regard will be final and binding on bidder.
16.	**Other than BHEL PMD (registered) vendors, bidders to confirm the following conditions:-Other than BHEL PMD (registered) vendors, bidders to confirm the following conditions:-**
a)	Should have aluminium welding qualified welders.
b)	Should have trained staff for quality testing not less than ENGG. Graduate.
c)	Should have qualified Production Manager/Supervisor (ENGG. Graduate).

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SPECIAL CONDITIONS OF CONTRACT (SCC):

1.	Delivery terms shall be F.O.R. BHEL, Rudrapur **INCLUSIVE OF TO & FRO TRANSPORTATION**. Quoted rates against the tender shall be on labour basis, inclusive of preparation of components and all machining, fabrication, painting, packing (as per packing drawing no. PACKING-005 REV. 01) operations required including DP test from qualified inspector. Please refer TCC for further scope. The rates shall be valid and firm during the tenure of FA's. In case of NO PACKING or IMPROPER PACKING compared to prescribed drawing, a **penalty @6% of basic supply value** will be imposed for each lot of the supply. However, any transit damage occurred due to NO PACKING or IMPROPER PACKING shall be to the BIDDER(s) account.
2.	The quoted rates shall be inclusive of minimum 65 microns Enamel Painting OR minimum of 50 microns Epoxy Painting OR Polyurethane Painting on external surface of enclosures and matt black paint on internal surface of enclosure & external surface of conductor, both as per Plant STD. no.: RU00099/ REV 00. Epoxy/PU Painting charges for ≥ 50 microns shall be payable **extra @ Rs. 19.95** per sq. mtr. per coat of 25 microns thickness if required in order.
3.	Material collection and dispatch of material from / to BHEL Rudrapur: (a) For raw material from BHEL to Sub-contractors' works: Freight shall be to BIDDER(s) A/c. Insurance shall be arranged by BHEL under open Policy. (b) For finished goods/Off Cut Scraps/Return of Raw Material from BIDDER(s) works to BHEL: Freight shall be to BIDDER(s) A/c as contract will be finalized on F.O.R. BHEL, Rudrapur basis. Insurance shall be arranged by BHEL under open Policy for which GR / Truck, Quantity details shall be provided to BHEL by the BIDDER(s) before exit of material from their works. (c) Failing to provide above details for insurance to BHEL in time, BIDDER shall be fully responsible for all consequences and liabilities arising out of any incident or accident.
4.	The charges for radiographic testing of enclosures and conductors shall be payable extra as below: (a) With complete testing facilities arranged by BHEL - **@14.95%** of basic fabrication rate. (b) With complete testing facilities arranged by BIDDER - **@29.95%** of basic fabrication rate.
5.	Rates have to be quoted FOR BHEL RUDRAPUR only. 'TO' & 'FRO' transportation is in BIDDER(s) scope.
6.	***The offer will have to be submitted in TWO BID SYSTEM against this notified tender.*** ***PART- (A) BID covers : Qualifying Criterion, Technical Bid with Un Priced copy of quoted price bid.*** ***PART- (B) BID covers : Price Bid*** ***Bids not submitted as per above shall be <u>SUMMARILY REJECTED.</u>***
7.	**Packing & Dispatch:** (a) Proper packing of finished items being sent to BHEL, Rudrapur should be done so as to avoid any damages during transit. (b) Use of Steel Slings / Chains should be avoided to the maximum extent possible. Only nylon slings should be used. However, in the rare cases where use of steel sling / chain becomes unavoidable, suitable rubber padding should be placed between the finished items & sling to avoid abrasion/damage on the surface of finished products. (c) Stenciled identification should be done on each individual finished item with indelible ink mentioning: (1) Project name, (2) BOM No., (3) Sl. No. & (4) PO No. on at least two places at diametrically opposite locations. (d) Identification with hard punch should also be done mentioning: (1) PO No., (2) Drg. No., (3) Revision No., (4) Variant No.

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TECHNICAL CONDITIONS OF CONTRACT (TCC):

1.	Raw material viz. Aluminium extrusions, Plates, Sheets, Flats etc. shall be supplied by BHEL under rule – 4 (5)(a) of CENVAT Credit Rule 2004. Consumables viz. Al. filler wire, spool, argon gas, paint, self etch primer, Red Oxide Primer etc. are to be arranged by fabricator.
2.	Applicable Drawings & Quality Assurance Plan (QAP) of BHEL shall be followed as per P.O., Sample QAP no. - QP/BD/SP Rev: 00 dated 15-May-2012 is enclosed for reference.
3.	The enclosure sheet joint shall be but or overlapped / flared as per drawing requirement.
4.	Availability of drawings / quality plan with latest revision must be ensured from Production/Engineering/Quality Deptt of BHEL, Rudrapur before start of the work.
5.	The fabricator shall cut the sheets/plates etc. as per the cutting plan furnished by BHEL. In the absence of any cutting plan from BHEL, the fabricator shall cut the material in such a way that off cuts/scrap generation is minimum.
6.	2% process loss shall be allowed as a non-refundable scrap without any deduction and 98 % finished material with remaining off cuts or raw material shall be returned to BHEL Rudrapur. Chips, turning & Granules / Powder generated during drilling, cutting and welding etc. shall be treated as non-refundable process loss. Such items shall not be accepted if returned as off cuts. Deduction will be made if off-cuts generated are not returned to BHEL. 2% process loss shall be calculated on drawing weight.
7.	Plant Standard (Painting): Doc No: RU00099 Rev-00.
8.	General Notes for SPBD : DRG 42221311099 REV-00
9.	General Manufacturing Drawing : DRG 02001200003 R00 Plain SPBD (With Middle Frame) & General Manufacturing Drawing : DRG 02001200004 R00 Canopy SPBD (With Middle Frame)
10.	General Manufacturing Drawing : DRG 01001000224 R01 Plain SPBD (Without Middle Frame) & General Manufacturing Drawing : DRG 01001000225 R01 Canopy SPBD (Without Middle Frame)
11.	Procedure for Liquid Penetration Examination : Doc No: AA0850131 Rev-02
12.	Acceptance Standard for Liquid Penetration Examination : Doc No: AA0850129
13.	Packing Drg. No. PACKING-005-R01-SPBD
14.	Straight Enclosure & Straight Conductor is first cluster in this tender.
15.	Right Angle Enclosure & Conductor is second cluster in this tender.
16.	'Z', 'E' & 'UAT' type Enclosure and Conductor and Top & Bottom Chamber is third cluster in this tender.
17.	BHEL can place P.O. for fabrication of Enclosures Only Or Conductors Only as per the rates finalized against the respective cluster in this tender.
18.	PQR DOC No. BHEL:PQR:AL:GMAW-00 & BHEL:PQR:AL:GTAW-00
19.	WPS DOC No. BHEL:WPS:AL:GMAW-00 & BHEL:WPS:AL:GTAW-00

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UNPRICE / ~~PRICE BID~~:

A) UNPRICE BID FORMAT

B) ~~PRICE BID (Please Fill Column "D" in this BID)~~

Sl. No.	Description	Quantity (Kg.)	Landed Rate (Rs. /Kg.)
(A)	(B)	(C)	(D)
1	Straight Enclosure & Conductor	369,000	**QUOTED**
2	Right Angle Enclosure and Conductor	396,000	**QUOTED**
3	Z, E & UAT type Enclosure and Conductor & Top and Bottom Chamber	135,000	**QUOTED**

Special Instructions:-

I. While quoting rates against column "D", bidder to ensure that they have gone through all Terms & Conditions of the tender enquiry and necessary impact of the same was taken while quoting rate in column "D".

II. Any Taxes/Duties on the above job work, will be borne by bidder and should be included in Landed rate- Column-D.BHEL will not be liable to pay any reimbursement/ dues on account of this.

III. Column-'D' indicates Landed rate in Rs/Kg. These landed rates are also inclusive of enamel painting minimum 65 micron or epoxy or PU painting minimum 50 microns. (Please refer Annexure-B, SCC, Cl. No.2).

IV. Column- D indicates Total Landed Rate in Rs/Kg. L1 rate will be decided based on the Slab wise landing rate mentioned in Column-D while Comparing Standing during evaluation (REVERSE AUCTION or PRICE BID).

V. Orders shall be released on Landed Rate for entire scope as given in Column "D" above. (Please refer Annexure-B, SCC, CL.3)

(Bidder's Sign & Seal)

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PART-(B) PRICE BID

Price Bid : 01 Page

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Please submit the above in an envelope SUPERSCRIBED as "PRICE BID"

ANNEXURE – I

~~UNPRICE~~ / PRICE BID:

~~C) UNPRICE BID FORMAT~~

D) PRICE BID (Please Fill Column "D" in this BID)

Sl. No.	Description	Quantity (Kg.)	Landed Rate (Rs. /Kg.)
(A)	(B)	(C)	(D)
1	Straight Enclosure & Conductor	369,000	QUOTE HERE
2	Right Angle Enclosure and Conductor	396,000	QUOTE HERE
3	Z, E & UAT type Enclosure and Conductor & Top and Bottom Chamber	135,000	QUOTE HERE

Special Instructions:-

i. While quoting rates against column "D", bidder to ensure that they have gone through all Terms & Conditions of the tender enquiry and necessary impact of the same was taken while quoting rate in column "D".

ii. Any Taxes/Duties on the above job work, will be borne by bidder and should be included in Landed rate- Column-D.BHEL will not be liable to pay any reimbursement/ dues on account of this.

iii. Column-'D' indicates Landed rate in Rs/Kg. These landed rates are also inclusive of enamel painting minimum 65 micron or epoxy or PU painting minimum 50 microns. (Please refer Annexure-B, SCC, Cl. No.2).

iv. Column- D indicates Total Landed Rate in Rs/Kg. L1 rate will be decided based on the Slab wise landing rate mentioned in Column-D while Comparing Standing during evaluation (REVERSE AUCTION or PRICE BID).

v. Orders shall be released on Landed Rate for entire scope as given in Column "D" above. (Please refer Annexure-B, SCC, CL.3)

(Bidder's Sign & Seal)

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BHARAT HEAVY ELECTRICALS LIMITED, RUDRAPUR

BHEL/CFP/QC	QUALITY ASSUARANCE PLAN FOR SUBMISSION TO FABRICATION / ASSEMBLY VENDOR	QUALITY ASSURANCE PLAN FOR FABRICATION & ASSEMBLY OF SEGREGATED PHASE BUS DUCT	MATERIAL INSPECTION / IN-PROCESS INSPECTION / FINAL INSPECTION	SUB VENDORS / VENDORS / CONTRACTORS WORKS	Doc No. : QP/BD/SP REV.No.: 00 DATE: 15.05.12 Page 1 of 2

Sl. No.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	
									M	BHEL/ TPI
1	**FABRICATION**									
1.1	Enclosure & Conductor Fabrication	a) Visual /Finish	B	V	100%	BHEL Appd. Drg.	BHEL Appd. Drg.	OS	P	W
		b) Dimension	B	I	100%			OS	P	W
		c) Welding Quality	B	V	100%	BHEL Appd. WPS	BHEL Appd. WPS	OS	P	W
		d) DP Test	B	T	100%	AA0850131	AA0850131	TC	P	W
		e) Filler Wire Rod Composition / Grade	B	T	Sample			TC	V	V
		f) Shielding Gas Purity	B	T	Sample			TC	V	V
2	**ASSEMBLY**									
2.1	Enclosure & Conductor Assembly	a) Visual	B	V	100%	BHEL Appd. Drg.	BHEL Appd. Drg.	OS	P	W
		b) Dimension	B	I	100%			OS	P	W
		c) Distance between Insulator	B	I	100%			OS	P	W
		d) Painting thickness & Adhesion Test	B	T	100%	BP56184	BP56184	TC	P	W

LEGEND: -

CLASS
A: CRITICAL
B: MAJOR
C: MINOR

TYPE OF CHECK
V: VISUAL
I: MEASUREMENT
T: TEST

AGENCY
M: MANUFACTURER / SUB CONTRACTOR
TPI: NOMINATED INSPECTION AGENCY

SCOPE
P: PERFORMER
V : VERIFICATION
W: WITNESS

FORMAT OF RECORD
TC: TEST CERTIFICATE
OS : OBSERVATION SHEET
Drg.: DRAWING
Ch.List: CHECK LIST

Note Packing to be as per BHEL Drg.

Prepared by

(FARAAZ ALI)

Engineer (QLY)

Checked & Approved by

(B BANERJEE)

Manager (QC)

S.B. Jaiswal
Engg (Mat Mgt)

Page 1 of 2

Sl. No.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	
									M	BHEL/ TPI
2.2	Wiring	a) Visual	B	V	100%	BHEL Drg.	BHEL Drg.	OS	P	W
		b) Continuity	B	T	100%			TC	P	W
		c) 2 kV HV Test	B	T	100%			TC	P	W
3	**Final testing on Bus Duct**									
3.1	a) Routine Test	a) HV test for 1 min	A	T	100%	IS-8084	IS-8084	TC	P	W
		b) IR	A	T	100%	IS-8084	IS-8084	TC	P	W
3.2	b) Type test	a) Air tightness test	A	T	Sample	IS-8084	IS-8084	TC	P	W
		b) Water tightness Test	A	T	Sample	IS-8084	IS-8084	TC	P	W
		c) Mili Volt Drop Test (On Straight but weld joint only)	A	T	Sample	BS:159	BS:159	TC	P	W

LEGEND: -

CLASS
A: CRITICAL
B: MAJOR
C: MINOR

TYPE OF CHECK
V: VISUAL
I: MEASUREMENT
T: TEST

AGENCY
M: MANUFACTURER / SUB CONTRACTOR
TPI: NOMINATED INSPECTION AGENCY

SCOPE
P: PERFORMER
V : VERIFICATION
W: WITNESS

FORMAT OF RECORD
TC: TEST CERTIFICATE
OS : OBSERVATION SHEET
Drg.: DRAWING
Ch.List: CHECK LIST

Note Packing to be as per BHEL Drg.

Prepared by

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Manager (QC)

ANNEXURE - D

Public Procurement Policy for MSEs Order 2012

15E00__ Dt: __.05.2015 Due On:__.06.2015

In line with the order dated 23-03-2012 of Ministry of Micro, Small & Medium enterprises, New Delhi following provisions shall apply to the tenders floated against this TC MoU:

1. BHEL, CFP, Rudrapur has set an annual goal of procurement from Micro and Small Enterprises from the FY 2012-13 and onwards, with the objective of achieving an overall procurement of minimum of 20% of total annual purchases of products produced and services rendered by Micro and Small Enterprises in a period of 3 years.
2. Out of 20% target of annual procurement from Micro and Small Enterprises, a sub-target of 20% (i.e. 4% out of 20%) is earmarked for procurement from Micro and Small Enterprises owned by the Scheduled Caste or Scheduled Tribe entrepreneurs. In the even of failure of such Micro and Small Enterprises to participate in the tender process or meet tender requirements or L1 price, 4% sub-target for procurement earmarked for Micro and Small Enterprises owned by Scheduled Caste or Scheduled Tribe entrepreneurs shall be met from other Micro and Small Enterprises.
3. In tender, participating Micro and Small Enterprises quoting price within price band of L1+15% shall also be allowed to supply a portion of requirement by bringing down their price to L1 price in a situation where L1 price is from someone other than a Micro and Small Enterprise and such Micro & Small Enterprise shall be allowed to supply up to 20% of total tendered quantity. In case of more than one such Micro and Small Enterprise, the supply shall be shared proportionately (to tendered quantity).
4. Tender Cost is free for Micro and Small Enterprises
5. Micro and Small Enterprises are exempt from paying Earnest Money Deposit.

Note:

a) All Micro and Small Enterprises and those Micro and Small Enterprises which are owned by the Scheduled Caste or the Scheduled Tribe entrepreneurs are required to submit LATEST & VALID CERTIFICATES for availing the benefits enumerated in "Public Procurement Policy for MSEs Order 2012".

b) Out of the 358 items reserved for exclusive purchase from Micro and Small Enterprises, the following items are procured by BHEL, CFP, Rudrapur at present from Industrial Enterpreneurs:

   a. Bolts & Nuts upto 10 mm^2 nominal CS.
   b. Boots & shoes of all types including canvas shoes.
   c. Conduit pipes
   d. Hand Gloves of all types
   e. Hand tools of all types
   f. Crates, wooden & plastic
   g. Lightening arresters upto 22 kV
   h. Domestic Electric appliances as:
      i. Measuring tapes & sticks as per BIS specifications.
      ii. Metal Clad Switches up to 30 Amps
      iii. Domestic (house wiring) PVC Cables and Wires (Aluminium)
      iv. PVC Pipes upto 110 mm conforming to the prescribed
   i. Screws of all types including High Tensile strength.

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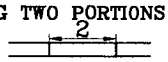
1			2			3		
REV.	DATE	ALTERD / CHECKED	REV.	DATE	ALTERD / CHECKED	REV.	DATE	ALTERD / CHECKED
						—	—	—

NOTES FOR WELDING OF FRAME:–

1. FILLET WELDING 5 ◺ IS TO BE DONE AT ALL THE CORNERS AND WHEREVER FILLET IS FORMED.
2. WHEREVER BUTT WELDING IS REQUIRED, THE OUTER SURFACES SHOULD BE GROUND FLUSH.
3. FROM INSIDE OF FRAME ALL THE 2TK. SHEETS (BARRIER) ARE TO BE INTERMITTED WELDED (3 ◺ 25(100))
4. THE FLANGE OF DUCTS ARE TO BE DRILLED WITH DRILL JIG TO AVOID MISMATCH DURING ERECTION.

NOTES FOR WELDING OF COVERING SHEET:–

1. ALL THE COVERING SHEETS ARE TO BE WELDED WITH 3 ◺ FILLET AND SUITABLE BUTT WELDING ALL AROUND FOR JOINING TWO PORTIONS OF COVER SHEET.
2. BUTT WELD IS FORMED AS SHOWN 

3. ENCLOSURE SHEET TO BE WELDED WITH ANGLE FRAME WORK FROM INSIDE BY INTERMITTED WELDING (3 ◺ 25(100))
4. CARE SHOULD BE TAKEN TO AVOID ANY DISTORTION DUE TO WELDING.
5. FOR OTHER WELDING REFERENCES WPS BDE:15008/R03 & BDE:15009/R03.
7. FOR SURFACE PREPARATION AND PAINTING REFER JS:0674196 / R00
8. BUSDUCT FABRICATION IS TO BE DONE AS PER APPROVED QUALITY PLAN.
9. PARTY WELDER QUALIFICATION TO BE DONE PRIOR TO START OF WELDING.
10. FOR TOLERANCES OF BUSDUCT ENCLOSURE AND CONDUCTOR REFER STD. BD–25001T.
11. CODE OF PRACTICE FOR ALUMINIUM WELDING IN BUSDUCT REFER STD. BD–15010W.
12. FOR PAINTING OF BUSDUCT REFER PROCESSS SPEC. JS0874196.
13. CONDUCTIVITY MEASUREMENT (MILLI VOLT DROP) TEST ON ENCLOSURE & CONDUCTOR WELDED JOINT TO BE DONE SAMPLE AS PER BS:159.
14. PO NO., PROJECT NAME, BOM NO. & DRG. NO. WILL BE MENTIONED ON ENCLOSURE & CONDUCTORE.
15. D.P. TEST TO BE DONE 10% AS PER AA0850129.

FINISH NOTES:–

1. FOR FABRICATION OF BUSDUCT, CUBICLES, MARSHALLING BOXES MATERIAL SHOULD BE USED AS PER TDS.
2. EXTERNAL SURFACES OF ALL BUSDUCT ENCLOSURES, CUBICLES, MARSHALLING BOXES SHALL BE THOROUGHLY CLEANED AND DE–GREASED TO REMOVE MILL SCALE, RUST, GREASE AND DIRT. THE EXTERNAL SURFACE OF ENCLOSURE SHALL BE PAINTED WITH PAINT AS PER IS: 5 SHADE No. 631 (MINIMUM THICKNESS 50 MICRONS. INCLUDING PRIMER THICKNESS).
3. INTERNAL SURFACES OF ENCLOSURE & EXTERNAL SURFACES OF CONDUCTOR ARE TO BE PAINTED WITH SELF ECHING MATT. BLACK PAINT TO BP56184. MINIMUM THICKNESS 50 MICRONS.
4. AT BOTH ENDS OF CONDUCTOR's OUTSIDE SURFACE, 125mm LENGTH TO BE LEFT UNPAINTED.
5. INTERNAL SURFACES OF ALL CUBICLES, MARSHALLING BOXES TO BE PAINTED WITH GLOSSY WHITE ENAMEL PAINT MIN. THICKNESS OF PAINT SHOULD BE 50 MICRONS.
6. SPACE HEATER AND THERMOSTAT WIRING WILL BE DONE AS PER DRG. NO. 25415153459 VAR.00.

VAR	REMARKS	ITEM NO.	DESCRIPTION	DRAWING NO.	IT.NO. / VAR.	MATL.CODE / MATL.SPCN.	WT. / QTY.	S
00								

CUSTOMER: GENERAL			PROJECT/PRODUCT: GENERAL	
BHARAT HEAVY ELECTRICALS LTD RUDRAPUR			NAME / SIGN. / DATE	NO. OF VAR.
			DRN. RUPESH KUMAR / 14/05/15	
			CKD. RUPESH KUMAR / 14/05/15	
			APPD. R.K. LAL / 14/05/15	
DEPTT. BDE	UNTOL.DIM.GR. C/M/F	SCALE –	WEIGHT–KG –	REF.TO ASSY.DRG. – / IT.NO. – / NO.OF ITEM
TITLE: GENERAL NOTES FOR SPBD			DRAWING NO. 42221311099	REV. 00
			SHEET NO.– 01 / NO.OF SHEETS– 01	SIZE– A4

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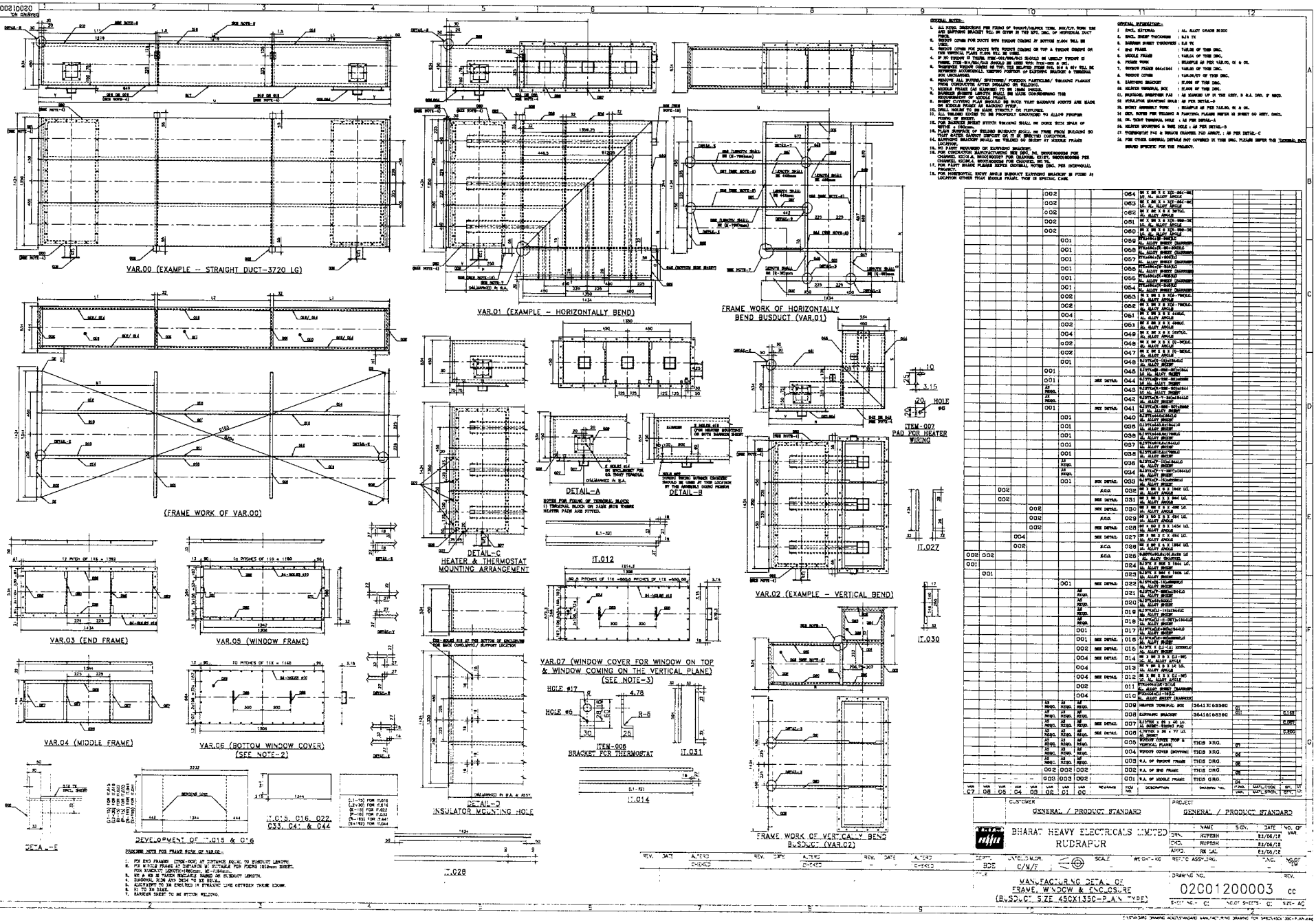

GENERAL NOTES:-

1. ALL FIXING DIMENSIONS FOR FIXING OF WINDOW/LOUVER TYPES, DOOR/S.W. PANEL ETC. AND BOTTOMOST BRACKET WILL BE GIVEN IN THE SITE INSP. OF INDIVIDUAL DUCT.
2. WINDOW COVER FOR DUCTS WITH WINDOW COMING AT BOTTOM PLANE WILL BE THERE.
3. WINDOW COVER FOR DUCTS WITH WINDOW COMING ON TOP & WINDOW COMING ON THE VERTICAL PLANE PLANE WILL BE THERE.
4. IF NO WINDOW IS THERE, ITEM-015/016/022 SHOULD BE USED WITH ITEM-033 & 041.
5. WHENEVER WINDOW COMES ON TOP, THE RELATED ITEMS 044, 016 & 017 WILL BE INTERCHANGED ACCORDINGLY. LENGTHS PORTION OF EARTHING BRACKET & TERMINAL BOX UNCHANGED.
6. REMOVE ALL BURRS/ SHARPNESS/ FOREIGN PARTICLES/ WELDING FLUXES ETC. BEFORE PAINTING. PAINT SHOULD BE APPLIED ON WELDINGS.
7. WELDED PRODUCT (AS MARKED) TO BE TAKEN CONSIDERING THE REQUIREMENT OF WELDED FRAME.
8. BUSDUCT JOINTS PLAN SHOULD BE SUCH THAT BARRIER JOINTS ARE MADE ON MIDDLE FRAME AS MARKING WISE.
9. DRILL HOLES TO BE MADE STRICTLY ON FIXTURES.
10. ALL WELDING SEAMS TO BE PROPERLY GROUNDED TO ALLOW PROPER WELDING.
11. ALL WELDS EXCEPT STITCH WELDING SHALL BE DONE WITH SPAN OF MIN. 4 MM.
12. PLUG SURFACE OF WELDED BUSDUCT SHALL BE FREE FROM BALLOONS SO THAT WATER CANNOT DEPOSIT ON IT IN SERVICING CONDITION.
13. EARTHING BRACKET SHALL BE WELDED AT EVERY AT MIDDLE FRAME LOCATION.
14. NO PAINT REQUIRED ON EARTHING BRACKET.
15. FOR CONDUCTING MANUFACTURING DRG. INC. GROUNDING FOR CHANNEL SEE A.1 GROUNDING FOR CHANNEL SHT. GROUNDING PER INDIVIDUAL PROJECT.
16. FOR PLAIN BRACE CHANNEL REFER OVERALL NOTES DRG. PER INDIVIDUAL PROJECT.
17. FOR HORIZONTAL KNOW ANGLE BUSDUCT EARTHING BRACKET IS FIXED AS LOCATION OTHER THAN MIDDLE FRAME, THEN IS SPECIAL CASE.

GENERAL INFORMATION:-

1. ENCL. MATERIAL : AL. ALLOY GRADE 91.000
2. ENCL. SHEET THICKNESS : 3.15 TK
3. BARRIER SHEET THICKNESS : 5.0 TK
4. END FRAME : THK.OF THIS DRG.
5. MIDDLE FRAME : THK.OF THIS DRG.
6. FLANGE WORK : 3 MM.IF NO THK.NO, OF 6 CK.
7. WINDOW FRAME 84x164 : THK.NO OF THIS DRG.
8. WINDOW COVER : THK.NO/QTY OF THIS DRG.
9. EARTHING BRACKET : FLOOR OF THIS DRG.
10. HEATER TERMINAL BOX : FLOOR OF THIS DRG.
11. BUSBARS, SPRINTHER PAD : AS MARKED UP IN THE ASSY. 3 M.A. DRG. IF NEED.
12. INSULATOR MOUNTING HOLE : AS PER DETAIL-D
13. SHORT ASSEMBLY WORK : 3 EXAMPLE AS PER VAR.00, 01 & 02.
14. CKD, PAPER FOR WELDING & PAINTING, FLANGE REFER AS SHEET NO ASSY. DRGS.
15. SM. TIGHT TERMINAL HOLE : AS PER DETAIL-A
16. HEATER MOUNTING & TRAY HOLE : AS PER DETAIL-B
17. THERMOSTAT PAD & BRACE CHANNEL PAD ARRGT. : AS PER DETAIL-C
18. FOR OTHER GENERAL DETAILS NOT COVERED IN THIS DRG. PLEASE REFER THE 'GENERAL NOTE' BRAND SPECIFIC FOR THE PROJECT.

SR. NO.	QTY.	DESCRIPTION	DRAWING NO.	MATERIAL SPEC.	QTY.
064	002				
063	002				
062	002				
061	002				
060	002				
059	001				
058	001				
057	001				
056	001				
055	001				
054	001				
053	002				
052	002				
051	004				
049	002				
048	002				
047	002				
046	001				
045	001				
044	001	SEE DETAIL			
043	AS REQD.				
042	AS REQD.				
041	001	SEE DETAIL			
040	001				
039	001				
038	001				
037	001				
036	001				
035	002				
034	001				
033	001	SEE DETAIL			
032	002	A.R.G.			
031	002	SEE DETAIL			
030	002	SEE DETAIL			
029	002	A.R.G.			
028	002	SEE DETAIL			
027	004	SEE DETAIL			
026	002	A.R.G.			
025	002	A.R.G.			
024	001	SEE DETAIL			
023	001				
022	001	SEE DETAIL			
021	AS REQD.				
020	AS REQD.				
019	AS REQD.				
018	AS REQD.				
017	001				
016	001	SEE DETAIL			
015	002	SEE DETAIL			
014	004	SEE DETAIL			
013	004				
012	004	SEE DETAIL			
011	002				
010	004				
009	AS REQD.	HEATER TERMINAL BOX	3641X163360	01	0.188
008	AS REQD.	EARTHING BRACKET	3641X163360	01	0.188
007	AS REQD.	SEE DETAIL			0.997
006	AS REQD.	SEE DETAIL			0.800
005	AS REQD.	WINDOW COVER (TOP & VERTICAL PLANE)	THIS DRG.	03	
004	AS REQD.	WINDOW COVER (BOTTOM)	THIS DRG.	02	
003	003	M.A. OF MIDDLE FRAME	THIS DRG.	01	
002	002	M.A. OF END FRAME	THIS DRG.	00	
001	002	M.A. OF WINDOW FRAME	THIS DRG.	04	

REV.	DATE	ALTERED	CHECKED
C7	08.06.18	C4	03.02.01
C6	05.06.18	C5	01.06.18

CUSTOMER: GENERAL / PRODUCT STANDARD

PROJECT: GENERAL / PRODUCT STANDARD

BHARAT HEAVY ELECTRICALS LIMITED
RUDRAPUR

	NAME	SIGN.	DATE	NO. OF VAR
DRN.	RUPESH		23/06/18	
CHD.	RUPESH		23/06/18	
APPD.	RK JAL		23/06/18	

DEPT. BDS | CONTROLLING DEPT. C/M/E | SCALE NTS | WEIGHT KG | REFFD ASSY.DRG. | T.NO. | MODIFICATION

TITLE: MANUFACTURING DETAILS OF FRAME, WINDOW & ENCLOSURE (BUSDUCT SIZE 450X1350-PLAIN TYPE)

DRAWING NO. 02001200003 REV. CC

SHEET NO. 01 | NO. OF SHEETS 01 | SIZE A0

STANDARD DRAWING ACCEPTANCE MANUFACTURING DRAWING FOR SPECIFICATION 2001-PLAIN-AIR

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ALL DIMENSIONS IN MILLIMETER

FIRST ANGLE PROJECTION

02001200003

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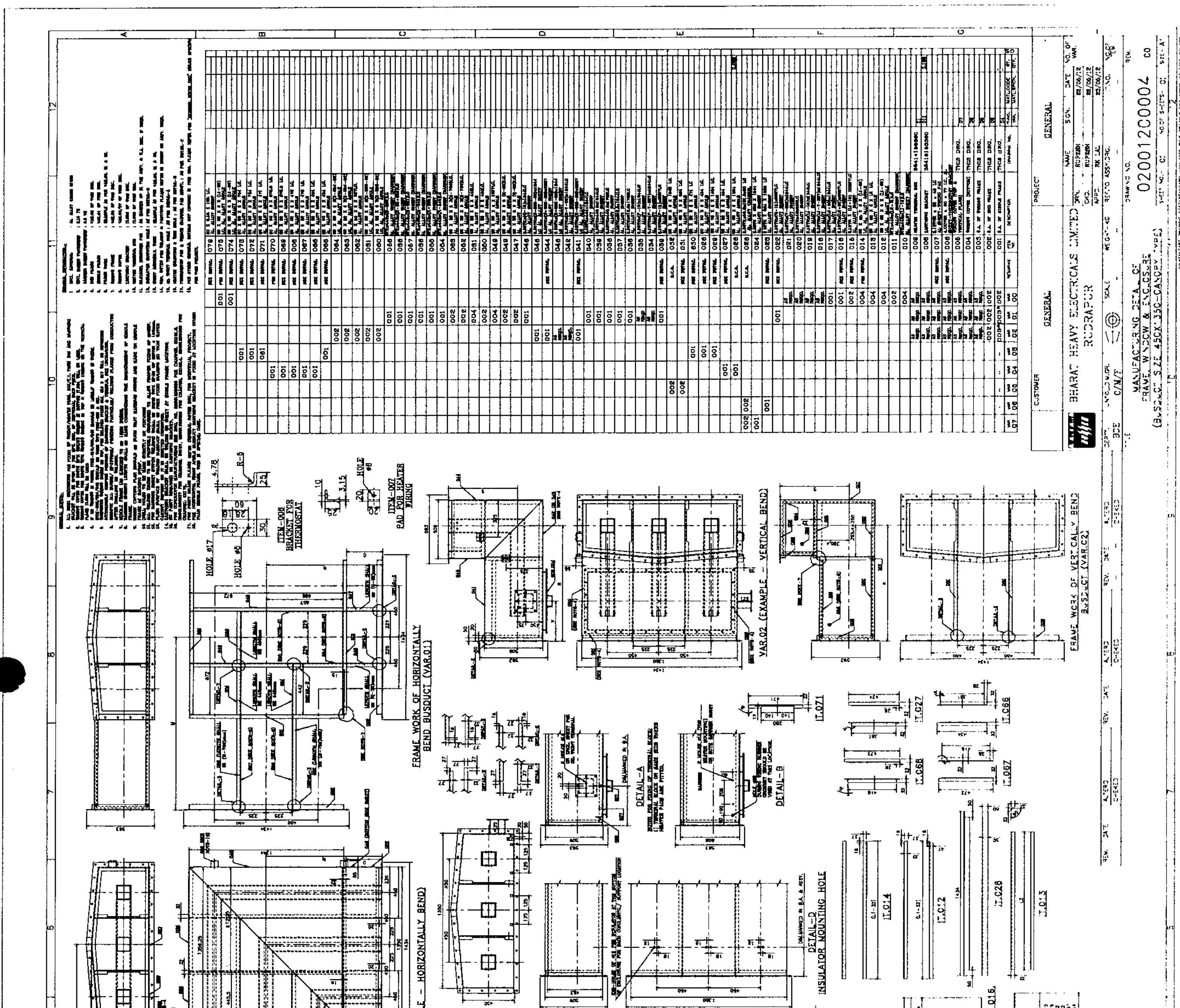

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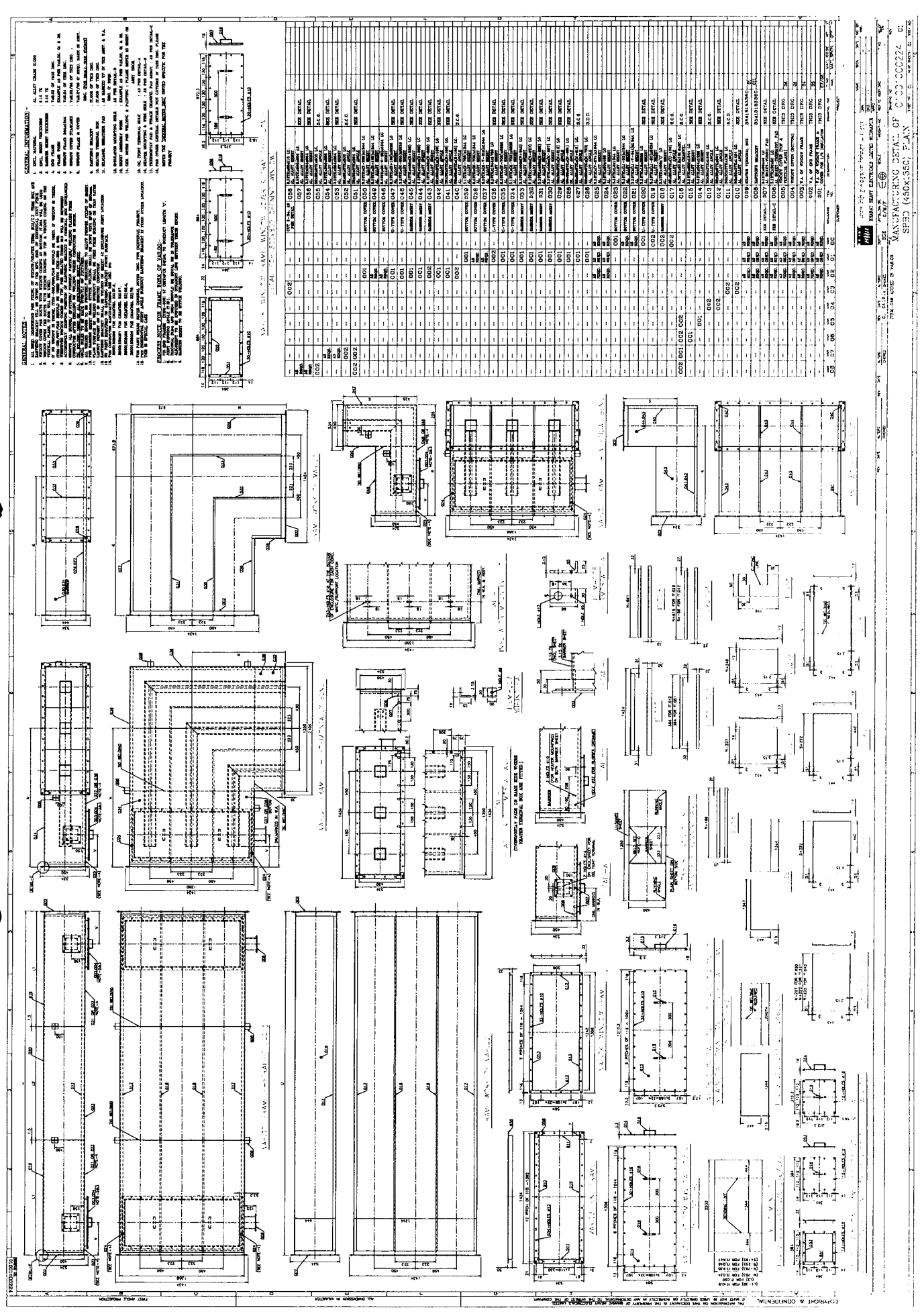

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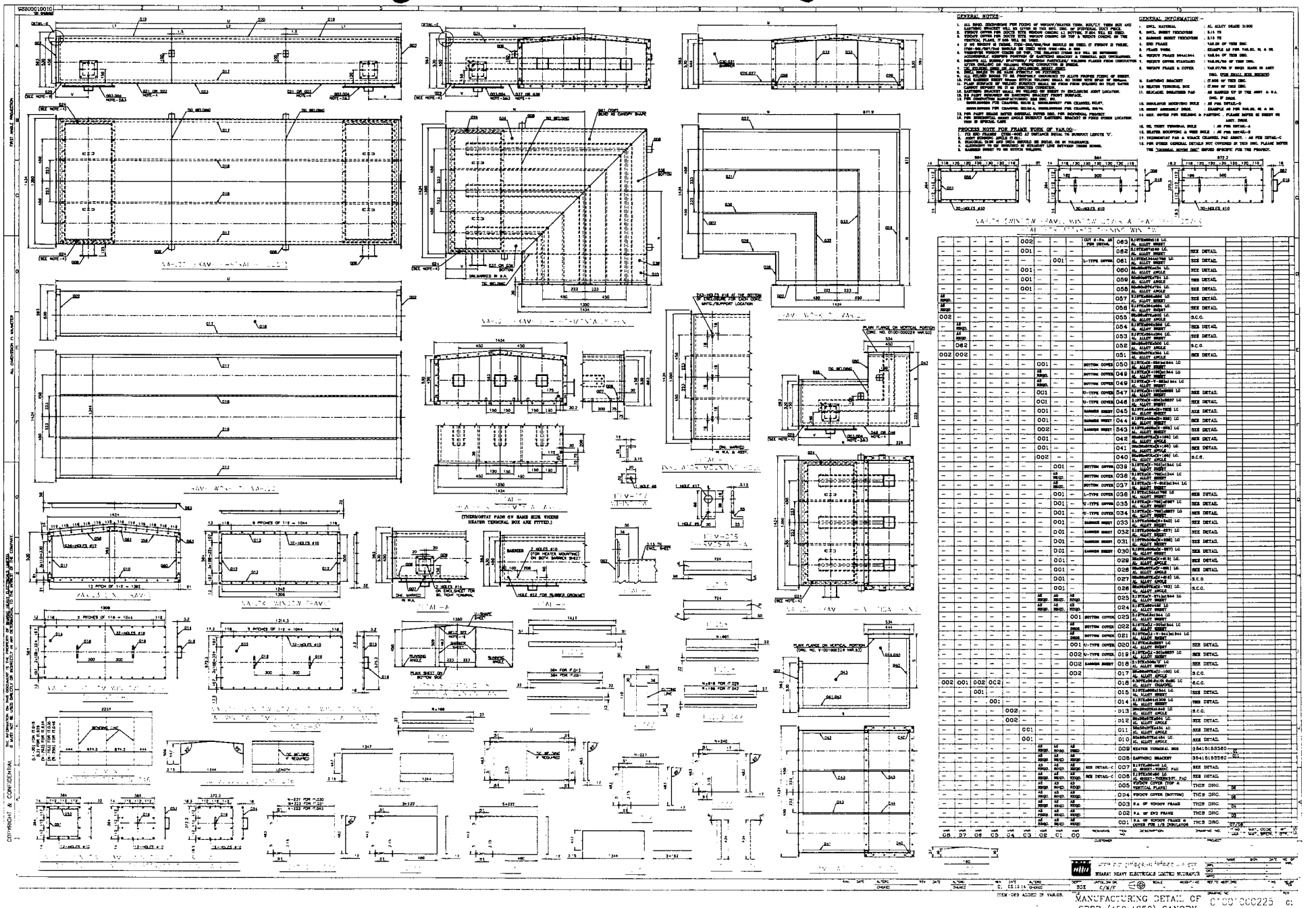

GENERAL NOTES:-

1. ALL WELDS SHOWN ARE FOR FIXING OF WINDOW/HEATER TERM. BOX/CTC TERM BOX AND EARTHING BRACKET WILL BE GIVEN IN THIS DRG. ONLY OF INDIVIDUAL DUCT PIECE.
2. WINDOW COVER FOR DUCTS WITH WINDOW CANOPY (I.E. BOTTOM, IT WILL BE OMIT).
3. WINDOW COVER FOR DUCTS WITH WINDOW CANOPY ON TOP & WINDOW CANOPY ON THE VERTICAL PLATE, IT WILL BE WELDED.
4. IF NO WINDOW IN CHANNEL TYPE-SMALL/BIG/Flat MEDIUM OR CHANNEL IF WINDOW IS THERE, TYPE-SMALL/BIG/Flat MEDIUM OR CHANNEL TYPE WILL BE GIVEN.
5. ALL WELDING SHOULD BE AS PER IS:816. THE WELDING WILL BE EXTENDING ACCORDINGLY WHERE PORTION OF EARTHING BRACKET & TERMINAL BOX OVERLAPPING.
6. ALL WELDING SHOULD BE CONTINUOUS, FILLET WELDING FLANGE FROM CONDUCTOR & OTHER UNLESS OF WELDING WORKING CONDUCTOR IS SHOWN.
7. ALL PLATES, ANGLES ARE ASSUMED TO BE OF MINIMUM THICKNESS.
8. ALL WELDING SHOULD BE OF PROPER THICKNESS.
9. ALL WELDING SHOULD BE CONTINUOUS.
10. EARTHING BRACKET SHALL BE WELDED ON SHEET BY EXCLUSIVE JOINT LOCATION.
11. EARTHING BRACKET SHALL BE WELDED ON SHEET BY EXCLUSIVE JOINT LOCATION.
12. FOR CONSTRUCTIONAL DETAILS OF EARTHING BRACKET REFER DRG. NO.
13. FOR DIMENSIONAL DETAILS OF EARTHING BRACKET IF FIXED OTHER LOCATION, THEN IT SPECIAL CARE.

PROCESS NOTE FOR FRAME WORK OF VARIOUS:-

1. FOR END FRAMES (TYPE-FOR) AT DEFLANCE EQUAL TO PRODUCT LENGTH 'L'.
2. ALL WELDING SHOULD BE CONTINUOUS.
3. ROOT OF WELDING SHOULD BE SOUND, OK IN TOLERANCE.
4. ALIGNMENT OF WELDING IS REQUIRED IN STRAIGHT LINE BETWEEN THESE NODES.
5. EARTHING BRACKET TO BE WELDED ON STRUCTURE.

GENERAL INFORMATION:-

1. DUCT MATERIAL	: AL. ALLOY GRADE 31000
2. DUCT THICKNESS	: 3.15 TK
3. EARTHING BRACKET THICKNESS	: 3.15 TK
4. END FRAME	: VAR.ON OF THIS DRG.
5. FRAME WORK	: EXAMPLE AS PER VAR.01, 02, & 03.
6. WINDOW FRAME	: VAR.04 OF THIS DRG.
7. WINDOW COVER STANDARD	: VAR.05/06 OF THIS DRG.
8. WINDOW FRAME & COVER	: VAR.07/08 OF WHICH NAME IN ABBY DRG. OTHER SMALL SIZE WINDOW
9. EARTHING BRACKET	: IT SIGN OF THIS DRG.
10 HEATER TERMINAL BOX	: IT SIGN OF THIS DRG.
11. BELOW/HEATERS PAD	: AS MARKED BY IT THE ABBY. & W.A. DRG. OF ABBY.
12. INSULATOR MOUNTING BOLT	: AS PER DETAIL-D
13. ABBOT ASSEMBLY DRGS.	: EXAMPLE AS PER VAR.09, 10, & 11.
14. GEN. NOTES FOR WELDING & PAINTING : PLEASE REFER RE SHEET OR ABBY. DRGS.	
15. OIL INLET TERMINAL BOLT	: AS PER DETAIL-A
16. HEATER MOUNTING & WIRE HOLE	: AS PER DETAIL-B
17. THERMOSTAT PAD & WIRING CHANNEL PAD ABBOT.	: AS PER DETAIL-C
18. FOR OTHER GENERAL DETAILS NOT COVERED IN THIS DRG. PLEASE REFER THE "GENERAL NOTES DRG" ISSUED SPECIFIC FOR THE PROJECT.	

–	–	–	–	002	–	–	CUT d-No. AS PER DETAIL	063	8.0 ST.ST.SHEET/316 LG AL. ALLOY SHEET			
–	–	–	–	001	–	–		062	8.0 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
–	–	–	–	–	001	–	L-TYPE COVER	061	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
–	–	–	–	001	–	–		060	50x50x5 ST.ST.316 LG AL. ALLOY ANGLE		SEE DETAIL	
–	–	–	–	001	–	–		059	50x50x5 ST.ST.316 LG AL. ALLOY ANGLE		SEE DETAIL	
–	–	–	–	001	–	–		058	50x50x5 ST.ST.316 LG AL. ALLOY ANGLE		SEE DETAIL	
AS REQD.	–	–	–	–	–	–		057	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
AS REQD.	–	–	–	–	–	–		056	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
002	–	–	–	–	–	–		055	50x50x5 ST.ST.316 LG AL. ALLOY ANGLE		S.C.O.	
AS REQD.	–	–	–	–	–	–		054	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
AS REQD.	–	–	–	–	–	–		053	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
–	002	–	–	–	–	–		052	50x50x5 ST.ST.316 LG AL. ALLOY ANGLE		S.C.O.	
002	002	–	–	–	–	–		051	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
–	–	–	–	001	–	–	BOTTOM COVER	050	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET			
–	–	–	–	AS REQD.	–	–	BOTTOM COVER	049	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET			
–	–	–	–	AS REQD.	–	–	BOTTOM COVER	049	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET			
–	–	–	–	–	001	–	W-TYPE COVER	047	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
–	–	–	–	–	001	–	W-TYPE COVER	046	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
–	–	–	–	–	001	–	BARRIER SHEET	045	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
–	–	–	–	–	001	–	BARRIER SHEET	044	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
–	–	–	–	–	002	–	BARRIER SHEET	043	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
–	–	–	–	–	001	–		042	50x50x5 ST.ST.316 LG AL. ALLOY ANGLE		SEE DETAIL	
–	–	–	–	–	001	–		041	50x50x5 ST.ST.316 LG AL. ALLOY ANGLE		SEE DETAIL	
–	–	–	–	–	002	–		040	50x50x5 ST.ST.316 LG AL. ALLOY ANGLE		S.C.O.	
–	–	–	–	–	–	001	BOTTOM COVER	039	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET			
–	–	–	–	–	–	AS REQD.	BOTTOM COVER	038	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET			
–	–	–	–	–	–	AS REQD.	BOTTOM COVER	037	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET			
–	–	–	–	–	001	–	L-TYPE COVER	036	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
–	–	–	–	–	001	–	W-TYPE COVER	035	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
–	–	–	–	–	001	–	W-TYPE COVER	034	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
–	–	–	–	–	001	–	BARRIER SHEET	033	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
–	–	–	–	–	001	–	BARRIER SHEET	032	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
–	–	–	–	–	001	–	BARRIER SHEET	031	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
–	–	–	–	–	001	–	BARRIER SHEET	030	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
–	–	–	–	–	001	–		029	50x50x5 ST.ST.316 LG AL. ALLOY ANGLE		SEE DETAIL	
–	–	–	–	–	001	–		028	50x50x5 ST.ST.316 LG AL. ALLOY ANGLE		SEE DETAIL	
–	–	–	–	–	001	–		027	50x50x5 ST.ST.316 LG AL. ALLOY ANGLE		S.C.O.	
–	–	–	–	–	001	–		026	50x50x5 ST.ST.316 LG AL. ALLOY ANGLE		S.C.O.	
–	–	–	–	AS REQD.	AS REQD.	AS REQD.		025	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET			
–	–	–	–	AS REQD.	AS REQD.	AS REQD.		024	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET			
–	–	–	–	–	–	001	BOTTOM COVER	023	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET			
–	–	–	–	–	–	AS REQD.	BOTTOM COVER	022	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET			
–	–	–	–	–	–	AS REQD.	BOTTOM COVER	021	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET			
–	–	–	–	–	001	–	W-TYPE COVER	020	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
–	–	–	–	–	002	–	W-TYPE COVER	019	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
–	–	–	–	–	002	–	BARRIER SHEET	018	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
–	–	–	–	–	002	–		017	50x50x5 ST.ST.316 LG AL. ALLOY ANGLE		S.C.O.	
002	001	002	002	–	–	–		016	6.30 ST.ST.SHEET/316 LG AL. ALLOY SHEET		S.C.O.	
–	001	–	–	–	–	–		015	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
–	–	001	–	–	–	–		014	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
–	–	–	002	–	–	–		013	50x50x5 ST.ST.316 LG AL. ALLOY ANGLE		S.C.O.	
–	–	–	002	–	–	–		012	50x50x5 ST.ST.316 LG AL. ALLOY ANGLE		SEE DETAIL	
–	–	–	–	001	–	–		011	50x50x5 ST.ST.316 LG AL. ALLOY ANGLE		SEE DETAIL	
–	–	–	–	001	–	–		010	50x50x5 ST.ST.316 LG AL. ALLOY ANGLE		SEE DETAIL	
–	–	–	–	AS REQD.	AS REQD.	AS REQD.		009	HEATER TERMINAL BOX		3541.91.03360	
–	–	–	–	AS REQD.	AS REQD.	AS REQD.		008	EARTHING BRACKET		3541.91.03360	
–	–	–	–	AS REQD.	AS REQD.	AS REQD.	SEE DETAIL-C	007	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
–	–	–	–	AS REQD.	AS REQD.	AS REQD.	SEE DETAIL-C	006	3.15 ST.ST.SHEET/316 LG AL. ALLOY SHEET		SEE DETAIL	
–	–	–	–	AS REQD.	AS REQD.	AS REQD.		005	WINDOW COVER (TOP & VERTICAL PLATE)		THIS DRG.	08
–	–	–	–	AS REQD.	AS REQD.	AS REQD.		004	WINDOW COVER (BOTTOM)		THIS DRG.	06
–	–	–	–	AS REQD.	AS REQD.	AS REQD.		003	W.A. OF WINDOW FRAME		THIS DRG.	04
–	–	–	–	AS REQD.	AS REQD.	AS REQD.		002	W.A. OF END FRAME		THIS DRG.	03
–	–	–	–	AS REQD.	AS REQD.	AS REQD.		001	W.A. OF WINDOW FRAME & COVER FOR L/S INDICATION		THIS DRG.	07/08

09	07	06	05	04	03	02	01	00	CUSTOMER	REVISION NO.	DESCRIPTION	DRAWING NO.	MAT. CODE	MAT. DESCRIPTION	WT.

BHARAT HEAVY ELECTRICALS LIMITED MURAIPUR

ITEM-069 ADDED IN VARS.

MANUFACTURING DETAIL OF 01001000225 01
SPBD (450x1350) CANOPY

SIZE A1/M/F | SCALE | WEIGHT-KG | NO.OF SHEET-SHS | NO. | REV.

	AMENDMENT -- NOTIFICATION	AA 085 01 31 REV,02
		PAGE 1 OF 1

AA 085 01 31: PROCEDURE FOR LIQUID PENETRANT EXAMINATION

Cl.1.3: This clause should be modified as below:

"This standard confirms substantially with ASTM E165 and ASME code Section V, Article 6."

REF:	AMD. NO.	APPROVED	ISSUED	DATE	CUM.SR.NO.
Cl.8.12 of MOM OF WG(NDT)	01	WG(NDT)	Corp.R&D	June '93	A 1279

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PROCEDURE FOR LIQUID PENETRANT EXAMINATION

1.0 **SCOPE:**

1.1 This standard details the procedure for liquid penetrant examination of non-porous ferrous and non-ferrous and non-metallic materials such as ceramics, plastics, glass, etc.

1.2 Typical surface discontinuities detectable by this method are cracks, seams, laps, cold shuts, porosity, laminations, etc.

1.3 This standard conforms substantially with ASTM E 165 - 1980 (Reapproved 1983) and ASME code section V, Article 6.

2.0 **PERSONNEL REQUIREMENT:**

Personnel performig non-destructive examination and evaluation shall be qualified to the recommended practice SNT-TC-1A or any other recognised practice.

3.0 **DESCRIPTION:**

In principle a liquid penetrant is applied to the surface to be examined and allowed to enter discontinuities, excess penetrant removed, the part dried and a developer applied. The developer functions both as a blotter to absorb penetrant that has been trapped in discontinuities and as a contrasting back ground to enhance the visibility of penetrant indications.

4.0 **APPROVED METHODS & MATERIALS:**

4.1 Either a colour contrast or fluorescent penetrant method may be used. Any one of the following penetrants shall be used:

(a) Solvent Removable
(b) Post Emulsifying
(c) Water Washable

4.2 For nickel base alloys and/or for stainless steel materials used in nuclear components the penetrant materials, cleaner, penetrant developer, etc., used shall not contain sulphur or halogen above 1% by weight.

4.3 Selection of liquid penetrant material shall be from the same family (brand). Inter-mixing of family of liquid penetrant materials is not allowed.

5.0 **PROCEDURE:**

5.1 **Surface Preparation:**

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5.1.1 Surface preparation by grinding or machining or other method may be employed where surface irregularities may mask indications of unacceptable discontinuities.

5.1.2 The surface to be examined and all adjacent areas within at least 25 mm shall be dry and free from any dirt, lint, scale, rust, welding flux, weld spatter, grease, oil or other extraneous matter that could obscure surface openings or otherwise interfere with examination.

5.1.3 The surface to be examined shall be cleaned with detergents, organic solvents, descaling solutions or paint removers. Degreasing and ultrasonic cleaning may be employed to increase cleaning efficiency. Cleaning method employed is an important part of the examination procedure. Cleaning solvents shall meet the requirements of Cl.4.2

Caution: Blasting with shot or dull sand, rotofinishing, buffing, wire brusing the soft material or machining with dull tools shall not be used as they may peen the discontinuities at the surface.

5.2 **Drying:**

Drying, after cleaning the surface to be examined, shall be accomplished by normal evaporation or with forced hot air, as appropriate. A minimum period of time shall be established to ensure that the cleaning solution has evaporated prior to application of the penetrant.

5.3 **Application Of Penetrants:**

5.3.1 The penetrant shall be applied by dipping, brushing or spraying. If the penetrant is applied by spraying using compressed air type apparatus, filters shall be placed at the air inlet to preclude contamination of penetrant by oil, water or dirt sediment that may have collected in the lines. Spraying should only be performed in a booth equipped with exhaust system.

5.3.2 The length of penetration time is critical and depends upon the material being inspected, the process through which it has passed and the type of discontinuities expected. The recommended penetration time is given in Table 1.

5.3.3 The temperature of the penetrant and the surface of the part to be examined shall not be below 10°C(50°F) nor above 50°C(125°F) throughout the examination period. Local heating or cooling is permitted provided the temperatures remain in the range of 10 to 50°C during the examination. Where it is not practical to comply with these temperature limitations, other temperatures and times shall be used provided the procedures are qualified as described in Annexure-I.

5.4 **Removal Of Excess Penetrant:**

After the penetration time specified in the procedure has elapsed, any penetrant remaining on the surface shall be removed, taking care to minimise removal of penetrant from discontinuities.

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5.4.1 **Postemulsifying Penetrants:**

The emulsifier shall be applied by spraying or dipping. The emulsifying time shall not exceed 5 minutes. After emulsification, the mixture shall be removed by water spray.

5.4.2 **Solvent Removable Penetrants:**

Excess penetrant shall be removed by wiping with a cloth or absorbent paper repeating the operation until most tracesof penetrants have been removed. The remaining traces shall be removed by wiping the surface lightly with cloth or absorbent paper moistened with solvent.

Caution: Care shall be taken to avoid excess solvent as this may remove penetrants from discontinuities. Flushing the surface with solvent following the application of the penetrant and prior to developing is prohibited.

5.4.3 **Water Washable Penetrants:**

Excess water washable penetrant shall be removed with a water spray. The water pressure shall not exceed 0.35 N/mm² (50 Psi) and the water temperature shall not exceed 43.3°C (110°F).

5.5 **Drying:**

Surface shall be dried before the application of developer.

5.5.1 a) If postemulsifying or water washable method is used, the surface shall be dried by blotting with clean materials or by using circulating warm air, provided the temperature of the surface is not raised above 50°C (125°F).

b) For solvent removable method, the surface may be dried by normal evaporation, blotting, wiping or forced air.

5.6 **Application Of Developer:**

The developer shall be applied as soon as possible after the removal of the excess penetrant. Two types of developer, dry or wet,shall be used with fluorescent penetrant. With colour contrast penetrants, only wet developer shall be used.

5.6.1 **Application Of Dry Developer:**

Dry developer shall be applied by a soft brush, a hand operated powder bulb or a powder gun or other means provided the powder is dusted evenly over the entire surface being examined.

5.6.2 **Application Of Wet Developer**

Prior to applying suspension type wet developer to the surface, the developer must be thoroughly agitated to ensure adequate dispersion of suspended particles.

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(a) **Aqueous Developer Application:**

Aqueous developer may be applied to either a wet or dry surface. It shall be applied by dipping, spraying or other means provided a thin coating is obtained over the entire surface being examined. Drying time may be decreased by using warm air, provided the surface temperature of the part is not raised above 50°C.

(b) **Non-aqueous Developer Application:**

Non-aqueous developer shall be applied only on a dry surface. It shall be applied by spraying, except where safety or restricted access preclude it. Under such conditions developer may be applied by brushing. Drying shall be by normal evaporation.

6.0 **EXAMINATION:**

Observe the surface during the application of the developer to detect nature of any indications which tend to bleed out profusely. Final examination shall be done between 7 minutes at the earliest and 30 minutes at the latest after application of the developer. The nature of discontinuities corresponding to the indications shall be defined depending upon the method of setting, appearance, direction, shape and dimensions of the same. If the bleed out does not alter the examination results, longer periods are permitted. If the surface to be examined is large enough to preclude complete examination within the prescribed time the surface shall be examined in increments.

6.1 **Colour Contrast Penetrants (Visible Dye Penetrants):**

6.1.1 With colour contrast penetrants the developer forms a reasonably uniform coating. Surface discontinuities are indicated by bleeding out of the penetrant which is normally of a deep red colour. Indication with a light pink colour may indicate excessive cleaning. Inadequate cleaning may leave an excessive background making interpretation difficult.

6.1.2 Adequate illumination is required to ensure no loss of the sensitivity in the examination. Examination shall be done under natural or suitable light (illumination level shall be in the order of 500 LUX).

6.2 **Fluorescent Penetrants:**

Examination of the surface shall be carried out with a high intensity black light in a darkened area or booth. Black light shall have a wave length of 3650 A°. The bulbs shall be allowed to warm up for not less than 5 minutes prior to use in the examination. The black light intensity shall be at least of 800 uW/cm^2 on the surface of the part being examined and the light source being kept at a distance of at least 375 mm from the surface being examined. The operator should allow his eyes to become accustomed to the darkness of the inspection booth for at least 5 minutes before inspecting the parts. He should avoid looking directly into the black light and also avoid going from the darkness to

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the light and back again without allowing sufficient time for his eyes to adjust to the darkness. The intensity shall be measured at least once every 8 hours and whenever the work station is changed.

7.0 **EVALUATION OF INDICATIONS & INTERPRETATION:**

7.1 As the developer dries to a smooth, even white coating, indications will appear at the locations of discontinuities. Depth of surface discontinuities may be correlated with the richness of colour and speed of bleeding out. However, localised surface imperfections such as may occur from machining marks or surface conditions may produce similar indications which are non-relevant.

7.2 Usually, a crack or similar opening will show a line and light cracks or partially welded lap will show a broken line. Gross porosity may produce large indications covering an entire area. Very fine porosity is indicated by random dots.

7.3 Any non-relevant indication shall be regarded as a defect until the indication is either eliminated by surface conditioning or it is Proved non-relevant by other NDT methods.

7.4 Linear indications are those indications in which the length is more than three times the width. Rounded indications are indications which are circular or elliptical with the length less than three times the width.

7.5 All indications shall be evaluated in terms of the acceptance standards of the referencing documents.

8.0 **ACCEPTANCE STANDARDS:**

8.1 For castings - Refer Corporate Standard AA 085 01 32.

8.2 For Austenitic Forgings - Refer Corporate Standard AA 085 01 30.

8.3 For Welds - Refer Corporate Standard AA 085 01 29.

9.0 **POST EXAMINATION CLEANING:**

Surfaces examined shall be cleaned after evaluation of the test with dry cotton rag with or without water rinse.

TABLE - 1 (Clause 5.3.2)

Suggested Penetration Time For Post-emulsified And Solvent Removable Penetrants

Material	Form	Type of discontinuity	*Penetration time (min.)
Aluminium	Castings	Porosity	5
		Cold shut	5
	Extrusions & Forgings	Laps	10
		Lack of fusion	5
	Welds	Porosity	5
	All forms	Cracks	10

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TABLE - 1 (Clause 5.3.2) Contd.

Material	Form	Type of discontinuity	*Penetration time (min.)
Magnesium	Castings	Porosity	5
		Cold shut	5
	Extrusions & Forgings	Laps	10
		Lack of fusion	10
	Welds	Porosity	10
	All forms	Cracks	10
Steel	Castings	Porosity	10
		Cold shut	10
	Extrusions & Forgings	Laps	10
		Lack of fusion	20
	Welds	Porosity	20
	All forms	Cracks	20
Brass & Bronze	Castings	Porosity	5
		Cold shut	5
	Extrusions & Forgings	Laps	10
		Lack of fusion	10
	Brazed parts	Porosity	10
	All forms	Cracks	10
Plastics	All forms	Cracks	5
Glass	All forms	Cracks	5
Carbide tipped tools	All forms	Lack of fusion	5
		Porosity	5
		Crack	20
Titanium & high temperature alloys	All forms		20 to 30
Ceramic	All forms	Cracks	5
		Porosity	5

* For lower temperatures, penetration time should be increased.

ANNEXURE - 1 (Clause 5.3.3)

PROCEDURE FOR NON-STANDARD TEMPERATURES

A.1 **General:**

When it is not practical to conduct a liquid penetrant examination within the temperature range of 15.6 to 51.6°C (60 to 125°F), the examination procedure at the proposed lower or higher temperature range requires qualification. This shall require the use of a quench cracked aluminium block, which is designated as 'Liquid Penetrant Comparator Block'.

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A.2 Liquid Penetrant Comparator Block:

The liquid penetrant comparator block shall be made of aluminum, ASTM B209, Type 2024 or SB-211. Type 2024, 10 mm (3/8 in.) thick, and shall have approximate face dimensions of 50 mm x 75 mm (2 in. x 3 in.). At the centre of each face, an area approximately 25 mm in diameter shall be marked with a 510°C (950°F) temperature indicating crayon or paint. The marked area shall be heated with a blow torch, a Bunsen burner or similar device to a temperature between 510°C (950°F) and 524°C (975°F). The specimen shall then be immediately quenched in cold water which produces a network of the fine cracks on each face. The block shall then be dried by heating to approximately 149°C (300°F). After cooling, the block shall be cut into two halves. One half of the specimen shall be designated block 'A' and the other block 'B' for identification in subsequent processing. Figure 1 illustrates the comparator blocks "A" and "B". As an alternate to cutting the block in half to make blocks "A" and "B", separate blocks 50 mm x 75 mm (2 in. x 3 in.) can be made using the heating and quenching technique as described above. Two comparator blocks with closely matched crack patterns may be used. The blocks shall be marked "A" and "B".

A.3 Comparator Application:

(a) If it is desired to qualify a liquid penetrant examination procedure at a temperature of less than 15.6°C (60°F) the proposed procedure shall be applied to block "B" after the block and all materials have been cooled and held at the proposed examination temperature until the comparison is completed. A standard procedure which has previously been demonstrated as suitable for use shall be applied to block "A" in the 15.6 to 51.6°C (60 to 125°F) temperature range. The indications of cracks shall be compared between blocks "A" and "B". If the indications obtained under the proposed condition on block "B" are essentially the same as obtained on block "A" during examination at 15.6 to 51.6°C (60 to 125°F), the proposed procedure shall be considered qualified for use.

(b) If the proposed temperature for the examination is above 51.6°C (125°F), block "B" shall be held at this temperature throughout the examination. The indication of cracks shall be compared as described in T-647.3(a) while block "B" is at the proposed temperature and block "A" is at the 15.6 to 51.6°C (60 to 125°F) temperature range.

(c) A procedure qualified at a temperature lower than 15.6°C (60°F) shall be qualified from that temperature to 15.6°C (60°F).

(d) To qualify a Procedure for temperatures above 51.6°C (125°F), the upper and lower temperature limits shall be established and the procedure qualified at these temperatures.

(e) As an alternate to the requirements of (a) and (b) when using color contrast penetrants, it is permissible to use a single comparator block for the standard and non-standard temperatures and to make the comparison by photography.

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(f) When the single comparator block and photographic technique is used, the processing details (as applicable) described in (a) and (b) above shall apply. The block shall be thoroughly cleaned between the two processing steps. Photographs shall be taken after processing at the nonstandard temperature and then after processing at the standard temperature. The indication of cracks shall be compared between the two photographs. The same criteria for qualification as (a) above shall apply.

(g) Identical photographic techniques shall be used to make the comparison photographs.

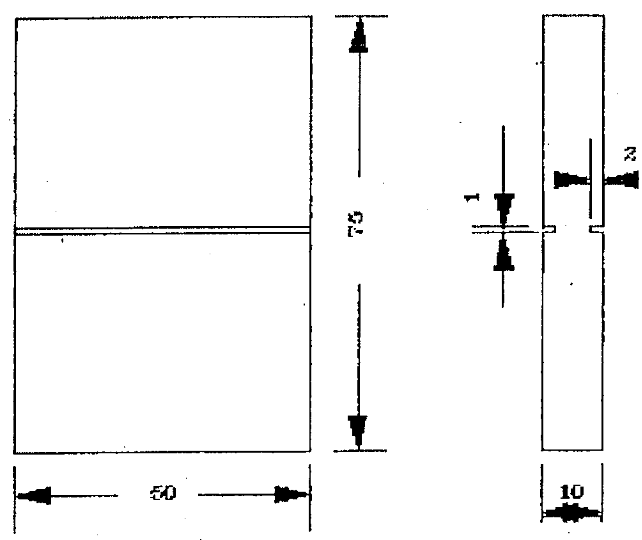

FIGURE: 1-LIQUID PENETRANT COMPARATOR BLOCK

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ACCEPTANCE STANDARDS FOR LIQUID PENETRANT EXAMINATION OF WELDS

1.0 **SCOPE:**

1.1 This standard covers the "Acceptance Standards For Liquid Penetrant Eamination Of Wleds'.

1.2 The procedure for liquid penetrant examination shall be as per Corporate Standard AA 085 01 31: Procedure For Liquid Penetrant Examination.

1.3 This standard is based on ASME Section 8, Division 1, Appendix 8.

2. **DEFINITION OF INDICATIONS:**
Relevant indications are those which result from mechanical discontinuities. Indications with major dimensions greater than 1.6 mm only shall be considered relevant.

2.1 Linear indications are those indications in which the length is more than three times the width.

2.2 Rounded indications are those indications which are circular or elliptical with the length equal to or less than 3 times the width.

2.3 Any questionable or doubtful indications shall be retested to verify whether or not they are relevant.

2.4 Localised surface imperfections, such as may occur from machining marks, surface conditions or incomplete bond between base metal and cladding may produce similar indications which are not relevent to the detection of unacceptable discontinuities.

3. **ACCEPTANCE STANDARDS:**
All surfaces to be examined shall be free from:

a) relevent linear indications.

b) relevent rounded indications greater than 4.8 mm.

c) four or more rounded defects in line separated by 1.6 mm or less (edge to edge) except where the specification for the material establishes different requirements for acceptance so far as defects are concerned.

Revisions :			Approved : INTERPLANT STANDARDIZATION COMMITTEE - WG (NDT)		
Rev. No.	Rev. Date	Revised :	Prepared HYDERABAD	Issued CORP. R&D	Date SEP. '87

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Painting of Bus Ducts and components of Aluminium by Synthetic Enamel, Epoxide or Matt Black Paint Externally & Internally, by spraying

These instructions apply to the painting procedure for painting of Bus Ducts and components of aluminium. These instructions also include surface preparation and pre-treatment for painting.

1.0 MATERIAL FOR SYNTHETIC ENAMEL PAINT:

1.1 White spirit or Thinner (CORPORATE STANDARD **AA 56701**)
1.2 Self Etch Primer (CORPORATE STANDARD **AA 56103**)
1.3 Anti corrosive priming paint (CORPORATE STANDARD **AA 56101**)
1.4 High quality full glossy enamel paint (CORPORATE STANDARD **AA 56126**)
(Colour as specified in the project)

2.0 MATERIAL FOR EPOXY PAINT:

2.1 White spirit or Thinner (CORPORATE STANDARD **AA 56701**)
2.2 Self Etch Primer (CORPORATE STANDARD **AA 56103**).
Chemical resistant epoxide red oxide Zinc phosphate priming paint (CORPORATE STANDARD **AA 56105**)
2.3 Chemical resistant epoxide finishing paint (CORPORATE STANDARD **AA 56131**)
(Colour as specified in the project)

3.0 MATERIAL FOR MATT BLACK PAINT:

3.1 White spirit or Thinner (CORPORATE STANDARD **AA 56701**)
3.2 Self Etch Primer (CORPORATE STANDARD **AA 56103**)
3.3 Anti corrosive priming paint (CORPORATE STANDARD **AA 56101**)
3.4 High quality Matt Black Paint

4.0 MEASURING APPARATUS:

4.1 Alcometer for checking the paint thickness
4.2 Ford cup no. 4 for measuring the viscosity of paint
4.3 Cutter & self adhesive tape for adhesion test
4.4 Gloss Meter for checking glossiness of paint

5.0 PROCEDURE FOR PAINTING:

5.1 SURFACE PREPARATION:
5.1.1 Blowing by compressed air should be done for overall cleaning
5.1.2 Clean the surface with Acetone to remove the dry penetration test chemicals.

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5.1.3 Clean the surface with General Purpose Thinner (White Spirit)

5.1.4 Emery paper of no. 180 can be used to remove oxide coating.

5.1.5 Wipe the surface with clean cotton cloth.

5.1.6 All the cut edges, weld spatters, any imperfection and layer of oxide from the painting surface shall be dressed by Sander (with 40 grit sanding sheet) so as to leave no sharp edges, dents, marks or protrusion.

5.1.7 ~~Before application of each coat of primer / paint the surface should be cleaned & dried. All oil, grease, dirt etc. should be removed by means of solvent / thinner with clean cloth and~~ blowing by compressed air

5.2 GENERAL:

5.3.1 Composition of the etch primer shall be as per details given at Sl.5 of corp standard AA56103. The primer shall consist of two pack system, i.e. base and accelerator. Subsequently, Application of normal primer over etch primer is essential. Mixing ratio shall be as specified by the manufacturer.

5.3.2 Primer coating should be done on the same day of surface preparation.

5.3.3 Paint, Primer & thinner etc should be from reputed supplier and should confirm to the standard specified above.

5.3.4 All paints, primers & thinners should be stored in original sealed containers with clear identification w.r.t., manufacturer's name, shade, expiry date, drying method & time and instructions for mixing and application. These details should be available with vendor in documented form

5.3.5 Paints, primers of expired shelf life should NOT be used.

5.3.6 Open the containers just before application and seal the same immediately after

5.3.7 Thoroughly examine the surface to be painted prior to commencement of work. Correct any condition that may adversely affect cleaning & coating application.

5.3.8 Check at each step of painting operation before proceeding with the next step

5.3.9 Verify that all painted surfaces are free from defects. If any defective area is found, repair and recheck before next operation.

5.3.10 Painting shall not be performed when the temperature is less than 3°C above the dew point of the surrounding air or when the relative humidity of the air is greater than 85%.

5.3.11 Paints shall not be applied within 50mm of edges which will later have to be welded. Such weld areas should be taped for a distance of 50mm on either side of the weld line.

5.3 PAINTING PROCEDURE (for external surface):

5.3.1 Etch primer: One coat of etch primer shall be applied within 3 – 4 hours after cleaning. Before application of Etch Primer coat, dust should be

removed with brush / clean cloths. The painted surface should be allowed to dry for approx. 4 hours and the thickness of the coat should be 5 – 10 microns.

5.3.2 First coat of primer (AA 56101 for synthetic enamel and AA 56105 for Epoxy Paint): First coat of primer shall be applied by spraying. Thickness of the coat shall be 15 – 20 microns. The painted surface shall be allowed to dry for approx. 4 hours.

5.3.3 Second coat of primer (AA 56101 for synthetic enamel and AA 56105 for Epoxy Paint): Second coat of primer shall be applied after 4 hours by spraying. The painted surface shall be allowed to air dry for approx. 4 hours. Thickness of the coat shall be 15 – 20 microns.

5.3.4 Final finishing coat of paint (AA 56126 for synthetic enamel and AA 56131 for Epoxy Paint): Finishing paint of required shade shall be applied after 4 hours by spraying. The painted surface shall be allowed to air dry for approx. 4 hours. Thickness of the coat shall be 25 – 30 microns. Total DFT of primer & finish coats shall be ≥ 65 microns

5.4 PAINTING PROCEDURE (for internal surface for enclosure and outer surface of conductor):

5.4.1 Etch primer: One coat of etch primer shall be applied within 3 – 4 hours after cleaning. Before application of Etch Primer coat, dust should be removed with brush / clean cloths. The painted surface should be allowed to dry for approx. 4 hours and the thickness of the coat should be 5 – 10 microns.

5.4.2 First coat of primer (AA 56101): First coat of primer shall be applied by spraying. Thickness of the coat shall be 15 – 20 microns. The painted surface shall be allowed to dry for approx. 4 hours.

5.4.3 Final finishing coat of paint (Matt Black): Two coats of Matt Black paint shall be applied after 4 hours by spraying. The painted surface shall be allowed to air dry for approx. 4 hours. Thickness of the coat shall be 40 – 50 microns. Total DFT of primer & finish coats shall be ≥ 65 microns

6 ACCEPTANCE CITERIA:

6.1 Painted surface shall be visually checked for defects like rundown, bubbles, blisters, wrinkles etc., and for areas not covered by coat.

6.2 Dry Film Thickness (DFT) shall be checked after drying of final coat.

6.3 Adhesion test shall be carried out as per ASTM D 3359 – 83

6.4 Glossiness should be checked with Gloss Meter. Values should be within limits as specified in specification for the respective type of paint.

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7 PRECAUTIONS:

7.1 Mix only a sufficient quantity of paint required for immediate use and the same should be used within 2 hours.

7.2 Do not use left-over paint which progressively hardens and becomes unusable even by adding more thinner.

7.3 For wiping or cleaning the dust or loose particles from painted surface, use clean cotton cloth only. Do not use cotton waste as it leaves loose fibre on the surface.

7.4 Painted surface, if damaged, should be re-painted with similar procedure.

7.5 Refer standard number AA 0674106 Rev 00 for Log Sheet for surface preparation and painting.

7.6 For paint shade and DFT requirements, refer standard drawing issued against the project.

****

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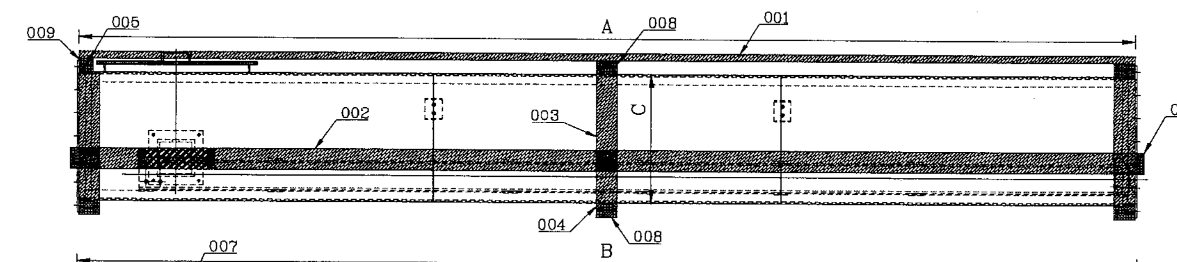

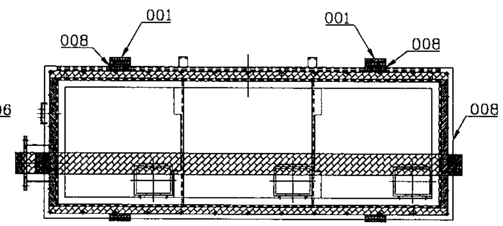

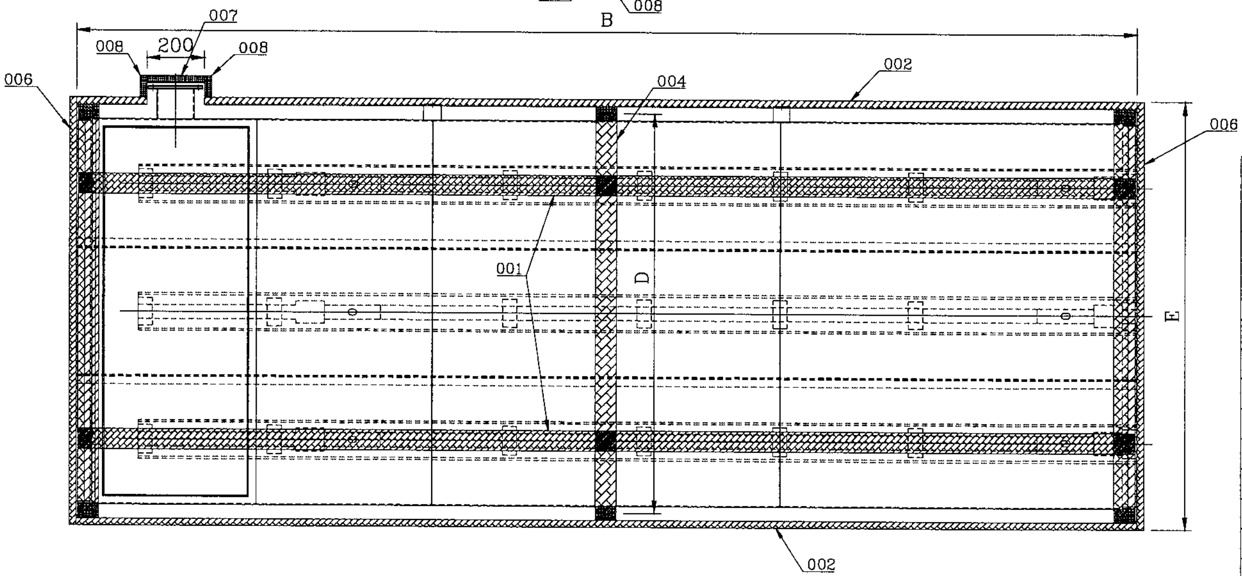

ITEM	DESCRIPTION	QTY.
001	WOODEN BATTEN 25TKx75xA LG.	002
002	WOODEN BATTEN 25TKx75xB LG.	002
003	WOODEN BATTEN 25TKx75xC LG.	006
004	WOODEN BATTEN 25TKx75xD LG.	005
005	WOODEN BATTEN 25TKx50xD LG.	001
006	WOODEN BATTEN 25TKx75xE LG.	002
007	WOODEN BATTEN 25TKx75x200 LG.	001
008	WOODEN SQUARE BATTEN 25TKx75x75 LG.	AS REQD.
009	WOODEN SQUARE BATTEN 25TKx50x50 LG.	002
010	FELT GASKET	AS REQD.
011	STEEL STRIP 1TKx75x150 LG.	AS REQD.
012	STEEL NAIL	AS REQD.
013	TRANSPARENT POLYTHENE SHEET	AS REQD.

NOTE:-

1. ALL BATTEN CORNER JOINTS WILL BE DONE WITH 1TKx70x150 LG STEEL STRIP.
2. USE 4TKx80x300 LG. FELT GASKET INSIDE BATTEN ON CORNER OF BUSDUCT.
3. WOODEN BATTEN LENGTH MAY BE CHANGE WITH BUSDUCT LENGTH, SHAPE & SIZE.
4. USE GOOD QUALITY WOOD BASED ON EASY AVAILABILITY AND STRENGTH FOR PACKING.
5. JOINTS IN THE LENGTH OF RUNNING BATTEN TO BE MADE ONLY AT ENDS AND OVER THE MIDDLE WOODEN FRAME. NO JOINT IN BETWEEN IS ALLOWED.
6. MAX. DISTANCE BETWEEN MIDDLE WOODEN FRAME NOT MORE THAN 2000 mm

VAR	REMARKS	ITEM NO.	DESCRIPTION	DRAWING NO.	IT.NO. / VAR.	MATL.CODE / MATL.SPCN.	WT. / QTY.	GS

CUSTOMER: –

PROJECT/PRODUCT: –

BHARAT HEAVY ELECTRICALS LIMITED
RUDRAPUR

	NAME	SIGN.	DATE
DRN.	SANJAY		–
CKD.	R K LAL		–
APPD.	R K LAL		–

NO. OF VAR.

REV.	DATE	ALTERD / CHEKED	REV.	DATE	ALTERD / CHEKED	REV.	DATE	ALTERD / CHEKED
						01	15.06.13	

DRG. REVISED.

DEPTT. BDE | UNTOL.DIM.GR. C/M/F | SCALE – | WEIGHT–KG – | REF.TO ASSY.DRG. – | IT.NO. – | NO.OF ITEM

TITLE: WOODEN PACKING DETAIL W.A. OF SP BUSDUCT

DRAWING NO. PACKING-005 REV. 01

SHEET NO.- 01 NO.OF SHEETS- 01 SIZE- A3

FIRST ANGLE PROJECTION

ALL DIMENSSIONS IN MILIMETER

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GTAW (1/2)

BHARAT HEAVY ELECTRICALS LIMITED
PROCEDURE QUALIFICATION RECORD [PQR]

PQR No.: **BHEL: PQR: Al: GTAW: 00**
Organization Name: **BHARAT HEAVY ELECTRICALS LIMITED, RUDRAPUR**
Welding Process: **GTAW**

Revision ..... Date .....
By.....
Authorized By : **WRI** Date : **23.08.2014**

JOINT DESIGN
Type : ***Butt Joint***

Weld Type : ***Single side weld***
Backing : ***Yes***
Backing Material : ***Stainless Steel***
Root opening : **2.0 mm**
Groove Angle : **Nil**
Back Gouging : **Nil**

Type: **Manual**
Position: **1G**

ELECTRICAL CHARACTERISTICS
Current : **AC**
TUNGSTEN ELECTRODE (GTAW / PAW)
Size : **Ø 2.4 x 150 mm**
Type : **1% Zirconiated Tungsten rod**

BASE METAL
Material specification : **Aluminium Alloy Plate**
Chemical composition : as per TC
Type / Grade : **Al 31000 H2**
Dimensions : **Plate150x300mm**
Thickness
A. Tested : **3.15 mm**
B. Qualified Range : **1.5 to 6.3 mm**

TECHNIQUE
Stringer or Weave Bead : **Stringer**
Pass (Per side) : **Multi pass (Single Side)**
No. of. Electrodes : **Single**
Peening : **Nil**
Pre-Weld Cleaning : **Nil**

FILLER METAL
Specifications : **ER 4043 Al Filler Wire**
Chemical composition : as per TC

PREHEAT
Preheat Temp : ***Nil***
Inter-pass Temp : ***Nil***

SHIELDING
Gas : **Argon**
Flow Rate : 10 lpm

POSTWELD HEAT
Temperature : ***Nil***
Time : ***Nil***

WELDING PROCEDURE

PASS / WELD LAYER	PROCESS	FILLER METALS		CURRENT		VOLTAGE (V)	TRAVEL SPEED mm/min	JOINT DETAILS
		CLASS	DIA	POLARITY	AMPS (A)			
ROOT	GTAW	ER 4043	3.15	AC	120-140	20	100	PLATE BUTT JOINT
FINAL	GTAW	ER 4043	3.15	AC	130-150	21	100	

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GTAW (2)

TENSILE TEST: Report No MT 287 / 14-15 dated 08.10.2014

Specimen No.	Width, mm	Thickness, mm	Area, mm2	Ultimate Tensile Strength, *[MPa]*	Failure and Location
1	**38.9**	**3.2**	**124.48**	**101**	**Base Metal**
2	**38.1**	**3.2**	**121.92**	**100**	**Base Metal**

BEND TEST: Report No MT 268 / 14-15 dated 18.09.2014

Specimen No.	Type of Bend	Result	Remarks
R1, R2	ROOT BEND	Acceptable	No Open Discontinuity
F1, F2	FACE BEND	Acceptable	No Open Discontinuity

VISUAL INSPECTION
[As per clause7 of AWS D1.2]
Test : **Visual Inspection**
Appearance : **Good**

RADIOGRAPHIC/ ~~ULTRASONIC~~ EXAMINATION:
RT Report No: **NDT/RTRP/0326** Result: **Acceptable**
UT Report No: **NA** Result: **NA**

Witnessed by : **M Kayarohanam** (St. No. 2157047) **Sr.Engineer /WRI**

OTHER TESTS:
Magnetic Particle test (MT) : **NA**
Dye Penetrant Test (PT) : **NA**

Welders Name: **JANKI PRASAD KORI [6205933]** ID No : **WRI 3470**

Test Conducted By: **WELDING RESEARCH INSTITUTE**
BHEL, THIRUCHIRAPPALLI-620014
Laboratory: **WRI Lab**

The undersigned hereby certifies that the requirements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of AWS D 1.2.

Signed .....
Name Seal M. KAYAROHANAM
Sr. Development Engineer
Welding Research Institute
Bharat Heavy Electricals Limited
Tiruchirappalli - 620 014.

Date 13.10.2014

PREPARED BY
K. GANESH KUMAR
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APPROVED BY
Dr. G. BUVANASHEKARAN
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GMAW (1/2)

BHARAT HEAVY ELECTRICALS LIMITED
PROCEDURE QUALIFICATION RECORD [PQR]

PQR No.: **BHEL: PQR: Al: GMAW: 00**
Organization Name: **BHARAT HEAVY ELECTRICALS LIMITED, RUDRAPUR**
Welding Process: **GMAW**

Revision ..... Date .....
By.....
Authorized By : **WRI** Date : **17.09.2014**

JOINT DESIGN
Type : ***Butt Joint***

Weld Type : ***Single side weld***
Backing : ***Yes***
Backing Material : ***Stainless steel***
Root opening : **2.5 mm**
Groove Angle : **70°** (included)
Back Gouging : **Nil**

Type : **Semi-Automatic**
Position : **1G**

ELECTRICAL CHARACTERISTICS
Current : **DCEP**

TUNGSTEN ELECTRODE (GTAW / PAW)
Size : NA
Type : NA

BASE METAL
Material specification : **Aluminium Alloy Plate**
Chemical composition : as per TC
Type / Grade : **Al 19501 H1**
Dimensions : **Plate150x300mm**
Thickness
A. Tested : **10 mm**
B. Qualified Range : **1.5 to 20.0 mm**

TECHNIQUE
Stringer or Weave Bead : **Stringer**
Pass (Per side) : **Multi pass (Single Side)**
No. of. Electrodes : **Single**
Peening : **Nil**
Pre-Weld Cleaning : **Nil**

FILLER METAL
Specifications : **ER 4043 Al Filler Wire**
Chemical composition : as per TC

PREHEAT
Preheat Temp : ***Nil***
Inter-pass Temp : ***Nil***

SHIELDING
Gas : **Argon**
Flow Rate : 15 lpm

POSTWELD HEAT
Temperature : ***Nil***
Time : ***Nil***

WELDING PROCEDURE

PASS / WELD LAYER	PROCESS	FILLER METALS		CURRENT		VOLTAGE (V)	TRAVEL SPEED mm/min	JOINT DETAILS
		CLASS	DIA	POLARITY	AMPS (A)			
ROOT	GMAW	ER 4043	1.6 mm	DCEP	220	24	75	PLATE BUTT JOINT
FILLER	GMAW	ER 4043	1.6 mm	DCEP	240	25	150	
FINAL	GMAW	ER 4043	1.6 mm	DCEP	270	25	150	

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GMAW (2/2)

TENSILE TEST: Report No MT 288 / 14-15 dated 08.10.2014

Specimen No.	Width, mm	Thickness, mm	Area, mm2	Ultimate Tensile Strength, *[MPa]*	Failure and Location
1	**38.7**	**9.0**	**348.30**	**81**	**Base Metal**
2	**38.1**	**9.0**	**342.90**	**81**	**Base Metal**

BEND TEST: Report No MT 274 / 14-15 dated 25.09.2014

Specimen No.	Type of Bend	Result	Remarks
R1, R2	ROOT BEND	Acceptable	No Open Discontinuity
F1, F2	FACE BEND	Acceptable	No Open Discontinuity

VISUAL INSPECTION
[As per clause7 of AWS D1.2]
Test : **Visual Inspection**
Appearance : **Good**

RADIOGRAPHIC/ ~~ULTRASONIC~~ EXAMINATION:
RT Report No: **NDT/RTRP/0367** Result: **Acceptable**
UT Report No: **NA** Result: **NA**

Witnessed by : M Kayarohanam (St. No. 2157047) Sr.Engineer /WRI

OTHER TESTS:
Magnetic Particle test (MT) : **NA**
Dye Penetrant Test (PT) : **NA**

Welders Name: **ANIL KUMAR [6205844]** ID No : **WRI 3472**

Test Conducted By: **WELDING RESEARCH INSTITUTE**
BHEL, THIRUCHIRAPPALLI-620014
Laboratory: **WRI Lab**

The undersigned hereby certifies that the requirements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of AWS D 1.2.

Signed .....
Name Seal
M. KAYAROHANAM
Sr. Development Engineer
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Tiruchirappalli - 620 014.

Date ...13.10.2014.....

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GTAW (1/1)

BHARAT HEAVY ELECTRICALS LIMITED
WELDING PROCEDURE SPECIFICATION [WPS]

WPS No: **BHEL: WPS: Al: GTAW: 00**
Organization Name: **BHARAT HEAVY ELECTRICALS LIMITED, RUDRAPUR**
Welding Process: **GTAW**

Revision ..... Date .....
By.....

Supporting PQR No: **BHEL: PQR: Al: GTAW: 00**
Authorized By : **WRI** Date : **13.10.2014**

JOINT DESIGN
Type : ***Butt Joint***

Weld Type : ***Single side weld***
Backing : ***Yes***
Backing Material : ***Stainless Steel***
Root opening : **2.0 mm**
Groove Angle : **Nil**
Back Gouging : **Nil**

Type: **Manual**
Position: **1G**

ELECTRICAL CHARACTERISTICS
Current : **AC**
TUNGSTEN ELECTRODE (GTAW / PAW)
Size : **Ø 2.4 x 150 mm**
Type : **1% Zirconiated Tungsten rod**

BASE METAL
Material specification : **Aluminium Alloy Plate**
Chemical composition : as per TC
Type / Grade : **Al 31000 H2**
Dimensions : **Plate150x300mm**
Thickness
A. Tested : **3.15 mm**
B. Qualified Range : **1.5 to 6.3 mm**

TECHNIQUE
Stringer or Weave Bead : **Stringer**
Pass (Per side) : **Multi pass (Single Side)**
No. of. Electrodes : **Single**
Peening : **Nil**
Pre-Weld Cleaning : **Nil**

FILLER METAL
Specifications : **ER 4043 Al Filler Wire**
Chemical composition : as per TC

PREHEAT
Preheat Temp : ***Nil***
Inter-pass Temp : ***Nil***

SHIELDING
Gas : **Argon**
Flow Rate : 10 lpm

POSTWELD HEAT
Temperature : ***Nil***
Time : ***Nil***

WELDING PROCEDURE

PASS / WELD LAYER	PROCESS	FILLER METALS		CURRENT		VOLTAGE (V)	TRAVEL SPEED mm/min	JOINT DETAILS
		CLASS	DIA	POLARITY	AMPS (A)			
ROOT	GTAW	ER 4043	3.15	AC	130	20	100	PLATE BUTT JOINT
FINAL	GTAW	ER 4043	3.15	AC	140	21	100	

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GMAW (1/1)

BHARAT HEAVY ELECTRICALS LIMITED
WELDING PROCEDURE SPECIFICATION [WPS]

WPS No: **BHEL: WPS: Al: GMAW: 00**
Organization Name: **BHARAT HEAVY ELECTRICALS LIMITED, RUDRAPUR**
Welding Process: **GMAW**

Revision ….. Date …………………
By………………..

Supporting PQR No: **BHEL: PQR: Al: GMAW: 00**

Authorized By : **WRI** Date : **13.10.2014**

JOINT DESIGN

Type : ***Butt Joint***

Weld Type : ***Single side weld***
Backing : ***Yes***
Backing Material : ***Stainless Steel***
Root opening : **2.5 mm**
Groove Angle : **70° (included)**
Back Gouging : **Nil**

Type : **Semi-Automatic**
Position : **1G**

ELECTRICAL CHARACTERISTICS

Current : **DCEP**

TUNGSTEN ELECTRODE (GTAW / PAW)

Size : NA
Type : NA

BASE METAL

Material specification : **Aluminium Alloy Plate**
Chemical composition : as per TC
Type / Grade : **Al 19501 H1**
Dimensions : **Plate150x300mm**
Thickness
A. Tested : **10 mm**
B. Qualified Range : **1.5 to 20 mm**

TECHNIQUE

Stringer or Weave Bead : **Stringer**
Pass (Per side) : **Multi pass (Single Side)**
No. of. Electrodes : **Single**
Peening : **Nil**
Pre-Weld Cleaning : **Nil**

FILLER METAL

Specifications : **ER 4043 Al Filler Wire**
Chemical composition : as per TC

PREHEAT

Preheat Temp : ***Nil***
Inter-pass Temp : ***Nil***

SHIELDING

Gas : **Argon**
Flow Rate : 15 lpm

POSTWELD HEAT

Temperature : ***Nil***
Time : ***Nil***

WELDING PROCEDURE

PASS / WELD LAYER	PROCESS	FILLER METALS		CURRENT		VOLTAGE (V)	TRAVEL SPEED mm/min	JOINT DETAILS
		CLASS	DIA	POLARITY	AMPS (A)			
ROOT	GMAW	ER 4043	1.6 mm	DCEP	220	24	75	PLATE BUTT JOINT
FILLER	GMAW	ER 4043	1.6 mm	DCEP	240	25	150	
FINAL	GMAW	ER 4043	1.6 mm	DCEP	270	25	150	

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