

1. Inviting Tenders

The bidder shall submit his response through bid submission to the tender on e-Procurement platform at <https://bheleps.buyjunction.in>

- The bidder would be required to register on the e-procurement market place <https://bheleps.buyjunction.in> and submit their bids online. Sealed cover bids / e-Mails / FAX / Manual offer will NOT be accepted.
- The bidder has to keep track of any changes by viewing the addendum / Corrigendum's issued by the Purchaser on time-to- time basis in the E-Procurement platform. The Company calling for tenders shall not be responsible for any claims/problems arising out of this.
- The user should complete all the processes and steps required for bid submission. The successful bid submission can be ascertained once acknowledgement is given by the system through bid submission number after completing all the processes and steps. BHEL and mjunction Services Ltd. will not be responsible for incomplete bid submission by users. Users may also note that the incomplete bids will not be saved by the system and are not available for the Purchaser for processing.

Before uploading scanned documents, the bidders should sign on all the statements, documents, certificates uploaded by him, owning responsibility for their correctness / authenticity. If nothing is mentioned it is assumed that all terms and conditions are acceptable. If supplier is mentioning his rates in units not asked by BHEL, BHEL has the right to reject/accept quotation. Quotations shall reach us by 1400 Hrs (IST) on due date. **Techno-Commercial bid shall be opened at 1530 hrs (IST) on same day. For finalizing prices, BHEL may go in for opening of sealed price bids (Part-II) or conduct reverse auction.**

Price bids/Reverse Auction of only those bidders shall be opened/conducted who qualifies in techno-commercial (Part-I) evaluation. Qualification in Part-I shall be adjudged by criteria mentioned in checklist. Date shall be informed.

Please submit all the documents/confirmations as per checklist. This will facilitate quick evaluation and early finalization of tender.

In case overseas suppliers route their offer through their accredited selling agents, a letter of authority should be furnished mentioning the name and address of their selling agents who are authorised to bid, negotiate and conclude a Contract on their behalf. This letter should be sent before the tender submission otherwise bid will be considered as unsolicited bid.

Pre-Qualification Terms:

- 1) **Vendor has to present any customer Purchase Order of Carbon Steel Castings with minimum cumulative value of Rs. 500000.00 (Five Lakh Only) as proof. Purchase Order/s date should be 01.01.2016 or afterwards. For MSEs, the required cumulative value of PO value shall be Rs. 200000.00 (Two Lakh only). This Pre-Qualification terms shall not be applicable to Start-Up Firms. These relaxations and exemptions are in line with D.O. No. 5(4)/2016-BE-I dated 15.02.2017. For claiming Start-Up exemption, vendors have to give documentary evidence or undertaking. For Claiming MSE benefits, vendor have to give documentary evidence like NSIC, UAN, etc.**
- 2) **Vendor has to give undertaking that he is manufacturer of Carbon Steel Castings.**

1.1 INSTRUCTION TO BIDDER (In case of E-Procurement)

Interested bidders/Suppliers shall submit their offer through e-Procurement mode at <https://bhel.abcpocure.com>. **Offers in any other mode will not be accepted.**

For Enterprise Procurement System (EPS) Bidders/Suppliers are requested to follow these steps:

a. Requirements

1. Computer with good Internet Connection.
2. Operating System should be Windows Vista / Windows 7 and above.
3. Web Browsers: Internet Explorer 9.0 (32-bit Browser only) & above

b. Mandatory Requirements:

Suppliers interested for registration for BHEL Open Tenders should have a valid DSC (Digital Signature Certificate) before Proceeding forward for Registration. Herein a Valid DSC refers to a Class-II/III Digital Signature Certificate (DSC) for Signing & Encryption (Required both digital signature certificate: Signing & Encryption) of bids issued by any of the valid Certifying Authorities (approved by Controller of Certifying Authorities) in India. Valid Digital Signature Certificate (DSC) must be installed in a computer system from where you want to access the website.

For Unregistered Suppliers in EPS:

Procedure for Online Registration in EPS for Open Tender Suppliers for BHEL. Please follow the below steps for registration: -

1. Click Register Button (Top of the Screen).
2. Please input your organization PAN No (in case of Indian supplier) or select your "country" in case you are an overseas Supplier.
3. Select Units to participate in.
4. Fill up Company details.
4. Key in your desired login id If you have registered by keying in PAN No. then your desired login id will be prefixed by "OTI", In case of **overseas suppliers it will be also prefixed with "OTI"**.
5. Fill in the Captcha code & agree to the terms & conditions and privacy policy of this website and click SUBMIT.

Once the above steps are completed, contact to M/s eProcurement Technologies Limited for ID Activation. M/s e Procurement Technologies limited, Ahmedabad will activate your ID within 2 business hours. After registering, follow the steps provided in "For Registered Supplier" to view RFQ.

NB: - 1 BHEL Administrator or user will have no role for approving Registration and Open Tenders and DSC for any supplier who has registered himself from the front END which is in case of OT.

For Registered Supplier in EPS:

1. Supplier visits EPS home page
2. Supplier Login in with their user id and password

3. Search the RFQ ID and views it.
4. Attaches themselves to the RFQ by clicking the “I/We wish to participate”.
5. Supplier fills the bid template and makes necessary attachments
6. Supplier submits their bid by clicking Sign, Encryption & Save button.

In any problem is faced by supplier while login/registration in EPS (<https://bhel.abcprocure.com>) and any other assistance, please contact the support team of M/s e Procurement Technologies limited, Ahmedabad as per details mentioned in table below:

Name	Contact Nos.	e-mail ID	Role	Location
Mukunthan	+91 6353215001	Trichy.bhel@eptl.in	Support Executive	Trichy
Swapnil Hamilton	+91 7940270549	swapnil.h@eptl.in	Support Executive	HO – Ahmedabad
Hardik Oza	+91 7940270560	Hardik.oza@eptl.in	Support Executive	HO – Ahmedabad
Ankur Bhatt	+91 7940270590	ankur.bhatt@eptl.in	Support Executive	HO – Ahmedabad
Prashant Rajyaguru	+91 7940270545	prashant@eptl.in	Asst. Manager – Implementation & Support	HO – Ahmedabad
Dharam Rathod	+91 7940270596	dharam@eptl.in	Manager – Implementation & Support	HO – Ahmedabad
Pradip Parmar	+91 7940270532	pradip@eptl.in	Sr Mgr – Implementation & Support	HO – Ahmedabad
Devang Patel	+91 7940270576	devang@eptl.in	Sr Manager – Implementation & Support	HO – Ahmedabad

2 OTHER IMPORTANT INFORMATION RELATED TO E-PROCUREMENT TENDERS

- a) The bidder has to keep track of any changes by viewing the addendum / Corrigendum's issued by the Purchaser on time-to- time basis in the E-Procurement platform. The Company calling for tenders shall not be responsible for any claims/problems arising out of this.
- b) The user should complete all the processes and steps required for bid submission. The successful bid submission can be ascertained once acknowledgement is given by the system through bid submission number after completing all the processes and steps. BHEL and M/s e Procurement Technologies limited will not be responsible for incomplete bid submission by users. Users may also note that the incomplete bids will not be saved by the system and are not available for the Purchaser for processing.
- c) Before uploading scanned documents if any, the bidders shall sign on all the statements, documents, certificates uploaded by him, owning responsibility for their correctness / authenticity.

- d) On the due date of tender opening, only technical bids will be opened. The opened technical bids will be evaluated by us and clarifications required, if any, will be called for from the bidders on technical and commercial points. If no reply is received from the vendor for the clarification raised by BHEL with in the final cut-off date, those vendors offer will be processed with the documents available / submitted against this tender. Offers not meeting the required specification and technical condition will be summarily rejected. The price bids of technically suitable bidders will be opened on a later date with prior intimation to techno-commercially suitable bidders.
- e) Ranking L-1, L-2 etc. shall be done for individual item for the techno-commercially acceptable offers on landed cost to BHEL, IVP Goindwal basis and BHEL reserves the right to place order for individual items with different vendors. In the event of more than one vendor becoming L1 for the item, the enquiry quantity will be shared equally among all the L1 vendors.
- f) BHEL reserves the right to negotiate with L1 vendor or re-float the tender for items where, L1 price is not the lowest acceptable price; BHEL reserves the right to increase or decrease the tender quantity.
- g) **If supplier is mentioning delivery destination within state/ outside state depending upon his location of factory, Free On Road etc these are assumed as on FOR Goindwal. If supplier is wishing to give delivery on Ex works basis, then he has to clearly mention about it.**

2.1 AGENCY COMMISSION:

In respect of offers from overseas suppliers, agency commission, if any, payable to their agents in India, shall invariably be shown separately in the proforma invoice and this will be paid by us in India, in Indian Rupees, on satisfactory completion of the Contract.

If overseas Principal has any tie up with any third party in respect of Agency Commission it should be declared while submitting the offers.

Copies of current Agency, / Agreemental Authorization Letter in respect of Agency Commission shall be furnished along with order, if not made available earlier.

3. PRICE BASIS

- a. The reimbursement of GST portion of invoice shall be released only upon: -
 - 1. vendor declaring such invoice in his GSTR-1and
 - 2. receipt of goods and Tax invoice by BHEL and
 - 3. Confirmation of payment of GST thereon by vendor on GSTN portal.
 - 4. Above is subject to receipt of goods/service and tax invoice thereof along with vendor declaring invoice in his return and paying GST within timeline prescribed for availing ITC by BHEL.

Since ITC can be availed only when BHEL is in possession of GST Tax invoice and after receipt of goods. Thus, vendor to ensure timely dispatch of goods and Tax invoice. It may be noted that in case of any delay in receipt of Tax Invoice and/or receipt of goods, the ITC

availment by BHEL will get delayed thus entailing additional cash outflow & may even get denied if ITC availment timelines are breached.

Further ITC can be availed only when vendor has declared such invoice in his outward supply Return GSTR-1 and after GST thereon has been paid by him at the time of filing of monthly Return.

- b. In case GST credit is delayed/denied to BHEL due to non/delayed receipt of goods and/or tax invoice or expiry of timeline prescribed in GST law for availing such ITC, or any other reasons not attributable to BHEL, GST amount shall be recoverable from vendor along with interest levied / leviable on BHEL.
 - c. In case vendor delays declaring such invoice in his return and GST credit availed by BHEL is denied or reversed subsequently as per GST law, GST amount paid by BHEL towards such ITC reversal as per GST law shall be recoverable from vendor/contractor alongwith interest levied / leviable on BHEL.
 - d. Any GST liability arising on BHEL under Reverse Charge (RCM) before actual receipt of goods and/ or Invoice thereof would be subject to recovery of Interest leviable for the period between the date of such liability and actual date of eligibility of ITC based on receipt of goods, receipt of Invoices and other conditions specified in GST Law as applicable.
 - e. Order of enquiry item sl. No. shall be maintained in the quotation.
 - f. The rates quoted shall be firm and fixed. No price variation is proposed and allowed.
 - g. Rates quoted should be F.O.R Goindwal basis. If bidder has quoted Ex Works, loading shall be done as per BHEL discretion for tender evaluation.
- 2a. Rates of raw casting components shall be quoted on **rate INR per kg basis & on FOR GOINDWAL SHAIB basis. Foreign supplier has to quote on FOB basis & in USD/INR.**
 - 2b. Rates shall be inclusive of pattern and development cost. The patterns cost shall be borne by the supplier.
 - 2c. **Comparison shall be made on landed rate per kg to BHEL Goindwal Sahib for deciding L1 offer.** Loading as per BHEL discretion will be done in case of deviation for delivery destination. For comparison purpose & Agent commission conversion rate from USD to INR will be taken for tender opening date. For conversion of fixed RT charges & repair charges into USD, the \$ rate at tender opening date will be taken throughout the contract. If the relevant day happens to be a bank holiday, then the forex rate as on the previous bank (SBI) working day shall be taken.
 - 2d. Unloading of material at Main Stores of BHEL shall be arranged by BHEL.
 - 2e. In case of disputes/errors/difficulty in interpretation of rates mentioned in figures, rates mentioned in words shall be taken as final.
 - 2f. Order of enquiry Sl. No. shall be maintained in quotation.
- Variation in taxes or any other statutory levis during contractual delivery period shall be to BHEL's account.

3.1 VALIDITY OF OFFERS:

The offers shall be kept open for acceptance **for 90 days** from the date of opening of the tender. In case of extension of tender opening date, the validity shall be suitably revised.

3.2 SCOPE OF SUPPLY:

Material shall be supplied as per the applicable latest Technical Delivery Conditions (TDC)/ Material Standard requirements/Drawings/RT Procedure and other requirement as given in the Purchase Order. The TDC applicable for Indian suppliers is TDC:0412/26 (latest revision) and TDC:6:396 Rev:00 (for Maitree Project Castings) and for foreign supplier is TDC:0:433 Rev00 (or latest applicable).

Also kindly note that material group given above are generated for e-tendering purpose only. Actual PO will be released as per material codes given in above table.

If in PO, some latest version of the drawings is mentioned than it is vendor's responsibility to demand the same from BHEL and supply according to latest version of drawing.

Sr · N o.	Material Code for EPS	Material Code	Description of material	Materi al Grade	Drawing No.	Unit weight, Kg	Enqui ry Qty (Nos.)
1	G9211008 0000	922038030000	BODY-28-C300-GV-BW-WCB	WCB	2VNB4412299R/00	1703.00	3
		922038070000	YOKE-28-C300-GV-WCB	WCB	2VNB4412300R/00	225.00	3
		922038080000	BONNET-28-C300-GV-WCB	WCB	2VNB4412301R/00	619.40	3
		922038160000	WEDGE-28-C300-MO-WCB	WCB	2VNB4412302R/00	477.30	3
		922018270005	BODY-26-C300-GV-BW-WCB-U689	WCB	3VU68925871R/00	1587.00	2
		922018320000	WEDGE-26-C300-MO-WCB	WCB	2VNB9714478R/00	330.00	2
		922018300005	BONNET-26-C300-GV-WCB-U689	WCB	3VU68925914R/00	450.00	2
		922018290000	YOKE-26-C300-GV-WCB	WCB	2VNB9714460R/01	301.00	2

Also kindly note that “material code for EPS” given above represents all castings of Gr. A216 Gr. WCB/WCC. These material/group codes are generated for e-tendering purpose only. Actual PO will be released on “92” material codes.

4. WELL KNOWN FOUNDARY:

It is the responsibility of successful vendor to ensure that all the castings are supplied with IBR TC [Valid IBR Well known Foundry status clearly mentioned on the TC] or under witness pouring clearly endorsed by IBR authority/authorized inspecting authority. The foundry will provide TCs in Form III G/III F (as applicable as per TDC) signed by competent authority. The cost for witness pouring from authorized inspecting authority has to be borne by supplier.

5. DELIVERY SCHEDULE:

Delivery required is within six months.

6. ACCESS TO MANUFACTURING PREMISES:

While Purchase Orders placed on the vendor are under execution, authorized representatives of BHEL shall be allowed free access to the manufacturing facilities for the purpose of inspection or monitoring the progress of purchase orders. This access will also be extended to representatives of BHEL's customers accompanying the authorized representative/s of BHEL, if our contractual requirements with our customers call for the same.

7. PROCEDURE FOR CASTING WEIGHT ESTABLISHMENT

Weights of same patterns for different material grade castings shall be same. The established weights shall be applicable to all vendors. Weights shall be established again only on revision of dimensions of component. Weight shall be established as per clause no. 08 of TDC: 0:412: Rev 26 (or latest applicable). Rate of any item shall be derived by multiplying established weight with rate per kg for the period when PO is being released. When a vendor is taking any item as a new development, if his weight is less than already established weight, this weight will be considered as new established weight and binding on all vendors. If his weight is more than already established weight, it shall be binding on the vendor. For any new item, not established till date, the first verified weight by BHEL after complete dimensional verification and acceptance shall be declared as established weight (as per clause No. 08 of TDC). Payments shall be made on established weights only. Additional claim of any vendor due to his extra weight over and above the established weight shall not be entertained.

8. DEVELOPMENT ORDERS FOR CASTINGS REQUIRING NEW PATTERNS:

Sample clearance shall be by BHEL and bulk supply shall be undertaken only after sample clearance. Quality requirement of new developments shall be as per TDC:0412/26 (latest revision) and TDC:6:396 Rev:00 (for Maitree Project Castings) and for foreign supplier is TDC:0:433 Rev00 (or latest applicable) besides other technical documents.

9. TERMS OF PAYMENT:

- a. Due payment against supplies received shall be due after 30 days of receipt and acceptance of material and shall be paid within next 15 days' period. In case of any deviation from standard payment term mentioned, BHEL at its discretion may load on the item price at "Base rate of SBI (as applicable on the date of bid opening; Techno-commercial bid opening) + 6% shall be considered for loading for the period of relaxation sought by bidders.
- b. Documents to be submitted (if applicable)
 - i. Tax invoice (Invoice shall be GST compliant and should contains all the required information such as GST No, HSN code etc.)
 - ii. Transporter copy along with material/consignment.
 - iii. Material Test Certificates (MTC) and
 - iv. Compliance Certificate.
 - v. Radiographic films and reports, if required.
 - vi. Third Party Inspection reports, if applicable.

- vii. Creep test certificate shall be required for Maitree project castings as per Maitree TDC
- viii. Packing Note
- c. GST registration number is to be submitted by qualified vendor as per GST law.
- d. It is mandatory to mention proper material codes in the invoices and separate invoices to be raised for different POs.
- e. ***BHEL releases payment through EFT mode ONLY. Necessary details may please be submitted by filling required format before release of payment.***
- f. ***Conditions relating to release of GST portion:***
 Payment of GST portion will be released to vendor only upon completion of statutory requirement and further subject to following:
 The reimbursement of GST portion of invoice shall be released only upon: -

- 5. vendor declaring such invoice in his GSTR-1and
 - 6. receipt of goods and Tax invoice by BHEL and
 - 7. Confirmation of payment of GST thereon by vendor on GSTN portal.
 - 8. Above is subject to receipt of goods/service and tax invoice thereof along with vendor declaring invoice in his return and paying GST within timeline prescribed for availing ITC by BHEL.
 - In case GST credit is delayed/denied to BHEL due to non/delayed receipt of goods and/or tax invoice or expiry of timeline prescribed in GST law for availing such ITC, or any other reasons not attributable to BHEL, GST amount shall be recoverable from vendor along with interest levied / leviable on BHEL.
- In case vendor delays declaring such invoice in his return and GST credit availed by BHEL is denied or reversed subsequently as per GST law, GST amount paid by BHEL towards such ITC reversal as per GST law shall be recoverable from vendor/contractor alongwith interest levied / leviable on BHEL.

For Foreign Supplier:

Payment shall be made in USD/INR only. 100% payment shall be made within 30-45 days of acceptance of received material at IVP Goindwal and receipt of following dispatch documents.

Documents Required (Complete in all respects)

- a. Bill of Lading.
- b. Packing list & Invoice
- c. Country of origin Certificate
- d. Test Certificates / Compliance Certificate
- e. PBG for 10% value of contract. The validity of PBG should be for 18 months from acceptance of material at BHEL with additional 2 months for claim period. Vendor has to furnish a Performance Bank Guarantee from a consortium Bank at no extra cost in a proforma attached.
- f. A Certificate that :

One copy of Tests / Compliances Certificate with non-negotiable documents, comprising of House Airway Bill, Invoice, Packing list, Country of origin Certificate, applicable

drawings and catalogues, duly signed and stamped, have been sent separately to the port Consignee, purchaser

Attn: SDGM/ MM Department, BHEL, IVP Goindwal Sahib -143422 Distt. Tarn Taran, Punjab –India and to DGM / Finance, <<Same address>>

Above documents should include your Registration numbers such as GST no, PAN no, any other applicable statutory document etc.

BHEL releases payment through EFT mode ONLY. Necessary details may please be submitted by filling required format before release of payment.

It is mandatory to mention proper material codes in the invoices and separate invoices to be raised for different POs and Radiographed castings. It is necessary to send MTCs and RT films along with material, failing which material will not be accounted for and no receipt will be given. Also RT charges are to be mentioned in same invoice in which material is being supplied. Above documents should include your Registration numbers such as GST no, PAN no. etc.

10. **INSPECTION:**

- a. All required tests (Physical properties, Chemical properties, Heat Treatment, NDE, Creep test, Visual, Surface finish etc.) as called in referred material standard/BHEL/TDC/drawing etc shall be carried out by vendor at no extra cost. **BHEL may decide to inspect itself/arrange third party at vendors' works itself as and when necessary with prior intimation to the vendor.** No additional charges shall be claimed for such inspections.
- b. Third party inspection charges will be borne by BHEL. Moreover all required infrastructure (testing, tools etc) have to be arranged by supplier.
- c. **Vendor will give inspection call sufficiently in advance considering the delivery period stipulated in the purchase order.**
- d. Material Test Certificates (MTC), Creep test certificate, Inspection reports and Compliance/Guarantee Certificate are to be provided along with the supplies.
- e. Latest applicable revisions of standards/procedures to be referred. International/National standards are to be arranged by vendor.
- f. Any inspection carried out before supply by vendor/incoming stage at BHEL not withstanding, if any defect/non-conformity is noted during processing, the same shall be attended/replaced by vendor at no extra cost.
- g. Necessary tooling including thread gauges etc have to be arranged by vendor. Only in exceptional cases, based on BHEL discretions item/nature, BHEL may consider request to provide gauges if available with BHEL. But in no case this shall be linked with delivery of material
- h. Sample castings are to be identified by vendor in the delivery challan as "Sample" and the dimensional reports and RT reports are to be provided to BHEL along with supply. Also mention "Sample" on castings with white paint.
- i. RT castings have to be mentioned "RT" on castings with white paint.
- j. Material code as mentioned in PO is to be mentioned on all casting with paint.

11. **RADIOGRAPHY:**

Consistent radiography quality is to be ensured and to be maintained uniformly in bulk supply with adequate process and method controls. Since the castings required are of radiographic quality, BHEL reserves the right to conduct radiographic testing of sample pieces at its own arrangement and derive conclusion of soundness of casting supplied against the said lot/heat based on the results of such testing.

- Standard requirement of radiography of castings shall be as per TDC:0412/26 (latest revision) and TDC:6:396 Rev:00 (for Maitree Project Castings) and for foreign supplier is TDC:0:433 Rev00 (or latest applicable).
- Any additional requirement shall be specifically called for in PO.
- BHEL intends to get delivery of castings along with radiographed sets as ordered. The claim of vendor for payment of supplies against any PO can be put on hold if the requisite no. of radiographed sets has not been delivered by then. BHEL shall reserve the right to select any sample from a lot offered and get it radiographed at vendor's works.

As per requirement of BHEL, vendor will be required to submit radiographic test reports as specified in the purchase orders released under the purview of the contract. BHEL will review and evaluate radiography films and RT reports and reserves the discretion to do so at the premises of the vendor.

Radiography procedure shall be as per ASME B 16.34, as mentioned in BHEL's TDC: 0:0412 Rev 26 Clause 7, S. No. 1 and TDC:6:396 Rev:00 (for Maitree Project Castings) and for foreign supplier is TDC:0:433 Rev00 (or latest applicable). All the radiography films shall be dispatched to BHEL without delay either before the castings are being dispatched or along with the castings. Vendor shall undertake radiography on new development as per TDC 412 Rev.26 and TDC:6:396 Rev:00 (for Maitree Project Castings) and for foreign supplier is TDC:0:433 Rev00 (or latest applicable).

RT charges for Indian supplier: Fixed RT charges @ Ir₁₉₂ : Rs 0.99 & Co₆₀ : Rs 1.50 per sq. cm shall be paid on actual verified film area.

RT charges for Foreign supplier: Fixed RT charges @ Ir₁₉₂ : Rs 0.99 & Co₆₀ : Rs 1.50 per sq. cm shall be paid on actual verified film area. The above RT cost is landed cost to BHEL (FOR Goindwal). Loading as per clause 2e of tender will be done if vendor is not quoting FOR Goindwal basis.

12. **REPAIR OF CASTINGS:**

All castings shall be supplied free of defects like shrinkage, hot tears and process variable defects like sand inclusion, slag inclusion, gas entrapment etc. If any casting is found containing defects more than allowable limit, the same shall be upgraded at foundry itself before dispatch to BHEL with necessary documentation, enabling BHEL to make use of such castings immediately for production.

Castings at different stages of manufacturing are found to be defective shall be repaired at the defective area and the repaired area shall be accepted after performing requisite NDT at

vendors cost for further acceptance. BHEL shall decide about the areas to be repaired in all such cases.

Castings that are found defective after receipt at BHEL, if necessary repair of the castings will be carried out by BHEL and repair charges @ Rs. 19.10 per cc for carbon Steel shall be deducted from any of the running bills of the vendor.

In case of rejection of casting after machining/ assembly/testing due to defects more than allowable limits or major variation in dimensions etc. then the entire cost incurred till that stage shall be deducted from any of the running bills of the vendor.

13. REPLACEMENT OF REJECTIONS

If the material is rejected due to defective workmanship during inspection or at the time of actual use, within the guarantee period (i.e. as per clause 16), the rejected material shall be replaced by the supplier. Corresponding quantity shall be treated as unsupplied against respective purchase order till replacement is received at BHEL. If the material is found defective and rejected during use for which payment has already been released the rejected quantity shall be supplied free of cost by the vendor within a month of intimation of the rejection by BHEL.

Lifting of rejected material is under Supplier's scope. BHEL will inform related invoice, qty etc to supplier. Supplier is expected to give the plan to lift and advance intimation when visiting to lift the material. Material should be lifted within one month from date of intimation. After one month BHEL will not be responsible for rejected material. BHEL may decide to send the rejected material on To Pay basis to supplier. Any leniency/unresponsiveness/delay on part of supplier may lead to appropriate action by BHEL. Any request to postpone in written may be considered but replacement should not be linked with lifting of material

Item/s pending in previous PO has to be billed in previous PO only. Otherwise BHEL will be free to adjust the supplies in previous PO. Any implication of taxes etc will be on supplier's account. For this it is desirable to reconcile the pending PO statement every month/frequently. BHEL will give pending PO statement every month. This can also be viewed at Portal (<http://vis.bheltry.co.in/mm/index.jsp>).

14. LOADING:

BHEL shall not give counter offers to any vendor.

15. GUARANTEE:

Vendor shall give a guarantee of 18 months from the date of dispatch or 12 months from date of receipt, whichever is earlier (for undertaking repairs/replacement of any defect observed during machining/ assembly/ hydraulic testing or subsequent processing notwithstanding the previous acceptance. Entire cost of such castings will be deducted from any of the running bills/PBG). In case of non-acceptance of this term bid will be rejected.

16. LIQUIDATED DAMAGES:

‘Time is the essence of the contract’. As such, delivery of goods specified in the Purchase Orders released under the scope this contract shall be made within the time limit prescribed therein. Liquidated damages clause will be applicable for delayed supplies @ 0.5% per week or part thereof subject to a maximum of 10%.

If any vendor does not accept LD ½% of the supply for each week of delay subject to a maximum of 5%, their offer is likely to be rejected by BHEL and the price bid shall not be opened. Bidders accepting for 10% LD shall not be loaded on account of LD. However bidders who offer any other % LD [between 5% to 10%] shall be loaded @ % deviation from 10% and their accepted %.e.g. If a bidder accepts for a max of 7% LD only, their offer would be loaded @ 3% (10 – 7 = 3).

BHEL reserves the right to receive or not receive material after the due date of PO.

17. RISK PURCHASE:

BHEL shall be entitled to terminate the contract/pending POs at any stage and to purchase elsewhere at the risk and cost of the vendor, either the whole of the goods or any part thereof which the supplier has failed to deliver or dispatch within the time stipulated as aforesaid. Vendor shall be liable for the losses, which BHEL may sustain by way of such risk purchase.

18. SUB-CONTRACT:

The casting process shall not be sub-contracted, assigned or otherwise transferred without previously obtaining the BHEL's consent in writing.

19. FORCE MAJEURE:

If at any time during the continuance of the contract, the performance in which or in any part by either party of any obligations under the contract are prevented or delayed by reason of any war, hostilities, acts of public enemy, civil commotion, sabotage, fires, explosions, epidemics, quarantine restrictions, or acts of God (hereinafter referred to “an events” then provided the notice of happening of any such event is given by either party to the other within 21 days of the occurrence thereof, neither party shall by reason of such event be entitled to terminate the contract nor shall either party have any claim for damages against the other in respect of such non-performance and delay in performance and delivery under the contract shall be resumed as soon as practicable after such event has come to an end or ceased to exist. If the performance in whole or part of any obligation under the contract is prevented or delayed by reason of any such event, claims of extension of time shall be granted for periods considered reasonable by BHEL subject to prior notification by the vendor to BHEL of the particulars of the event and supply to BHEL, if required, of any supporting evidence. Any waiver of time in respect of partial installment shall not be deemed a waiver of time in respect of remaining deliveries.

20. DISPUTES:

In the event of any dispute and/or difference arising between the Vendor and BHEL as to interpretation and/or execution of the contract and/or the respective rights and liabilities of the parties, such disputes and/or differences shall be referred to the sole arbitrator nominated by BHEL. The provisions of the Indian Arbitration Act and the rules there under

shall apply to such arbitration. The award passed by the arbitrator shall be final and conclusively binding on all the parties.

21. JURISDICTION:

The court of the place from where the purchase order is issued during the contractual period shall alone have jurisdiction to decide any dispute arising out of or in connection with the purchase order.

22. GENERAL:

- a) BHEL will not be bound by any power of attorney granted by the vendors or by changes in the composition of the firm made subsequent to the execution of the contract. They may, however, recognize such power of attorney and changes after obtaining proper legal advice, the cost of which will be chargeable to the vendor concerned.
- b) BHEL reserves the right to extend the due date of opening, which shall be informed. Validity of offer shall be deemed to be revised accordingly.
- c) BHEL reserves the right to accept or reject any part or whole of the tender of a bidder by assigning a valid reason thereof. BHEL reserves the right to cancel the tender without assigning any reason thereof and without any obligation before any commitment.
- d) If possible, please submit soft copy of price quotation [copied on a blank CD of standard make] put in the sealed offer.
- e) Acceptance of all terms and conditions, in the form of signed copy of T&C or confirmation separately written, shall be submitted along with quotation. If nothing is mentioned, it shall be concluded that terms and conditions are acceptable.
- f) BHEL may increase/decrease item/s based on BHEL requirement before price bid opening. Suitable price implication may be asked from suppliers.
- g) BHEL may drop item/items from tender at any stage of tender before placing PO. BHEL may also delete PO with consent with supplier within delivery date of PO.
- h) After releasing PO, it is assumed that supplier has accepted PO if we do not receive acknowledgement from supplier within 5 days of date of PO.
- i) Any term is special tender terms and conditions will supersede the GCC.
- j) BHEL reserves the right to negotiate with L1 bidder/s of Reverse auction/sealed bid.
- k) The Drawings and Technical documents given in this enquiry are the sole property of BHEL. It must not be used directly or indirectly in any way detrimental to the interest of the company.
- l) **Documents submitted with the offer shall be signed and stamped in each page by authorized representative of the bidder.**
- m) If vendor has mentioned **FOR Punjab** in his quotation, then it will be considered as FOR Goindwal Sahib (Pb.).

For Foreign Supplier only:

- a. All documents are to be in “ENGLISH LANGUAGE” only.
- b. Contract No. and Import License No. are to be inducted in all documents
- c. Invoice should show the description of the goods and the unit rate of each item as in the purchase contract.

- d. Packing list must indicate case identification, case dimension, and case contents, gross and net weight.
- e. Against each item in the invoice and packing list, the serial number of the corresponding item in the purchase contract or as per order acknowledgement should be indicated.
- f. Demurrage charges due to delayed presentation of the original shipping documents for the reason not attributable to the buyer should be borne by the seller
- g. All documents should be submitted in triplicate

23. WORDS AND FIGURES:

- a. If, in the price structure quoted for the required goods/ services/ works, there is discrepancy between the unit price and the total price (which is obtained by multiplying the unit price by the quantity}, the unit price shall prevail and the total price corrected accordingly, unless in the opinion of the purchaser there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price corrected accordingly.
- b. If there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; and
- c. If there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject of (a) and (b) above.
- d. If there is such discrepancy in an offer, the same shall be conveyed to the bidder with target date upto which the bidder has to send his acceptance on the above lines and if the bidder does not agree to the decision of the purchaser, the bid is liable to be ignored.
- e. Bids should be free from correction, overwriting, using corrective fluid, etc. Any interlineation, cutting, erasure or overwriting shall be valid only if they are attested under full signature(s) of person(s) signing the bid else shall be liable for rejection.
- f. All overwriting/cutting, etc will be numbered by bid opening officials and announced during bid opening.

24. PREFERENCES FOR MSE's :

Preferences as mentioned in "Public Procurement Policy for Micro and Small Enterprises (MSEs) Order, 2012" shall be given to Micro and Small enterprises.

Main points which are mentioned in the above order are as follows:

- 25% Procurement of the tender value shall be made from MSE (Micro, Small Enterprises) firms.
- 6.25% from the above 25% procurement quantity shall be procured from MSE's owned by SC /ST's. Failure to participate by any MSE owned by SC/ST's this 6.25% quantity shall be procured from other MSEs.
- 3% from within the 25% quantity offered to the MSE's shall be reserved for women owned MSE's. Failure to participate by any MSE owned by SC/ST's this 3% quantity shall be procured from other MSEs.

- EMD shall be exempted for MSE's. All these benefits are subject to production of all statutory documents
- In tender, participating Micro and Small Enterprises quoting price within price band of L1+15 per cent 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 and Small Enterprise shall be allowed to supply up to 20 per cent of total tendered value. In case of more than one such Micro and Small Enterprise, the supply shall be shared proportionately (to tendered quantity).

“MSE suppliers can avail the intended benefits only if they submit along with the offer, attested copies of either EM II certificate having deemed validity (five years from the date of issue of acknowledgement in EM II) or valid NSIC certificate or EM II certificate along with attested copy of a CA certificate (Format enclosed at Annexure -1 where deemed validity of EM II certificate of five years has expired) applicable for the relevant financial year (latest audited). Date to be reckoned for determining the deemed validity will be the date of bid opening (Part 1 in case of two part bid). Non submission of such documents will lead to consideration of their bid at par with other bidders. No benefit shall be applicable for this enquiry if any deficiency in the above required documents is not submitted before price bid opening. If the tender is to be submitted through e-procurement portal, then the above required documents are to be uploaded on the portal. Documents should be notarized or attested by a Gazetted officer.” UAN shall also be considered for giving MSE benefits as per government guidelines.

25. BANNED FIRMS:

The offers of the bidders who are on the banned list as also the offer of the bidders, who engage the services of the banned firms, shall be rejected. The list of banned firms is available on BHEL website www.bhel.com.

26. FRAUD PREVENTION POLICY:

The Bidder along with its associate/collaborators/sub-contractors/sub-vendors/consultants/service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website <http://www.bhel.com> and shall immediately bring to the notice of BHEL management about any fraud or suspected fraud as soon as it comes to their notice.

27. CLARIFICATIONS:

The correspondence exchanged against the tender from both tenderer and BHEL through email & through e-procurement portal are considered as valid document legally though it is not signed. It is treated as valid confirmations made on behalf of the respective company and very much comes under the legal ambit of the business transaction and hence it is binding on both the parties to the business. Any transaction pertaining to the tender from both the parties of business done round the clock irrespective of the office or business hours of the companies, are valid legally and binding on both the parties. This applies to

the extent only in such cases where deadline time for transaction is not specifically declared by either or both the parties to the business. In case Letter of Intent (LOI) is issued through email, the PC generated time and date of mail shall be construed as the official time and date of release of LOI. In as much as this date is within the last date of validity given by the bidder the LOI is said to have been issued within the validity period and shall be bidding on both the parties to the business.

28. REVERSE AUCTION:

BHEL reserves the right to go for Reverse Auction (RA) (Guidelines as available on www.bhel.com) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial evaluation. Bidders to give their acceptance with the offer for participation in RA. Non-acceptance to participate in RA may result in non-consideration of their bids, in case BHEL decides to go for RA.

Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit 'Process compliance form' (to the designated service provider) as well as 'Online sealed bid' in the Reverse Auction. Non-submission of 'Process compliance form' or 'Online sealed bid' by the agreed bidder(s) will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com).

The bidders have to necessarily submit online sealed bid less than or equal to their envelope sealed price bid already submitted to BHEL along with the offer. The envelope sealed price bid of successful L1 bidder in RA, if conducted, shall also be opened after RA and the order will be placed on lower of the two bids (RA closing price & envelope sealed price) thus obtained. The bidder having submitted this offer specifically agrees to this condition and undertakes to execute the contract on thus awarded rates.

If it is found that L1 bidder has quoted higher in online sealed bid in comparison to envelope sealed bid for any item(s), the bidder will be issued a warning letter to this effect. However, if the same bidder again defaults on this count in any subsequent tender in the unit, it will be considered as fraud and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com).

29. SUSPENSION OF BUSINESS DEALINGS WITH DEFAULTERS

The offers of the bidders who are under suspension as also the offers of the bidders, who engage the services of the banned firms, shall be rejected. The list of banned firms is available on BHEL web site www.bhel.com.

1.0 Integrity commitment, performance of the contract and punitive action thereof:

1.1. Commitment by BHEL:

BHEL commits to take all measures necessary to prevent corruption in connection with the tender process and execution of the contract. BHEL will during the tender process treat all Bidder(s) in a transparent and fair manner, and with equity.

1.2. Commitment by Bidder/ Supplier/ Contractor:

1.2.1. The bidder/ supplier/ contractor commit to take all measures to prevent corruption and will not directly or indirectly influence any decision or benefit which he is not legally entitled to nor will act or omit in any manner which tantamount to an

offence punishable under any provision of the Indian Penal Code, 1860 or any other law in force in India.

1.2.2. The bidder/ supplier/ contractor will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract and shall adhere to relevant guidelines issued from time to time by Govt. of India/ BHEL.

1.2.3. The bidder/ supplier/ contractor will perform/ execute the contract as per the contract terms & conditions and will not default without any reasonable cause, which causes loss of business/ money/ reputation, to BHEL.

If any bidder/ supplier/ contractor during pre-tendering/ tendering/ post tendering/ award/ execution/ post-execution stage indulges in mal-practices, cheating, bribery, fraud or and other misconduct or formation of cartel so as to influence the bidding process or influence the price or acts or omits in any manner which tantamount to an offence punishable under any provision of the Indian Penal Code, 1860 or any other law in force in India, then, action may be taken against such bidder/ supplier/ contractor as per extant guidelines of the company available on [www. bhel.com](http://www.bhel.com) and/or under applicable legal provisions

30. DISCLAIMER CLAUSE: (Only for E procurement)

Neither the Organization (Bharat Heavy Electricals Ltd.) nor the service provider (M/s e Procurement Technologies limited) is responsible for any failure of submission of bids due to failure of internet or other connectivity problems or reasons thereof.

31. LOI (Letter of Intent)

BHEL may issue LOI prior to the PO for any reason whatsoever. The LOI in such cases is to be treated as PO for all practical purposes and all the Terms & Conditions of the tender shall be applicable from the date of issue of LOI.

32. PREFERENCE TO MAKE IN INDIA

For the procurement, Public Procurement (Preference to make in India), order 2017 dated 15.06.2017 & 28.05.2018 and subsequent Orders issued by respective Nodal Ministry shall be applicable even if issued after issue of this NIT before finalization of contract/PO/WO against this NIT

Check List for Tender

Necessary Document to be submitted in Part-I:

- Acceptance of all techno-commercial terms and conditions. If nothing is mentioned for any terms and condition, it shall be concluded that the same is accepted.
- MSME certificate if applicable

Document to be submitted in Part-II:

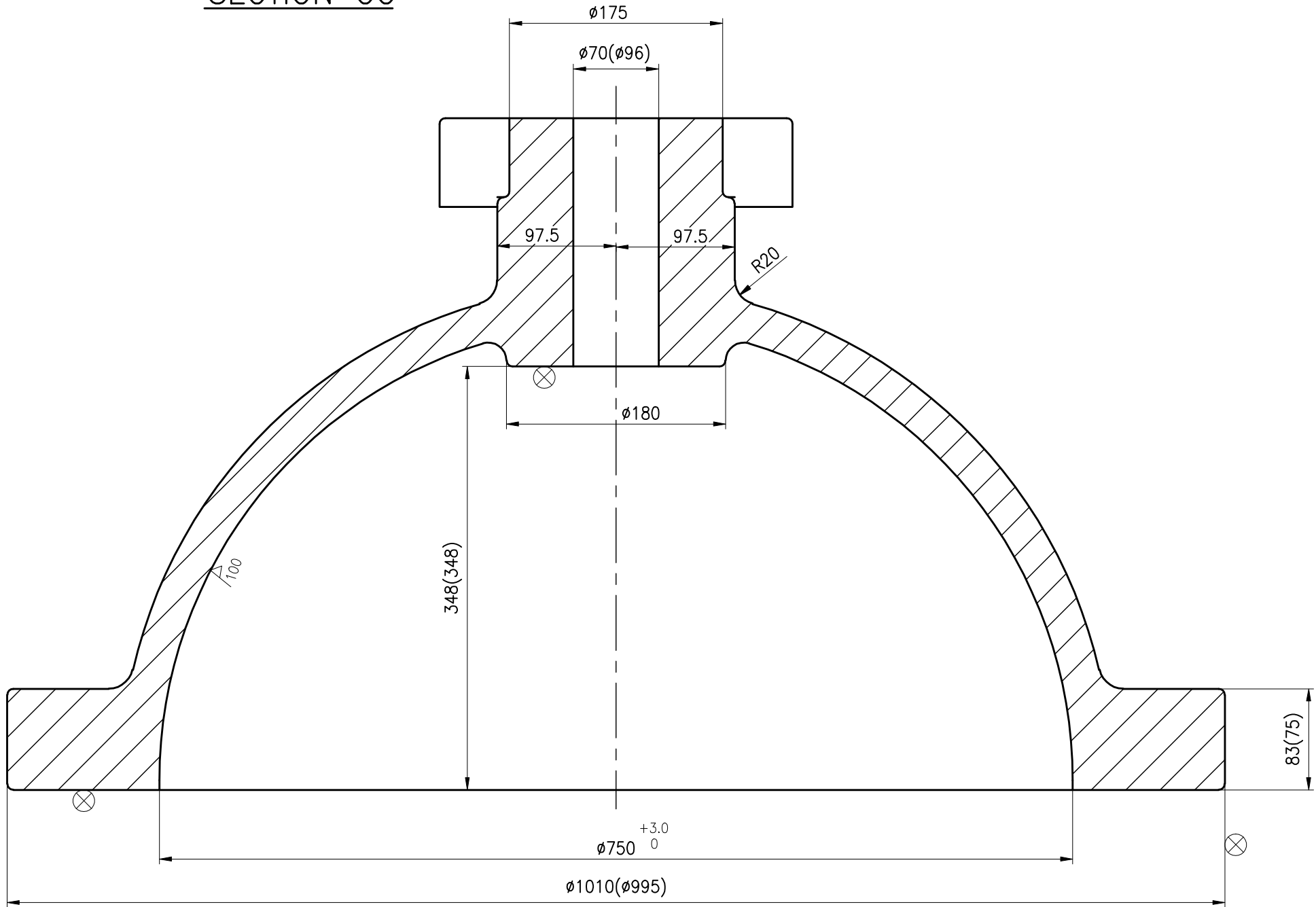
Prices per kg mentioned in figures as well as in words. **No other condition shall be mentioned.**

Note: Kindly ensure that each page of document given with quotation is signed by authorized representative of company.

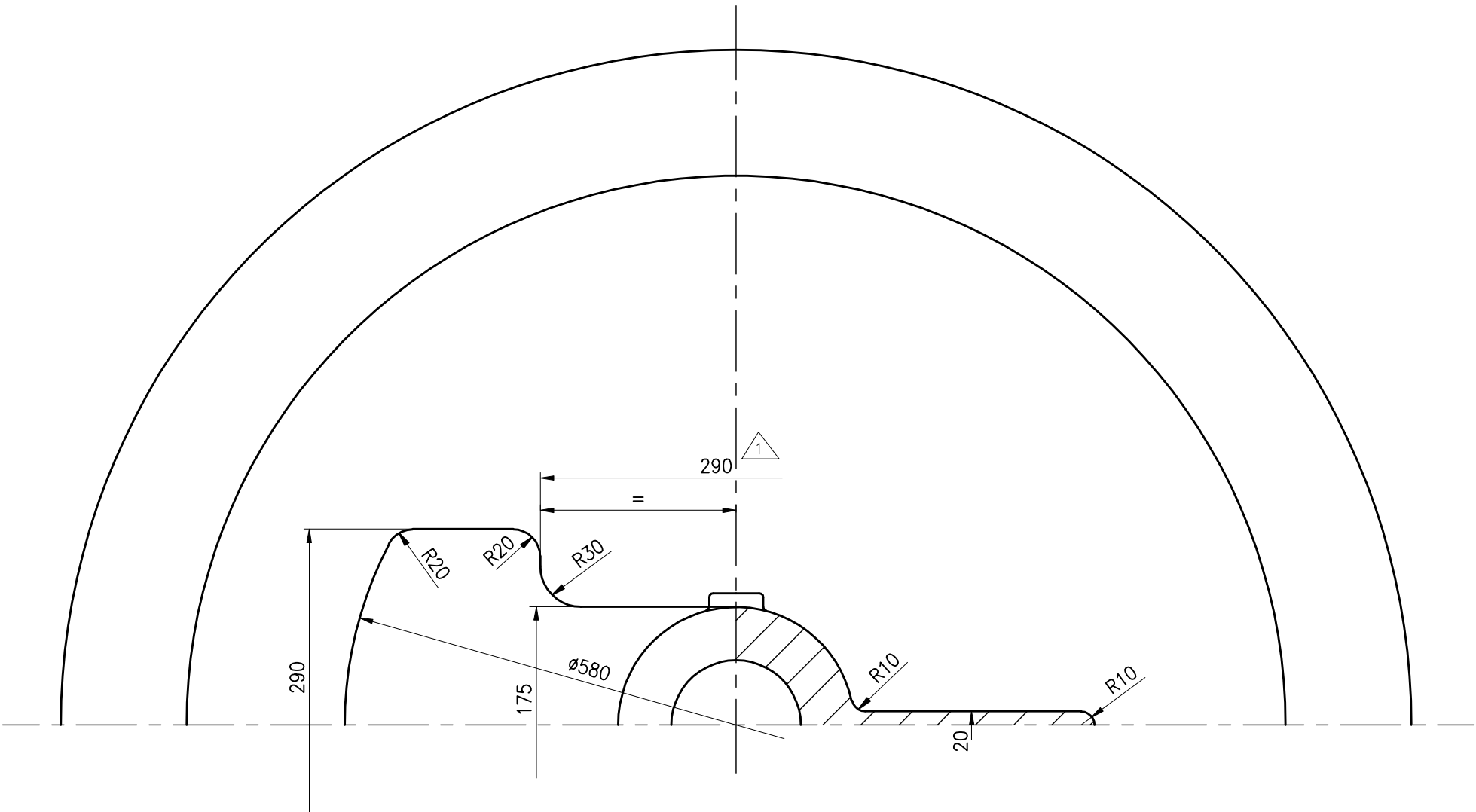
2-V-0000-14463R/1
DRAWING NO

ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP

SECTION CC



SECTION BB



NOTES:

1. CASTING SHALL COMPLY WITH THE REQUIREMENT OF LATEST APPLICABLE QUALITY WORK INSTRUCTION IN ALL RESPECTS.
2. NECESSARY ALLOWANCES HAVE BEEN ADDED ON ALL MACHINABLE SURFACES.
3. PERMISSIBLE DIMENSIONAL DEVIATIONS OF CASTING SURFACES REFER LATEST APPLICABLE QUALITY WORK INSTRUCTION
4. UNSPECIFIED CASTING RADIOUS 5mm
5. ⊗ SURFACE TO BE MACHINED.
6. HEIGHT OF CASTING LETTERS 40mm.
7. FINISH MACHINED DIMENSIONS ARE INDICATED WITHIN BRACKETS FOR INFORMATION.
8. PUNCHING DETAILS SHALL BE MARKED ONLY ON RAISED FLAT SURFACE ONLY.
9. ✓ CASTING SURFACES MUST BE OF HIGH QUALITY WITHOUT SURFACE UNEVENNESS

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01	2-V-NF97-14463R/1	922018300000	A216 WCB CERTIFY,NR	WCB	
SL. No.	DRAWING No.	MATL. CODE	MATL. SPECN.	*MATL. MARK	
No OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT
				NET WT (kg)	GROSS WT (kg)
				DRAWING No	ITEM No

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT					
BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI -620014.			DRN V.BAIRAVAN	SIGN	DATE 10.10.09
365-120			CHD S.SATHEESKUMAR		10.10.09
DEPT VL			APPD M.RAJAKUMAR		10.10.09
CODE 320			REFERENCE INFORMATION		
TITLE			CAD:2-V-0000-14463R-1-0		
BONNET			DRAWING NO.		
26"/300 CLASS			2-V-0000-14463R		
			REV		
			1		

REV 1	DATE 29.01.10	ALTERED VB
ZONE	CHD & APPDSSK & MRK	
	DIMENSION 290 INCLUDED.	
	DCP. No.801026	

CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.

ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP

SECTION CC

NOTES:

1. CASTING SHALL COMPLY WITH THE REQUIREMENT OF LATEST APPLICABLE QUALITY WORK INSTRUCTION IN ALL RESPECTS.
2. NECESSARY ALLOWANCES HAVE BEEN ADDED ON ALL MACHINABLE SURFACES.
3. PERMISSIBLE DIMENSIONAL DEVIATIONS OF CASTING SURFACES REFER LATEST APPLICABLE QUALITY WORK INSTRUCTION
4. UNSPECIFIED CASTING RADIUS 3mm
5. ⊗ SURFACE TO BE MACHINED.
6. HEIGHT OF CASTING LETTERS 20mm.

BHEL
26
300
MATL. MARK
PUNCH MELT NO.

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01	2-V-NF97-14478R	922018320000	A216 WCB CERTIFY,NR		WCB
SL. No.	DRAWING No.	MATL. CODE	MATL. SPECN.		*MATL. MARK

No OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No
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	TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT
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	BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT, TIRUCHIRAPALLI -620014.	DRN	V.BAIRAVAN	SIGN	DATE	NO.OF VAR.
		CHD	S.SATHEESKUMAR		13.10.09	
		APPD	M.RAJAKUMAR		13.10.09	

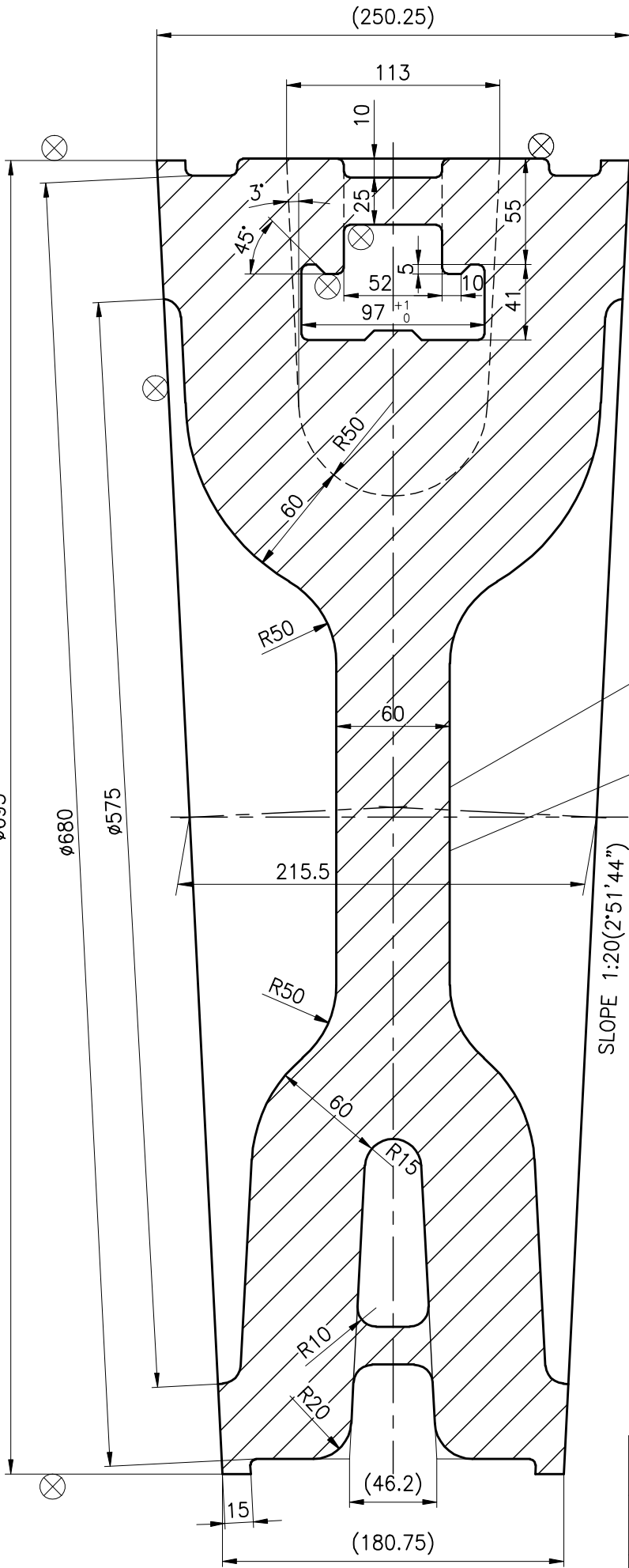
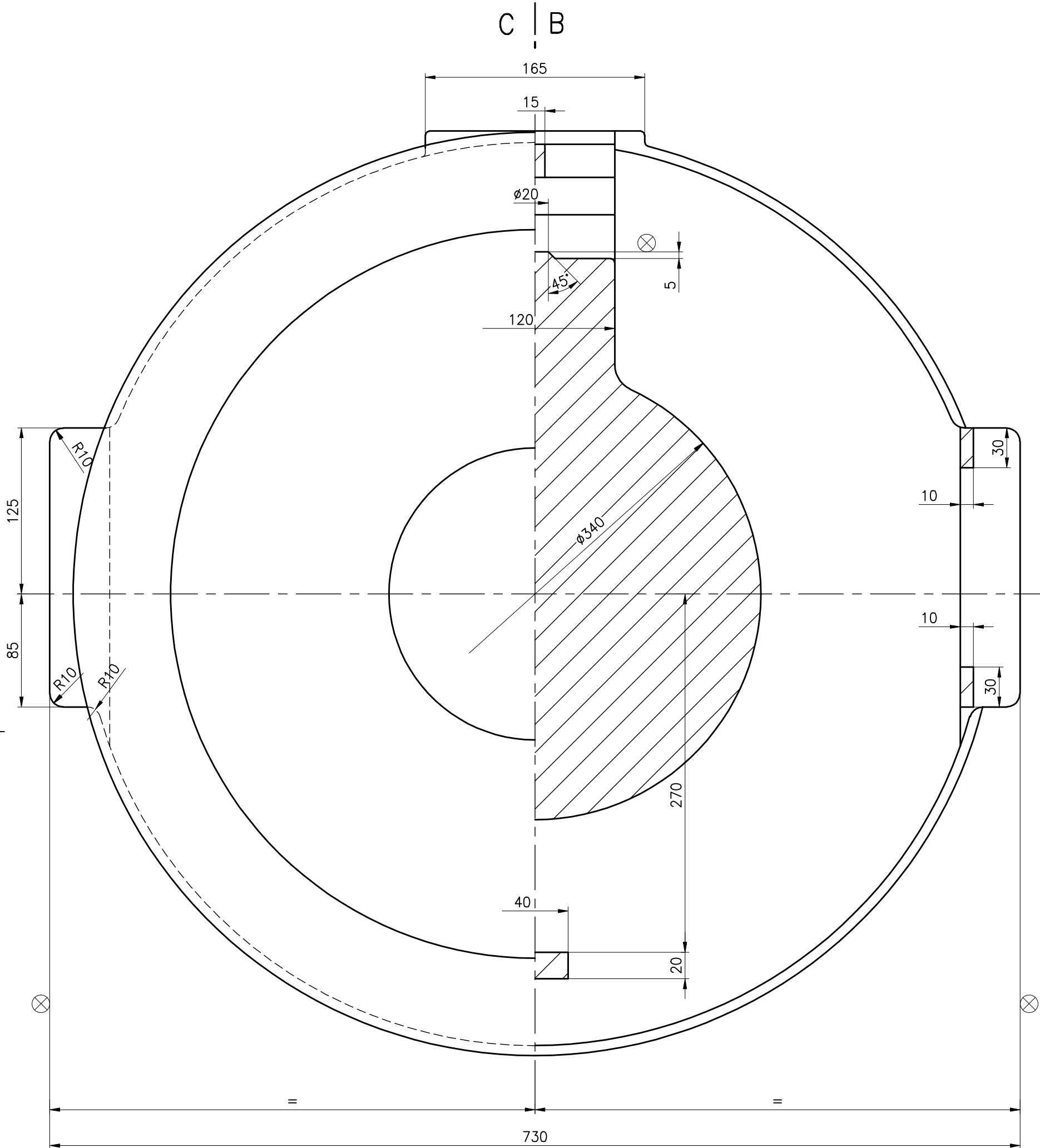
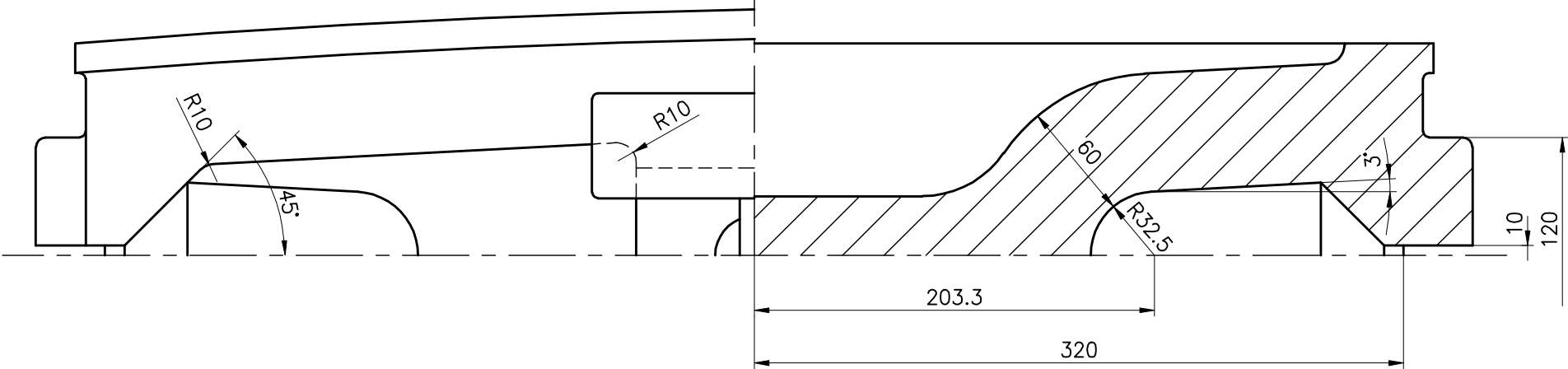
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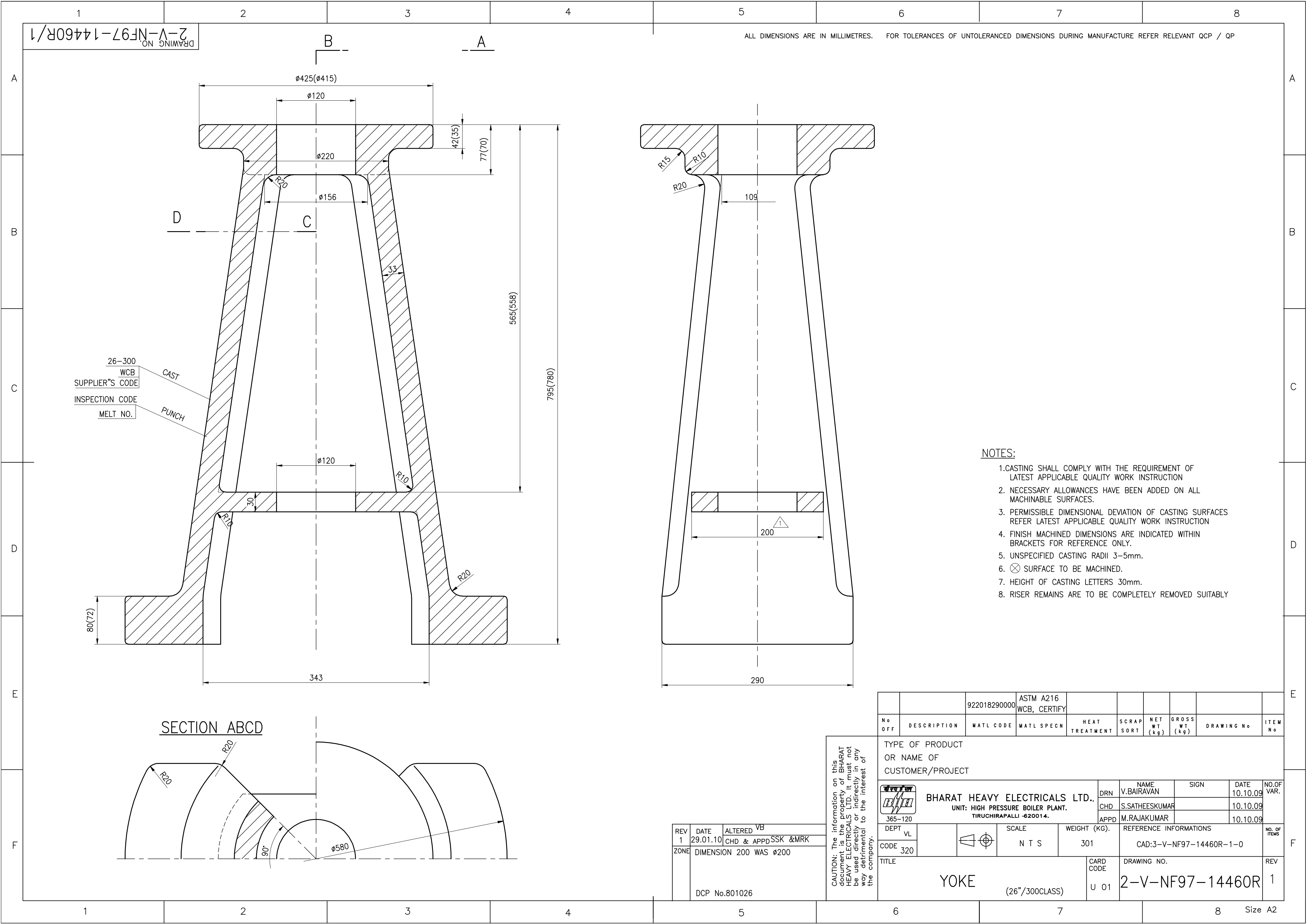
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REV	DATE	ALTERED
		CHD & APPD
ZONE		

SECTION BB





2-V-NF97-14460R/1
DRAWING NO

ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP

NOTES:

- 1.CASTING SHALL COMPLY WITH THE REQUIREMENT OF LATEST APPLICABLE QUALITY WORK INSTRUCTION
2. NECESSARY ALLOWANCES HAVE BEEN ADDED ON ALL MACHINABLE SURFACES.
3. PERMISSIBLE DIMENSIONAL DEVIATION OF CASTING SURFACES REFER LATEST APPLICABLE QUALITY WORK INSTRUCTION
4. FINISH MACHINED DIMENSIONS ARE INDICATED WITHIN BRACKETS FOR REFERENCE ONLY.
5. UNSPECIFIED CASTING RADII 3-5mm.
6. $\otimes$ SURFACE TO BE MACHINED.
7. HEIGHT OF CASTING LETTERS 30mm.
8. RISER REMAINS ARE TO BE COMPLETELY REMOVED SUITABLY

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TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT										
 BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI -620014.					DRN	NAME V.BAIRAVAN	SIGN	DATE 10.10.09	NO.OF VAR.	
					CHD	S.SATHEESKUMAR		10.10.09		
					APPD	M.RAJAKUMAR		10.10.09		
DEPT VL				SCALE N T S		WEIGHT (KG). 301	REFERENCE INFORMATION			NO.OF ITEMS
CODE 320							CAD:3-V-NF97-14460R-1-0			
TITLE YOKE (26"/300CLASS)							CARD CODE U 01	DRAWING NO. 2-V-NF97-14460R		REV 1

CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.

REV	DATE	ALTERED	VB
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ZONE	DIMENSION 200 WAS ϕ 200		
	DCP No.801026		

ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP.

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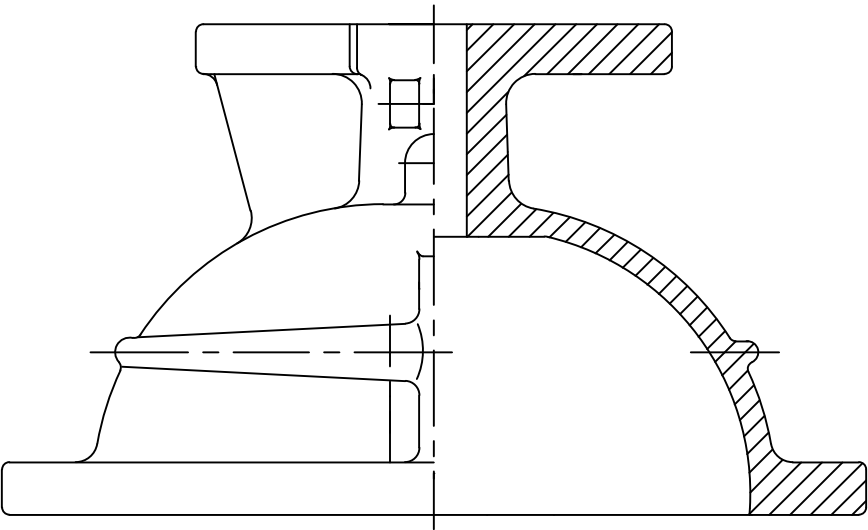
NOTE:

1. FOR ALL DETAILS, REFER THE BASIC DRAWING NUMBER WITH LATEST REVISION LISTED IN THE TABULAR COLUMN.

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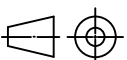
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2	3-V-U645-25914R	922003610005	2-V-N316-05938R/02	922003610000	SA216 WCB, NR	14-C150-GV
3	3-V-U646-25914R	922003980005	2-V-N350-05975R/02	922003980000	SA216 WCB, NR	16-C150-GV
4	3-V-U677-25914R	922001520005	2-V-N224-05713R/02	922001520000	SA216 WCB, NR	20-C150-GV
5	3-V-U678-25914R	922012200005	2-V-N929-08295R/01	922012200000	SA216 WCB, NR	32-C150-GV
6	3-V-U688-25914R	922017510005	2-V-NE96-14233R/01	922017510000	SA216 WCB, NR	22-C300-GV
7	3-V-U689-25914R	922018300005	2-V-NF97-14463R/01	922018300000	SA216 WCB, NR	26-C300-GV
8	3-V-U691-25914R	922005270005	1-V-N436-05126R	922005270000	SA216 WCB, NR	16-C300-GV
9	3-V-U692-25914R	922030810005	3-V-F999-25169P	922030810000	SA105, NR	38-C600-GV
10	3-V-U693-25914R	920339840005	2-V-F716-06224R	920339840000	SA216 WCC, NR	10-C600-GV
11	3-V-U695-25914R	920339860005	2-V-F717-06225R	920339860000	SA216 WCC, NR	12-C600-GV
12	3-V-U817-25914R	922020070005	2-V-NG10-06130R	922020070000	SA217 WC9, NT	20-C300-GV
13	3-V-U971-25914R	922033220005	2-V-NJ26-14944R	922033220000	SA217 C12A, NT	18-C300-GV



NOTES:

1. FOR ALL DETAILS REFER THE BASIC DRAWING No. LISTED IN THE TABULATION.

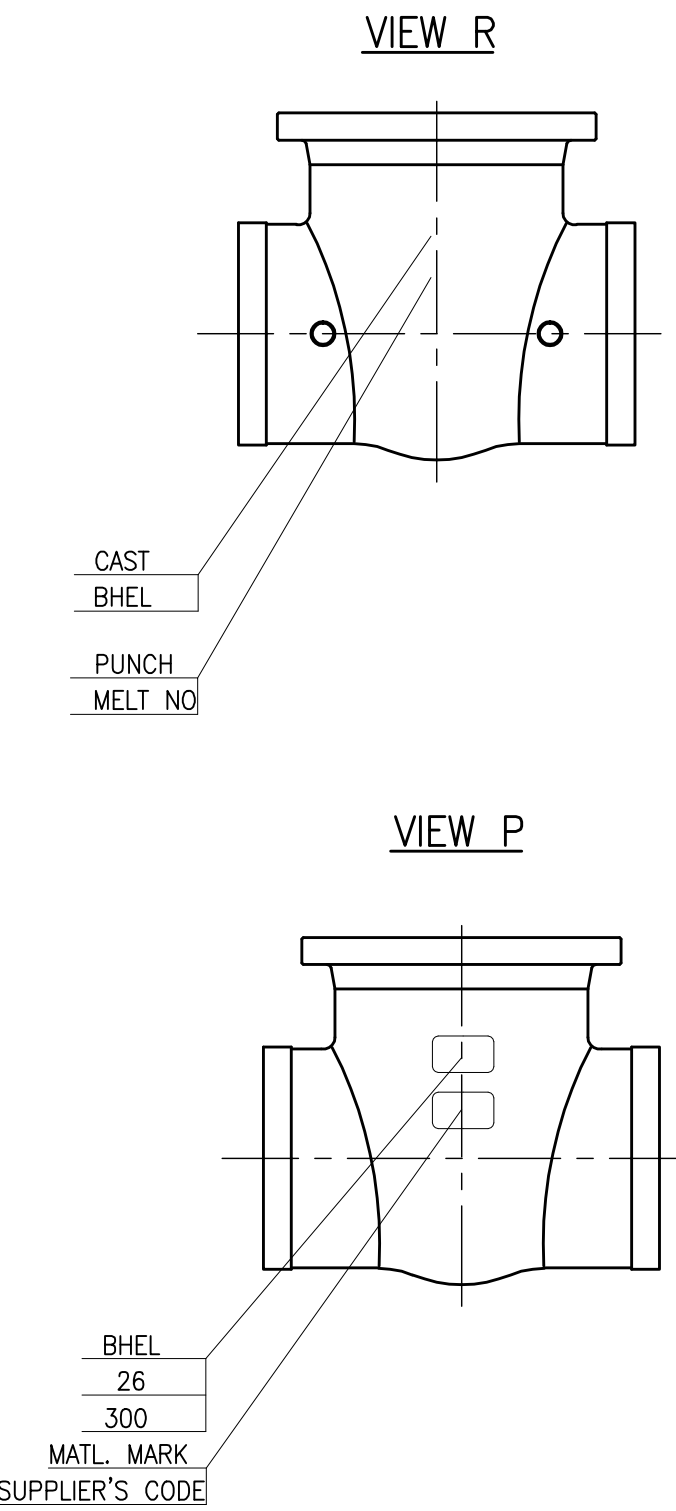
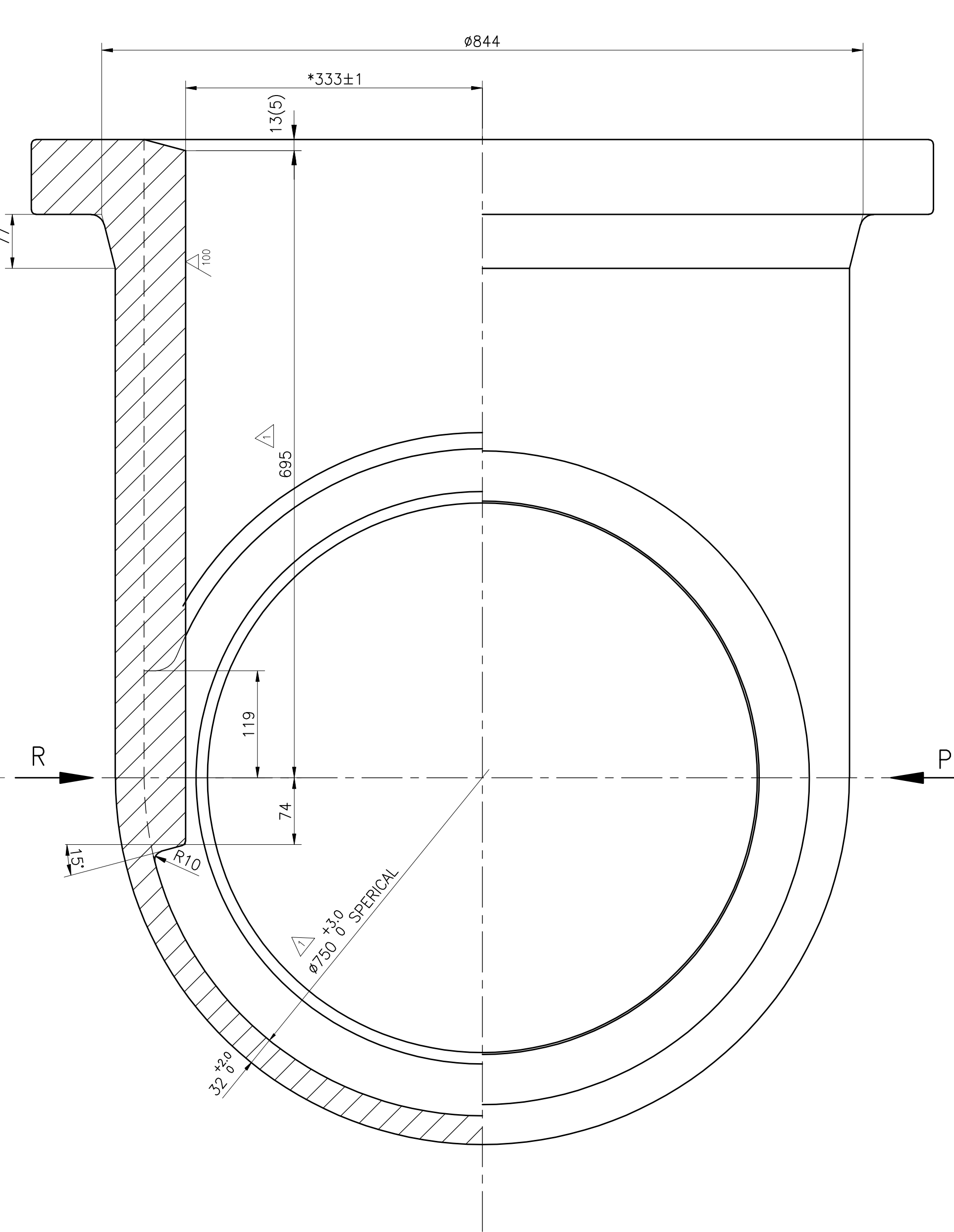
--	--	--	--	--	--	--	--	--	--
NO OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT									
 BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI-620014.					DRN	NAME	SIGN	DATE	NO.OF VAR.
					CHD	S.SATHEESKUMAR		11.04.18	
					APPD	K.RAJASEKARAN		11.04.18	
DEPT VL			SCALE	WEIGHT (KG).	REFERENCE INFORMATIONSTITLE				NO. OF ITEMS
CODE 320			NTS	-					
BONNET				CARD CODE U 01	DRAWING NO. 3-V-0000-25914R 01				REV

REV	DATE	ALTERED	R.P.SINGH
01	10.12.18	CHD & APPD	SSK & KRS
SL.No. 13 INCLUDED.			

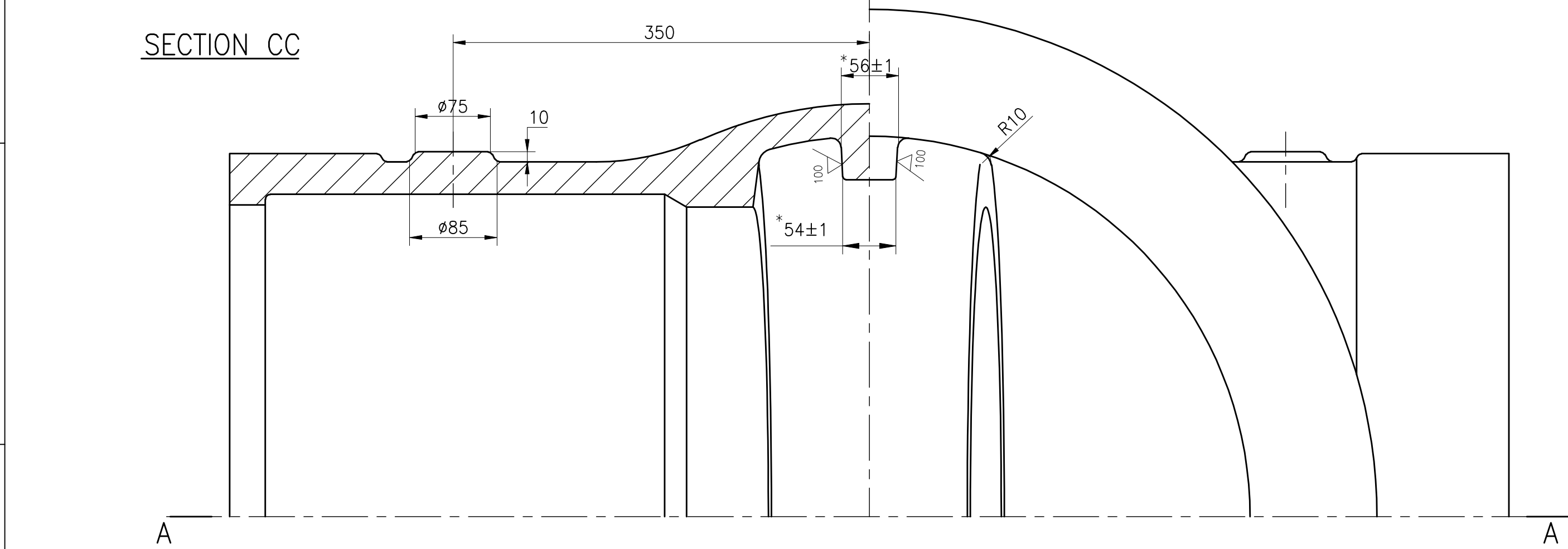
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SECTION BB

MARKING DETAILS ON CASTING



SECTION CC



1. NECESSARY MACHINING ALLOWANCES HAVE BEEN ADDED ON ALL MACHINABLE SURFACES.
2. THIS MARK INDICATES THE SURFACES TO BE MACHINED.
3. UNSPECIFIED CASTING RADI—R5 MAX.
4. FOR PERMISSIBLE DIMENSIONAL DEVIATIONS OF NON TOLERANCED CASTING DIMENSIONS REFER LATEST APPLICABLE QUALITY WORK INSTRUCTIONS.
5. CASTING SHALL GENERALLY COMPLY WITH THE REQUIREMENTS OF LATEST APPLICABLE QUALITY WORK INSTRUCTIONS IN ALL RESPECTS.
6. ¹⁰⁰ INDICATES THE CASTING SURFACES WHICH MUST BE OF HIGH QUALITY WITHOUT SURFACE UNEVENNESS.
7. FINISH MACHINED DIMENSIONS ARE INDICATED WITHIN BRACKETS FOR INFORMATION ONLY.,
8. PUNCHING DETAILS SHALL BE MARKED ONLY ON RAISED FLAT SURFACE GIVEN IN VIEW—R
9. HEIGHT OF CASTING LETTERS 100mm.
10. * MARKED DIMENSIONS IN GUIDES OF THE BODY TO BE CHECKED WITH TEMPLATES FOR DIMENSIONS/PROFILE AND PARALLELISM.

02	1-V-NF98-05228R/01	922018280000	A217 WC9,ATTEST	WC9					
01	1-V-NF97-05228R/01	922018270000	A216 WCB,ATTEST	WCB					
SL. No.	DRAWING No.	MATL. CODE	MATL. SPECN.	MATL. MARK					
No.Off	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP	NET WT (LBS)	GROSS WT (LBS)	DRAWING No	ITEM No

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT		DRN	NAME V.BAIRAVAN	SIGN	DATE 05.10.09
	BHARAT HEAVY ELECTRICALS LTD.,	CHD	S.SATHEESKUMAR		08.10.09
	UNIT: HIGH PRESSURE BOILER PLANT. TRUCHIRAPALLI-620014.	APPD	M.RAJAKUMAR		08.10.09

DEPT VL		SCALE	WEIGHT (KG.)	REFERENCE INFORMATION	
CODE 320		N T S	1587	CAD:1-V-0000-05228R-1-0	
TITLE			CARD CODE	DRAWING NO. REFER TABLE	REV
BODY				1-V-0000-05228R	01
CASTING			26"/300 CLASS		

REV	DATE	ALTERED	VB
01	06.04.10	CHD & APPD	SSK& MRK
ZONE	DIMENSIONS 407,695& Ø750 WEP		
	434,696 & Ø814 RESPECTIVELY.		
	DCP No.801044		

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SALE	WEIGHT
N T S	1

(KG).	REFERENCE INFORMATION
37	CAD:1-V-0000-05228R-1-0

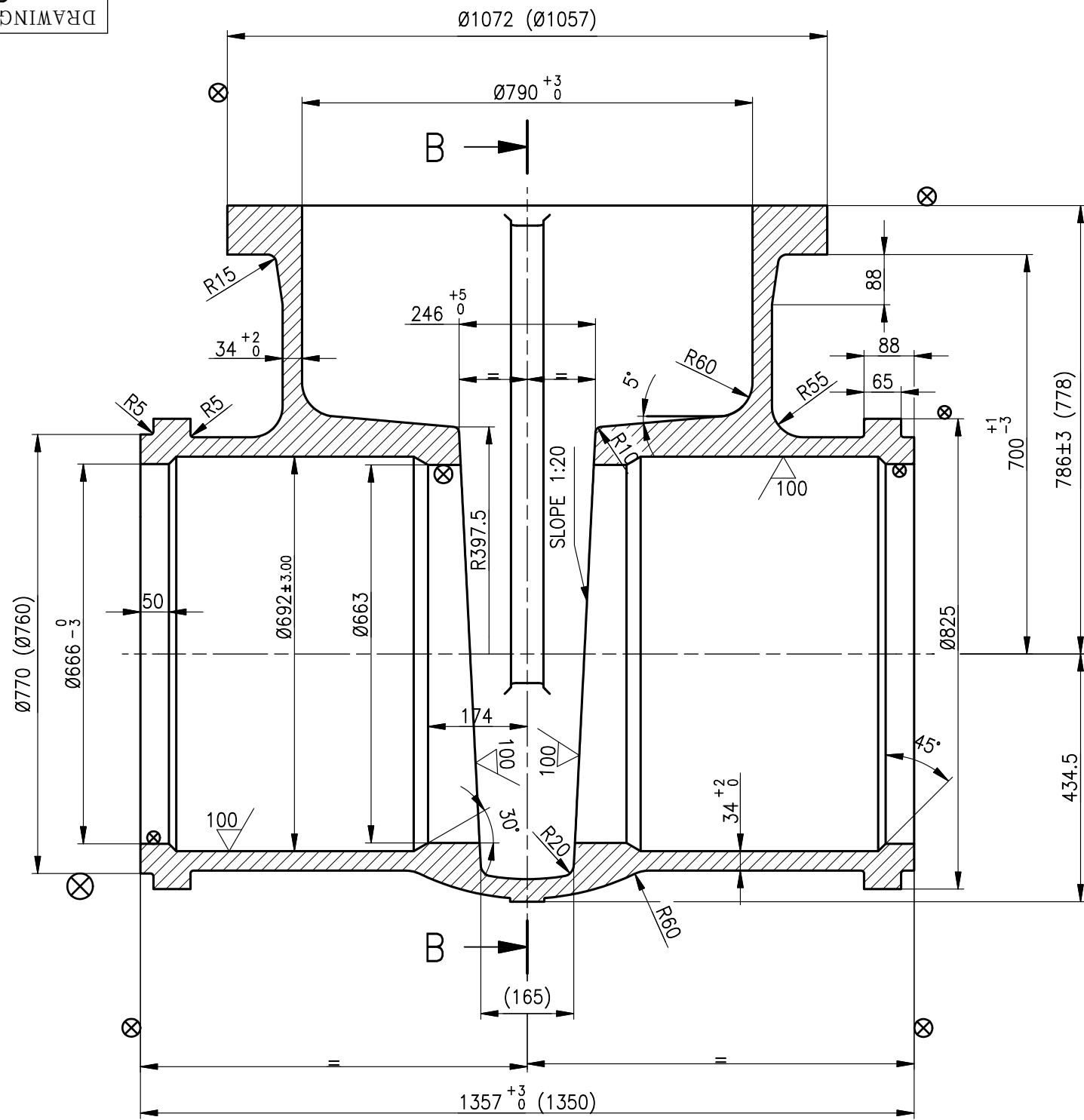
CARD CODE	DRAWING NO. REFER TABLE	RE
U. 24	1-V-0000-05228R	0

CASTING BODY 26"/300 CLASS

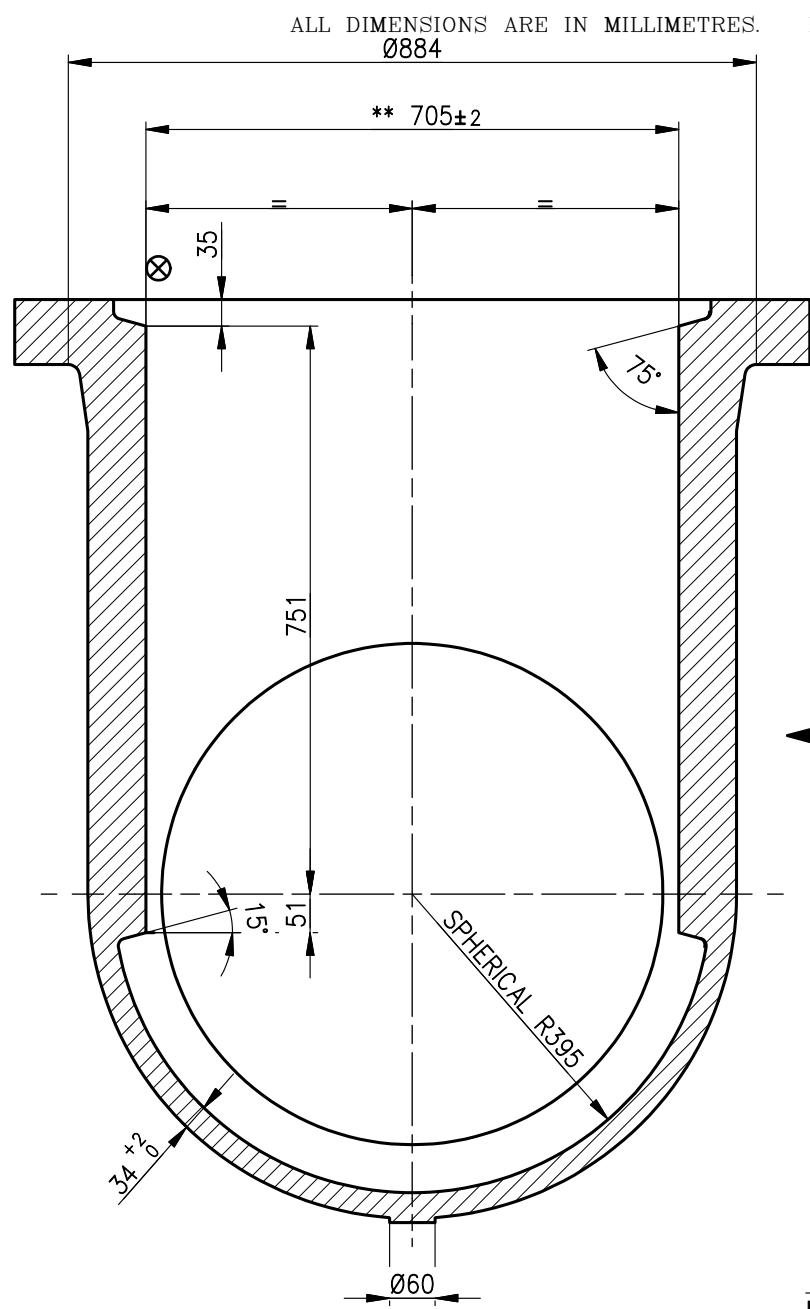
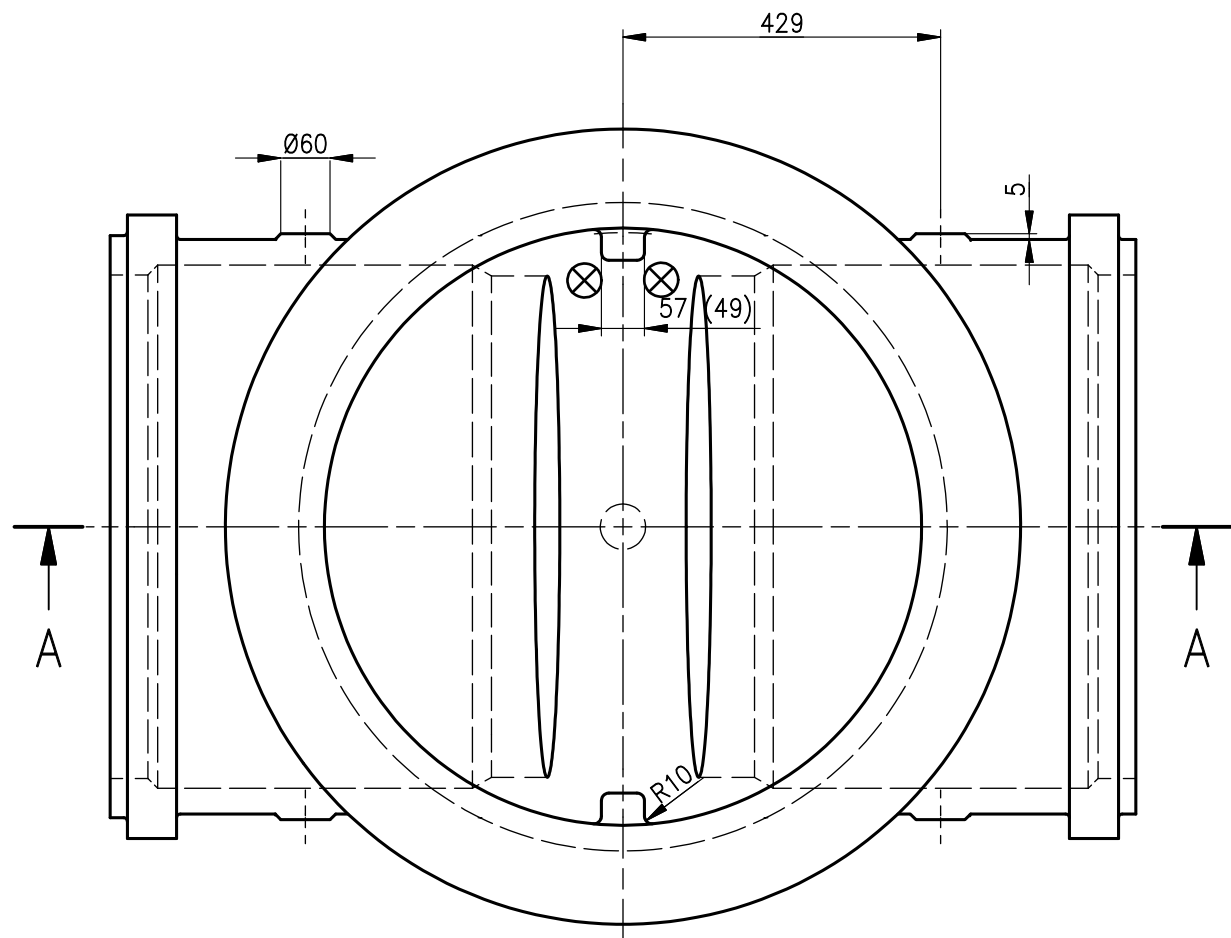
CARD CODE	DRAWING NO. REFER TABLE	RE
U. 24	1-V-0000-05228R	0

Size A1
12

2-V-0000-12299R
DRAWING NO.

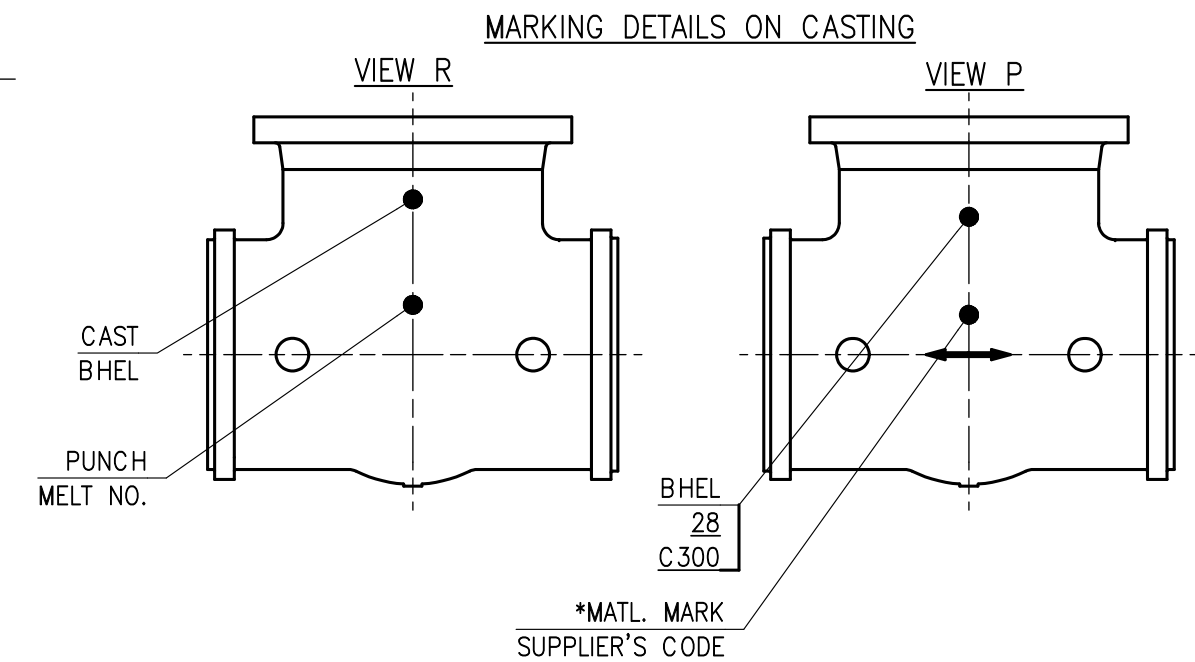


SECTION A-A



SECTION B-B

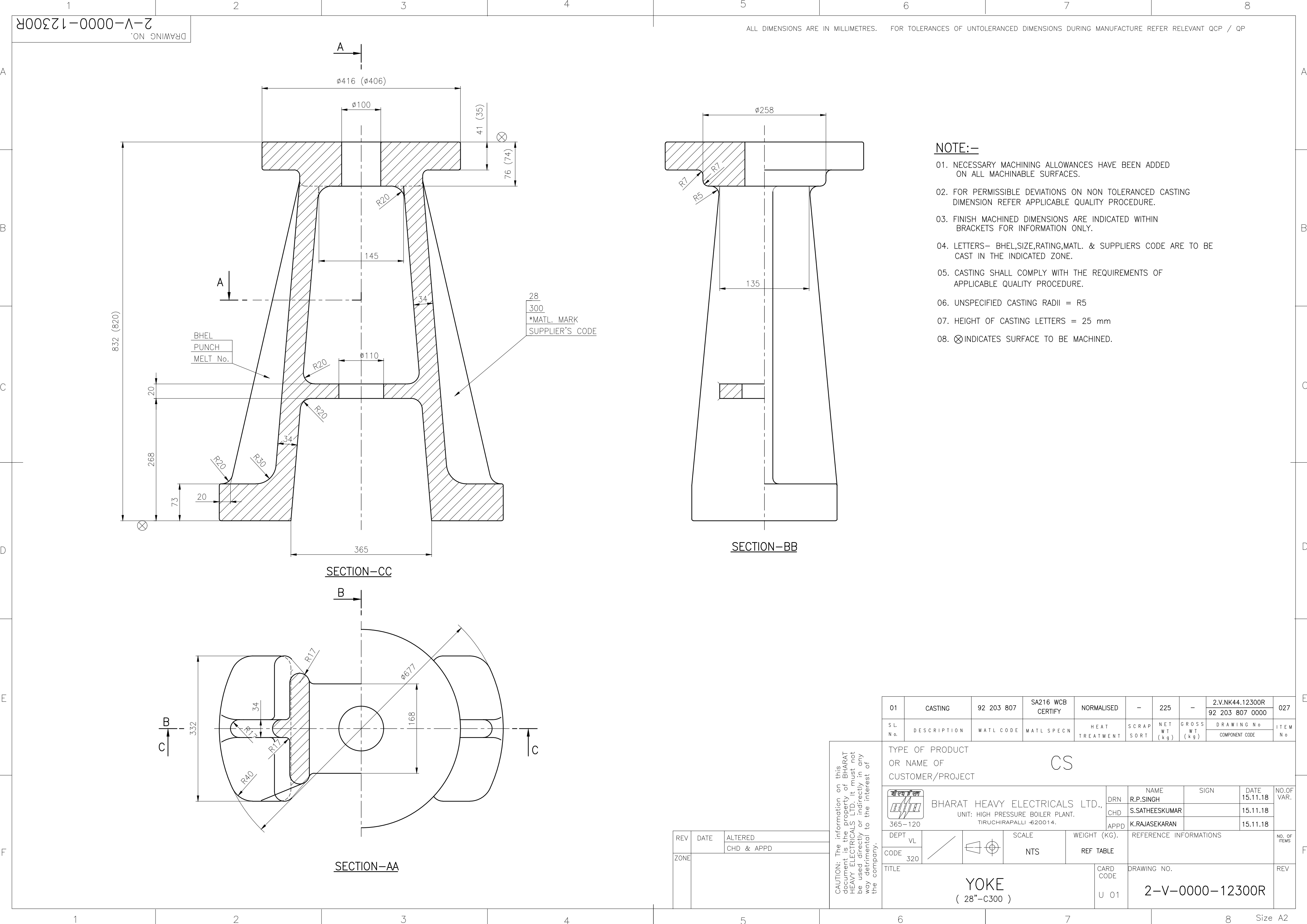
- ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP
- NOTE:-
01. NECESSARY MACHINING ALLOWANCES HAVE BEEN ADDED ON ALL MACHINABLE SURFACES.
 02. $\otimes$ THIS MARK INDICATES THE SURFACE TO BE MACHINED
 03. UNSPECIFIED CASTING RADII-R5 MAX.
 04. FOR PERMISSIBLE DIMENSIONAL DEVIATIONS OF NON TOLERNANCED CASTING DIMENSIONS REFER LATEST APPLICABLE QUALITY PROCEDURE
 05. CASTING SHALL GENERALLY COMPLY WITH THE REQUIREMENTS OF LATEST APPLICABLE PROCEDURE IN ALL RESPECTS.
 06. ∇ INDICATES THE CASTING SURFACES WHICH MUST BE HIGH QUALITY WITHOUT SURFACE UNEVENNESS.
 07. PUNCHING DETAILS SHALL BE MARKED ONLY ON RAISED FLAT SURFACE GIVEN IN VIEW R
 08. HEIGHT OF CASTING LETTERS 30mm.
 09. FINISH MACHINED DIMENSIONS ARE INDICATED WITHIN BRACKETS FOR INFORMATION ONLY.
 10. ** MARKED DIMENSIONS IN GUIDES OF THE BODY TO BE CHECKED WITH TEMPLATES FOR DIMENSIONS/PROFILE AND PARALLALISM.
 11. LETTERS- BHEL,SIZE,RATING,MATL. & SUPPLIERS CODE ARE TO BE CAST IN THE INDICATED ZONE.



CF8	04	CASTING	92 203 806	SA351 CF8	SH	-	-	-	2.V.NK47.12299R	
C12A	03	CASTING	92 203 805	SA217 C12A	NT	-	-	-	2.V.NK46.12299R	
WC9	02	CASTING	92 203 804	SA217 WC9	NT	-	-	-	2.V.NK45.12299R	
WCB	01	CASTING	92 203 803	SA216 WCB	NR	-	-	-	2.V.NK44.12299R	
*MATL. MARK	SL No	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT										CS
Bharat Heavy Electricals Ltd. UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI-620014.							DRN	R.P.SINGH	SIGN	DATE 12.11.18
365-120							CHD	S.SATHEES		DATE 12.11.18
							APPD	K.RAJASEKARAN		DATE 12.11.18
DEPT	V L	SCALE	WEIGHT (KG).	REFERENCE INFORMATION						NO. OF ITEMS
CODE	320	NTS	1703	-						REV
TITLE							CARD CODE	DRAWING NO.		
BODY (CASTING)							U 01	2-V-0000-12299R		
28" / C300 GV										

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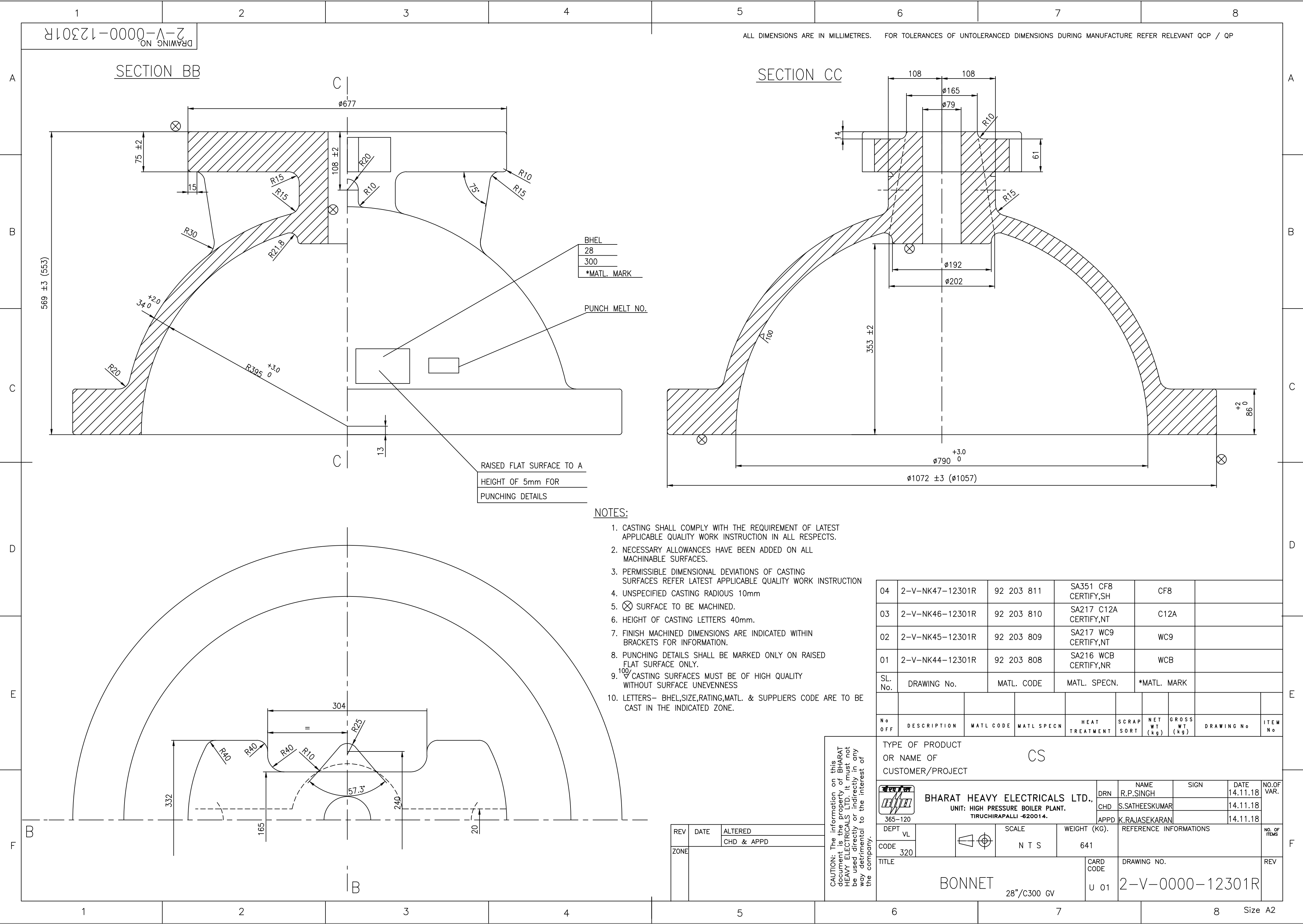
REV	DATE	ALTERED
		CHD & APPD
ZONE		



NOTE:-

01. NECESSARY MACHINING ALLOWANCES HAVE BEEN ADDED ON ALL MACHINABLE SURFACES.
02. FOR PERMISSIBLE DEVIATIONS ON NON TOLERANCED CASTING DIMENSION REFER APPLICABLE QUALITY PROCEDURE.
03. FINISH MACHINED DIMENSIONS ARE INDICATED WITHIN BRACKETS FOR INFORMATION ONLY.
04. LETTERS- BHEL,SIZE,RATING,MATL. & SUPPLIERS CODE ARE TO BE CAST IN THE INDICATED ZONE.
05. CASTING SHALL COMPLY WITH THE REQUIREMENTS OF APPLICABLE QUALITY PROCEDURE.
06. UNSPECIFIED CASTING RADII = R5
07. HEIGHT OF CASTING LETTERS = 25 mm
08. ⊗ INDICATES SURFACE TO BE MACHINED.

01	CASTING	92 203 807	SA216 WCB CERTIFY	NORMALISED	—	225	—	2.V.NK44.12300R 92 203 807 0000	027	
S.L No.	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No COMPONENT CODE	ITEM No	
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT										
CS										
 BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI -620014.					DRN	NAME R.P.SINGH	SIGN	DATE 15.11.18	NO.OF VAR.	
365-120					CHD	S.SATHEESKUMAR		15.11.18		
					APPD	K.RAJASEKARAN		15.11.18		
DEPT VL				SCALE NTS	WEIGHT (KG).	REFERENCE INFORMATIONS				NO. OF ITEMS
CODE 320					REF TABLE					
TITLE					CARD CODE U 01	DRAWING NO. 2-V-0000-12300R				REV
YOKE (28"—C300)										





70-006

Bharat Heavy Electricals Limited

High Pressure Boiler Plant, Tiruchirappalli-620 014, India.

Grams : BHARATELEC

Phone : --

Telex : 0455 - 211, 212, 295 & 298

FAX : 91 - (0431) - 52710

PRODUCT ENGINEERING/VALVES

VL:STDC:023

REV.00

PAGE 1 OF 6

TDC FOR UNTOLERANCED DIMENSIONS IN CASTING & FORGING DRAWINGS**Scope :**

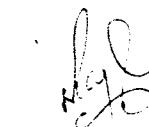
This technical delivery condition specifies the tolerance for the untoleranced dimension for the castings and forgings wherever tolerances are not specified in the applicable drawing applicable material TDC.

A. Castings :

Nominal dimension (in mm)		Tolerance on diameter & height (in mm)
UPTO	4	± 0.5
OVER	4 UPTO 16	± 1.0
OVER	16 UPTO 65	± 1.5
OVER	65 UPTO 125	± 2.0
OVER	125 UPTO 250	± 2.5
OVER	250 UPTO 500	± 3.0
OVER	500 UPTO 1000	± 4.0
OVER	1000 UPTO 1600	± 5.0

B. Forgings : As per Table (1), (2), (3) & (4)


PREPARED


CHECKED

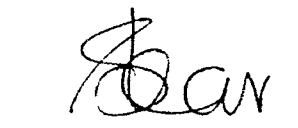

APPROVED
(S. KUMAR)
SM/PE/VSB
28/2/94

TABLE 1. LENGTH, WIDTH, HEIGHT, MISMATCH, RESIDUAL FLASH AND TRIMMED FLAT OF DROP, PRESS AND UPSET FORGINGS (NORMAL TOLERANCES)

DROP, PRESS & UPSET FORGINGS - TOLERANCES FOR: LENGTH, WIDTH & HEIGHT ^M																					
MISMATCH	RESIDUAL FLASH (+) TRIMMED FLAT (-)	TRIM LINE		WEIGHT (kg) ABOVE TO (INCL)	DIFFICULTY OF MATERIAL		COMPLEXITY		MISMATCH ; RESIDUAL FLASH & TRIMMED FLAT ^(DIA & LENGTH FOR UPSET FORGINGS)												
		ASYMMETRIC	STRAIGHT OR SYMMETRIC		M1	M2	S1 S2 S3 S4	S5 S6 S7 S8	NOTE: CENTRE TO SURFACE; STEP IN ONE DIE; + $\frac{1}{3}$, - $\frac{1}{3}$ OF TOTAL TOLERANCE												
									INTERNAL DIMENSION: REVERSE + AND - SIGNS.												
											0 ABOVE TO [INCL]	MM									
												32	100	160	250	400	630	1000	1600	2500	
0.4	0.5			0-0.4							1.1 ^{+0.7} _{-0.4}	1.2 ^{+0.8} _{-0.4}	1.4 ^{+0.9} _{-0.5}	1.6 ^{+1.0} _{-0.6}	1.8 ^{+1.2} _{-0.6}	2 ^{+1.3} _{-0.7}					
0.5	0.6			0.4-10							1.2 ^{+0.8} _{-0.4}	1.4 ^{+0.9} _{-0.5}	1.6 ^{+1.0} _{-0.6}	1.8 ^{+1.2} _{-0.6}	2 ^{+1.3} _{-0.7}	2.2 ^{+1.5} _{-0.7}					
0.6	0.7			10-18							1.4 ^{+0.9} _{-0.5}	1.6 ^{+1.0} _{-0.6}	1.8 ^{+1.2} _{-0.6}	2 ^{+1.3} _{-0.7}	2.2 ^{+1.5} _{-0.7}	2.5 ^{+1.7} _{-0.8}	2.8 ^{+1.9} _{-0.9}				
0.7	0.8			18-32							1.6 ^{+1.0} _{-0.6}	1.8 ^{+1.2} _{-0.6}	2 ^{+1.3} _{-0.7}	2.2 ^{+1.5} _{-0.7}	2.5 ^{+1.7} _{-0.8}	2.8 ^{+1.9} _{-0.9}	3.2 ^{+2.1} _{-1.1}	3.6 ^{+2.4} _{-1.2}			
0.8	1			32-56							1.8 ^{+1.2} _{-0.6}	2 ^{+1.3} _{-0.7}	2.2 ^{+1.5} _{-0.7}	2.5 ^{+1.7} _{-0.8}	2.8 ^{+1.9} _{-0.9}	3.2 ^{+2.1} _{-1.1}	3.6 ^{+2.4} _{-1.2}	4 ^{+2.5} _{-1.3}	4.5 ^{+2.7} _{-1.5}		
1	1.2			56-10							2 ^{+1.3} _{-0.7}	2.2 ^{+1.5} _{-0.7}	2.5 ^{+1.7} _{-0.8}	2.8 ^{+1.9} _{-0.9}	3.2 ^{+2.1} _{-1.1}	3.6 ^{+2.4} _{-1.2}	4 ^{+2.5} _{-1.3}	4.5 ^{+2.7} _{-1.5}	5 ^{+2.8} _{-1.6}		
1.2	1.4			10-20							2.2 ^{+1.5} _{-0.7}	2.5 ^{+1.7} _{-0.8}	2.8 ^{+1.9} _{-0.9}	3.2 ^{+2.1} _{-1.1}	3.6 ^{+2.4} _{-1.2}	4 ^{+2.5} _{-1.3}	4.5 ^{+2.7} _{-1.5}	5 ^{+2.8} _{-1.6}	5.6 ^{+3.0} _{-1.7}		
1.4	1.7			20-50							2.5 ^{+1.7} _{-0.8}	2.8 ^{+1.9} _{-0.9}	3.2 ^{+2.1} _{-1.1}	3.6 ^{+2.4} _{-1.2}	4 ^{+2.5} _{-1.3}	4.5 ^{+2.7} _{-1.5}	5 ^{+2.8} _{-1.6}	5.6 ^{+3.0} _{-1.7}	6.3 ^{+3.2} _{-1.8}		
1.7	2			50-120							2.8 ^{+1.9} _{-0.9}	3.2 ^{+2.1} _{-1.1}	3.6 ^{+2.4} _{-1.2}	4 ^{+2.5} _{-1.3}	4.5 ^{+2.7} _{-1.5}	5 ^{+2.8} _{-1.6}	5.6 ^{+3.0} _{-1.7}	6.3 ^{+3.2} _{-1.8}	7 ^{+3.3} _{-1.9}		
2	2.4			120-250							3.2 ^{+2.1} _{-1.1}	3.6 ^{+2.4} _{-1.2}	4 ^{+2.5} _{-1.3}	4.5 ^{+2.7} _{-1.5}	5 ^{+2.8} _{-1.6}	5.6 ^{+3.0} _{-1.7}	6.3 ^{+3.2} _{-1.8}	7 ^{+3.3} _{-1.9}	8 ^{+3.4} _{-2.0}		
2.4	2.8										3.6 ^{+2.4} _{-1.2}	4 ^{+2.5} _{-1.3}	4.5 ^{+2.7} _{-1.5}	5 ^{+2.8} _{-1.6}	5.6 ^{+3.0} _{-1.7}	6.3 ^{+3.2} _{-1.8}	7 ^{+3.3} _{-1.9}	8 ^{+3.4} _{-2.0}	9 ^{+3.5} _{-2.1}		
QUALITY (NORMAL)												4 ^{+2.5} _{-1.3}	4.5 ^{+2.7} _{-1.5}	5 ^{+2.8} _{-1.6}	5.6 ^{+3.0} _{-1.7}	6.3 ^{+3.2} _{-1.8}	7 ^{+3.3} _{-1.9}	8 ^{+3.4} _{-2.0}	9 ^{+3.5} _{-2.1}	10 ^{+3.6} _{-2.2}	
												4.5 ^{+2.7} _{-1.5}	5 ^{+2.8} _{-1.6}	5.6 ^{+3.0} _{-1.7}	6.3 ^{+3.2} _{-1.8}	7 ^{+3.3} _{-1.9}	8 ^{+3.4} _{-2.0}	9 ^{+3.5} _{-2.1}	10 ^{+3.6} _{-2.2}	11 ^{+3.7} _{-2.3}	
												5 ^{+2.8} _{-1.6}	5.6 ^{+3.0} _{-1.7}	6.3 ^{+3.2} _{-1.8}	7 ^{+3.3} _{-1.9}	8 ^{+3.4} _{-2.0}	9 ^{+3.5} _{-2.1}	10 ^{+3.6} _{-2.2}	11 ^{+3.7} _{-2.3}	12 ^{+3.8} _{-2.4}	
												5.6 ^{+3.0} _{-1.7}	6.3 ^{+3.2} _{-1.8}	7 ^{+3.3} _{-1.9}	8 ^{+3.4} _{-2.0}	9 ^{+3.5} _{-2.1}	10 ^{+3.6} _{-2.2}	11 ^{+3.7} _{-2.3}	12 ^{+3.8} _{-2.4}	14 ^{+4.0} _{-2.6}	

TABLE 2 THICKNESS FOR DROP, PRESS AND UPSET FORGINGS AND EJECTOR MARKS FOR DROP AND PRESS FORGINGS (NORMAL TOLERANCES)

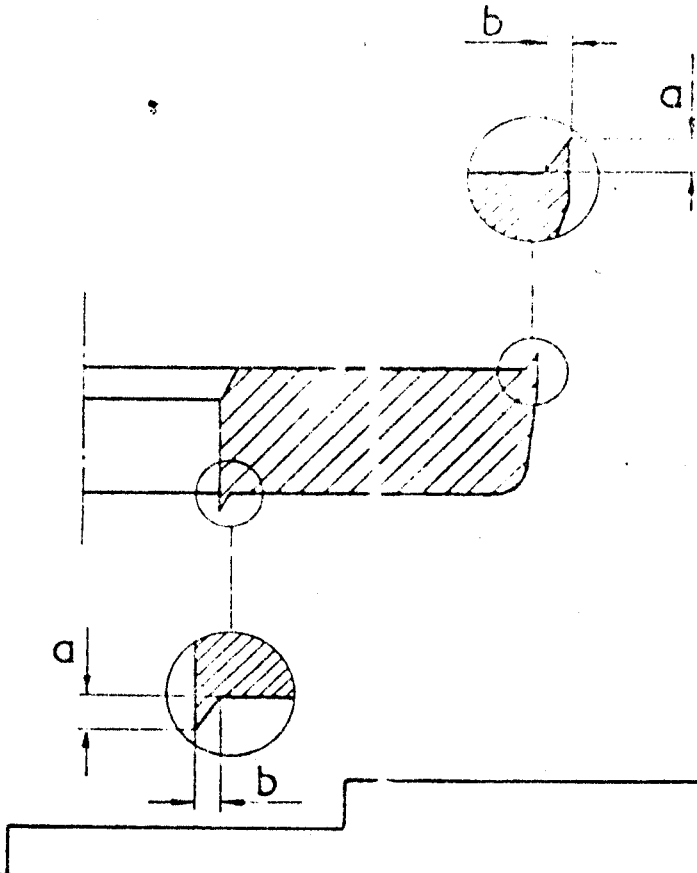
DROP, PRESS & UPSET FORGINGS - TOLERANCES FOR: THICKNESS; EJECTOR MARKS*																	
EJECTOR MARKS	WEIGHT (kg) ABOVE - TO (INCL)	DIFFICULTY OF MATERIAL M1 M2		COMPLEXITY				* (DROP AND PRESS FORGINGS ONLY)									
				S1 A 0.63 ≤ 1	S2 A 0.32 ≤ 0.63	S3 A 0.16 ≤ 0.32	S4 S 0.15	0 ABOVE	M M								
									TO (INCL)	16	40	63	100	160	250	> 250	
1	0-0.4							1	±0.3	1.1 ±0.4	1.2 ±0.4	1.4 ±0.5	1.6 ±0.5	1.8 ±0.5	2 ±0.5		
1.2	0.4-1.2							1.1	±0.4	1.2 ±0.4	1.4 ±0.5	1.6 ±0.5	1.8 ±0.5	2 ±0.5	2.2 ±0.5		
1.6	1.2-2.5							1.2	±0.4	1.4 ±0.5	1.6 ±0.5	1.8 ±0.5	2 ±0.5	2.2 ±0.5	2.5 ±0.5		
2	2.5-5							1.4	±0.5	1.6 ±0.5	1.8 ±0.5	2 ±0.5	2.2 ±0.5	2.5 ±0.5	2.8 ±0.5		
2.4	5-8							1.6	±0.5	1.8 ±0.5	2 ±0.5	2.2 ±0.5	2.5 ±0.5	2.8 ±0.5	3.2 ±0.5		
3.2	8-12							1.8	±0.5	2 ±0.5	2.2 ±0.5	2.5 ±0.5	2.8 ±0.5	3.2 ±0.5	3.6 ±0.5		
4	12-20							2	±0.5	2.2 ±0.5	2.5 ±0.5	2.8 ±0.5	3.2 ±0.5	3.6 ±0.5	4 ±0.5		
5	20-36							2.2	±0.5	2.5 ±0.5	2.8 ±0.5	3.2 ±0.5	3.6 ±0.5	4 ±0.5	4.5 ±0.5		
6.4	36-63							2.5	±0.5	2.8 ±0.5	3.2 ±0.5	3.6 ±0.5	4 ±0.5	4.5 ±0.5	5 ±0.5		
8	63-110							2.8	±0.5	3.2 ±0.5	3.6 ±0.5	4 ±0.5	4.5 ±0.5	5 ±0.5	5.6 ±0.5		
10	110-200							3.2	±0.5	3.6 ±0.5	4 ±0.5	4.5 ±0.5	5 ±0.5	5.6 ±0.5	6.3 ±0.5		
12.6	200-250							3.6	±0.5	4 ±0.5	4.5 ±0.5	5 ±0.5	5.6 ±0.5	6.3 ±0.5	7 ±0.5		
QUALITY (NORMAL)								4	±0.5	4.5 ±0.5	5 ±0.5	5.6 ±0.5	6.3 ±0.5	7 ±0.5	8 ±0.5		
								4.5	±0.5	5 ±0.5	5.6 ±0.5	6.3 ±0.5	7 ±0.5	8 ±0.5	9 ±0.5		
								5	±0.5	5.6 ±0.5	6.3 ±0.5	7 ±0.5	8 ±0.5	9 ±0.5	10 ±0.5		
								5.6	±0.5	6.3 ±0.5	7 ±0.5	8 ±0.5	9 ±0.5	10 ±0.5	11 ±0.5		
								6.3	±0.5	7 ±0.5	8 ±0.5	9 ±0.5	10 ±0.5	11 ±0.5	12 ±0.5		

TABLE 3 STRAIGHTNESS, FLATNESS AND CENTRE TO CENTRE DIMENSIONS FOR DROP, PRESS AND UPSET FORGINGS

DROP, PRESS AND UPSET FORGINGS																
NOTE. QUALITY E DOES NOT APPLY TO UPSET FORGINGS																
RANGE OF TOLERANCES FOR STRAIGHTNESS AND FLATNESS																
LENGTH ABOVE TO (INCL)	MM															
	0 100	100 125	125 160	160 200	200 250	250 315	315 400	400 500	500 630	630 800	800 1000	1000 1250	1250 1600	1600 2000	2000 2500	
QUALITY	NORMAL															
	0.6	0.7	0.8	0.9	1	1.1	1.2	1.4	1.6	1.8	2	2.2	2.5	2.8	3.2	
RANGE OF TOLERANCES FOR CENTRE TO CENTRE DIMENSIONS																
LENGTH ABOVE TO (INCL)	MM															
	0 100	100 160	160 200	200 250	250 315	315 400	400 500	500 630	630 800	800 1000	1000 1250					
QUALITY	NORMAL															
	±0.3	±0.4	±0.5	±0.6	±0.8	±1	±1.2	±1.6	±2	±2.5	±3.2					
	0.6	0.8	1	1.2	1.6	2	2.4	3.2	4	5	6.4					

TABLE 4 FILLET, EDGE RADIUS AND BURRS FOR DROP, PRESS AND UPSET FORGINGS

DRCP, PRESS AND UPSET FORGINGS		
FILLET AND EDGE RADII TOLERANCES		
r MM ABOVE — TO (INCL)	+	—
0 — 10	50%	25%
10 — 32	40%	20%
32 — 100	32%	15%
> 100	25%	10%
BURR TOLERANCES (AND PARTING LINE FINS FOR UPSET FORGINGS)		
WEIGHT (kg) ABOVE — TO (INCL)	a	b
0 — 1	1	0.5
1 — 6	1.6	0.8
6 — 40	2.5	1.2
40 — 250	4	2



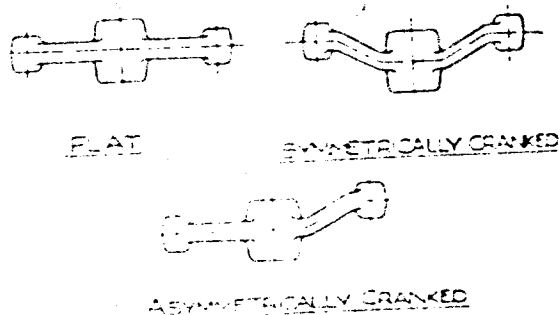


Fig. 1. Die boxes

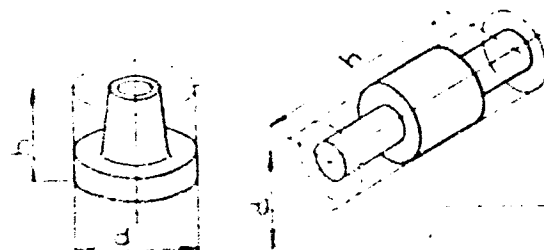


Fig. 2. Enveloping shapes of circular forgings

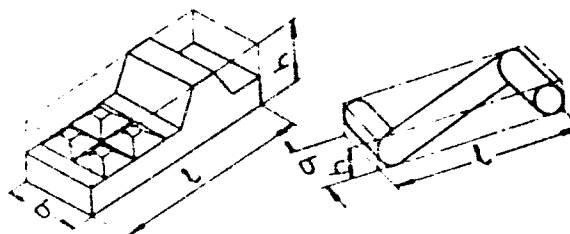


Fig. 3. Enveloping shapes of non-circular forgings

NOTE :

1. The type of steel used is determined as falling within one of the following categories :
 - a. M1 - steel with carbon content not more than 0.65% and total of specified alloying elements not more than 5%
 - b. M2 - steel with carbon content above 0.65% or total of specified alloying elements above 5%.
2. Complexity factor of a forging is the ratio of the weight of the forging to the weight of the overall shape necessary to accommodate the maximum dimensions of the forging.

The resulting complexity factor is determined as falling within one of the following categories :

- S4 - Upto and including 0.16
- S3 - Above 0.16 upto and including 0.32
- S2 - Above 0.32 upto and including 0.63
- S1 - Above 0.63 upto and including 1.00

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Product: Steel Castings for Boilers & Valves for Maitree Project		
CUST: 1725 & 1726	PROJECT: MAITREE (2x660 MW)	

Revisions record:

Rev 00 – Dt: 13/01/2018 – Fresh issue

1. MATERIAL SPECIFICATIONS:

Specification	:	ASME 2015
Carbon Steel (CS)	:	SA / ASTM A216 WCB, WCC & 352 LCB, LCC
Alloy Steel (AS)	:	SA / ASTM A217 WC6, WC9, C12A.
Stainless Steel (SS)	:	SA / ASTM A351 CF3M, CF8, CF8C, CF8M & SA995 6A
Additional Requirement	:	As listed below (Supplementary to above material specifications)
Size, Quantity, Grade/Class	:	As per Purchase Order & Drawing / Pattern.

2. CHEMICAL COMPOSITION AND PROCESS:

- a) Melting: As per the Specification, Fully Killed.
Carbon= 0.25% maximum: for SA / ASTM A216 WCB only.
Carbon= 0.15% maximum: for SA / ASTM A217 WC6 & WC9 (For the castings used in QCNRV, CRHNRV, TOA Valves & Conventional valves having contours for welding).

Product Analysis on test bar for each melt including residual elements shall be carried out.

- b) All raw materials used in steel making including incoming scrap shall be checked by supplier to ensure freedom from radioactivity. (Applicable for SS material only)
c) Tolerance for chemistry shall be as per the above applicable material specifications/standards specified in Cl 1.

3. DIMENSIONS AND TOLERANCES:

Dimensions & their tolerances shall be as per applicable drawings. For untoleranced dimensions: VL: STDC: 023(Latest).

4. HEAT TREATMENT (HT):

CS – Castings of High Pressure Valve. (Cl.1500 & above), QCNRV & CRHNRV: Shall be in Annealed Condition.
AS – Castings: Normalized and Tempered.
Normalizing Temperature: SA/ASTM A217 WC6, WC9: 920-950°C and for C12A: 1050-1080°C.
Tempering Temperature: SA/ASTM A217 WC6: 680°C min.; WC9: 720°C min.; C12A: 750-780°C.
Others: Heat treatment as per the applicable material specification & grade.

5. MECHANICAL TESTS:

Test bars to be cast integral with the casting or separately. If cast separately, they shall be cast at the same time as the castings and from the same ladle. A metal strip with heat number stamped shall be fused with the test bar during casting, to maintain traceability.

If one (1) casting is made from more than one heat, separate test bars for each cast to be poured and all test bars shall satisfy the requirements. Tests mentioned in Table 1 shall be conducted per heat / Heat treatment batch, as per ASTM A370.

Perform tensile tests at room temperature in accordance with the procedures specified in ASTM A370. Perform a minimum of one tensile test. All yield strengths shall be determined using 0.2 % offset method of ASTM A370. The results of the tensile test(s) shall satisfy the applicable material specification requirements. Hardness testing shall be as per ASTM E10 or E18.

If the results of the tensile test(s) do not satisfy the applicable requirements, two additional tests on two additional test specimens (removed from the same TC with no additional heat treatment) may be performed in an effort to qualify the material. The results of each of these tests shall satisfy the applicable requirements.

Table 1.

No	TEST	MATERIAL SPECIFICATION				
		SA/ASTM A216, 217			SA/ASTM A352	SA/ASTM A351
1	Tension Test	As per the Specification				
2	Hardness Test	As per the Specification			225 HBW max.	Not applicable
3	Bend Test Specimen 1” x ¾ “		Angle of Bend	Dia of Pin	Not applicable	S3 of SA703
		WCB	90 ⁰	2t		
		WCC	90 ⁰	2t		
		WC6	120 ⁰	3t		
		WC9	90 ⁰	3t		
		C12A	90 ⁰	2t		

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4	Charpy- U Impact for all QCNRV, CRHNRV bodies.	At Room temperature. Acceptance: Avg /Single=36J/32J min.	Not applicable	Not applicable
5	Charpy- V Impact for LPBP bodies	At 20 °C temperature. Acceptance: Avg/Single=27J/21J min.	Not applicable	Not applicable

Creep testing shall be carried out as per CIP:938 (latest revision) for high chrome castings.

6. FETTLING, DRESSING & CLEANING:

- Dressing of castings-Free from risers, in gates, notches, undercuts, deep marks etc.
- Fused wires, parting line fins, chills etc. shall be removed by grinding.
- Gas cutting if employed shall be done before Heat treatment.
- Preheat the material to 200°C. before gas cutting the Alloy steels.
- Castings shall be blast cleaned both inside and outside for the removal of fused sand, scales etc.
- Visual inspection: 100% as per MSS-SP: 55 (Latest). Acceptance: Type 1: none accepted; Type 2-12: A & B only accepted.

7. NON DESTRUCTIVE TESTING (NDT) AFTER HEAT TREATMENT

The NDE requirements for the castings shall meet the following as shown in Table-2 below. Castings shall be free from surface and internal defects like porosity, shrinkage, sand inclusion, crack, cold shut and other harmful defects. All castings shall be of Radiographic Quality.

1. Radiographic Testing Procedure (RT) : As per ASME B 16.34
2. Magnetic Particle Inspection (MPI) : As per ASTM E709
3. Liquid Penetrant Inspection (LPI) : As per ASTM E165

Table: 2

Product	Components	Characteristics	Type of NDE Check				
			RT	RT Area	RT Acc. Std	MT \$	MT Area
Conventional Valves (Gate, Globe & Check)	Body, Bonnet Pr.part yoke, Cover	< 600 Class	10%#	ASME B 16.34 / On critical area as indicated in the Drawing.	As per Table: 3	--	--
	Body, Bonnet, Cover	600 Class & above	100%			--	
	Body, Bonnet, Cover	1500 Class & above	100%			100%	All accessible surfaces including belly.
	Wedge	All Special Class Valves	--	--	--	100%	
Safety Valve	Base	Flanged ends of All Castings	100%	Critical Zones as given in the Drawing/ area shown in the sketch below. The areas where RT cannot be carried out MPI shall be done.	Class 2 of ASTM E446 / E186. For Butt weld ends as per Table- 3	100%	All accessible surfaces
		Weld ends of All Castings	100%			--	--
Safety Relief Valve	Base	All	100%			--	--
	Bonnet		10%#			--	--
	SRV Nozzle	All	100%	All area	Class-2 of ASTM E446 / E186.	--	--
QC NRV, CRH NRV	Body	150 & 300 Class	100%	Butt Weld Ends	As per Table: 3	100%	All accessible surfaces including belly.
		600 Class & above	100%	Critical Zones as given in the Drawing/ area shown in the sketch below. The areas where RT cannot be carried out MPI shall be done.	As per Table: 3	100%	
	Body (Special)	All					
Soot Blower Valve	Body	All	10%#	Critical Zones as given in the Drawing/ area shown in the sketch below. The areas where RT cannot be carried out MPI shall be done.	As per Table: 3	--	--



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PROJECT: MAITREE (2x660 MW)

Isolating Valve/ device	Body	< 600 Class	100%	Critical Zones as given in the Drawing/ area shown in the sketch below. The areas where RT cannot be carried out MPI shall be done.	As per Table: 3	--	All accessible surfaces including belly.
		600 Class & above				--	
		1500 Class & above				100%	
LP Bypass Valve	Body	All	100%	Critical Zones as given in the Drawing/ area shown in the sketch below. The areas where RT cannot be carried out MPI shall be done.	As per Table: 3	--	--

\$ LPI can be substituted for MPI in all inaccessible area and for stainless steel castings # Refer Cl 7.1

Table: 3

Type Of Discontinuity	Acceptance Level Category	< 600 CLASS		≥ 600 CLASS	
		Thickness ≤2"	Thickness >2"	Thickness ≤2"	Thickness >2"
Gas Porosity	A	A2	A3	A1	A2
Sand/Slag inclusion	B	B3	B3	B2	B2
Shrink Type-1	C	CA2	CA3	CA1	CA2
Shrink Type-2	C	CB3	CB3	CB2	CB2
Shrink Type-3	C	CC3	CC3	CC2	CC2
Crack	D	NONE	NONE	NONE	NONE
Hot Tear	E	NONE	NONE	NONE	NONE
Un-fused Inserts (Chills/Chaplets)	F	NONE	NONE	NONE	NONE
a. Butt welding ends shall be free of shrinkage, crack & hot tear.					
b. For butt weld ends Gas hole/Porosity and sand inclusions to be within level A1 & B1 respectively					

NDE for SS material: Castings shall be checked for radioactive contamination and reported. Survey meter shall be used to measure near the surface. Acceptance limits: Shall be less than 0.1 milli Rontgen (MR) per hour or 1 micro Sievert per hour.

7.1 # 10% Sampling shall be done as follows: (Wherever specified): The vendor shall select 10% of the Casting from the lot consisting of same size and type, (along with melt number / Sl.nos of the castings covered in the lot) for Radiography. A lot to be specified as the total number of castings as above, supplied in 4 months period (Jan-Apr, May-Aug, Sep-Dec). The vendor shall radiograph these specified castings and incorporate the lot size and melt no. and Sl.no in the RT reports along with the other Sl. No.s of the other castings covered in the lot. If the identified casting is defective then two more castings shall be radiographed. If these two castings are defect free then the lot is acceptable. If any one of these castings is defective then all the remaining castings shall be radiographed and all defective areas shall be repaired. BHEL will carry out audit on the lots at the vendor works at any time.

7.2 Surface NDE (MPI & LPI): Testing as per ASME B16.34.

- Relevant indication:** Surface-rupture NDE indication with major dimensions > 1.6 mm (1/16 in).
 - Linear indication:** Surface NDE indication whose length is ≥ three times its width.
 - Rounded indication:** Surface NDE indication whose length is < three times its width.
- Acceptance for MPI & LPI:**
- Cracks are not permitted.
 - For linear indications other than cracks, indications must be separated by a distance greater than the length of an acceptable indication. Maximum allowable length of the indication shall be:
 - For thickness(t) up to 13mm= 8mm,
 - For thickness from 13 to 25mm = 13mm
 - For thickness above 25mm=18mm.
 - For rounded indications, 4 or more indications in a line separated by 1.5 mm or less edge to edge are unacceptable. Maximum allowable diameter of the indication shall be:
 - For thickness up to 13mm =8mm
 - For thickness above 13mm =13mm

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8. DEVELOPMENT STAGE OF CASTING:

- a) During developmental stage of new castings or change to an existing casting on account of change in dimension which warrants pattern correction, Foundry to ensure the first sample casting meets dimensional, NDE & Quality requirements in this TDC, before starting bulk production. Sample castings: Three castings with nominal bore (NB) ≤ 100 mm & One casting with NB > 100 mm for each type shall be inspected by BHEL personnel for dimension and RT requirements at Casting Vendor /BHEL works. One Test bar for each melt/heat treatment batch shall be supplied along with casting for test at BHEL. RT shall be carried out on entire area of the casting to the acceptance requirement of Table-2 & 3. In addition 100% MPI on all critical areas like change of sections, riser & in gate portions shall be carried out. Casting to be inspected for dimensions after proof machining wherever necessary. If machining operation is involved, the same shall be done and defect free condition shall be ensured. If any defect noticed in RT and machining, the type of defect shall be analyzed and accordingly size of gate, runner, riser and pouring methodology to be modified to get defect free casting. Sampling shall be continued till achieving sound casting. After satisfactory development of sampling, bulk production shall be started. However, weld repaired areas identified in visual examination for doubtful indications to be probed by MPI. Accepted sample castings may be considered for fixing the nominal weight of the castings.
- b) During developmental stage, RT on sample castings of Yoke, Yoke Clamp & Wedge/Disc shall meet Level-3 of ASTM E446/E186/E280.
- c) Radiography not required after satisfactory development of casting & production based on established method for following parts: SRV Bonnet, Disc Holder, Upper and Lower adjusting rings, Packed cap, Cover Plate, Yoke and SRV guide flanges.

9. REPAIR:

Castings with unacceptable cracks, hot tears, shrinkage, etc. to be rectified by grinding & if required by welding. Welding to be done by qualified welder and qualified procedure as per ASME Section IX.

Guidelines for repair of steel castings shall be as per SIP:VS:17(Latest) for activities like defects require/ not require weld repair, welding, Post Weld Heat Treatment, NDE and surface treatment. All repaired areas after PWHT shall be NDE tested and Hardness tested. Hardness shall meet the material specification requirements.

10. SURFACE TREATMENT:

SS castings to be pickled & passivated (after repair & HT if any) as per ASTM A380. Satisfactory passivity of the surface to be checked using SS passivity test kit (Free iron test). After passivation, rinsing & test, the rinsed demineralised water to be checked for chloride with 1% Silver nitride, which shall not exceed 0.5 PPM.

11. DIMENSIONAL CHECK:

For all QCNRV & CRHNRV Body Castings: Thickness of the body shall be checked throughout the surface on a grid of 100mm x 100mm and recorded & submitted to BHEL.

12. MARKING AND PACKING:

Representation of Marking and identification shall be as per drawing. Also following details to be marked on each casting, on a raised pad using low stress stamps and Castings shall be suitably packed to avoid damage during transit.

1. Foundry code, 2. Material specification, grade 3.Heat/melt number 4. Size and 5. Class rating.

13. INSPECTION AND CERTIFICATION:

13.1 Supplier shall have valid ISO:9001-2015 certificate for the duration of the contract. However, ISO:9001-2008 certification is acceptable till 14th September 2018.

13.2 Finished Castings shall be inspected at supplier works and certified as per BS EN 10204 Type 3.2 by any ASME Authorized Inspection Agency or their subsidiaries covering all details listed in Cl. 13.3.

13.3 Manufacturer's Test certificate (MTC) in English language, not limited to the following, shall accompany all products:

1. Purchase Order No. (BHEL), TDC No & its revision no, Test certificate no & date.
2. Material Specification, Grade & Class with applicable year of code, Heat Number, Quantity & Size
3. Steel making process, Chemistry including incidental elements - Heat wise, Product analysis, Carbon Equivalent (CE).
4. Heat treatment details of the material and test bars.
5. Mechanical test results-Tensile (UTS, YTS (0.2% offset), % elongation, % reduction in area), Impact & Hardness and NDE test results with reference & acceptance standard.
6. Repair details including HT, if any, Cleaning & Surface treatment details.
7. Any other information like clearance of sample casting.
8. Dimensional Inspection Report, where applicable.

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9. For SS: Measured Radioactivity levels at 5cm from the surface of the castings shall be reported in the Test Certificate stating the measured value at the specified distance.
10. Creep test report as per CIP:938 (latest revision) for high chrome castings.
11. Valid ISO 9001 Certificate

14. AUDIT CHECKS AT BHEL:

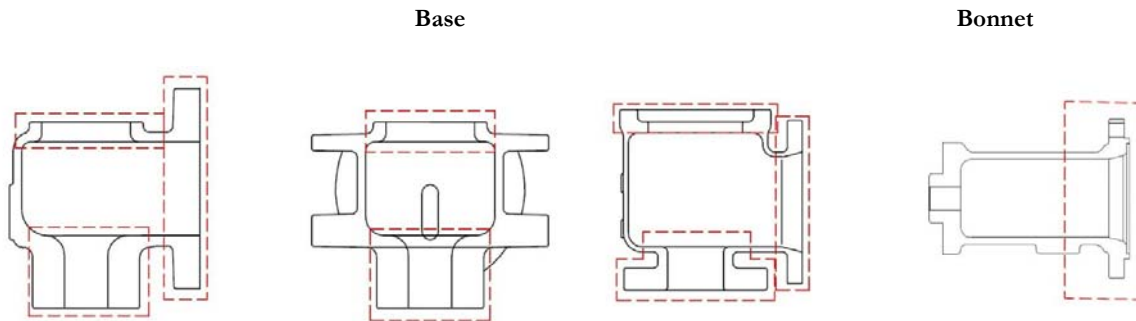
BHEL reserves the right to carry out audit checks for chemistry, HT condition, mechanical test and NDT on representative test bars or job. Items found defective during check or subsequent processing at BHEL will be rejected.

15. END USE:

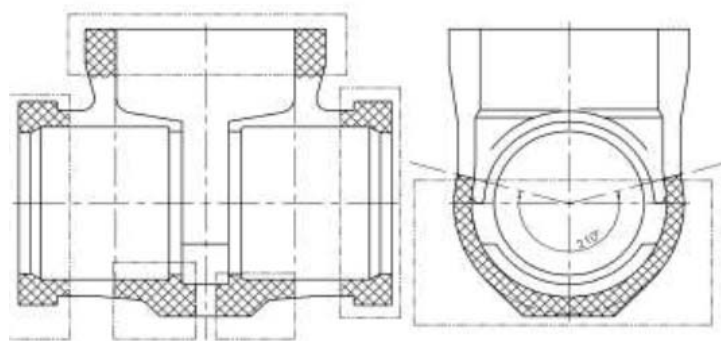
For use in valves and other components like flanges, fittings etc. for high temperature & high pressure applications meeting ASME Section I and ASME B 16.34 for Maitree Project (2x660 MW).

Sketch of zones for RT

SV and SRV Base castings



Reheater Isolating Device Body



 Radiography Area

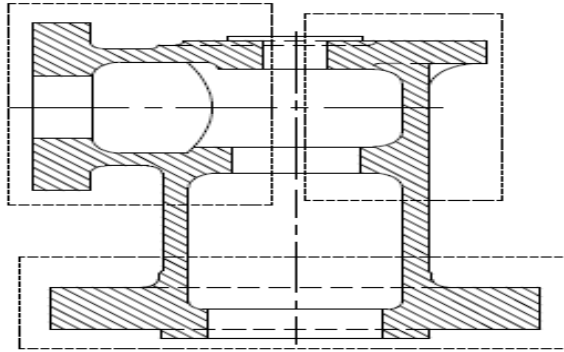


Product: Steel Castings for Boilers & Valves for Maitree Project

CUST: 1725 & 1726

PROJECT: MAITREE (2x660 MW)

Soot Blower Valve Body

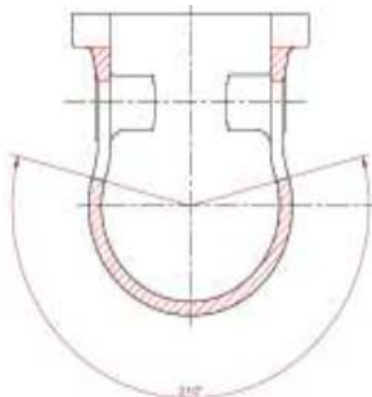


PART CODES : 920243870000, 920131810000, 920243870100, 920131810100

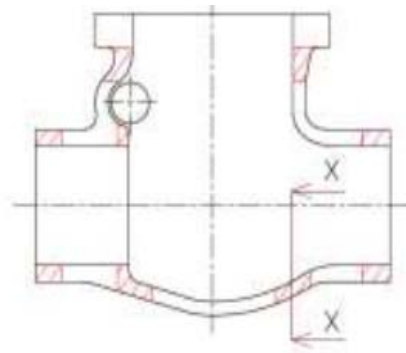
LRD IE, LRD IIE & WB IE - 2.5" 600#

 — RADIOGRAPHY AREA

Quick Closing Non Return Valve Body



Section-XX



 Radiography Area



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Quality Assurance Department
TECHNICAL DELIVERY CONDITIONS

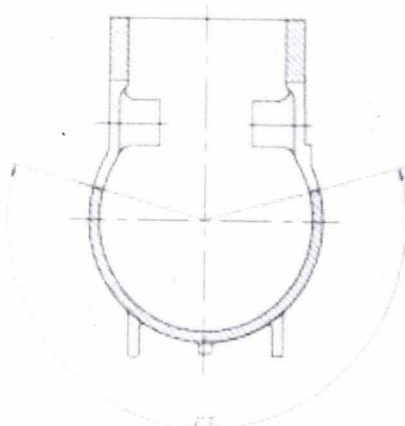
DOC No: TDC:6:396 Rev: 00
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Product: Steel Castings for Boilers & Valves for Maitree Project

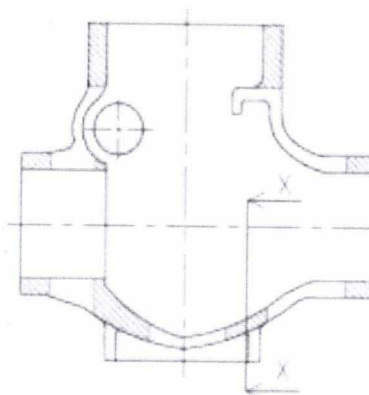
CUST: 1725 & 1726

PROJECT: MAITREE (2x660 MW)

Cold Reheat Non Return Valve Body

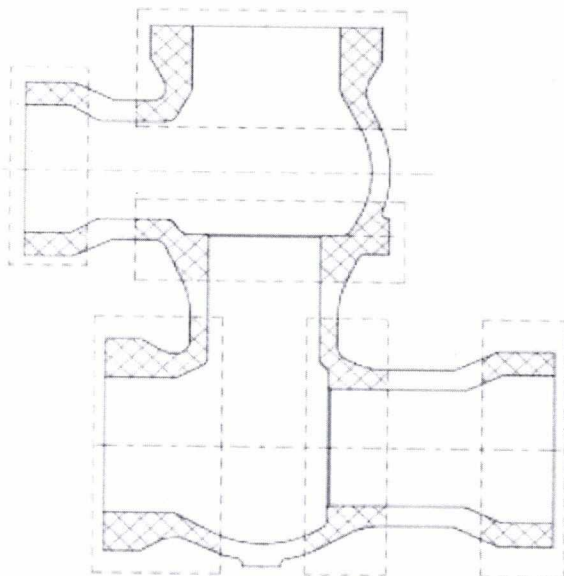


Section-XX



Radiography Area

LP Bypass Stop cum Control Valve Body



Radiography Area

<i>R. Venkanna</i> 13/01/2018	<i>G. Panneer Selvam</i> 13/01/18	<i>J.V.V. Aruna Kumar</i> 13/1/18	<i>N. Kirubakaran</i> 13/1/18	<i>K. Rajasekaran</i> 13/1/18	<i>R. Rajappan</i> 13.1.18	<i>R. Ananthakrishnan</i> 13/01/18	<i>Amit Roy</i> 13/01/18
Venkanna Rupani	G. Panneer Selvam	J.V.V. Aruna Kumar	N. Kirubakaran	K. Rajasekaran	R. Rajappan	R. Ananthakrishnan	Amit Roy
Sr. Engt/ QA	DGM/QA	DGM/QA	SDGM/PE/ FB	SM/Valves/ Engg	SDGM/ MM	AGM/Valves/ Purchase	AGM/QA& BE
Prepared By	Reviewed By						Approved By

BHEL,Tiruchirapalli-620014.	Quality Assurance	TECHNICAL DELIVERY CONDITION
Product : STEEL CASTINGS (VALVES)- IMPORTED		
Document No: TDC:0:433	Rev No : 00	Effective Date: 15.07.2011 Page 1 of 4

1.0 MATERIAL:

Specification : ASME / ASTM {Latest on date of Purchase Order (PO)}:
 CARBON STEEL (CS) : SA / ASTM A216 WCB, WCC & 352 LCB , LCC
 ALLOY STEEL (AS) : SA / ASTM A217 WC6, WC9, C12A.
 STAINLESS STEEL (SS): SA / ASTM A351 CF3M,CF8,CF8C & CF8M.
 Additional Requirement : As listed below(Supplementary to Specification)
 Size, Qty, Grade/Class : As per Purchase order & Drawing / Pattern.

2.0 CHEMICAL COMPOSITION AND PROCESS:

Melting: As per the Specification, Fully Killed.
 Carbon= 0.25% maximum : for SA / ASTM A216 WCB only.
 Carbon= 0.15% maximum : for SA / ASTM A217 WC6 & WC9
 Product Analysis on test bar for each melt including residual elements shall be carried out and reported in Test Certificates.

In case of API-6D materials the following additional requirements shall be met:

CS: Carbon=0.23% max.(in ladle) and 0.25% max.(in Product analysis)
 Carbon Equivalent=0.43 max.(in ladle) and 0.45 max.(in Product analysis)
 Carbon Equivalent= $\%C + (\%Mn/6) + (\%Cr + \%Mo + \%V)/5 + (\%Ni + \%Cu)/15$
 SS: Carbon=0.03% max. except as below.
 Carbon=0.08% max.for stabilized steels with Nb >10xC.and
 for stabilized steels with Nb and Ta mass of (Nb+Ta)>8xC.

3.0 DIMENSIONS AND TOLERANCES:

Tolerances as per the Drawing.
 Non tolerance Dimensions for valve components as per the Drawing:VL:STDC:023 (Latest)

4.0 HEAT TREATMENT :(HT)

CS. Castings of High Pressure Valve.(Cl.1500 & above),QCNRV & CRHNRV: Shall be in Annealed Condition.
 AS. Castings: Normalized and Tempered.
 SA/ASTM A217 WC6 :Normalizing Temperature 920-950 °C and Tempering Temperature 680 °C (Minimum)
 SA/ASTM A217 WC9 :Normalizing Temperature 920-950 °C and Tempering Temperature 720 °C (Minimum)
 SA/ASTM A217 C12A: Normalizing Temperature 1050-1080 °C and Tempering temperature 750-780°C
 Others: Heat Treat as per the Specification.

5.0 MECHANICAL TESTS:

Test bars to be cast integral with the casting or separately. If cast separately, they shall be cast at the same time as the castings and from the same ladle. A metal strip with heat number stamped shall be fused with the test bar during casting, to maintain traceability. If one(1) casting is made from more than one heat, separate test bars for each heat/cast to be poured & all test bars shall satisfy the requirements. Following tests to be conducted per heat / Heat treatment batch, as per ASTM A370. .

S. NO	TEST	Material specification			
		SA/ASTM A216, 217		SA/ASTM A352	SA/ASTM A 351
1	Tension Test	As per the Specification			
2	Hardness Test	As per the Specification		225 BHN. max.	Not applicable
3	Bend Test Specimen 1" x 3/4"		Angle of Bend	Dia of Pin	Not applicable S3 of SA703
		WCB	90°	2t	
		WCC	90°	2t	
		WC6	120°	3t	
		WC9	90°	3t	
		C12A	90°	2t	
4	Charpy- U Impact for all Quick Closing Non-Return Valve, Cold Re-Heat Non-Return Valve Bodies FOR IBR.	As per IBR. at Room temperature. Acceptance: Avg /Single=36J/32J min.		Not applicable	Not applicable
5	Charpy- V Impact for Low-Pressure Bye-pass Valve BODIES.	At 20 Deg.C temperature. Acceptance: Avg /Single=27J/21J min.		Not applicable	Not applicable

In addition to above IMPACT Test for API -6D and PED Valves shall be done as below

S. NO	TEST	Material specification		
		SA/ASTM A216, 217		SA/ASTM A 351
1	Charpy- V Impact for CE Marking-Pressure Equipment Directive (PED) items as Specified in the Purchase Order.	At 20 Deg.C temperature. Acceptance: Avg /Single=40J/27J min.		As per Specification Not applicable
2	Charpy- V Impact for API -6D items if design temperature below minus 29°C (-29 °C)	Test Temperature=As per specification Acceptance: Avg/Single=34J/25J		As per Specification Not applicable

Product : **STEEL CASTINGS (VALVES)- IMPORTED**Document No: **TDC:0:433**Rev No : **00**Effective Date: **15.07.2011**

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6.0 FETTLING, DRESSING & CLEANING:

- Dressing of castings- Free from risers, in gates, notches, undercuts and deep marks etc.
- Fused wires, parting line fins, chills etc. shall be removed by grinding.
- Gas cutting if employed shall be done before Heat treatment.
- Preheat the material to 200 Deg. C. before gas cutting the Alloy steels.
- Castings shall be blast cleaned both inside and outside for the removal of fused sand, scales etc.
- Visual inspection of castings for surface quality as per MSS-SP-55 shall be carried out.

7.0 NON DESTRUCTIVE TESTING (NDT) AFTER HEAT TREATMENT:

The NDE requirements for the castings shall meet the following as shown in Table-1 below. Castings shall be free from surface and internal defects like porosity, shrinkage, sand inclusion, crack, cold shut and other harmful defects. All castings shall be of Radiographic Quality.

Radiographic Testing Procedure: As per ASME B16.34.

Magnetic Particle Inspection (MPI): As per ASTM E709

Liquid Penetrant Inspection (LPI): As per ASTM E165

Table: 1

Product	Components	Charecteristics	Type of NDE Check				
			RT	RT Area	RT Acc. Std	MT \$	MT Area
Conventional Valves (Gate, Globe & Check) and API 6D Gate Valves	Body,Bonnet	< 600Class	10%	ASME B16.34 (latest) as per SPL class Valve RT requirement	As per Table: 2	--	--
	Body,Bonnet	600Class & above	100%			--	
	Body,Bonnet & Wedge	1500Class & above	100%			100%	All accessible surfaces including belly
		All Special Class Valves	100%			100%	
<u>Quick Closing Non-Return Valve & Cold Re-Heat Non-Return Valve</u>	Body	150 & 300 Class	10%	Butt Weld Ends, Change of sections including seat and neck portion	As per Table: 2	100%	All accessible surfaces including belly
		600Class & above	100%		As per Table: 2	100%	All accessible surfaces .
	Body (Special)	150 & 300 Class					
		600Class & above					
CRH Isolating Device	Body	< 600Class	100%	ASME B16.34 (latest) as per SPL class Valve RT requirement.	As per Table: 2	--	All accessible surfaces including belly
		600Class & above				--	
		1500Class & above				100%	
\$ LPI Can be substituted for MPI in all inaccessible area and for stainless steel castings.							

\$ LPI Can be substituted for MPI in all inaccessible area and for stainless steel castings.

Table: 2

TYPE OF DISCONTINUITY	ACCEPTANCE LEVEL CATEGORY	< 600 CLASS		≥ 600 CLASS	
		Thickness ≤2"	Thickness >2"	Thickness ≤2"	Thickness >2"
Gas Porosity	A	A2	A3	A1	A2
Sand/Slag inclusion	B	B3	B3	B2	B2
Shrink Type-1	C	CA2	CA3	CA1	CA2
Shrink Type-2	C	CB3	CB3	CB2	CB2
Shrink Type-3	C	CC3	CC3	CC2	CC2
Crack	D	NONE	NONE	NONE	NONE
Hot Tear	E	NONE	NONE	NONE	NONE
Unfused Inserts (Chills/Chaplets)	F	NONE	NONE	NONE	NONE

a. Butt welding ends shall be free of shrinkage, crack & hot tear.
b. For butt weld ends Gas hole/Porosity and sand inclusions to be within level A1 & B1 respectively

BHEL,Tiruchirapalli-620014.	Quality Assurance	TECHNICAL DELIVERY CONDITION
Product : STEEL CASTINGS (VALVES)- IMPORTED		
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7.1 Acceptance for MPI & LPI: ASME B16.34.

- (1)Cracks are not permitted.
- (2)For linear indications (with length > 3 times width) other than cracks,indications must be separated by a distance greater than the length of an acceptable indication. Maximum allowable length of the indication shall be:
 - (a) For thickness (t) up to 13mm= 8mm,
 - (b) For thickness from 13 to 25mm = 13mm
 - (c) For thickness above 25mm =18mm.
- (3)For rounded indications (circular or elliptical with length < 3 times width), 4 or more indications in a line separated by 1.5 mm or less edge to edge are unacceptable. Maximum allowable diameter of the indication shall be:
 - (a)For thickness up to 13mm =8mm, and
 - (b)For thickness above 13mm =13mm

8.0 Development Stage of Casting:

a. During developmental stage, RT on sample castings (3 Castings with nominal bore (NB) ≤100mm. & 1 casting with NB > 100mm) for each type of casting shall be carried out on entire area of the casting to the acceptance requirement of Table-1 & 2. In addition 100% MPI on all critical areas like change of sections, riser & in gate portions shall be carried out. If machining operation is involved the same shall be done and defect free condition shall be ensured. If any defect noticed in RT and machining, the type of defect shall be analysed and accordingly size of gate, runner, riser and pouring methodology to be modified to get defect free casting. Sampling shall be continued till achieving sound casting. After satisfactory development of sampling bulk production shall be started. However weld repaired areas identified in visual examination for doubtful indications to be probed by MPI.

b. During developmental stage RT on sample castings of yoke, yoke clamp & wedge/disc shall meet Level-3 of ASTM E446/E186/E280

9.0 REPAIR:

Castings with unacceptable cracks, hot tears, shrinkage, etc. to be rectified by grinding & if required by welding. Welding to be done by qualified welder and the procedure used for welding shall be qualified in accordance with ASTM A 488/ASME Section IX.

.For IBR items welder shall be qualified as per IBR and approved by IBR approved Inspecting Authority.

The welding consumables and parameters shall be as per the qualified procedures. The recommended welding consumables are given in Table below.

Casting Material	Electrode Specification	Minimum Preheat in ° C	Minimum Post heat Temperature in ° C	PWHT Temperature in ° C
A 216 WCB, A 216 WCC	E 7018 - A1	150	150 for 2 hours	595 to 625
A 217 WC6	E 8018 B2	220	220 for 2 hours	650 to 680
A 217 WC9, A 217 C5, CSN 422744	E 9018 B3	220	220 for 2 hours	675 to 705
A 217 C12A	E 9015 B9 E 9018 B9 Ref Note - 1	220-280	220-280 for 2 hrs	750 to 770
A 217 CA15	E 410	220	220 for 2 hours	760 to 790
A 351 CF3M, A 351 CF8M	E 316	Nil	Nil	Nil
A 351 CF8, A 351 CF8C	E 347	Nil	Nil	Nil

Note – 1:

A. The following welding filler materials only shall be used.

Cromocord 9 M (Oerlikon)

Fox C 9 MV (Bohler)

Cromo 9V (Thyssen)

B. C12A castings to be Post weld heat treated irrespective of depth or size of repair

BHEL,Tiruchirapalli-620014.	Quality Assurance	TECHNICAL DELIVERY CONDITION
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9.1 All repaired areas after PWHT shall be subjected to NDE and Hardness test. Hardness shall meet material Specification. (If Specified)

10.0 SURFACE TREATMENT:

SS castings to be pickled & passivated (after repair & HT if any) as per ASTM A380. Satisfactory passivity of the surface to be checked using SS passivity test kit (Free iron test). After passivation, rinsing & test, the rinsed demineralised water to be checked for chloride with 1% Silver nitride, which shall not exceed 0.5 PPM

11.0 DIMENSIONAL CHECK:

- Dimensional reports for Sample castings and for All fully Machined castings are to be furnished along with other Certificates.
- For all QCNRV & CRHNRV Body Castings, thickness of the body shall be checked on throughout the surface on a grid of 100mm x 100mm and recorded & reports to be submitted to BHEL.

12.0 MARKING AND PACKING:

Following details to be marked on each casting on a raised pad using low stress stamps and Castings shall be suitably packed to avoid damage during transit.

- Foundry code,
- Specification, grade & Melt number,
- Other details as per drawing.

13.0 INSPECTION AND CERTIFICATION:

13.1: For IBR items

- If the Foundry is recognized as "Well known Foundry" under IBR, Items shall be inspected by foundry and works certificate along with IBR Form III F shall be issued.
- If the Foundry is not recognized as "Well known Foundry" under IBR, Items shall be inspected by an Inspecting Authority approved by IBR and work certificate along with IBR Form III G shall be issued.

13.2: For CE-marking items the materials shall be inspected by M/s. LLOYD'S/ TUV/ BVQI or any other agency approved for PED of CE marking, if the foundry is not certified to ISO 9000 by any of the above organisation.

13.3 For API items, the castings shall be inspected by the foundry and works certificate with details like PSL No., Temperature class rating, size shall be issued.

13.4 Test certificates shall contain the following details.

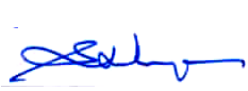
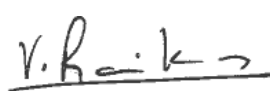
- Purchase Order No.(BHEL),TDC No. & Test certificate number
- Specification and Grade with applicable year of code, Heat Number, Quantity & Size
- Steel making process, Chemistry including incidental elements - Heat wise.
- Heat treatment details of the material and test bars.
- Mechanical test results, NDE test results with reference & acceptance standard.
- Repair details including HT, if any, Cleaning & Surface treatment details.
- Any other information like clearance of sample casting.
- Dimensional Inspection Report where applicable.

14.0 AUDIT CHECKS AT BHEL:

BHEL reserves the right to carry out audit checks for chemistry, HT condition, mechanical test and NDT on representative test bars or job. Items found defective during check or subsequent processing at BHEL are liable for rejection.

15.0 END USE:

For use in valves and other components like flanges, fittings etc. for high temperature & high pressure applications meeting IBR, ASME Section I, ASME B 16.34, PED and API.

			
D.SUDHAKARAN QA	M.RAJAKUMAR ENGG/VALVES	S.SELVARAJAN QUALITY ASSUARANCE	V.RAVIKUMAR QUALITY ASSUARANCE
PREPARED BY	REVIEWED BY		APPROVED BY

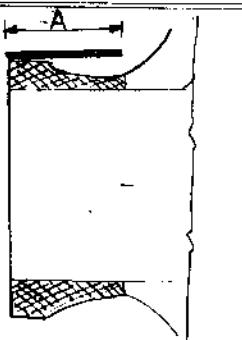
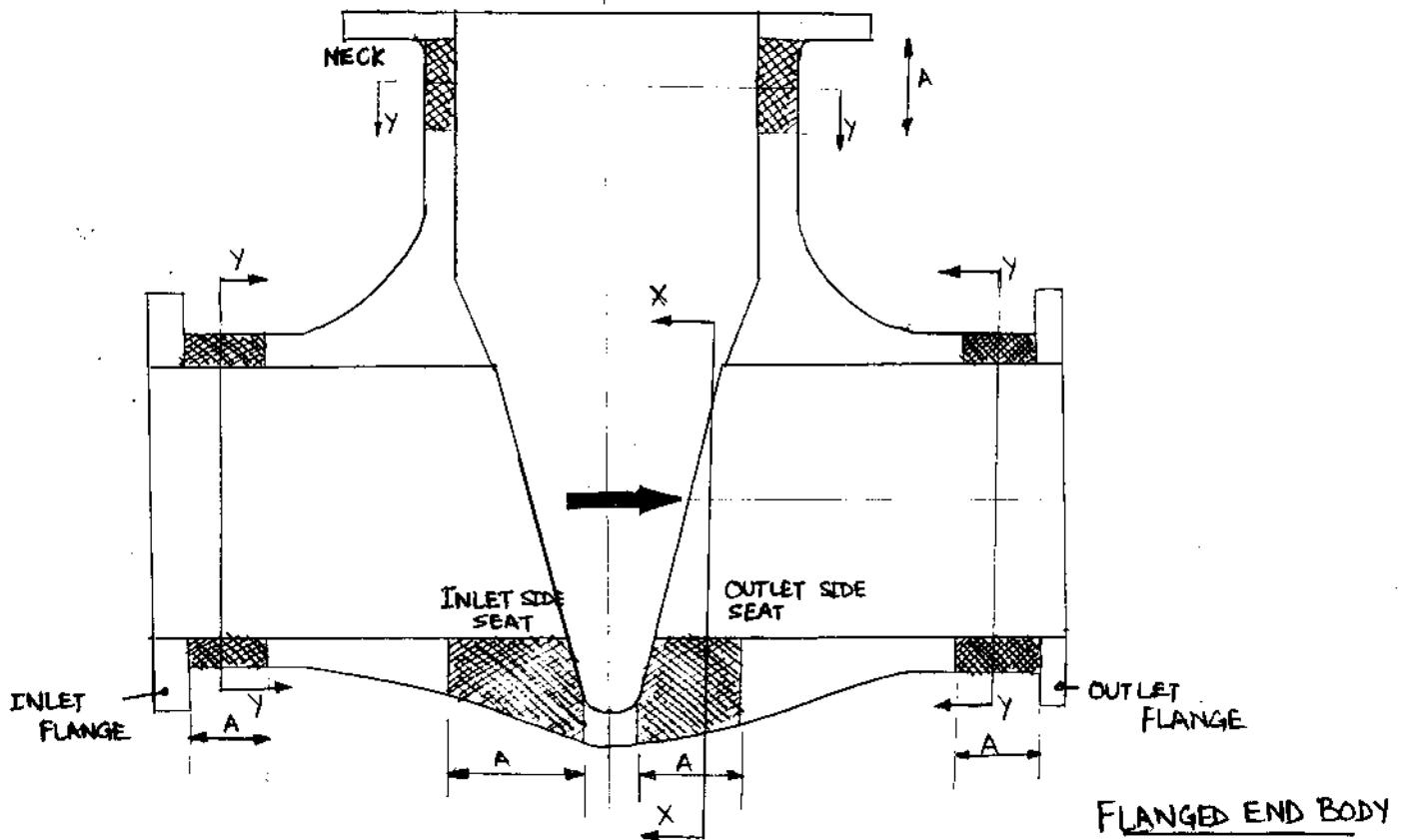


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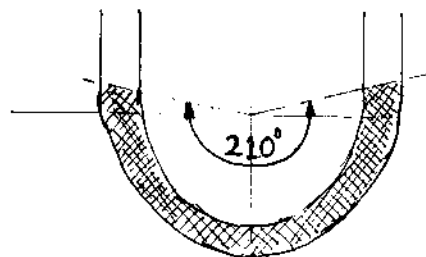
433, Ind. Valves Plant, GOINDWAL SAHIB (Distt. Amritsar)-143 423.

Annexure D

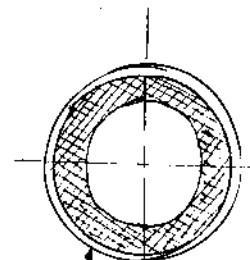
BHE: IVP: RT: PR Rev 03



BW END BODY



SECTION X-X
210° coverage



To cover round the shell
SECTION Y Y

$$A = \text{Max } [3t_m, 70 \text{ mm}]$$

$t_m \rightarrow$ wall thickness 'min'



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SHOOTING LOCATION DESIGNATION

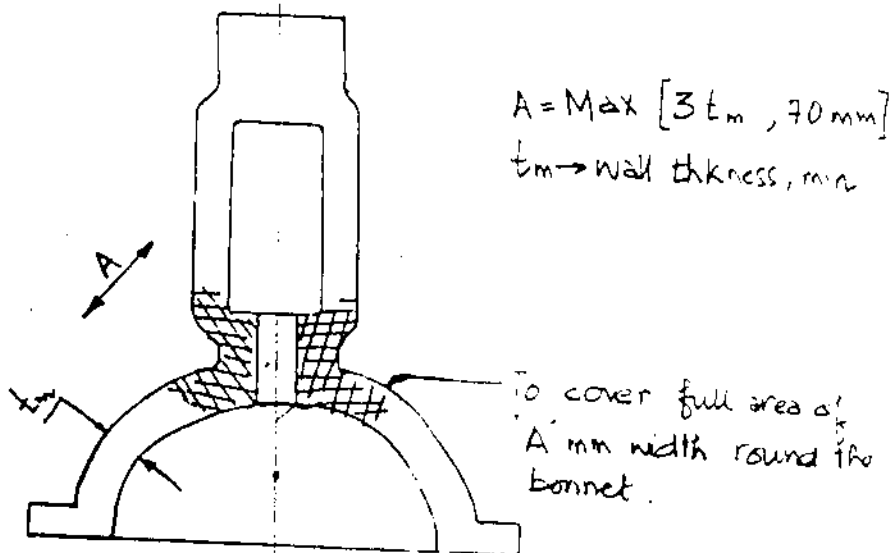
- AT NECK : N1, N2, N3, N4, ...
- AT INLET FLANGE PIPE : A1, A2, A3, A4, ...
- AT INLET SIDE SEAT : SA1, SA2, SA3, SA4, ...
- AT OUTLET SIDE SEAT : SB1, SB2, SB3, SB4, ...
- AT OUTLET FLANGE PIPE : B1, B2, B3, B4, ...
- * AT INLET FLANGE FACE : FA1, FA2, FA3, FA4, ...
- * AT OUTLET FLANGE FACE : FB1, FB2, FB3, FB4, ...
- * FOR FLANGED END BODIES ONLY



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BHEL IVP: RT: PR: Rev 03



SHOT DESIGNATION AS 1, 2, 3, 4, ...

SHOOTING SKETCH OF GATE VALVE YOKE / BONNET

Regd. Office : 'BHEL HOUSE, Siri Fort, New Delhi-110 049.

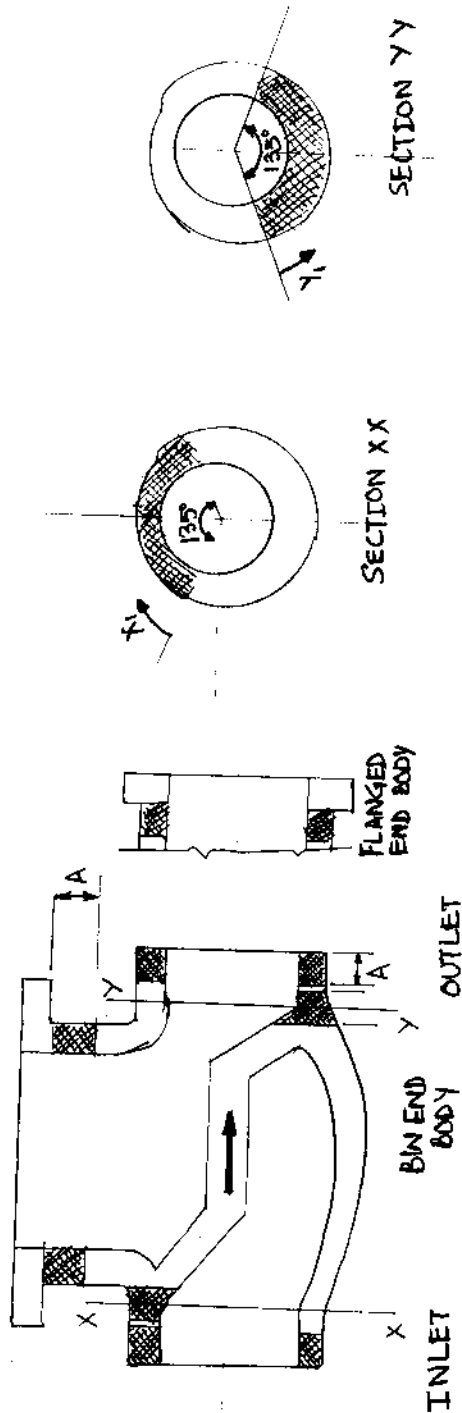
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BHEL/VR: RT: PR: Rev 03



$$A = \text{Max} \{ 3.t_m, 70\text{mm} \}$$

t_m — min. wall thickness, mm

SHOOTING LOCATION DESIGNATION

AT NECK :	N1, N2, N3, ...
AT INLET END	A1, A2, A3, ...
AT OUTLET END	B1, B2, B3, ...
AT SECTION XX	X1, X2, ...
AT SECTION YY	Y1, Y2, ...



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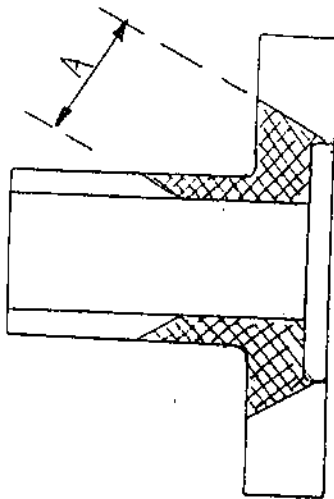
BHE: E.V.P. RT: PR Rev 3

SHOOTING SKETCH OF CORNER

$A = \max [2t_m, 70 \text{ mm}]$

$t_m = \text{min thickness, mm}$

To cover full area round the corner



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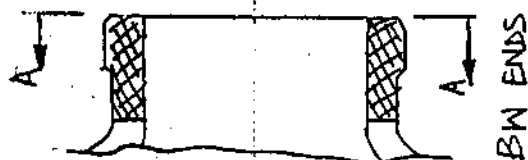
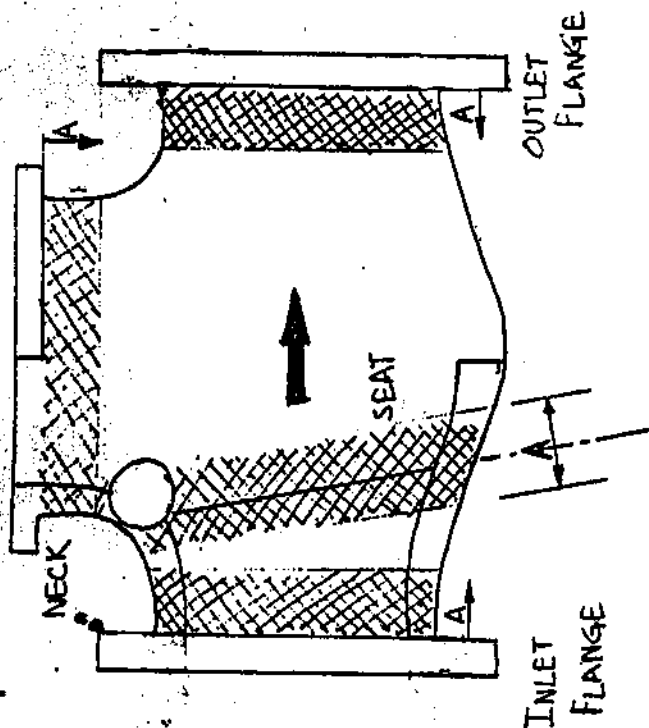


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BHE: IVP: RT: PR REV 03

SHOOTING SKETCH OF FLAP VALVE BODY



SHOOTING LOCATION DESIGNATION

AT NECK	N1, N2, N3, ...
AT INLET PIPE	A1, A2, A3, ...
AT INLET BW END	FA1, FA2, ...
AT OUTLET PIPE	B1, B2, B3, ...
AT OUTLET BW END	FB1, FB2, FB3, ...
AT SEAT	S1, S2, S3, ...

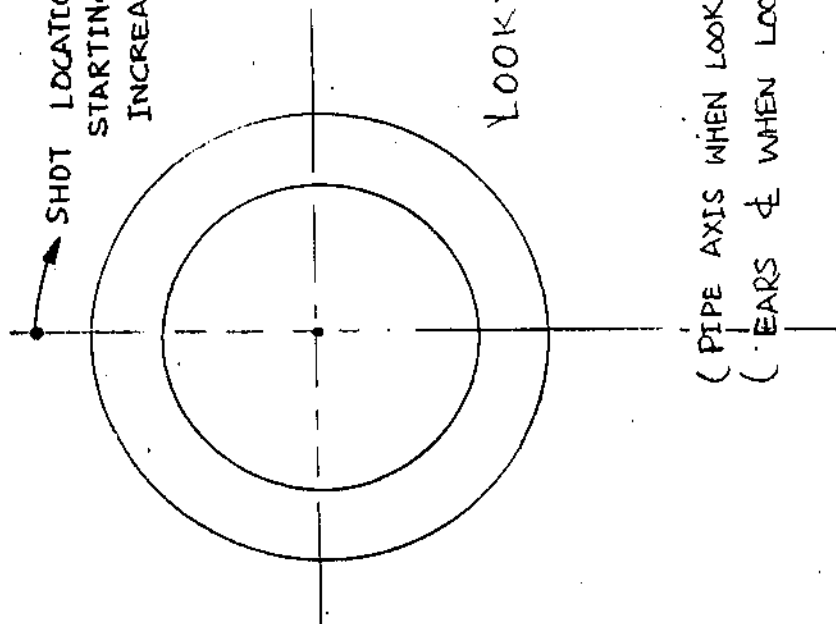


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DIRECTION AND SHOT LOCATION

SHOT LOCATION NUMBERING
STARTING POINT,
INCREASING IN THE DIRECTION SHOWN



LOOKING FROM INLET SIDE TOWARDS
OUTLET SIDE

(PIPE AXIS WHEN LOOKING FROM TOP WITH DIRECTION OF FLOW ↑)
(EARS & WHEN LOOKING BONNET FROM TOP)

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Product: Steel Castings for Boilers & Valves

Revisions record:

Rev. 21 – 1) Cl 8 – requirements of test bar added. 2) Cl 7 Table 1 – SV, SRV and QC NRV RT quantum for body casting modified. 3) Isolating valve, product name modified. 4) Cl 8 a) clarity on need for re qualification of castings added. 5) Cl 12 modified to include drawing details, 6) Cl 13.4 A – clarity to submit IBR certificate and MTC added.

Rev. 22- Dt: 26/06/2014 1) Cl 7.0 Table 1 –RT area of QCNRV body revised. 2) Cl.8.0 a) Modified. 3) Sketch of Zones of RT – RT zones of SV and SRV base castings modified based on Engineering review.

Rev. 23 Dt: 06/10/2015: Cl. 2, 4, 5, 6, 7, 8, 13, 15 modified to incorporate API 6D 24th Edition requirements.

Rev 24 Dt: 23/12/2015: Cl 1, 2, 3, 5, 6, 7, 8, 9, 10, 13, 14 & 15 modified.

Rev: 25 Dt: 11/02/2017: Cl 1 changed to indicate the use of latest revisions of referred codes, standards, specifications, drawings, procedures, etc; Requirements of API 6D removed from Cl 2, 4, 5, 7, 13 & 15 since the API 6D certificate license was not applied for; Definitions for relevant, linear and rounded indications provided in Cl 7; Cl 2 to 10, 12, 13 & 15 revised to bring better clarity; Type 3.2 certification updated as per BS EN 10204-2004 in Cl 13.2.

Rev: 26 : Dt – 21/02/2018 - SA/ASTM A 995 Gr 4A (CD3MN) added in Cl 1 & 5 based on Engineering/Valves input; Creep testing requirements removed and referred to SIP:RM:01.

1. MATERIAL SPECIFICATIONS:

All the codes, standards, specifications, drawings & procedures, etc., referred in this TDC shall be of latest revision as on the date of Enquiry/Purchase Order, whichever is earlier, unless specified otherwise.

Carbon Steel (CS)	:	SA / ASTM A216 WCB, WCC & 352 LCB, LCC
Alloy Steel (AS)	:	SA / ASTM A217 WC6, WC9, C12A.
Stainless Steel (SS)	:	SA / ASTM A351 CF3M, CF8, CF8C & CF8M; SA / ASTM 995 Gr. 4A(CD3MN)
Additional Requirement	:	As listed below (Supplementary to above material specifications)
Size, Quantity, Grade/Class	:	As per Purchase Order & Drawing / Pattern.

2. CHEMICAL COMPOSITION AND PROCESS:

a) Melting: As per the Specification, Fully Killed.

Carbon= 0.25% maximum: for SA / ASTM A216 WCB only.

Carbon= 0.15% maximum: for SA / ASTM A217 WC6 & WC9 (For the castings used in QCNRV, CRHNRV, TOA Valves & Conventional valves having contours for welding).

Product Analysis on test bar for each melt including residual elements shall be carried out.

b) All raw materials used in steel making including incoming scrap shall be checked by supplier to ensure freedom from radioactivity. (Applicable for SS material only)

c) Tolerance for chemistry shall be as per the above applicable material specifications/standards specified in Cl 1.

3. DIMENSIONS AND TOLERANCES:

Dimensions & their tolerances shall be as per applicable drawings. For untoleranced dimensions: VL: STDC: 023.

4. HEAT TREATMENT (HT):

CS – Castings of High Pressure Valve. (Cl.1500 & above), QCNRV & CRHNRV: Shall be in Annealed Condition.

AS – Castings: Normalized and Tempered.

Normalizing Temperature: SA/ASTM A217 WC6, WC9: 920-950°C and for C12A: 1050-1080°C.

Tempering Temperature: SA/ASTM A217 WC6: 680°C min.; WC9: 720°C min.; C12A: 750-780°C.

All other materials: Heat treatment shall be as per the applicable material specification & grade.

5. MECHANICAL TESTS:

a) Test bars to be cast integral with the casting or separately. If cast separately, they shall be cast at the same time as the castings and from the same ladle. A metal strip with heat number stamped shall be fused with the test bar during casting, to maintain traceability.

If one (1) casting is made from more than one heat, separate test bars for each cast to be poured and all test bars shall satisfy the requirements. Tests mentioned in Table 1 shall be conducted per heat / Heat treatment batch, as per ASTM A370.

Perform tensile tests at room temperature in accordance with the procedures specified in ASTM A370. Perform a minimum of one tensile test. All yield strengths shall be determined using 0.2 % offset method of ASTM A370. The results of the tensile test(s) shall satisfy the applicable material specification requirements. Hardness testing shall be as per ASTM E10 or E18.



Product: Steel Castings for Boilers & Valves

If the results of the tensile test(s) do not satisfy the applicable requirements, two additional tests on two additional test specimens (removed from the same TC with no additional heat treatment) may be performed in an effort to qualify the material. The results of each of these tests shall satisfy the applicable requirements.

Table 1.

No	TEST	MATERIAL SPECIFICATIONS			
		SA/ASTM A216, 217	SA/ASTM A352	SA/ASTM A351	SA/ASTM A995
1	Tension Test	As per the Material Specification			
2	Hardness Test	As per the Specification	225 HBW max.	Not applicable	<i>Not Applicable</i>
3	Bend Test Specimen 1" x 3/4"		Not applicable	S3 of SA703	<i>Not applicable</i>
		Bend Angle			
		WC6			
		WC9			
		C12A			
4	Charpy- U Impact for all QCNRV, CRHNRV bodies for IBR.	As per IBR. At Room temperature. Acceptance: Avg /Single=36J/32J min.	Not applicable	Not applicable	<i>Not applicable</i>
5	Charpy- V Impact for CE Marking-Pressure Equipment Directive (PED) items as Specified in the Purchase Order.	At 20 Deg.C temperature. Acceptance:Avg/Single=40J/27J min.	As per Specification	Not applicable	<i>Not applicable</i>
6	Charpy- V Impact for LPBP bodies	At 20 Deg.C temperature. Acceptance: Avg/Single=27J/21J min.	Not applicable	Not applicable	<i>Not applicable</i>

b) Creep testing & reporting shall be carried out as per SIP:RM:01 (latest revision) whenever indicated in the Enquiry/Purchase Order/Engineering Drawing.

6. FETTLING, DRESSING & CLEANING:

- Dressing of castings-Free from risers, in gates, notches, undercuts, deep marks etc.
- Fused wires, parting line fins, chills etc. shall be removed by grinding.
- Gas cutting if employed shall be done before Heat treatment.
- Preheat the material to 200°C before gas cutting the Alloy steels.
- Castings shall be blast cleaned both inside and outside for the removal of fused sand, scales etc.
- Visual inspection: 100% as per MSS-SP:55. Acceptance: Type 1: none accepted; Type 2-12: A & B only accepted.

7. NON DESTRUCTIVE TESTING (NDT) AFTER HEAT TREATMENT

The NDE requirements for the castings shall meet the following as shown in Table-2 below. Castings shall be free from surface and internal defects like porosity, shrinkage, sand inclusion, crack, cold shut and other harmful defects. All castings shall be of Radiographic Quality.

1. Radiographic Testing Procedure (RT) : As per ASME B 16.34
2. Magnetic Particle Inspection (MPI) : As per ASTM E709
3. Liquid Penetrant Inspection (LPI) : As per ASTM E165

Table: 2

Product	Components	Characteristics	Type of NDE Check				
			RT	RT Area	RT Acc. Std	MT \$	MT Area
Conventional Valves (Gate, Globe & Check)	Body, Bonnet Pr.part yoke, Cover	< 600 Class	10%#	ASME B 16.34 / On critical area as indicated in the Drawing.	As per Table: 3	--	--
	Body, Bonnet, Cover	600 Class & above	100%			--	
	Body, Bonnet, Cover	1500 Class & above	100%			100%	All accessible surfaces
	Wedge	All Special Class Valves	--			100%	



Product: Steel Castings for Boilers & Valves

							including belly.
Safety Valve	Base	Flanged ends of All Castings	100%	Critical Zones as given in the Drawing/ area shown in the sketch below . The areas where RT cannot be carried out MPI shall be done.	Class 2 of ASTM E446 / E186. For Butt weld ends as per Table- 3	100%	All accessible surfaces
		Weld ends of All Castings	100%			--	--
Safety Relief Valve	Base	All	100%			--	--
	Bonnet		10%#			--	--
	SRV Nozzle	All	100%	All area	Class-2 of ASTM E446 / E186.	--	--
QC NRV, CRH NRV	Body	150 & 300 Class	100%	Butt Weld Ends	As per Table: 3	100%	All accessible surfaces including belly.
		600 Class & above	100%	Critical Zones as given in the Drawing/ area shown in the sketch below. The areas where RT cannot be carried out MPI shall be done.	As per Table: 3	100%	
	Body (Special)	All					
Soot Blower Valve	Body	All	10%#	Critical Zones as given in the Drawing/ area shown in the sketch below. The areas where RT cannot be carried out MPI shall be done.	As per Table: 3	--	--
Isolating Valve/ device	Body	< 600 Class	100%	Critical Zones as given in the Drawing/ area shown in the sketch below. The areas where RT cannot be carried out MPI shall be done.	As per Table: 3	--	All accessible surfaces including belly.
		600 Class & above				--	
		1500 Class & above				100%	
LP Bypass Valve	Body	All	100%	Critical Zones as given in the Drawing/ area shown in the sketch below. The areas where RT cannot be carried out MPI shall be done.	As per Table: 3	--	--

\$ LPI can be substituted for MPI in all inaccessible area and for stainless steel castings # Refer Cl 7.1

Table: 3

Type Of Discontinuity	Acceptance Level Category	< 600 CLASS		≥ 600 CLASS	
		Thickness ≤2"	Thickness >2"	Thickness ≤2"	Thickness >2"
Gas Porosity	A	A2	A3	A1	A2
Sand/Slag inclusion	B	B3	B3	B2	B2
Shrink Type-1	C	CA2	CA3	CA1	CA2
Shrink Type-2	C	CB3	CB3	CB2	CB2
Shrink Type-3	C	CC3	CC3	CC2	CC2
Crack	D	NONE	NONE	NONE	NONE
Hot Tear	E	NONE	NONE	NONE	NONE
Un-fused Inserts (Chills/Chaplets)	F	NONE	NONE	NONE	NONE
a. Butt welding ends shall be free of shrinkage, crack & hot tear. b. For butt weld ends Gas hole/Porosity and sand inclusions to be within level A1 & B1 respectively					

NDE for SS material: Castings shall be checked for radioactive contamination and reported. Survey meter shall be used to measure near the surface. Acceptance limits: Shall be less than 0.1 milli Rontgen (MR) per hour or 1 micro Sievert per hour.



Product: Steel Castings for Boilers & Valves

7.1 # 10% Sampling shall be done as follows: (Wherever specified): The vendor shall select 10% of the Casting from the lot consisting of same size and type, (along with melt number / Sl.nos of the castings covered in the lot) for Radiography. A lot to be specified as the total number of castings as above, supplied in 4 months period (Jan-Apr, May-Aug, Sep-Dec). The vendor shall radiograph these specified castings and incorporate the lot size and melt no and Sl.no in the RT reports along with the other Sl.nos of the other castings covered in the lot. If the identified casting is defective then 2 more castings shall be radiographed. If these 2 castings are defect free then the lot is acceptable. If any one of these castings is defective then all the remaining castings shall be radiographed and all defective areas shall be repaired. BHEL will carry out audit on the lots at the vendor works at any time.

7.2 Surface NDE (MPI & LPI): Testing as per ASME B16.34.

1. **Relevant indication: Surface-rupture NDE indication with major dimensions > 1.6 mm (1/16 in).**
 2. **Linear indication: Surface NDE indication whose length is $\geq$ three times its width.**
 3. **Rounded indication: Surface NDE indication whose length is < three times its width.**
- Acceptance for MPI & LPI:**
4. Cracks are not permitted.
 5. For linear indications other than cracks, indications must be separated by a distance greater than the length of an acceptable indication. Maximum allowable length of the indication shall be:
 - a) For thickness(t) up to 13mm = 8mm,
 - b) For thickness from 13 to 25mm = 13mm
 - c) For thickness above 25mm = 18mm.
 6. For rounded indications, 4 or more indications in a line separated by 1.5 mm or less edge to edge are unacceptable. Maximum allowable diameter of the indication shall be:
 - a) For thickness up to 13mm = 8mm
 - b) For thickness above 13mm = 13mm

8. DEVELOPMENT STAGE OF CASTING:

- a) During developmental stage, of new castings or change to an existing casting on account of change in dimension which warrants pattern correction, Foundry to ensure, first sample pieces meet dimensional, NDE & Quality requirements in this TDC, before starting bulk production. Sample castings, 3 castings with nominal bore (NB) $\leq$ 100mm. & 1 casting with NB > 100 mm for each type shall be inspected for dimension and RT requirements at BHEL/Vendor works by BHEL personnel. One Test bar for each melt/heat treatment batch shall be supplied along with casting for test at BHEL. RT shall be carried out on entire area of the casting to the acceptance requirement of Table-2 & 3. In addition 100% MPI on all critical areas like change of sections, riser & in gate portions shall be carried out. Casting to be inspected for dimensions after proof machining wherever necessary. If machining operation is involved the same shall be done and defect free condition shall be ensured. If any defect noticed in RT and machining, the type of defect shall be analyzed and accordingly size of gate, runner, riser and pouring methodology to be modified to get defect free casting. Sampling shall be continued till achieving sound casting. After satisfactory development of sampling bulk production shall be started. However weld repaired areas identified in visual examination for doubtful indications to be probed by MPI. Accepted sample castings may be considered for fixing the nominal weight of the castings.
- b) During developmental stage RT on sample castings of Yoke, Yoke Clamp & Wedge/Disc shall meet Level-3 of ASTM E446/E186/E280.
- c) Radiography not required after satisfactory development of casting & production based on established method for following parts: SRV Bonnet, Disc Holder, Upper and Lower adjusting rings, Packed cap, Cover Plate, Yoke and SRV guide flanges.

9. REPAIR:

Castings with unacceptable cracks, hot tears, shrinkage, etc. to be rectified by grinding & if required by welding. Welding to be done by qualified welder and qualified procedure as per ASME Section IX. For IBR items welders shall be qualified as per IBR.

Guidelines for repair of steel castings shall be as per SIP:VS:17 for activities like defects require/ not require weld repair, welding, Post Weld Heat Treatment, NDE and surface treatment. All repaired areas after PWHT shall be NDE tested and Hardness tested. Hardness shall meet material specification.

For PED (CE-Marking) castings, permanent joining (welding and weld repair) of components must be carried out by suitably qualified personnel according to suitable operating procedures. Also Non-Destructive tests of permanent joints must be carried out by suitable qualified personnel.

The procedures and personnel must be approved by a competent third party which at the manufacturer's discretion, may be - A notified body, - A third party organization recognized by a Member State of European Community.

	BHEL – Tiruchirappalli - 620014, India. Quality Assurance Department TECHNICAL DELIVERY CONDITIONS	DOC No: TDC:0:412 Rev: 26 Effective Date: 21/02/2018 Page: 5 of 7
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10. SURFACE TREATMENT:

SS castings to be pickled & passivated (after repair & HT if any) as per ASTM A380. Satisfactory passivity of the surface to be checked using SS passivity test kit (Free iron test). After passivation, rinsing & test, the rinsed demineralised water to be checked for chloride with 1% Silver nitride, which shall not exceed 0.5 PPM.

11. DIMENSIONAL CHECK:

For all QCNRV & CRHNRV Body Castings: Thickness of the body shall be checked throughout the surface on a grid of 100mm x 100mm and recorded & submitted to BHEL.

12. MARKING AND PACKING:

Representation of Marking and identification shall be as per drawing. Also following details to be marked on each casting, on a raised pad using low stress stamps and Castings shall be suitably packed to avoid damage during transit.

1. Foundry code, 2. **Material** specification, grade & **Heat**/melt number, 3. Size and 4. Class rating.

13. INSPECTION AND CERTIFICATION:

13.1 For IBR items:

Products shall be inspected at works and the applicable IBR Form must be countersigned by the Inspecting Authority as indicated below in case the shop/**mill/foundry** is not recognised as a "Well known Foundry" under IBR:

- ☐ **Imported Items:** Inspecting Authority approved by IBR for the Country of origin.
- ☐ **Indigenously Supplied items:** Director of Boilers/Chief Inspector of Boilers/Inspecting Authority approved by IBR, for the respective state.

Certification in IBR Form III-F for IBR items from "IBR-Well Known Foundry" or "Inspecting Authority", as applicable, to be submitted. IBR Form III-F & **separate** Test certificate in English language with following details, shall accompany the product:

1. Purchase Order No. (BHEL), TDC No & its revision no, Test certificate no & date.
2. **Material** Specification, Grade & **Class** with applicable year of code, Heat Number, Quantity & Size
3. Steel making process, Chemistry including incidental elements - Heat wise, Product analysis, Carbon Equivalent (CE).
4. Heat treatment details of the material and test bars.
5. Mechanical test results-Tensile (UTS, YTS (**0.2% offset**), % elongation, % reduction in area), Impact & Hardness and NDE test results with reference & acceptance standard.
6. Repair details including HT, if any, Cleaning & Surface treatment details.
7. Any other information like clearance of sample casting.
8. Dimensional Inspection Report, where applicable.
9. **For SS:** Measured Radioactivity levels at 5cm from the surface of the castings shall be reported in the Test Certificate stating the measured value at the specified distance (not to be recorded in IBR Form).
10. **Creep test report as per the format suggested in Cl 5 of this TDC (applicable only for IBR application).**

13.2 For PED 2014/68/EU (CE-marking), test certificates of type 3.1 or 3.2, with details specified in Cl 13.1 for separate test certificate, shall be submitted as per BS EN 10204.

- ☐ Type 3.1 – Suppliers shall have ISO 9001-2008/2015 certification certified by Notified Body recognized by European community and test certificate certified by suppliers authorized inspection representative.
- ☐ Type 3.2 – Components inspected and test certificates certified by both the supplier's authorized inspection representative and Notified Body recognized by European community.

14. AUDIT CHECKS AT BHEL:

BHEL reserves the right to carry out audit checks for chemistry, HT condition, mechanical test and NDT on representative test bars or job. Items found defective during check or subsequent processing at BHEL will be rejected.

15. END USE:

For use in valves and other components like flanges, fittings etc. for high temperature & high pressure applications meeting IBR, ASME Section I, ASME B 16.34 and PED 2014/68/EU (CE-marking).



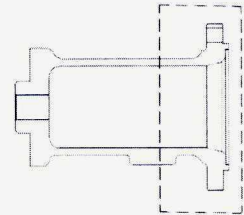
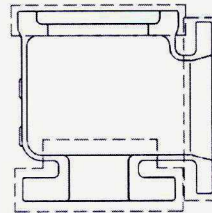
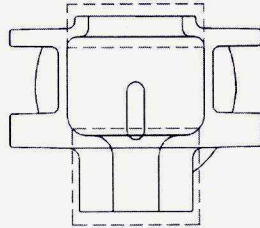
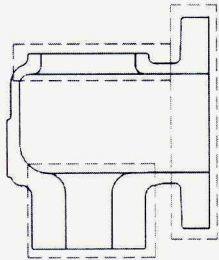
Product: Steel Castings for Boilers & Valves

Sketch of zones for RT

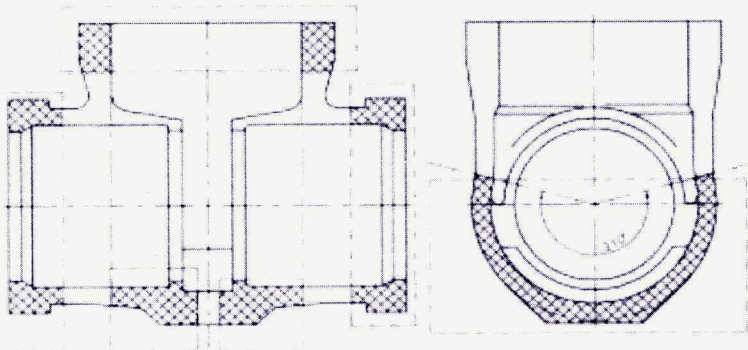
SV and SRV Base castings

Base

Bonnet

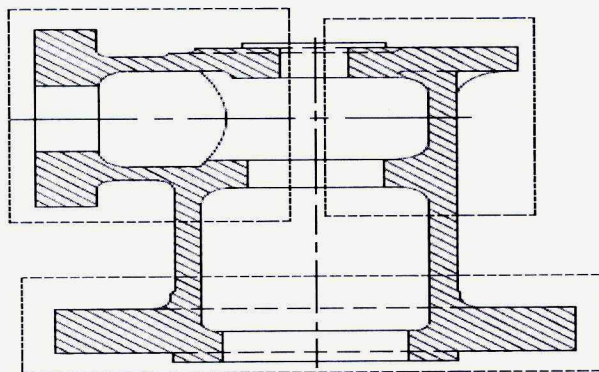


Reheater Isolating Device Body



 Radiography Area

Soot Blower Valve Body



PART CODES : 920243870000, 920131810000, 920243870100, 920131810100

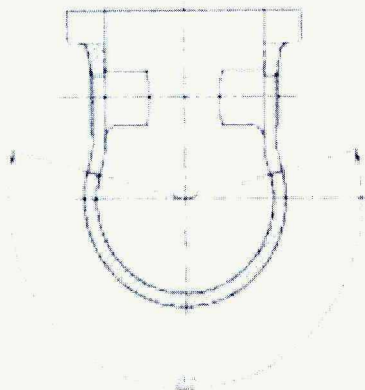
LRD IE, LRD IIE & WB IE - 2.5" 600#

 — RADIOGRAPHY AREA

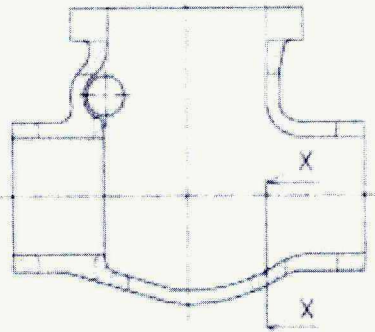
Quick Closing Non Return Valve Body



Product: Steel Castings for Boilers & Valves

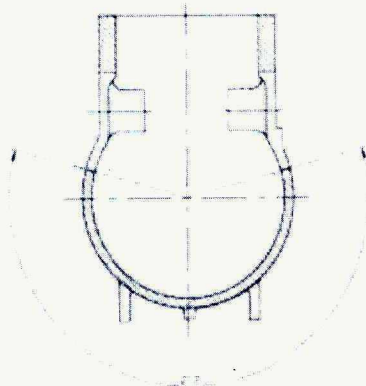


Section-XX

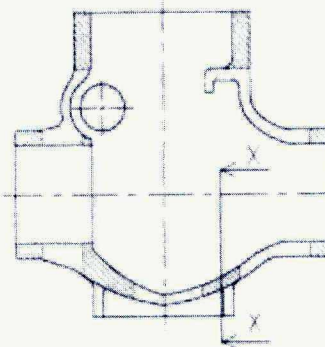


Radiography Area

Cold Reheat Non Return Valve Body

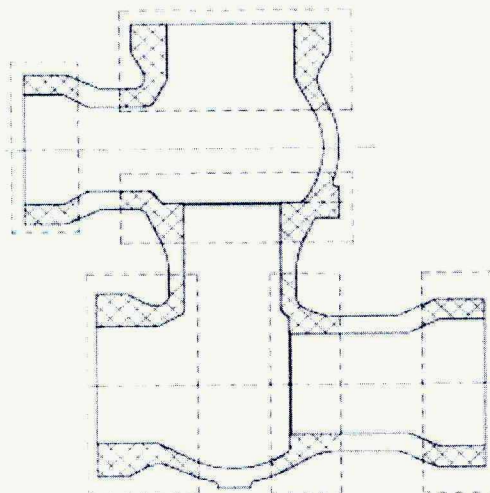


Section-XX



Radiography Area

LP Bypass Stop cum Control Valve Body



Radiography Area

<i>R. G. Kumar</i> 21/02/2018	<i>G. Panneer Selvam</i> 21/02/18	<i>K. Rajasekaran</i> 21/02/18	<i>R. Ananthakrishnan</i> 21/02/18	<i>Amit Roy</i> 21/02/18
Venkanna Rupani	G. Panneer Selvam	K. Rajasekaran	R. Ananthakrishnan	Amit Roy
Sr.Engineer /QA	DGM/QA	SM/Valves/Engg	AGM/Valves/Purchase	AGM/QA&BE
Prepared By	Reviewed By			Approved By

Certificate by Chartered Accountant on letter head

This is to Certify that M/S
(hereinafter referred to as 'company') having its registered office at
is registered under MSMED Act 2006, (Entrepreneur
Memorandum No (Part-II) dtd:.....,
Category: (Micro/Small)). (Copy enclosed).

Further verified from the Books of Accounts that the investment of the company as per the latest audited financial year as per MSMED Act 2006 is as follows:

1. **For Manufacturing Enterprises:** Investment in plant and machinery (i.e. original cost excluding land and building and the items specified by the Ministry of Small Scale Industries vide its notification No.S.O.1722(E) dated October 5, 2006 :
Rs.....Lacs
2. **For Service Enterprises:** Investment in equipment (original cost excluding land and building and furniture, fittings and other items not directly related to the service rendered or as may be notified under the MSMED Act, 2006:
Rs.....Lacs

(Strike off whichever is not applicable)

The above investment of Rs.....Lacs is within permissible limit of Rs.....Lacs forMicro / Small (Strike off which is not applicable) Category under MSMED Act 2006.

Or

The company has been graduated from its original category (Micro/ Small) (Strike off which is not applicable) and the date of graduation of such enterprise from its original category is (dd/mm/yyyy) which is within the period of 3 years from the date of graduation of such enterprise from its original category as notified vide S.O. No. 3322(E) dated 01.11.2013 published in the gazette notification dated 04.11.2013 by Ministry of MSME.

Date:



(Signature)

Name -

Membership number -

Seal of Chartered Accountant