

1. **Inviting Tenders**

Bid submission in two part, Part-I: Techno-commercial bid and Part-II: Price bid are hereby invited for entering into Rate Contract for **manufacture and supply of radiographic quality castings of valve (of C600), BHEL drawings of various material grades (ASTM A 216 Gr. WCB/WCC; A 217 Gr. WC9; A 351 Gr. CF8/CF8M)** as per relevant TDC/Matl Standards/Drgs and bill of materials mentioned. The bidder shall submit his response through bid submission to the tender on e-Procurement platform at <https://bhel.abcprocure.com>. **Offers in any other mode will not be accepted.**

- The bidder would be required to register on the e-procurement market place <https://bhel.abcprocure.com> 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 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.
- 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.

Bid		Documents required
Part-I	Techno-Commercial Quotation in response to tender enquiry no. 1920-093E dt 11.11.2019	As per check list
Part-II	Price Quotation in response to tender enquiry no. 1920-093E dt 11.11.2019	Price bid

Quotations shall reach us by 1400 Hrs (IST) on due date. **Techno-Commercial bid shall be opened at 1530 hrs (IST) on due date.**

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 for participating in the Rate Contract:

1. Vendor has to submit customer Purchase Orders of Carbon Steel Castings/Alloy Steel Castings /Stainless Steel Castings with minimum cumulative value of Rs. 20,00,000.00 (Rs. Twenty Lakh Only) as proof. Purchase Order/s should be 01.10.2016 or afterwards. For MSEs, the required cumulative value of POs shall be Rs. 10,00,000.00 (Rs. Ten Lakh only). Start-ups shall be exempted from the above criteria of Purchase order submission without any relaxation in quality standards or technical parameters as per D.O. No. 5(4)/2016-BE-I dated 15.02.2017. For claiming Start-Up exemption, vendors have to submit DPIIT (Dept. of Promotion of Industry and Internal Trade)/DIPP (Department for Industrial Policy and Promotion) recognition certificates.
2. Vendor shall have to submit "Well Known Foundry" certificate which shall be valid as on date of tender opening and vendor has to submit undertaking that they shall renew it from time to time if the IBR certificate is valid till 31.03.2021 or before. IBR foundries which have applied for renewal on the date of tender opening shall submit the expired "Well Known Foundry" certificate and documentary evidence/undertaking for renewal of the same. Foreign suppliers shall give the undertaking that they shall follow the process of witness pouring through IBR authorized agencies.

G1.2 INSTRUCTION TO BIDDER (In case of E-Procurement)

Interested bidders/Suppliers shall submit their offer through e-Procurement mode at **<https://bhel.abcprocure.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"**.

- 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:

- Supplier visits EPS home page
- Supplier Login in with their user id and password
- Search the RFQ ID and views it.
- Attaches themselves to the RFQ by clicking the "I/We wish to participate".
- Supplier fills the bid template and makes necessary attachments
- Supplier submits their bid by clicking Sign, Encryption & Save button.

In any problem is faced by supplier while login/registration in EPS (<https://bhel.abcpurchase.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

G2.2. OTHER IMPORTANT INFORMATION RELATED TO E-PROCUREMENT TENDERS

- 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.
2. 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.
 3. 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.
 4. 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.
 5. 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.
 6. 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.
 7. **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.**

1.1 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.

The details of tender items is as per below details:

Sl. No.	Group Code	Material Specification	Item Description	Qty. (MT)
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600 class items				
1	G92110170000	ASTM A 216 Gr. WCB & WCC	Valve Casting of C600 for size 2" & 3" Gate (GV), Globe (RV/SV), NRV(FV) valves [Description A]	10
2	G92110180000	ASTM A 216 Gr. WCB & WCC	Valve Casting of C600 for size 4" & above Gate (GV), Globe (RV/SV), NRV(FV) valves [Description B]	120
3	G92110190000	ASTM A 217 Gr. WC9	Refer [Description A] above	5
4	G92110200000	ASTM A 217 Gr. WC9	Refer [Description B] above	5
5	G92110210000	ASTM A 351 Gr. CF8	Refer [Description A] above	5
6	G92110220000	ASTM A 351 Gr. CF8	Refer [Description B] above	5
7	G92110230000	ASTM A 351 Gr. CF8M	Refer [Description A] above	5
8	G92110240000	ASTM A 351 Gr. CF8M	Refer [Description B] above	5
Sub-Total				160
Isolating Bodies				
1	G92110420000	ASTM A 216 Gr. WCB & WCC	Isolating Casting from (1MT to 3.5MT)	30
Sub-Total				30
Total				190

The tender quantity given above is tentative only. The actual ordering quantity may vary Between grades and also overall tender quantity can vary by any percentage. **Also kindly note that material codes given above are codes which represent a group (e.g material code/group code 'G92110170000' represents all castings of Gr. A216 Gr. WCB/WCC as per Description A). These material/group codes are generated for e-tendering purpose only. Actual PO will be released as per material codes given in "list of items". List of items is a probable list. New items in the list of items in the same pressure class can be added from time to time which will also be covered under this RC as per clause 10.**

2. PRICE BASIS

G3. PRICE BASIS

- a. The reimbursement of GST portion of invoice shall be released only upon: -
1. vendor declaring such invoice in his GSTR-1 and
 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 except as per PVC clause.
 - 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.
 - 2e. **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.
 - 2f. Unloading of material at Main Stores of BHEL shall be arranged by BHEL.
 - 2g. In case of disputes/errors/difficulty in interpretation of rates mentioned in figures, rates mentioned in words shall be taken as final.
 - 2h. Order of enquiry Sl. No. shall be maintained in quotation.
 Variation in taxes or any other statutory levi's during contractual delivery period shall be to BHEL's account.

3. a. 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.

b. VALIDITY OF RATE CONTRACT:

The rate contract with PVC shall be valid for one year from the date of finalization of contract. Same can be extended again for one year on mutual agreement. BHEL can terminate rate contract earlier also without assigning any reason.

4. PRICE VARIATION:

Casting prices shall be revised based on the prices of only four materials [viz; Ferrous scrap, Ferromoly, Nickel & Chromium] ; labour, Fuel & Power index. Price variation due to change in any other input shall not be considered during the currency of RC. Revised rates shall be arrived at by using following formulae:

Material	Formulae for calculating X_n , price for two months period
WCB, WCC	$X_n = X_0 + 1.0909 (H_n - H_0) + 0.18 * \Delta E + 0.10 * \Delta L$
WC9	$X_n = X_0 + 1.0536 (H_n - H_0) + 0.0115 (F_{m_n} - F_{m_0}) + 0.0259 (Cr_n - Cr_0) + 0.18 * \Delta E + 0.10 * \Delta L$
CF8	$X_n = X_0 + 0.7691 (H_n - H_0) + 0.0055 (F_{m_n} - F_{m_0}) + 0.2127 (Cr_n - Cr_0) + 0.1036 (Ni_n - Ni_0) + 0.18 * \Delta E + 0.10 * \Delta L$
CF8M	$X_n = X_0 + 0.7364 (H_n - H_0) + 0.0273 (F_{m_n} - F_{m_0}) + 0.2127 (Cr_n - Cr_0) + 0.1145 (Ni_n - Ni_0) + 0.18 * \Delta E + 0.10 * \Delta L$

TERMS USED

X_0	Price finalized & valid for first two months of the rate contract; taken as base for further calculations.
X_n	Revised price of the material to be declared after every two months. POs shall be released on this revised price for two months period.
H_0	Ferrous scrap price HMS (High Melting scrap 80:20 mix) from the Metal bulletin (monthly avg data for the preceding two months of finalization). Shall be informed by BHEL alongwith final rates.
H_n	New Average ferrous scrap price HMS (80:20 mix) taken from the Metal bulletin. (Avg for just preceding two months when the price is being revised)
F_{m_0}	Price of Ferromoly taken from the Metal bulletin, basis as for HMS, H_0 above.
F_{m_n}	New Average Price for Ferromoly taken from the Metal bulletin, basis as for HMS, H_n above
Cr_0	Price of Chromium, taken from the Metal bulletin, basis as for HMS, H_0 above.
Cr_n	New Average Price for Chromium taken from the Metal bulletin, basis as for HMS, H_n above
Ni_0	Price of Nickel during the start date of the rate contract taken from the website www.lme.com , basis as for HMS H_0 above. From average values of two months, Price in Rs./kg for all values of two months shall be calculated.
Ni_n	New Price arrived for Nickel from the website www.lme.com , basis as for HMS, H_0 above
Va_0	Price of Vanadium, taken from the Metal bulletin, basis as for HMS, H_0 above.
Van	New Average Price for Vanadium taken from the Metal bulletin, basis as for HMS, H_n above
ΔE	Change in Wholesale Price Index Numbers– All-India basis reference taken from >publications>>Monthly>>RBI bulletin>>Prices">http://rbi.org.in/home.aspx>>publications>>Monthly>>RBI bulletin>>Prices [Table no. 21]-1.2: Fuel and Power. ΔE will be calculated as per below formula: $\Delta E = (E_n - E_0) / E_0 * X_0 * 0.18$; where E_0 is base index for Fuel & Power and E_n is index for Fuel & Power for new months

ΔL	Change in Consumer Price Index Numbers for Industrial Workers – All-India basis reference taken from >publications>>Monthly>>RBI bulletin>>Prices [Table no. 19]-1">http://rbi.org.in/home.aspx>>publications>>Monthly>>RBI bulletin>>Prices [Table no. 19]-1 . ΔL will be calculated as per below formula: $\Delta L = (L_n - L_0) / L_0 * X_0 * 0.10$; where L ₀ is base index for labour and L _n is index for labour for new months
All prices used in formulae are in Rs. per kg. \$ (USD) to Rs. price shall be taken from www.rbi.org.in . Rs./kg value for any variant shall be derived for each value by using \$/kg for respective date(nearest preceding date) and then average shall be derived for the period. For foreign supplier also new rate by PVC will be calculated in INR firstly. For calculating rate in INR, PVC formula on landed cost to BHEL (L1 rate in INR) will be applied. In this calculation for conversion of H, Fm, Cr, Ni rate from \$ to INR, the \$ (USD) rate at respective date (the date at which metal rate is taken) will be taken. Then this new rate in INR will be converted to \$ (USD) by considering \$ rate at tender opening date.	

Finalized prices shall be applicable for two months from the date of finalization of rate contract. These finalized prices shall be taken as base prices, X₀. Base indices shall be taken as avg. of indices published in the period of previous two months from date of finalisation. New casting rates to be operated for POs to be released from the end of two months from RC finalization date shall be declared based on indices for the previous two months

5. 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 Rev26/TDC6396Rev00/TDC6400Rev 01 (or latest applicable) as per the requirement and for foreign supplier is TDC:0:433 Rev00 (or latest applicable).

Purchase orders for castings which involve Creep testing/IGC testing shall be released only on mutual consent from the bidders.

It is made clear that POs released in sets, i.e. [all components for a particular type of valve] have to be supplied in sets only. The claim of vendor for payment of supplies against any PO can be put on hold if the components have not been delivered in sets. However, depending upon our own planning and requirement, BHEL may ask for delivery of some components not in sets, for which due consideration shall be given relieving the vendor from above condition. Also vendor has to supply items in oldest PO first if any item is pending in more than two POs.

6. WELL KNOWN FOUNDRY:

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.

7. DELIVERY SCHEDULE:

There is no firm commitment against tender quantity. During the currency of the Rate Contract, BHEL will release POs from time to time based upon our requirement of any tonnage. Vendor shall be required to complete the order as per the schedule mentioned in PO/delivery requirement given through other communications. Delivery Schedule in the POs shall be given based on the monthly commitment given in the Annexure A by supplier. For pattern development items, minimum 3 month time shall be given for the supply of sample castings.

8. 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.

9. PROCEDURE FOR CASTING WEIGHT ESTABLISHMENT

Weights already established are attached along with tender documents. Weights of same patterns for different material grade castings shall be same. These 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, the already established weight 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.

10. DEVELOPMENT ORDERS FOR CASTINGS REQUIRING NEW PATTERNS:

If a party has already developed a particular type and size of casting, regular orders will be placed for those castings. For the item/s for which pattern/s is yet to be developed by the party, in the first instance, a developmental order/s will be placed on mutual consent basis. The vendor has to develop the pattern maximum within 45 days and supply first sample castings within next 30-45 days of pattern completion report submitted to BHEL, failing which BHEL may cancel the PO. Vendor need to submit the pattern completion report on the lapse of 45 days from the date of PO placement. Bulk supply shall be undertaken only after sample clearance. Quality requirement of new developments shall be as per TDC:0412 Rev26/TDC6396Rev00/TDC6400Rev 01/TDC:0:433 Rev00(or latest revisions applicable from time to time) besides other technical documents. Pattern development items shall be considered on par with the development orders as considered in SEARP clause 5.2 according to which development orders shall not be subjected to LD clause and shall also not be subjected to Risk Purchase clause.

11. 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. 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-1 and
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.

12. INSPECTION:

- a. All required tests (Physical properties, Chemical properties, Heat Treatment, NDE, 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), 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 notwithstanding, 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.
- k. BHEL representative from unit or CQ is authorized to carry out audits along with TPIA at vendor’s works before clearing the items for dispatch.

13. **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 Rev26/TDC6396Rev00/TDC6400Rev 01 TDC:0:433 Rev00
- 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:0412 Rev26/TDC6396Rev00/TDC6400Rev 01/ TDC:0:433 Rev00 Clause 7, S. No. 1. 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:0412 Rev26/TDC6396Rev00/TDC6400Rev 01/TDC:0:433 Rev00.

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.

14. **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, Rs. 21.00 per cc for Alloy Steel and Rs. 24.20 per cc for Stainless Steel grades 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.

15. 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 17), 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 GST 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>).

16. LOADING:

Rate Contract will be entered into requisite no. of vendors to ensure that our requirement is met. For this, BHEL reserves the right to give counter offers to other than L1 vendor except highest bidder.

1. Tender quantity shall be divided in the proportion 60:15:25 (60% for L1, 15% for L2 and 25% for MSE's) in case the L1 vendor is not a MSE subject to following conditions:

- I. L2 acceptance of L1 rates.
 - II. In tender, participating Micro and Small Enterprises quoting price within price band of L1+15 per cent shall also be offered 25% quantity of tender quantity at L1 price in a situation where L1 price is from someone other than a Micro and Small Enterprise. In case of more than one such Micro and Small Enterprise, the supply shall be shared equally. If there are more than one MSE in the price band of L1+ 15% to whom the offer has been sent and some of them reject the offer, then the remaining quantity shall be distributed equally to the MSEs accepting L1 prices.
 - III. 25% from the 25% quantity (i.e. 6.25% of the tender quantity) offered to the MSE's shall be reserved for MSE's owned by SC/STs. In event of failure of such Micro and Small Enterprises to participate in tender process or meet tender requirements and L1 price, 6.25 per cent quantity for Micro and Small Enterprises owned by SC/ST entrepreneurs shall be met from other Micro and Small Enterprises. 3% from within the 25% quantity offered to the MSE's will be offered to women owned MSE's. Failure to participate by any MSE owned by women; this 3% quantity shall be offered to other MSE's.
 - IV. In case any MSE vendor does not accept the counter offer, the above mentioned 25% quantity shall be offered to L2.
 - V. If there is no MSE in the Price band of L1+15% then the 25% quantity shall be offered to L2 vendor.
 - VI. If other suppliers (other than L1) are not under MSE then 60% quantity shall be given to L1 and 40% quantity shall be offered to L2 supplier.
2. In case if the L1 vendor is MSE then quantity shall be provided as 60 % for L1, 30.75% for L2, 6.25% tender quantity shall be offered to the MSEs owned by SC/ST's in the price band of L1+15% and 3% quantity shall be offered to the MSEs owned by women entrepreneur. In event of failure of such Micro and Small Enterprises to participate in tender process or meet tender requirements and L1 price, 6.25 per cent sub-target for procurement earmarked for Micro and Small Enterprises owned by SC/ST entrepreneurs and 3 per cent sub-target for procurement earmarked for Micro and Small Enterprises owned by women entrepreneurs shall be met from L2 vendor.
3. In case the L1 vendor is MSE owned by SC/ST Women entrepreneur then quantity shall be provided as 60 % to L1 and 40% to L2.

All above offered quantity are subject to acceptance of L1 rates.

In case of non- acceptance of counter offer by any vendor after above applicable provisions the whole quantity would be offered to L1 vendor. All above mentioned preferences shall be given to MSEs and SC/STs only on the submission of documentary evidence in the Techno-Commercial part only.

It shall be the discretion of BHEL to give counter offer to highest bidder in case there are only two bidders for the item.

Above indicated criteria is liable to be monitored/controlled/regulated by BHEL from the first ordering itself/subsequent ordering based on commitment given by L1 vendor/other vendors, past performance, quality of castings, availability of patterns etc.

Once the rate contract is in place with various vendors based on acceptance of counter offer, while placing regular Purchase orders, BHEL will place orders for required quantity based on pattern availability, pattern development time, BHEL delivery requirement, pending POs at any time with vendor (including previous RC POs) and vendor's monthly commitment, capability, delivery records and quality. Performance of vendors shall be monitored as per the performance monitoring system attached. Though BHEL requires and intend to procure castings in sets for a particular size,

but BHEL reserve the right to release POs of casting components in any proportion to meet its requirement. The vendor has to mention his monthly commitment in MT.

17. 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.

18. 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% of undelivered portion.

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.

19. 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.

20. SUB-CONTRACT:

The purchase order or any part thereof shall not be sub-contracted, assigned or otherwise transferred without previously obtaining the BHEL's consent in writing.

21. 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.

22. 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.

23. 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.

24. 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) 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.
- e) BHEL may increase/decrease item/s based on BHEL requirement before price bid opening. Suitable price implication may be asked from suppliers.
- f) 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.
- g) 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.
- h) BHEL reserves the right to negotiate with L1 bidder/s of Reverse auction/sealed bid.
- i) 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.
- j) If vendor has mentioned **FOR Punjab** in his quotation, then it will be considered as FOR Goindwal Sahib (Pb.).
- k) **Documents submitted with the offer shall be signed and stamped in each page by authorized representative of the bidder.**

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

25. 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.

26. 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 UAM(Udyog Aadhar Memorandum), 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.”

27. 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.

28. 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.

29. 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.

G31. 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).

G32. 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

G33. 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.

G34. PREFERENCE TO MAKE IN INDIA

For this procurement, Public Procurement (Preference to Make in India), Order 2017 dated 15.06.2017, 28.05.2018 & 29.05.2019 and subsequent Orders issued by the respective Nodal Ministry shall be applicable even if issued after issue of this NIT before finalization of contract/PO/WO against this NIT.

In the event of any Nodal Ministry prescribing higher or lower percentage of purchase Preference and / or local content in respect of this procurement, same shall be applicable.

G35. 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.

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.
- Monthly supply commitment in MT
- Annexure-A duly filled
- SC/ST certificate and 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.**

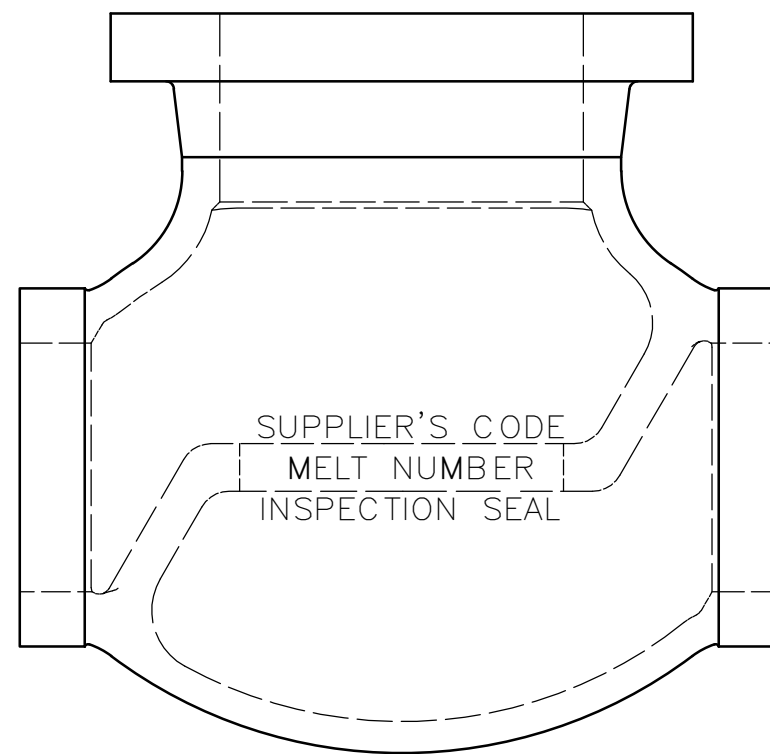
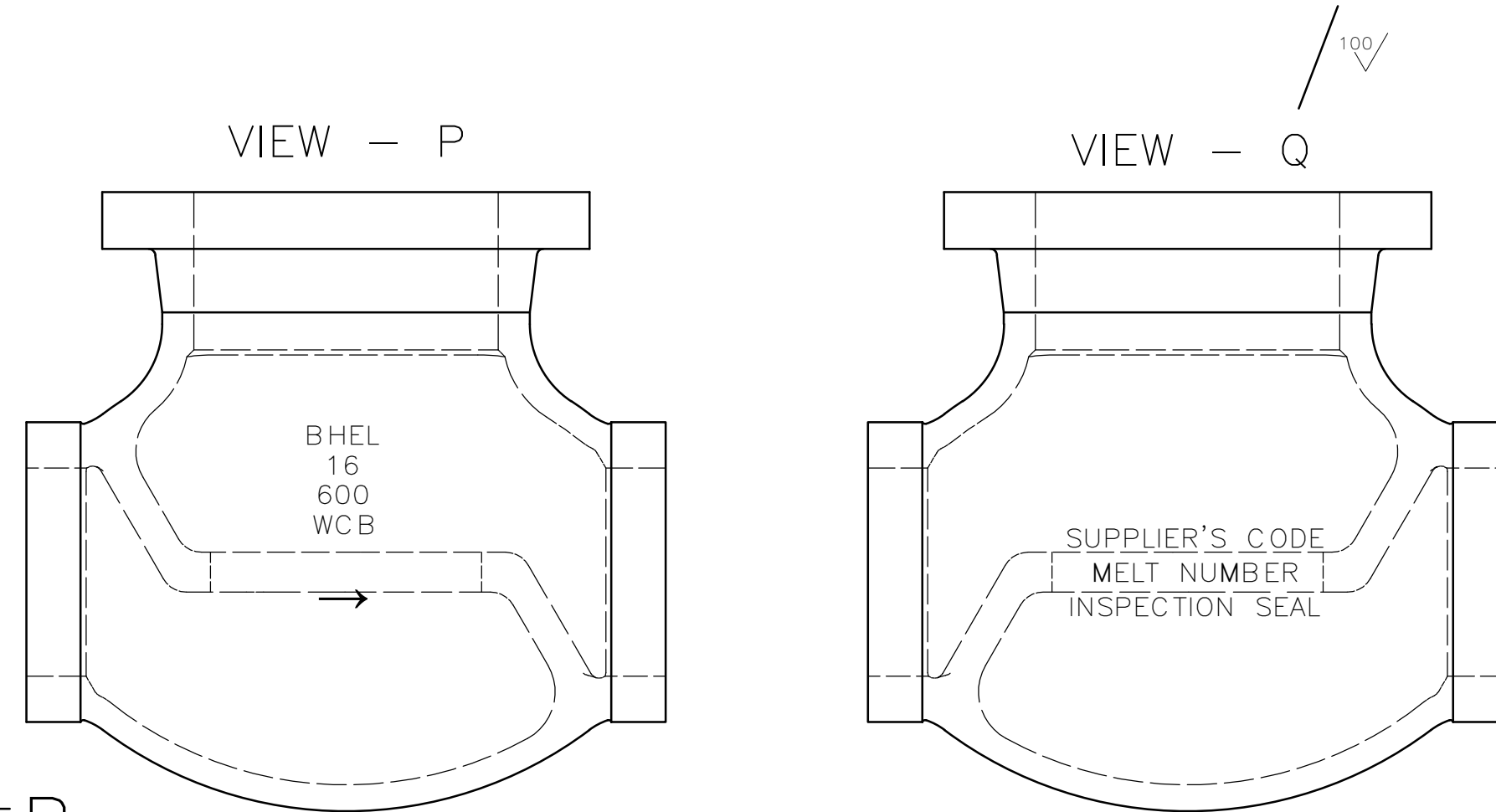
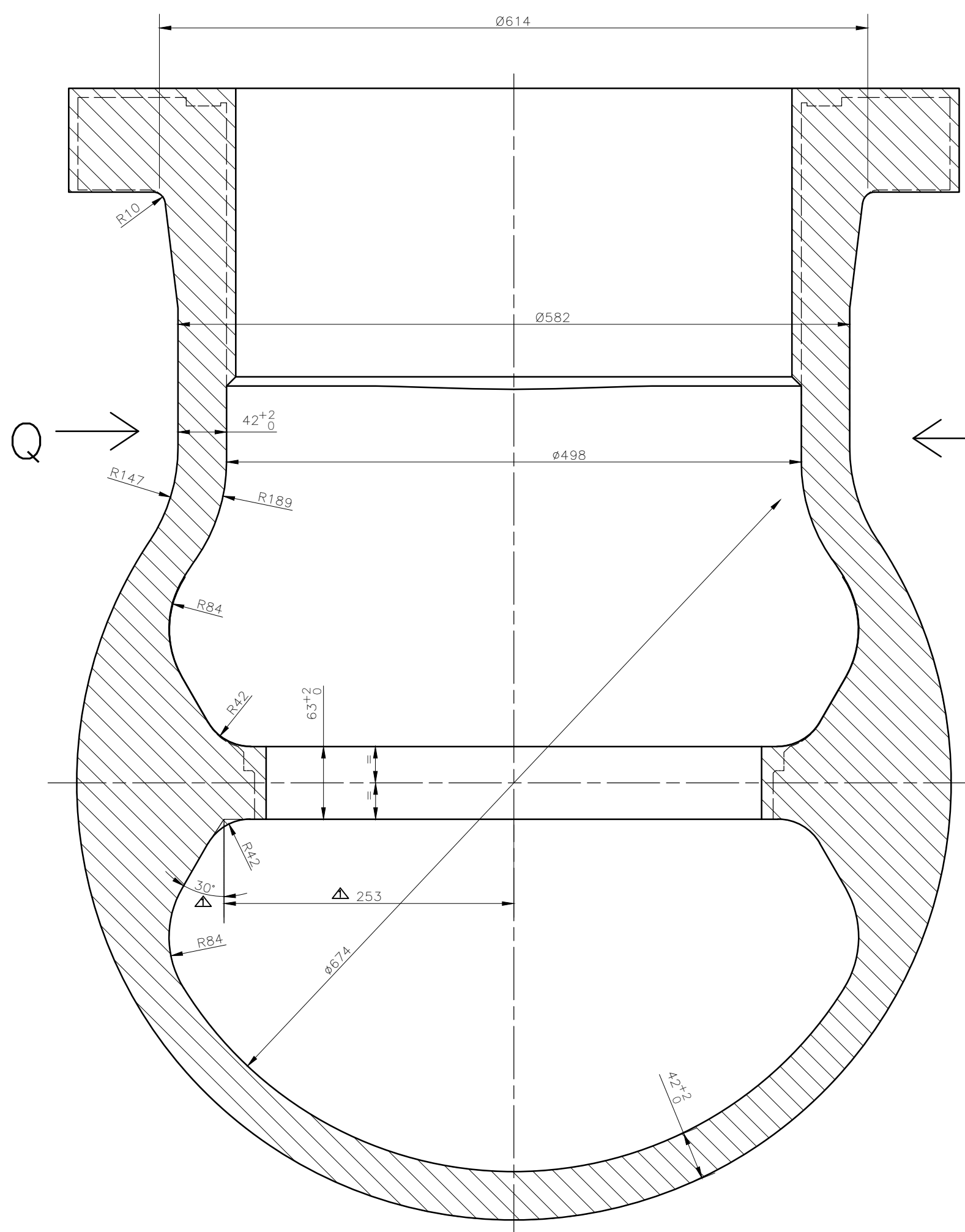
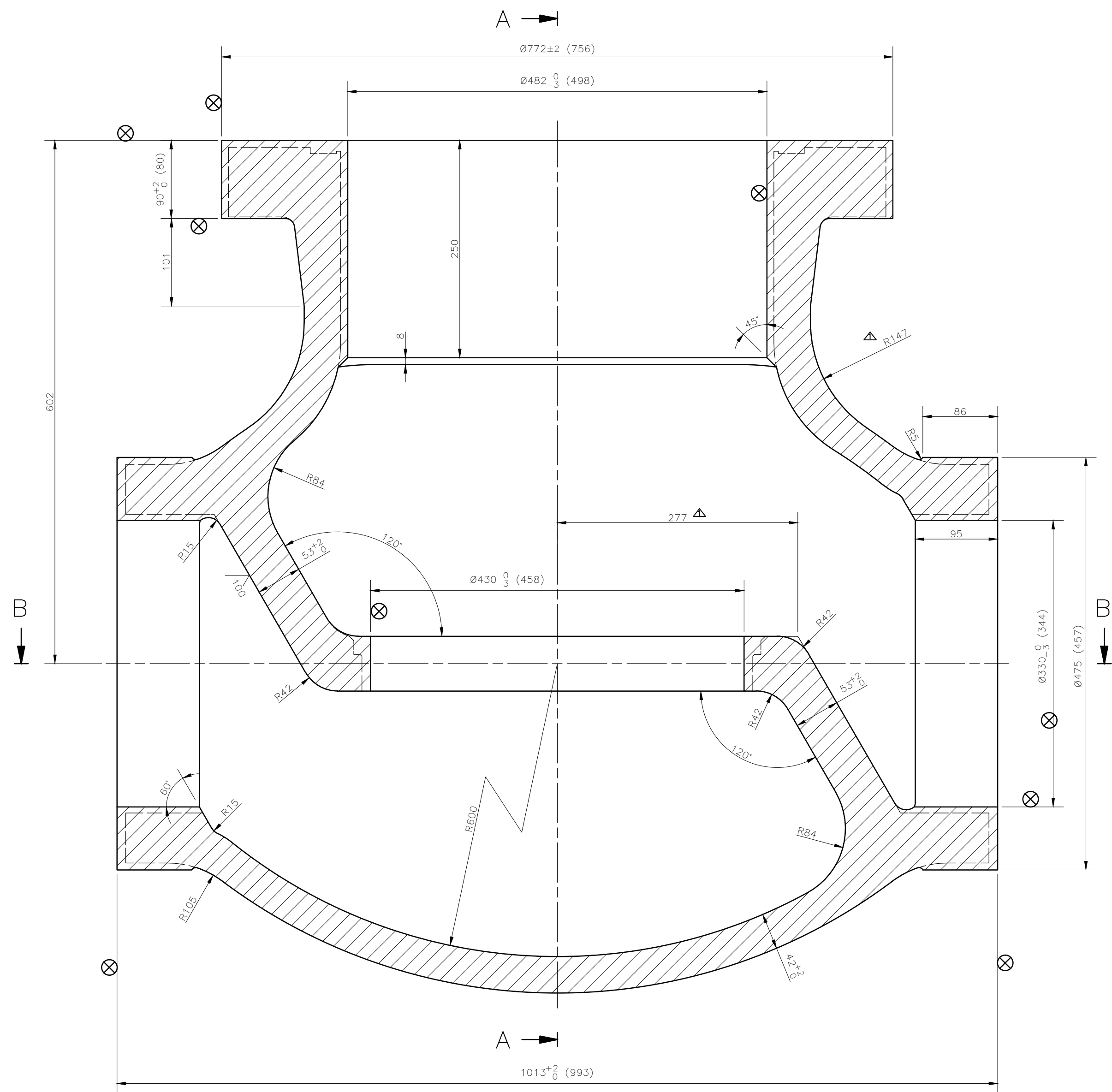
Procedure to finalise the rate contract:

- Receipts of quotations (Part-I & Part-II): **By 1400 Hrs on due date**
- Opening of part-I: **By 1530 Hrs on due date**
- Evaluation of part-I of vendors and declaration of price bids opening or reverse auction : **Date shall be announced and informed to all bidders.**

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

DRAWING NO.	1-V-0000-05255R
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ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP/QP



NOTES:

01. CASTING SHALL COMPLY WITH THE REQUIREMENTS OF APPLICABLE QUALITY PROCEDURE

02. NECESSARY MACHINING ALLOWANCES HAVE BEEN ADDED ON ALL MACHINABLE SURFACES.

03. ⊗ INDICATES SURFACES TO BE MACHINED.

04.100/ INDICATES CASTING SURFACES SHALL BE OF HIGH QUALITY WITHOUT SURFACE UNEVENNESS.

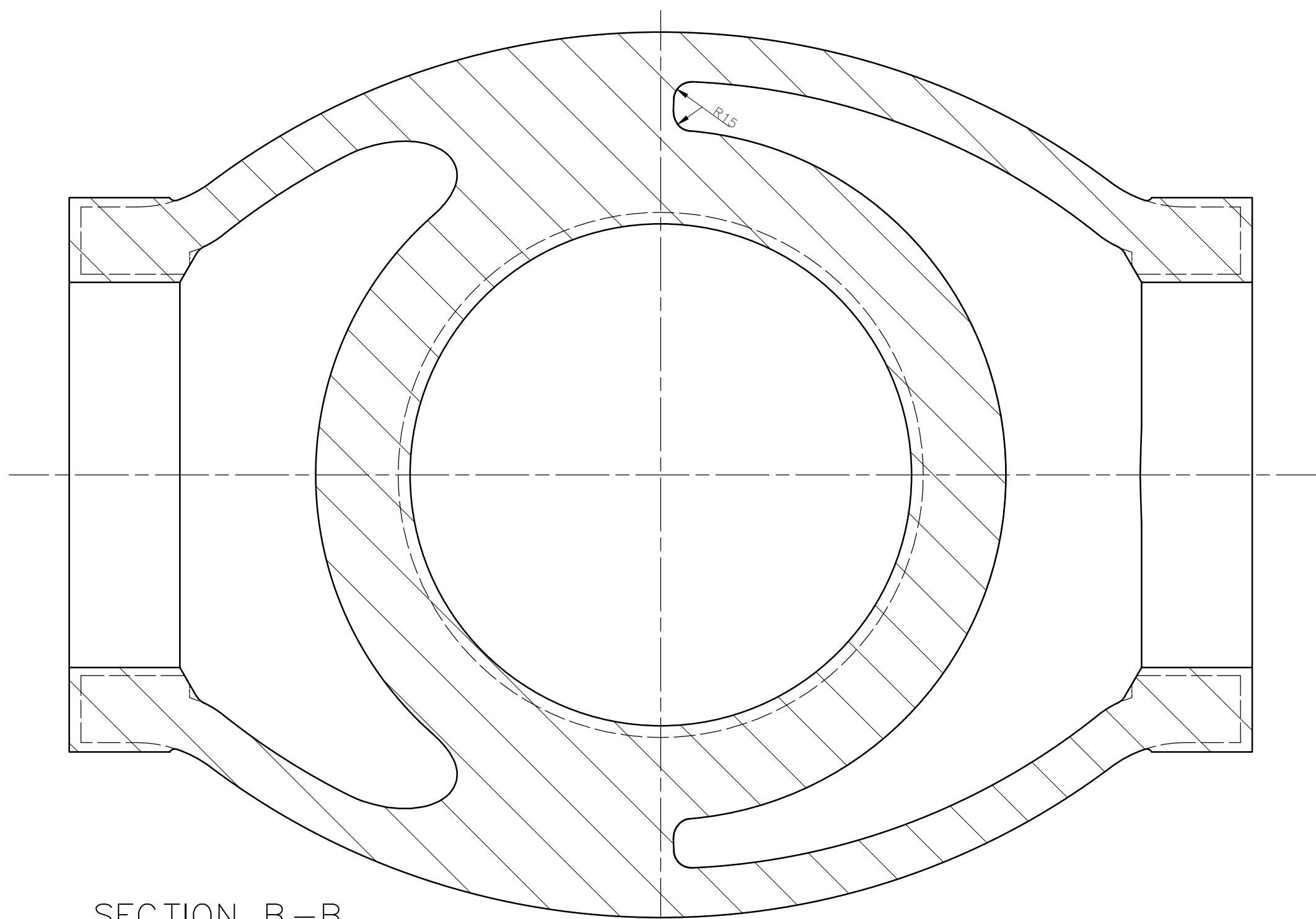
05. UNSPECIFIED CASTING RADII = R5 MAXIMUM.

06. ALL DETAILS IN VIEW "A" & VIEW "B" EXCEPT MELT NO. & INSPECTION SEAL ARE TO BE CAST. HEIGHT OF CASTING LETTERS - 30MM.

07. FINISH MACHINED DIMENSIONS ARE INDICATED WITHIN BRACKET FOR INFORMATION ONLY.

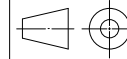
08. PERMISSIBLE DEVIATIONS OF NON - TOLERANCED CASTING DIMENSIONS REFER APPLICABLE QUALITY PROCEDURE

09. MINIMUM WALL THICKNESS 42 MM.



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.

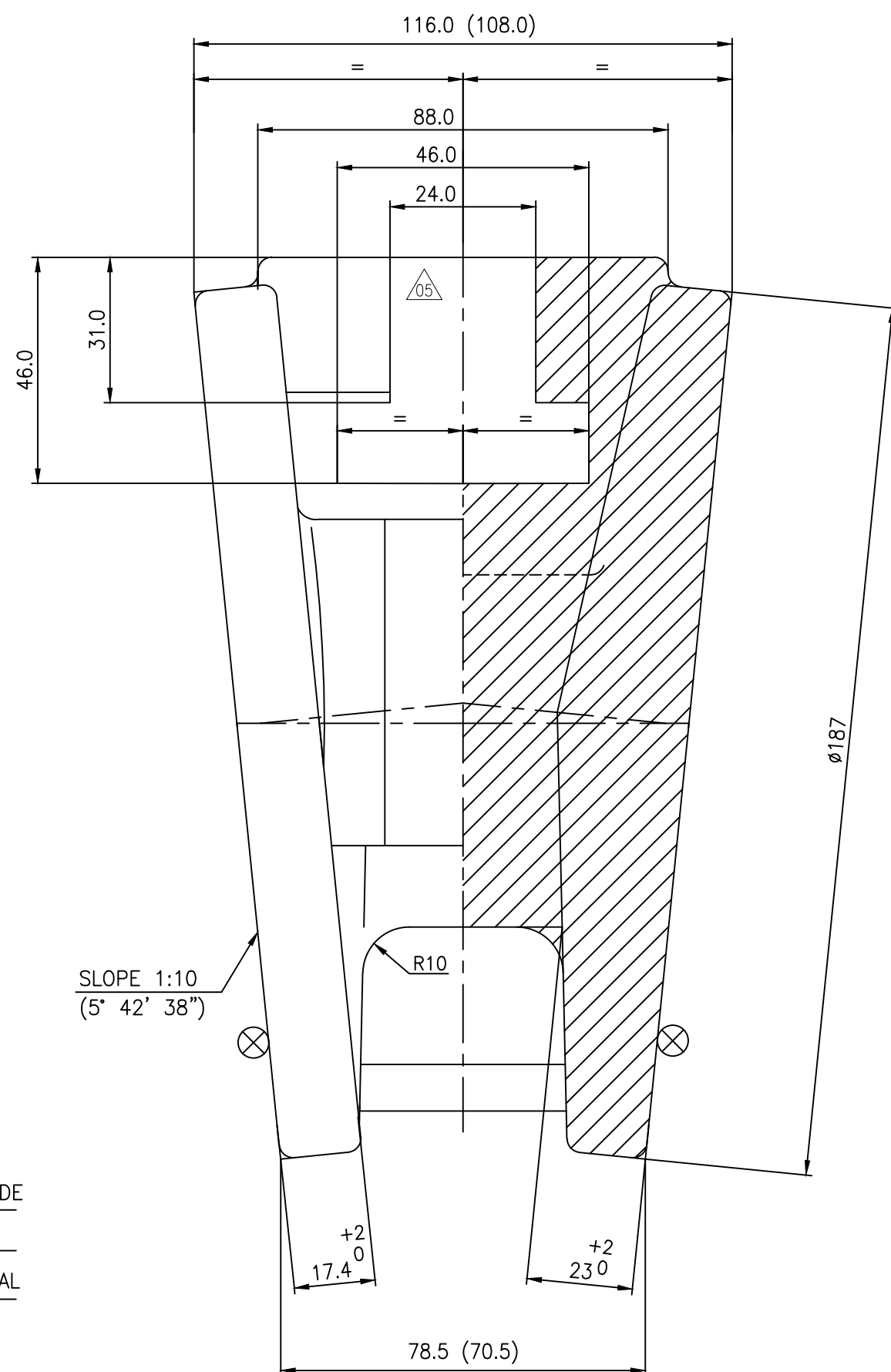
REV 01	DATE 18.01.13	ALTERED ARUNKUMAR P CHD & APPD K RAJASEKAR
WCC MATERIAL INCLUDED - NH56 DIMENSIONS 253, 277, R147 & 30" INCLUDED SYMBOL  INDICATES REVISION 01.		
DCN: 801471/5016204		

—	CASTING	922030890000	SA216 WCB ATTEST	NR	—	1198	—	1.V.NH56.05255R/1	—	
—	CASTING	922030890000	SA216 WCB ATTEST	NR	—	1198	—	1.V.NH56.05255R/1	—	
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				CS						
 BHARAT HEAVY ELECTRICALS LTD. UNIT: HIGH PRESSURE BOILER PLANT. TRICHURHAPALLI-620014.				DRN	NAME ARUNKUMAR P		SIGN	DATE 27.11.12		
				CHD	MRAJAK			27.11.12		
				APPD	MRAJAK			27.11.12		
365-119		SCALE		WEIGHT (KG).		REFERENCE INFORMATIONS				
DEPT VL			NTS		1198		—			
CODE 320										
TITLE					CARD CODE	DRAWING NO.			REV	
BODY CASTING					U 01	1-V-0000-05255R			0	
16" - C600										

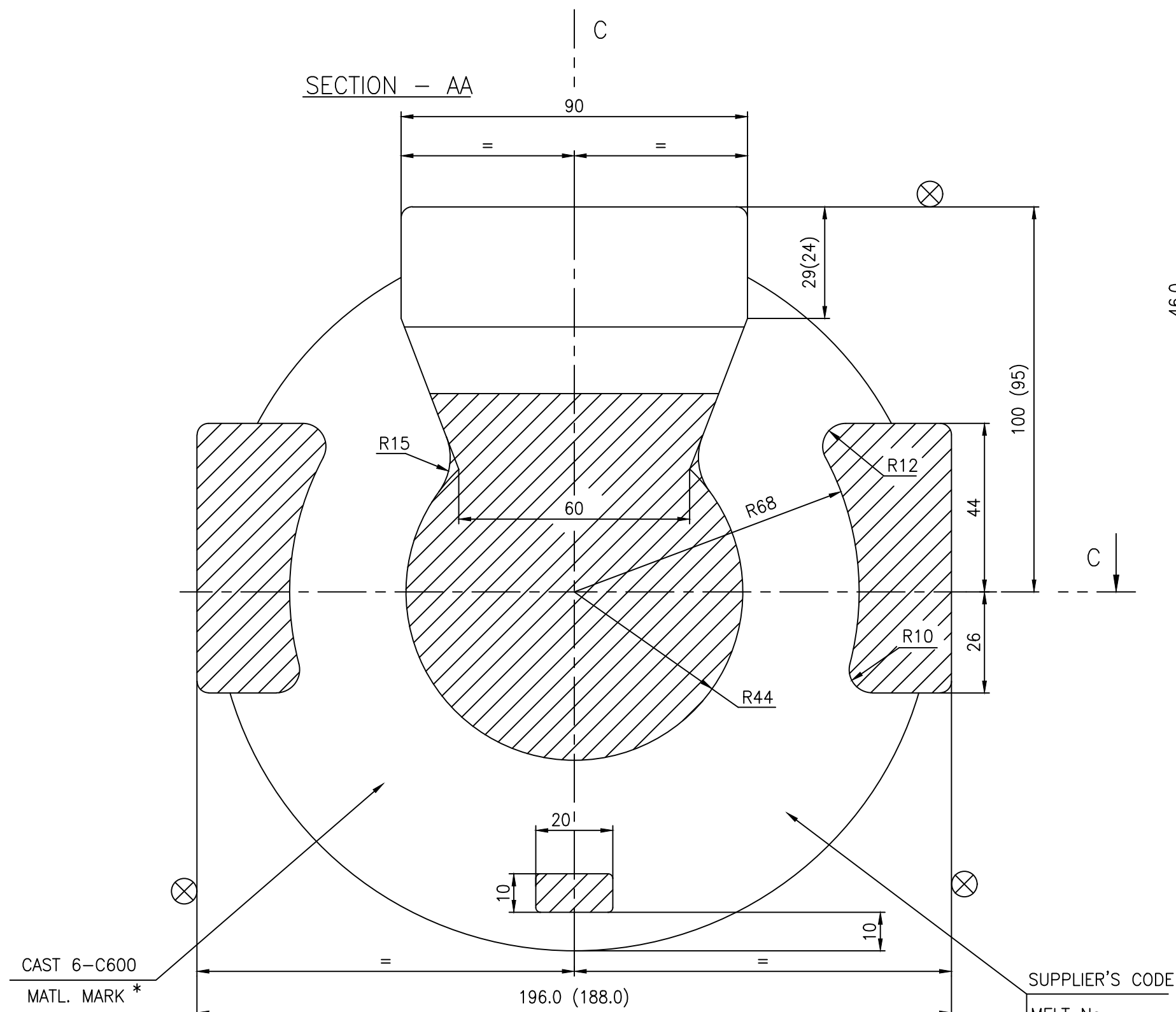
DRAWING NO. 2-V-0000-05890R

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

SECTION - BB



SECTION - AA

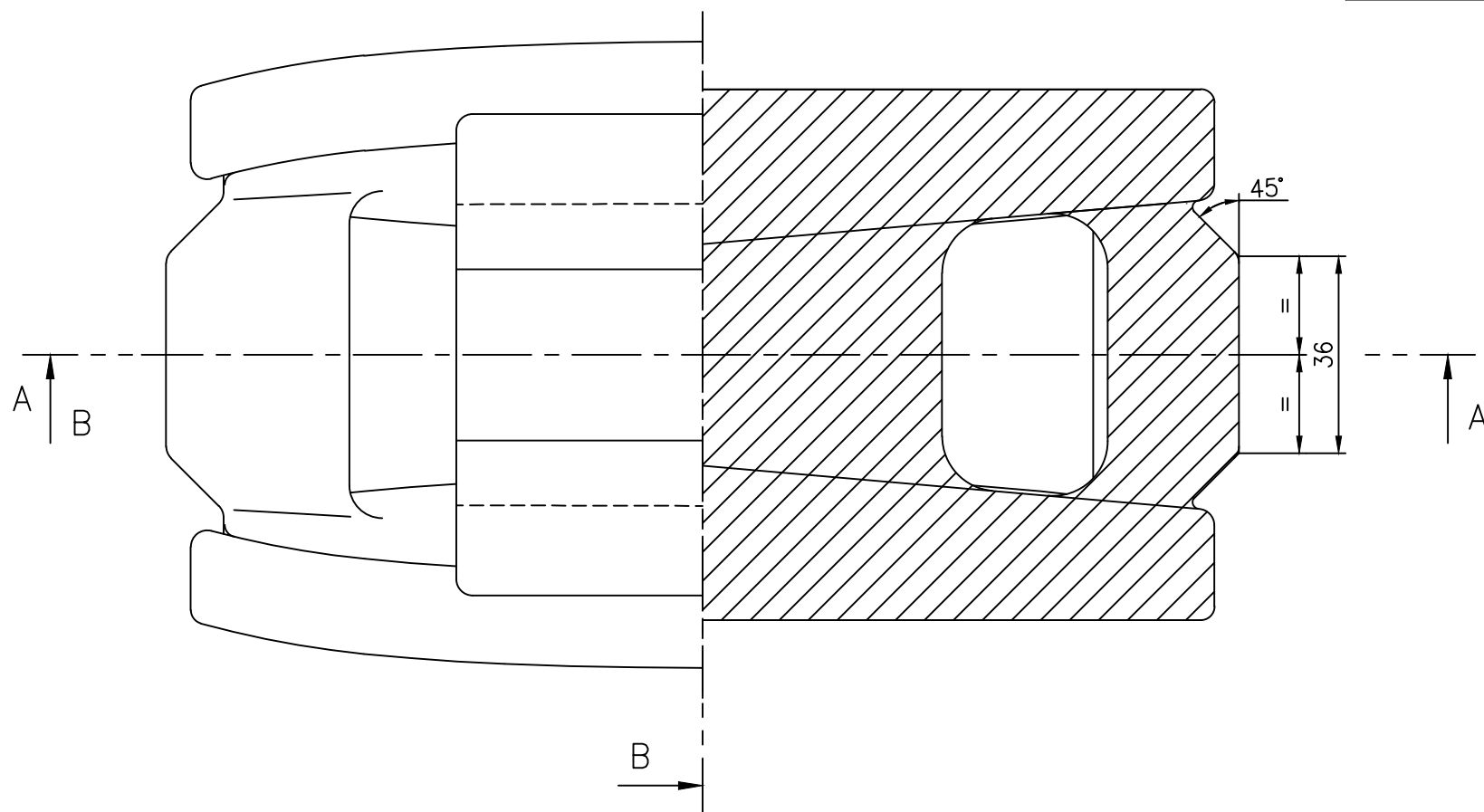


SUPPLIER'S CODE

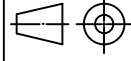
MELT No.

INSPECTION SEAL

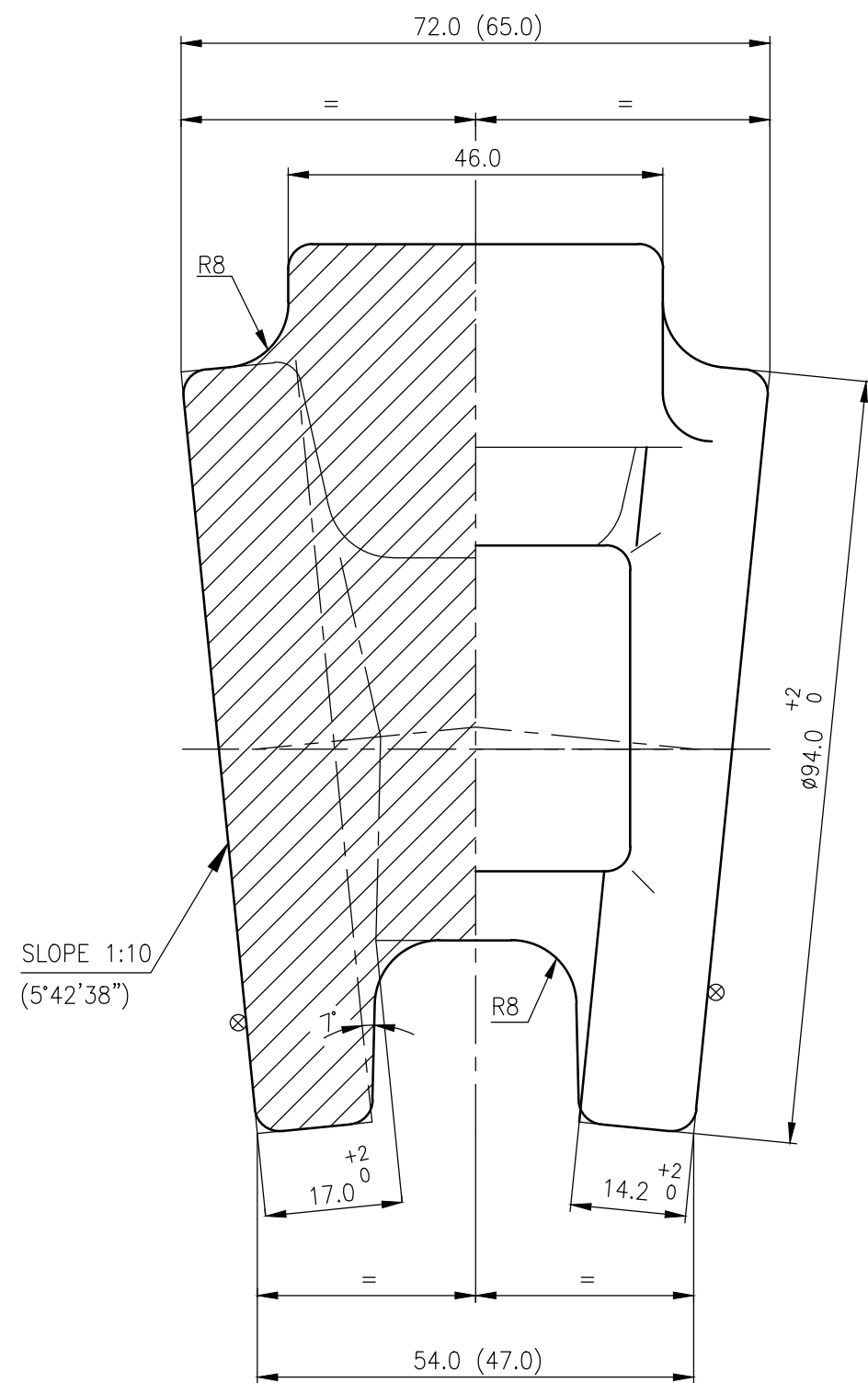
SECTION - CC



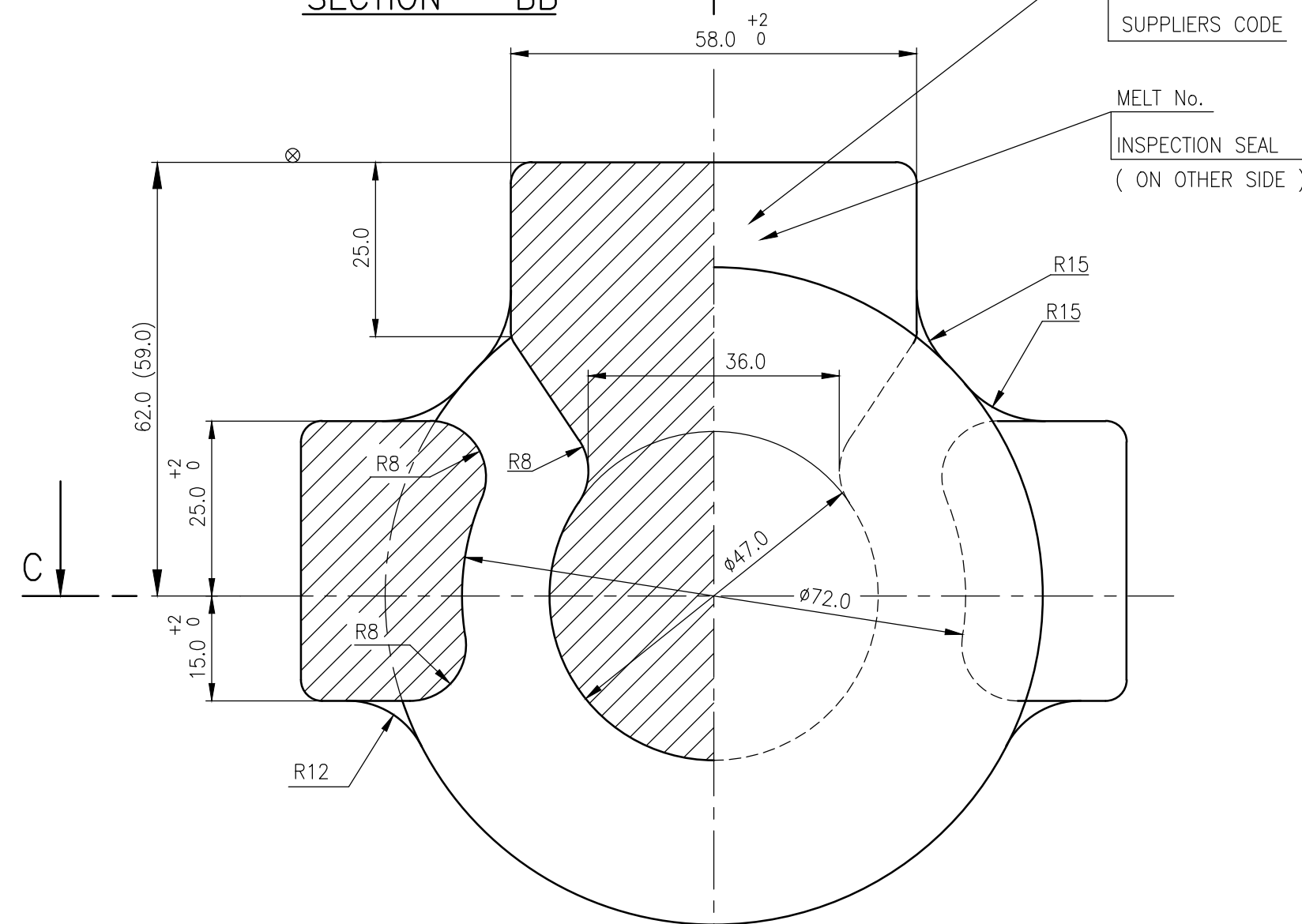
REV 05	DATE 22.10.19	ALTERED R.P.SINGH CHD & APPD SAMEER & SSK	REV 04	DATE 02.05.16	ALTERED V.JENIS CHD & APPD MS & SSK	REV 03	DATE 13.08.01	ALTERED MS CHD & APPD KSR	REV 02	DATE 24.06.2K	ALTERED MS CHD & APPD KSR	REV 01	DATE 21.08.96	ALTERED MS CHD & APPD KSR
	T-SLOT DIMENSIONS INCLUDED. WEIGHT 12 WAS 13 Kgs. DCP:802519			SL. NO. 05 INCLUDED	DONCS:154		MARKING LOCATION CHANGED		DCN No. HM : 0	DIMENSIONS Ø175 & 10 REMOVED RIB SIZE 20x10 INTRODUCED. WCC, WC6 AND WC9 MATERIAL INCLUDED.	ZONE DCN No.: 0204 HM :		DIA 187 TO THE THICKNESS OF 10 INTRODUCED.	

CF8	05	CASTING	—	ASTM A351 CF8—CERTIFY	SOLUTION & ANNEALED	—	12.0	—	2.V.F528.05890R/01 92 203 459 0000	—
WC9	04	CASTING	—	ASTM A217 WC9—CERTIFY	NORMALISED & TEMPERED	—	12.0	—	2.V.F534.05890R/02 92 033 969 0000	—
WC6	03	CASTING	—	ASTM A217 WC6—CERTIFY	NORMALISED & TEMPERED	—	12.0	—	2.V.F524.05890R/02 92 033 954 0000	—
WCC	02	CASTING	—	ASTM A216 WCC—CERTIFY	NORMALISED	—	12.0	—	2.V.F514.05890R/02 92 033 968 0000	—
WCB	01	CASTING	—	ASTM A216 WCB—CERTIFY	NORMALISED	—	12.0	—	2.V.F504.05890R/04 92 033 852 0000	—
MATL. MARK *	S L No.	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No COMPONENT CODE	ITEM No
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.  BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI -620014.										
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT DRN CHD APPD NAME P.SRINIVASAN P.Boomminathan K.S.RAMAN SIGN DATE 24.06.2K DATE 24.06.2K NO. OF VAR.										
DEPT VL CODE 320   SCALE NTS WEIGHT (KG). 12.0 REFERENCE INFORMATIONS CAD :C205890R NO. OF ITEMS										
TITLE WEDGE (6 - C600) CARD CODE U 01 DRAWING NO. 2—V—0000—05890R REV 05										

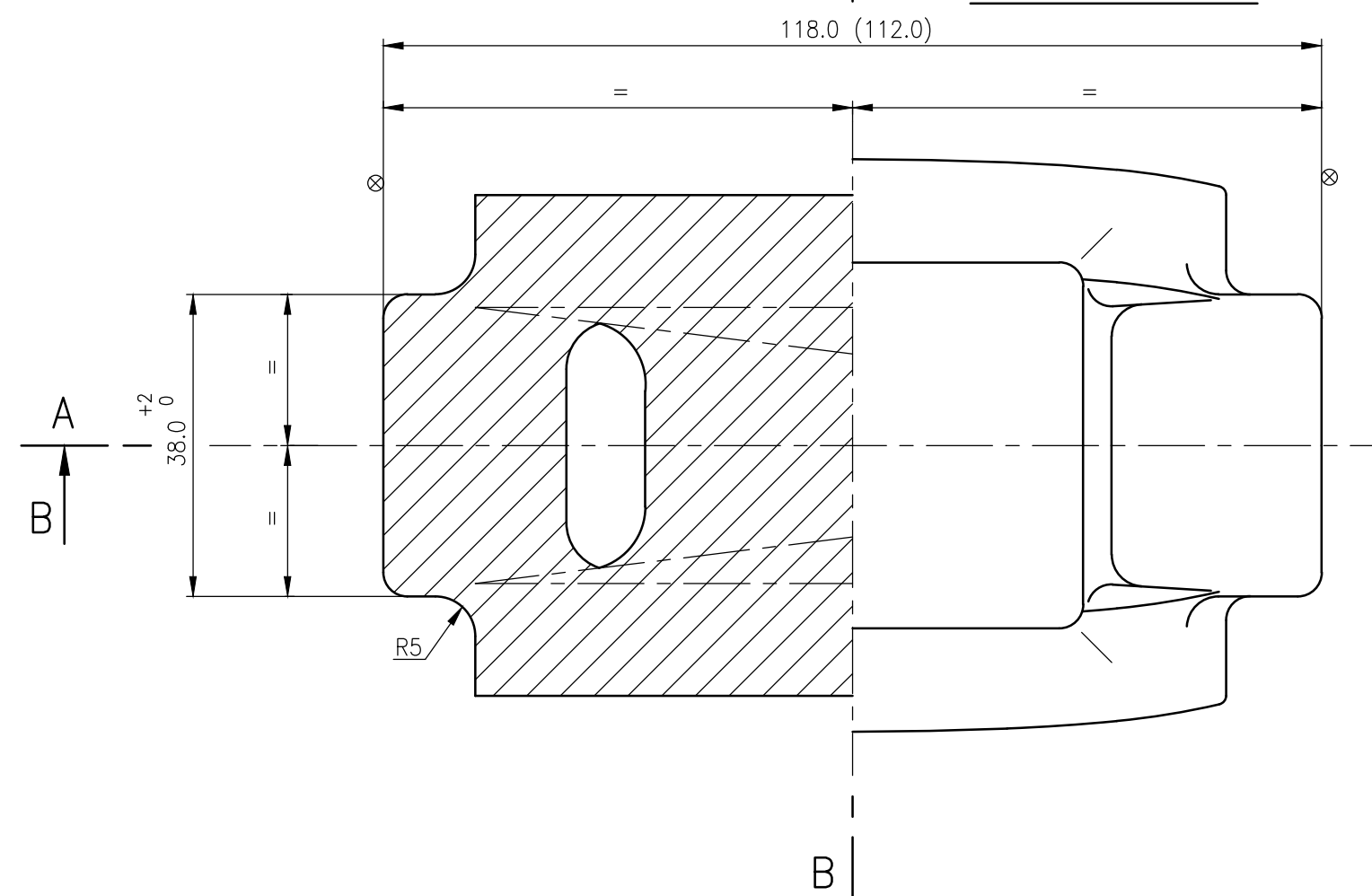
SECTION - AA



SECTION — BB



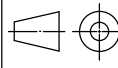
SECTION - CC

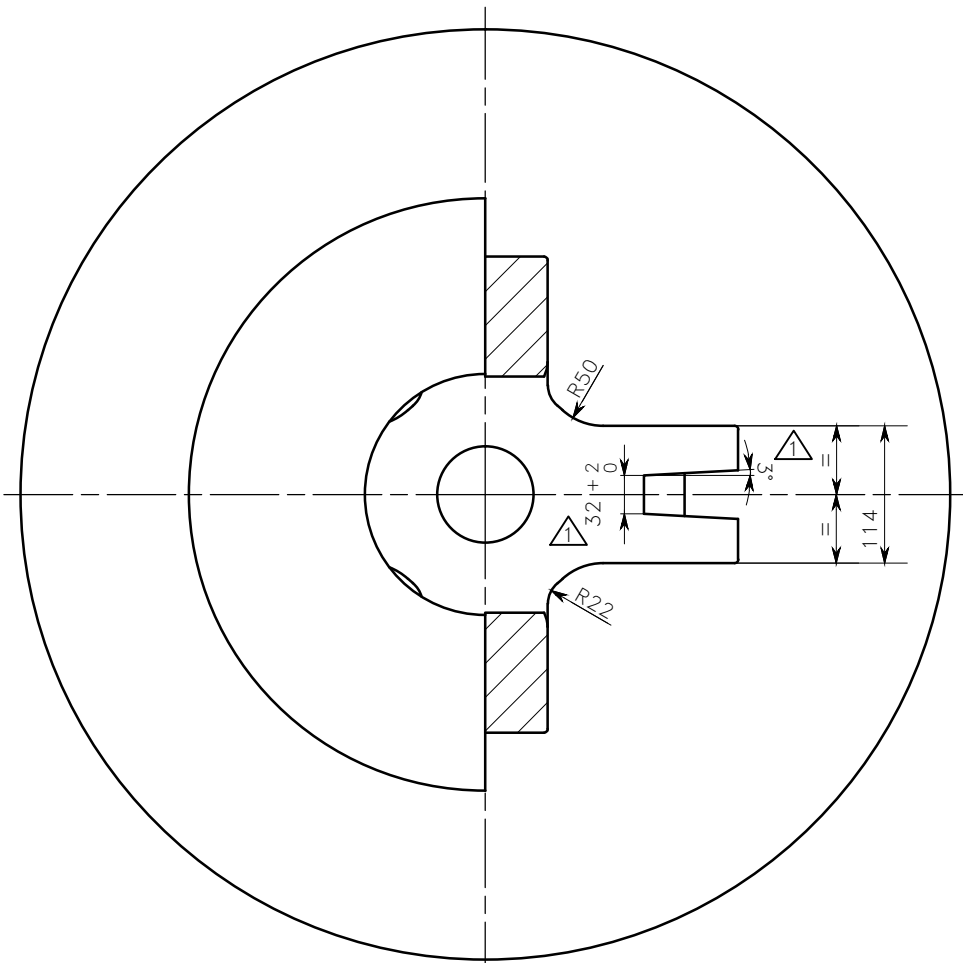
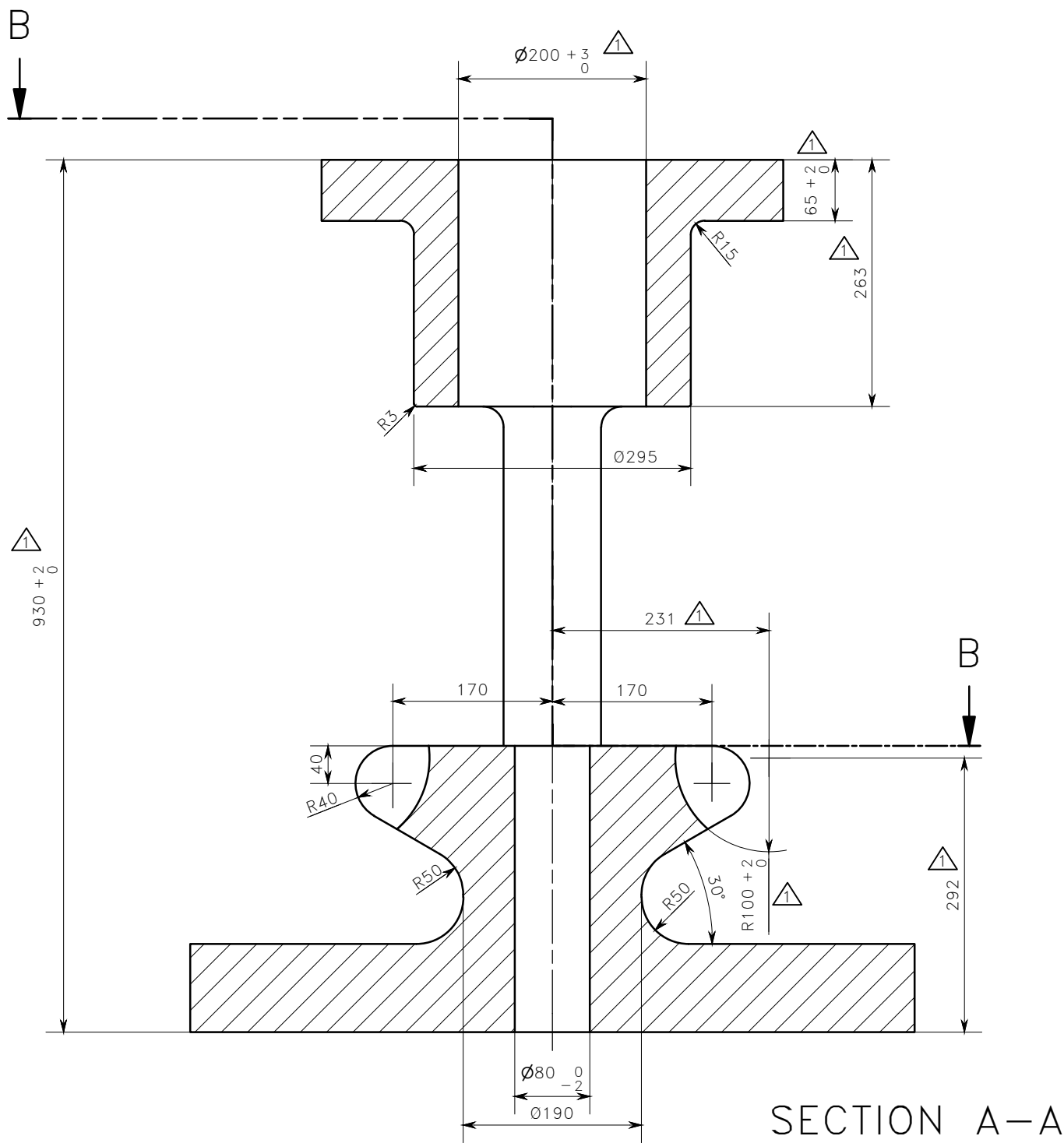


NOTES:

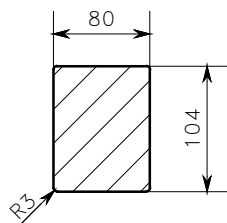
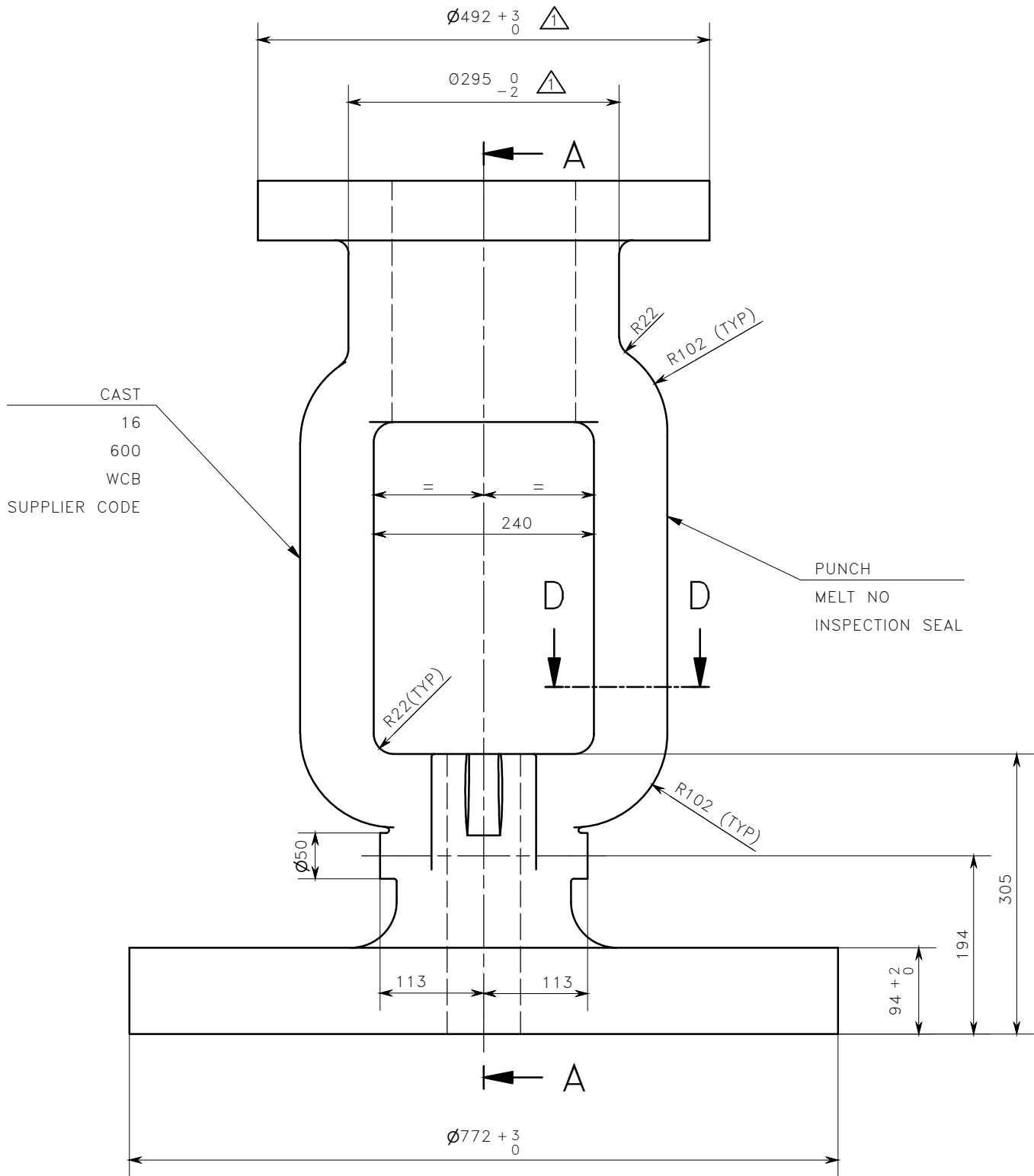
1. NECESSARY ALLOWANCES HAVE BEEN ADDED ON ALL MACHINABLE SURFACES.
2. PERMISSIBLE DIMENSIONAL DEVIATIONS OF CASTING SURFACES REFER LATEST APPLICABLE TDC:
3. FINISH MACHINED DIMENSIONS ARE INDICATED WITHIN BRACKETS FOR INFORMATION.
4. UNSPECIFIED CASTING RADII 3–4mm.
5. ⊗ INDICATES SURFACE TO BE MACHINED.
6. HEIGHT OF CASTING LETTERS 8 mm.
7. THE IDENTIFICATION DETAILS ARE TO BE CAST IN THE INDICATED ZONE ONLY. (MELT No. & INSPECTION SEAL ARE TO BE PUNCHED)

DRAWING RETRACED WITH REV 01 ON 24.06.2000

CF8	06	CASTING	—	A351 CF8 CERTIFY	SOLUTION ANNEALED	—	3.2	—	2.V.F912.05988R 92 203 451 0000	004
CF8M	05	CASTING	—	A351 CF8M CERTIFY	SOLUTION ANNEALED	—	3.2	—	2.V.F921.05988R 92 203 192 0000	004
WC9	04	CASTING	—	ASTM A217 WC9— CERTIFY	NORMALISED & TEMPERED	—	3.2	—	2.V.F532.05988R 92 033 965 0000	004
WC6	03	CASTING	—	ASTM A217 WC6— CERTIFY	NORMALISED & TEMPERED	—	3.2	—	2.V.F522.05988R 92 033 952 0000	004
WCC	02	CASTING	—	ASTM A216 WCC— CERTIFY	NORMALISED	—	3.2	—	2.V.F512.05988R 92 033 964 0000	004
WCB	01	CASTING	—	ASTM A216 WCB CERTIFY	NORMALISED	—	3.2	—	2.V.F502.05988R 92 033 863 0000	004
MATL. MARK *	S.L N o.	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										
 365-120 BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI - 620014. DRN NAME SIGN DATE NO.OF CHD M.SRINIVASAN 24.06.2K VAR. APPD P.BOOMINATHAN 24.06.2K K.S.RAMAN 24.06.2K										
DEPT VL	/		SCALE	WEIGHT (KG).	REFERENCE INFORMATIONS					NO. OF ITEMS
CODE 320			NTS	3.2	CAD :C205988R					
TITLE				CARD CODE	DRAWING NO.					REV
WEDGE (3"—C600)				U 01	2—V—0000—05988R					03



SECTION B-B



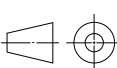
SECTION D-D

NOTES:

- 01. NECESSARY ALLOWANCES HAVE BEEN ADDED ON ALL MACHINABLE SURFACES
- 02. PERMISSIBLE DIMENSIONAL DEVIATIONS OF CASTING SURFACES REFER LATEST APPLICABLE QUALITY PROCEDURE
- 03. UNSPECIFIED CASTING RADII 3-5MM
- 04. HEIGHT OF CASTING LETTERS 25 MM

REV	DATE	ALTERED		ARUN
01	06.03.13	CHD & APPD	MRK	
ZONE	SYMBOL  INDICATES THE CHANGES FOR REVISION 01. WCC MATERIAL ADDED (NH56)			
	DCN : 801468			

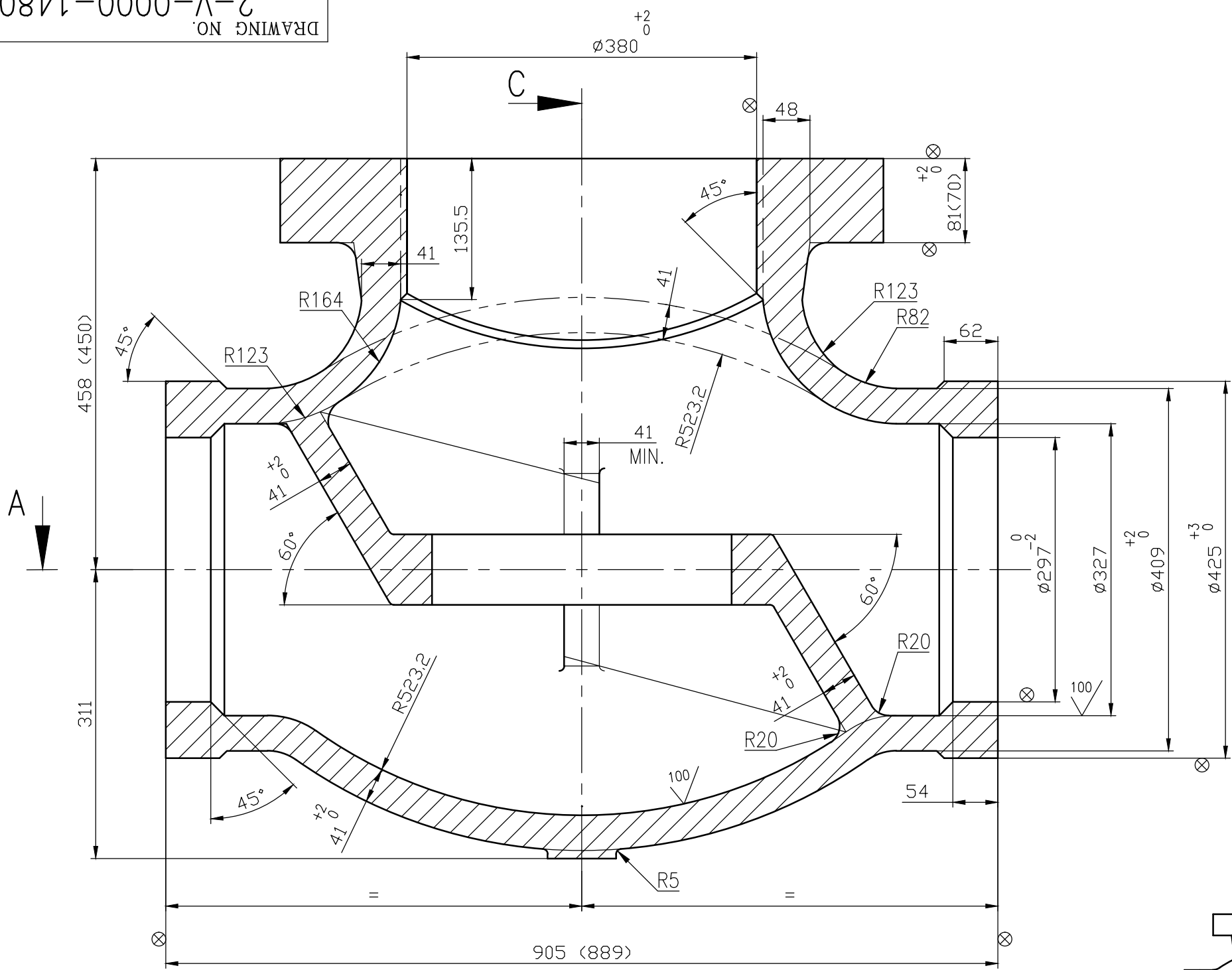
CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.

1	CASTING	922031090000	ASTM A216 WCC CERTIFY	NR	—	603.6	—	2.V.NH56.14803R/0	—
1	CASTING	922030900000	ASTM A216 WCB CERTIFY	NR	—	603.6	—	2.V.NH52.14803R/1	—
No OFF	DESCRIPTION	MATI CODE	MATI SPFCN	HEAT REMARKS	SCRAP SOURCE	LFT WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT									
 365-120 BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI-620014.				DRN	NAME	SIGN	DATE	NO.OF VAR.	
				CHD	MRK		25.01.13		
				APPD	MRK		25.01.13		
DEPT	V L		SCALE	WEIGHT (KG)	REFERENCE INFORMATIONS				NO. OF ITEMS
CODE	320		NTS	603.6 kg	—				
TITLE				CARD CODE	DRAWING NO.				
YOKE CASTING 16"—C600—RV				U 01	2—V—0000—14803R				01

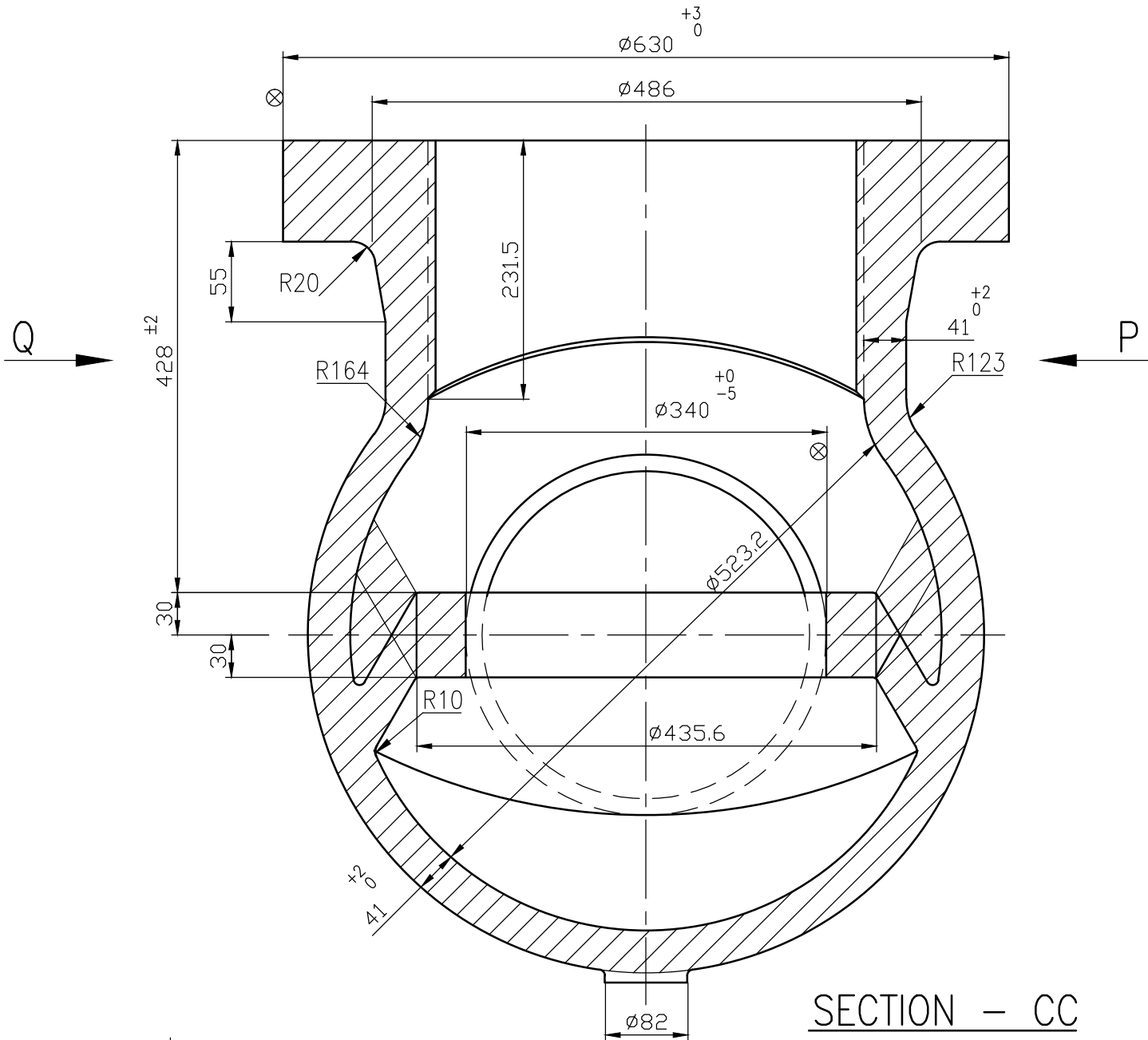
2-V-0000-14808R
DRAWING NO.

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

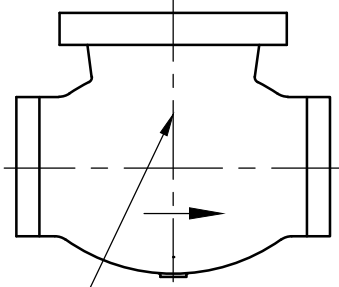
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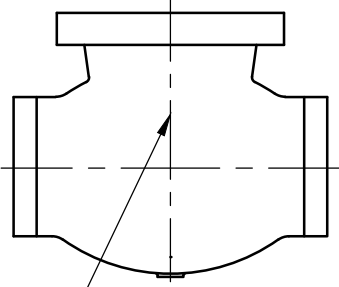
SECTION - BB



SECTION - CC



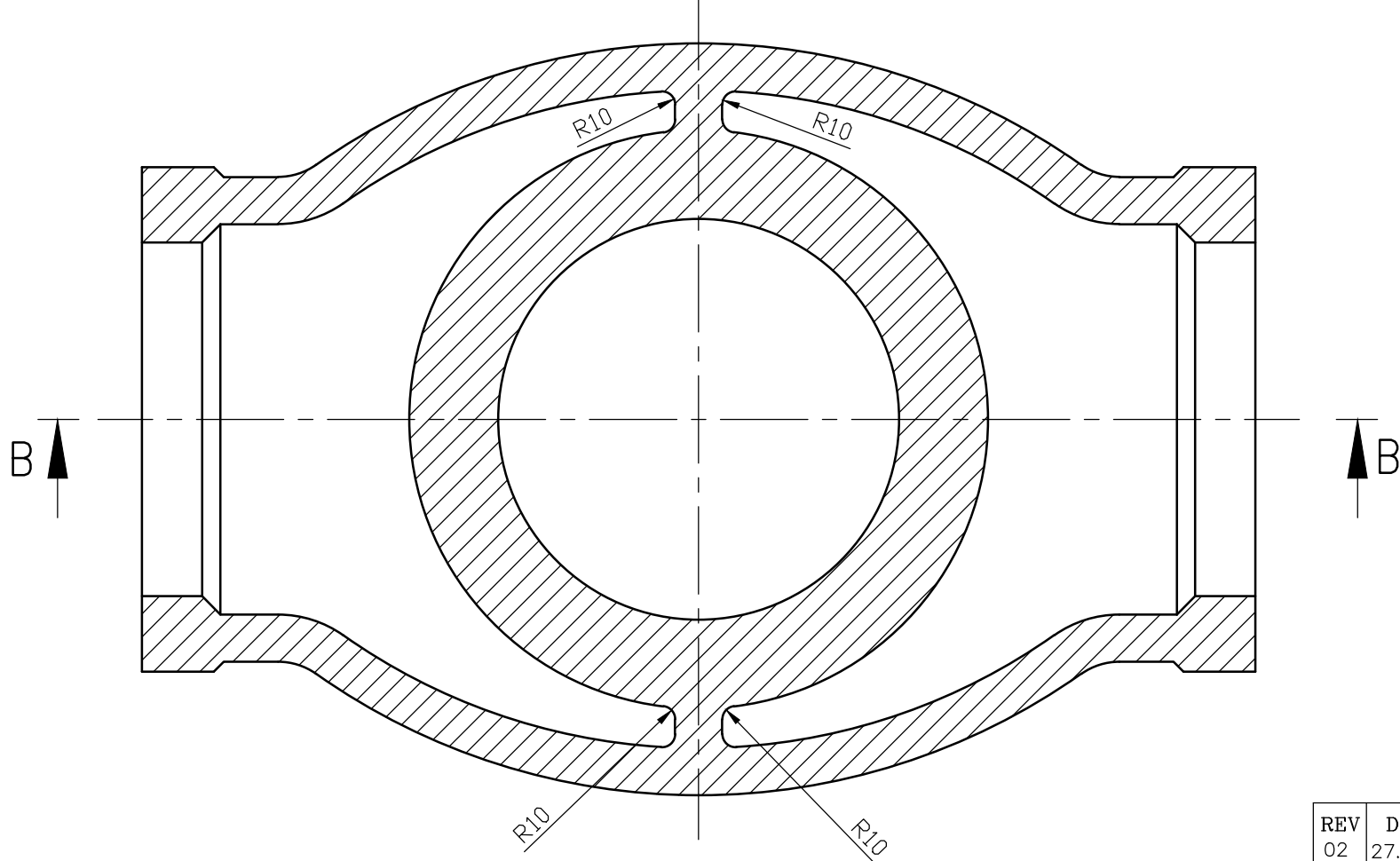
VIEW-P



VIEW-Q

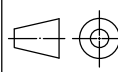
NOTES

- NECESSARY MACHINING ALLOWANCES HAVE BEEN ADDED ON ALL MACHINABLE SURFACES.
- PERMISSIBLE DEVIATIONS OF NON TOLERANCED CASTING DIMENSIONS REFER APPLICABLE QUALITY PROCEDURE.
- FINISH MACHINED DIMENSIONS ARE INDICATED WITHIN BRACKETS FOR INFORMATON ONLY.
- THE EMBOSSING OF BHEL, MATL. MARK, RATING & SIZE SHALL BE DONE STRICTLY AS PER THE SEQUENCE SHOWN IN VIEW-P.
- CASTING SHALL COMPLY WITH THE REQUIREMENTS OF APPLICABLE SPECIFICATION.
- UNSPECIFIED CASTING RADII = R5
- HEIGHT OF CASTING LETTERS = 30 MM.
- ⊗ INDICATES SURFACE TO BE MACHINED
- 100/ INDICATED CASTING SURFACES SHALL BE OF HIGH QUALITY WITHOUT SURFACE UNEVENNESS.

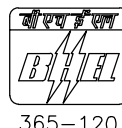


SECTION - AA

REV	DATE	ALTERED	M.SELVAM
03	09.10.15	CHD & APPD	M.S & SSK
DIMENSION 428 WAS 421			
DCP: 802016			
REV	DATE	ALTERED	GANESH
02	27.04.13	CHD & APPDK	RAJASEKARAN
SL.No. 2 INCLUDED.			
REV	DATE	ALTERED	GANESH
01	13.03.13	CHD & APPDM	RAJAKUMAR
MATL. SPEC. SA 216 WCC WAS ASTM 216 WCC			
DCP : 801480			

C12A	02	CASTING	92 203 125	SA A217 C12A ATTEST	NT	-	698.5	-	2.V.NH60.14808R/1	001
WCC	01	CASTING	92 203 093	SA A216 WCC ATTEST	NORMALISED	-	698.5	-	2.V.NH50.14808R/2	001
MATL.*	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										
 365-120 BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI-620014.						DRN	NAME	SIGN	DATE	NO.OF VAR.
						CHD	GANESH		08.12.2012	
						APPD	M.RAJAKUMAR		08.12.2012	
DEPT	V L			SCALE	WEIGHT (KG).	REFERENCE INFORMATION				NO. OF ITEMS
CODE	320			NTS	REF.TABLE	CAD : C214808R				
TITLE					CARD CODE	DRAWING NO.				REV
BODY (14"-C600-BW)					U 01	2-V-0000-14808R				03

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BHARAT HEAVY ELECTRICALS LTD.,
UNIT: HIGH PRESSURE BOILER PLANT.
TIRUCHIRAPALLI-620014.

DRN	NAME	SIGN	DATE	NO.OF VAR.
CHD	GANESH		08.12.2012	
APPD	M.RAJAKUMAR		08.12.2012	

DEPT	SCALE	WEIGHT (KG).	REFERENCE INFORMATION	NO. OF ITEMS
V L	NTS		CAD : C214808R	
CODE 320			DRAWING NO.	REV
			2-V-0000-14808R	03

BODY
(14"-C600-BW)

2-V-0000-14808R

03

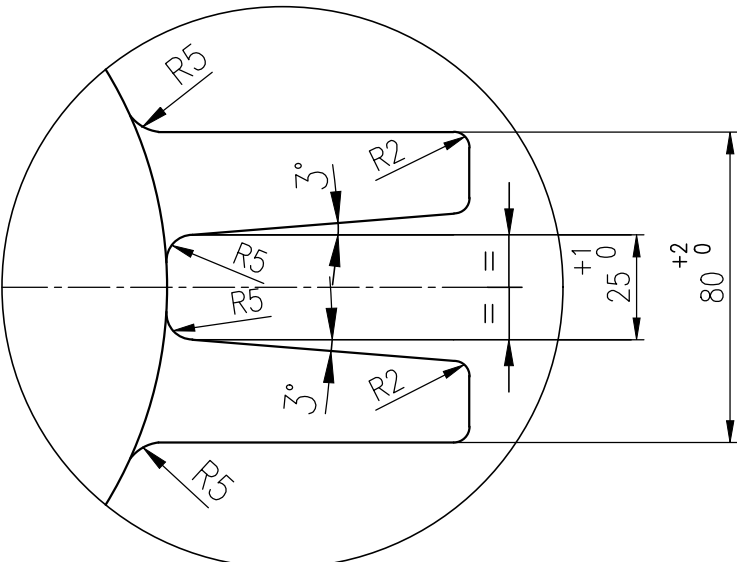
Size A2

DRAWING NO.
2-V-0000-14810R

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

NOTES:

01. NECESSARY ALLOWANCES HAVE BEEN ADDED ON ALL MACHINABLE SURFACES.
02. PERMISSIBLE DIMENSIONAL DEVIATIONS OF CASTING SURFACES REFER LATEST APPLICABLE QUALITY PROCEDURE.
03. FINISH MACHINED DIMENSIONS ARE INDICATED WITHIN BRACKETS FOR INFORMATON.
04. UNSPECIFIED CASTING RADII 3–5mm.
05. ⊗ SURFACE TO BE MACHINED.
06. HEIGHT OF CASTING LETTERS 10 mm.
07. # MARKED ITEMS IGC TEST SHALL BE CONDUCTED.



14"–C600
*MATL. MARK
SUPPLIER'S CODE
MELT. NUMBER
INSPECTION SEAL

SECTION – CC

SECTION – DD

SECTION – AA

SECTION – BB

#04	CF8	92 203 794	SA351 CF8 CERTIFY	SH	–	340.0	–	2.V.U961.14810R	008
03	CF8	92 203 790	SA351 CF8 CERTIFY	SH	–	340.0	–	2.V.P764.14810R	008
02	C12A	92 203 126	ASTM A217 C12A, CERTIFY	NT	–	340.0	–	2.V.NH60.14810R	008
01	WCC	92 203 094	ASTM A216 WCC, CERTIFY	NORMALISED	–	340.0	–	2.V.NH50.14810R/1	008
SL No	MATL. MARK TO BE CAST	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	NAME	SIGN	DATE	NO.OF VAR.
CHD	GANESH		08.12.12	
APPD	M.RAJAKUMAR		08.12.12	

DEPT VL	SCALE NTS	WEIGHT (KG). REF.TABLE	REFERENCE INFORMATION CAD:C214810R	NO. OF ITEMS
CODE 320				
TITLE YOKE COVER (14" – C600 – RV)	CARD CODE U 01	DRAWING NO. 2–V–0000–14810R	REV 03	

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REV 03	DATE 13.12.18	ALTERED CHD & APPD	R.P.SINGH SSK & KRS
			SL.No. 03 & 04 INCLUDED. NOTES No. 07 INCLUDED.
REV 02	DATE 24.03.13	ALTERED CHD & APPD	GANESH K.RAJASEKARAN
			SL.No. 2 INCLUDED.
REV 01	DATE 15.03.13	ALTERED CHD & APPD	GANESH M.RAJAKUMAR
			DIMESIONS 155, 60, 115, 244, 730, 86, R26, 80, 146.2 WERE 151, 56, 135, 240, 722, 76, R18, 54, 142.2 DCP : 801480

A
B
C
D
E
F

A
B
C
D
E
F

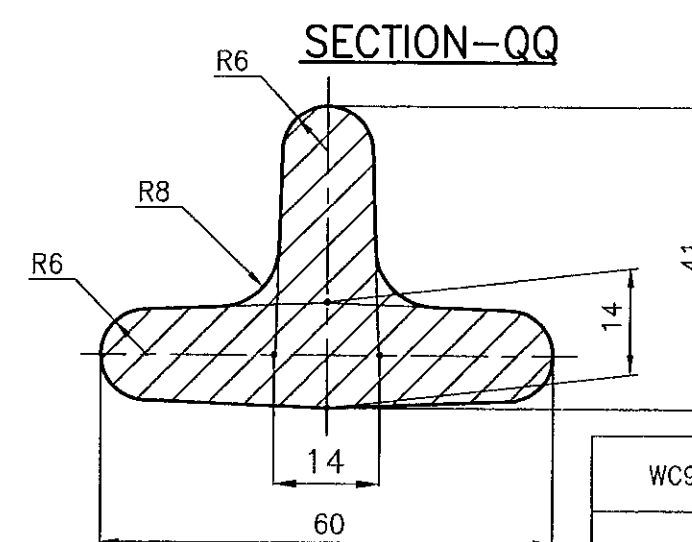
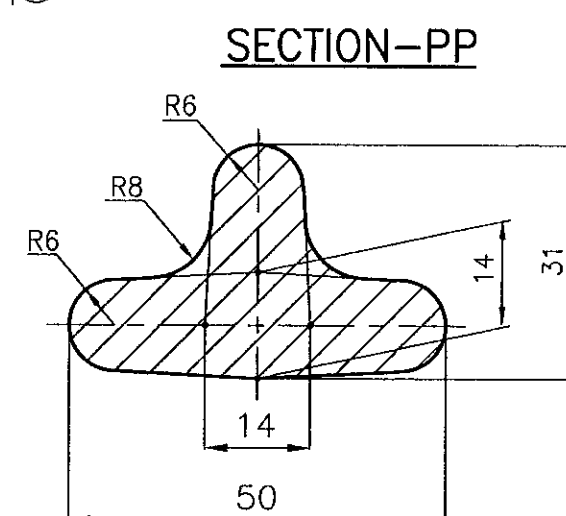
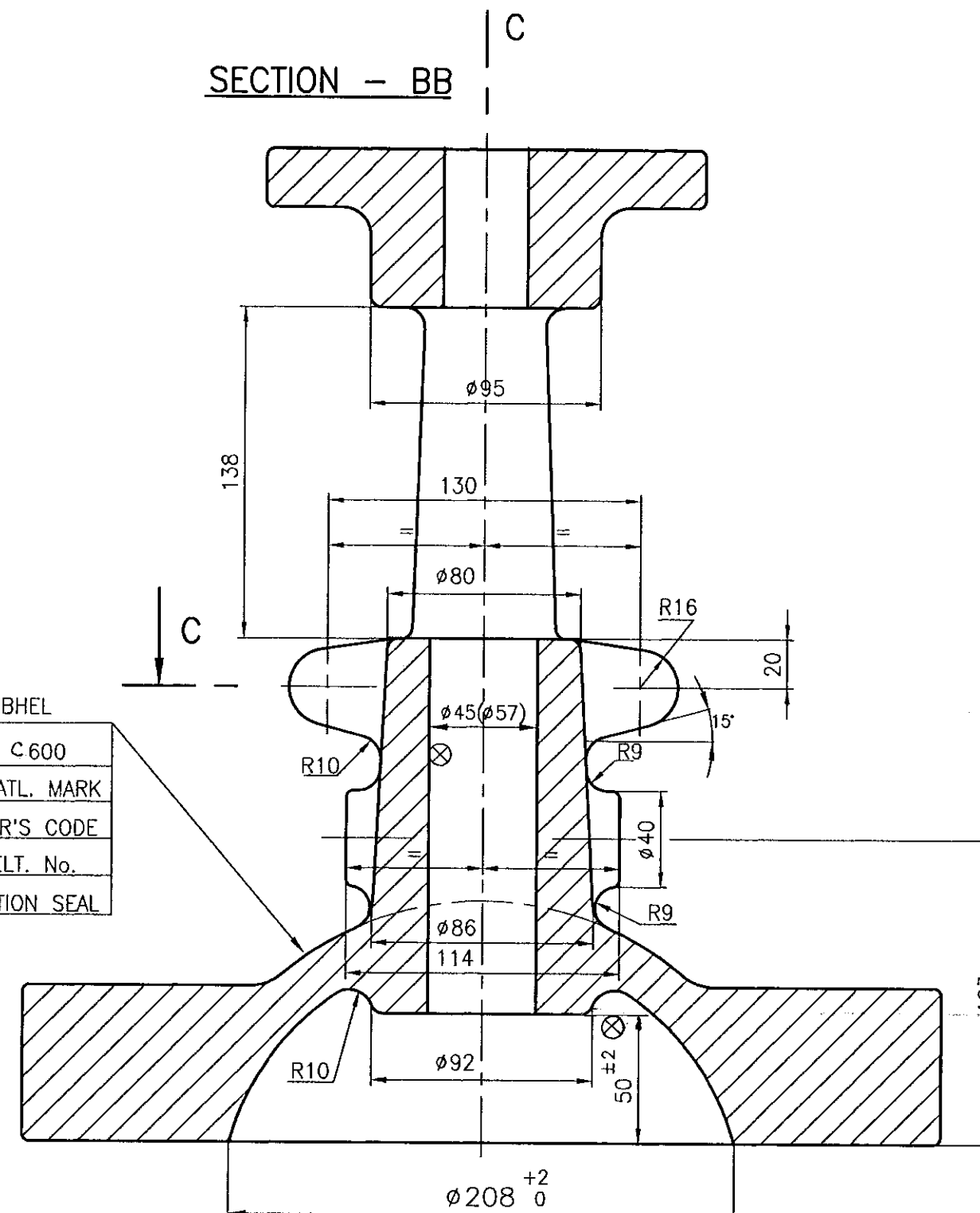
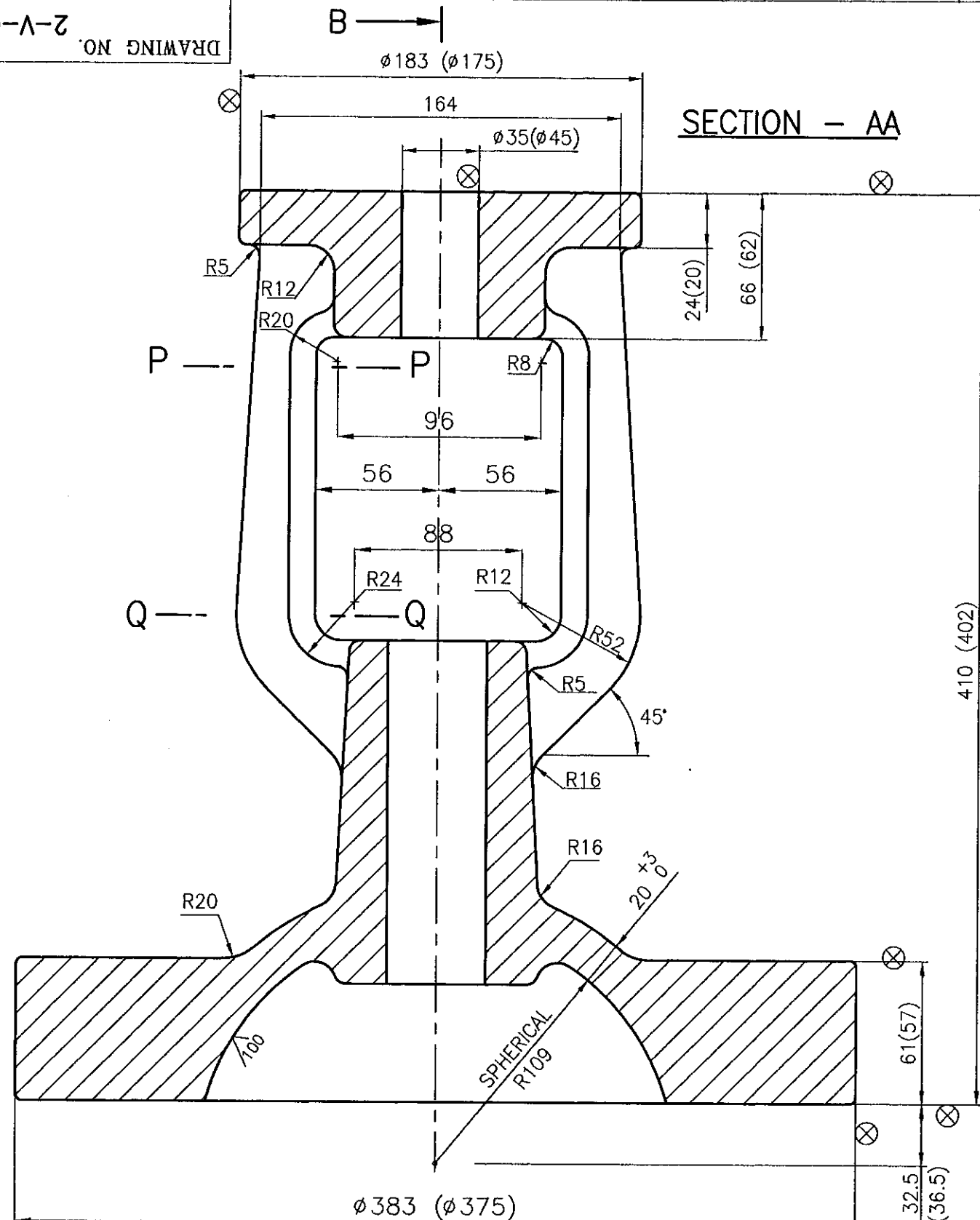
DRAWING NO. 2-V-0000-06215R

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

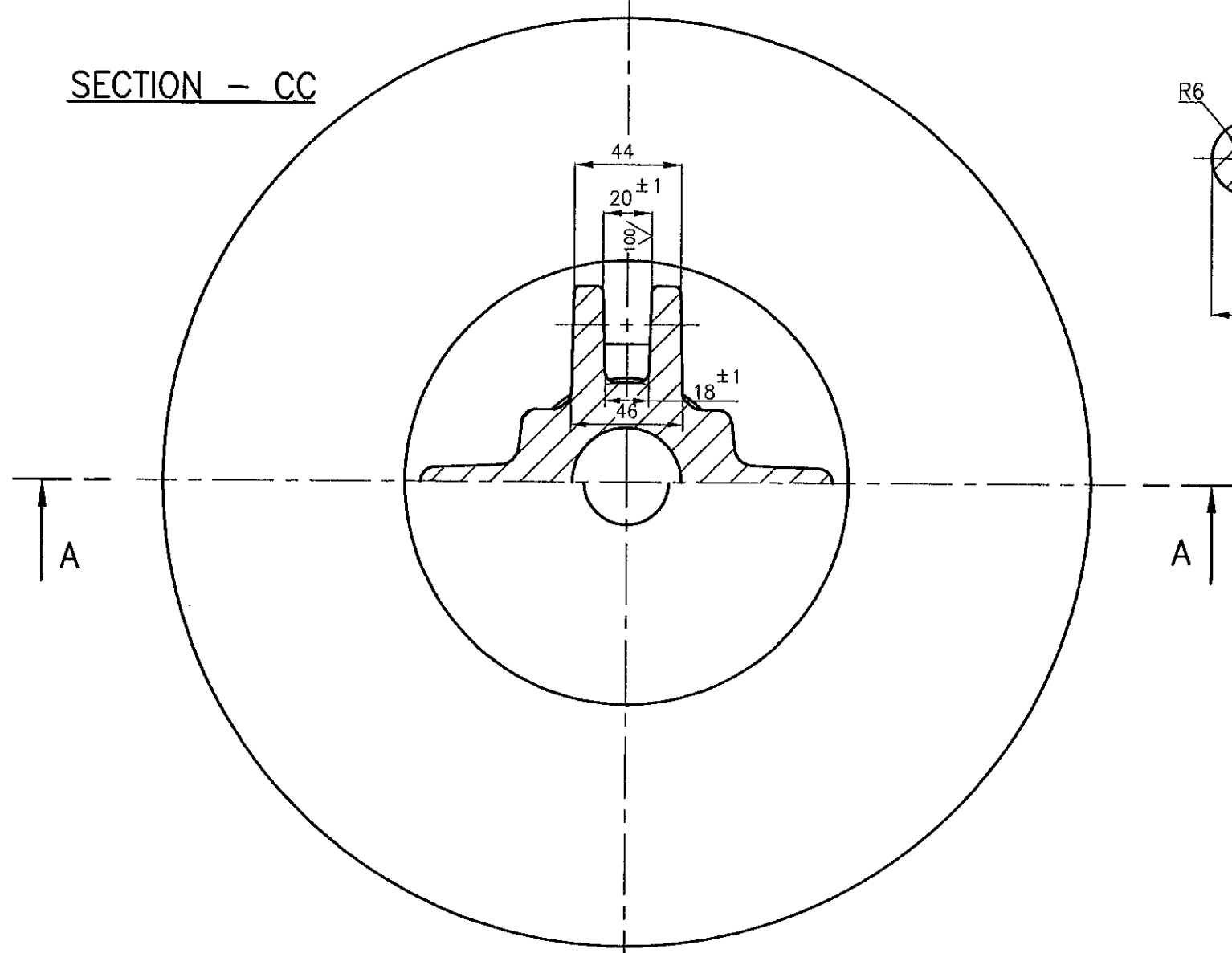
100/

NOTE

- NECESSARY MACHINING ALLOWANCES HAVE BEEN ADDED ON ALL MACHINABLE SURFACES.
- PERMISSIBLE DEVIATIONS OF NON TOLERANCED CASTING DIMENSIONS REFER APPLICABLE TDC
- FINISH MACHINED DIMENSIONS ARE INDICATED WITHIN BRACKETS FOR INFORMATION ONLY.
- LETTERS- BHEL, SIZE, MATL. & SUPPLIERS CODE ARE TO BE CAST IN THE INDICATED ZONE.
- CASTING SHALL COMPLY WITH THE REQUIREMENTS OF APPLICABLE TDC
- UNSPECIFIED CASTING RADII = R3 TO R5
- HEIGHT OF CASTING LETTERS = 15 mm
- ⊗ INDICATES SURFACE TO BE MACHINED.
- 100/ INDICATED CASTING SURFACES SHALL BE OF HIGH QUALITY WITHOUT SURFACE UNEVENNESS.



SECTION - CC

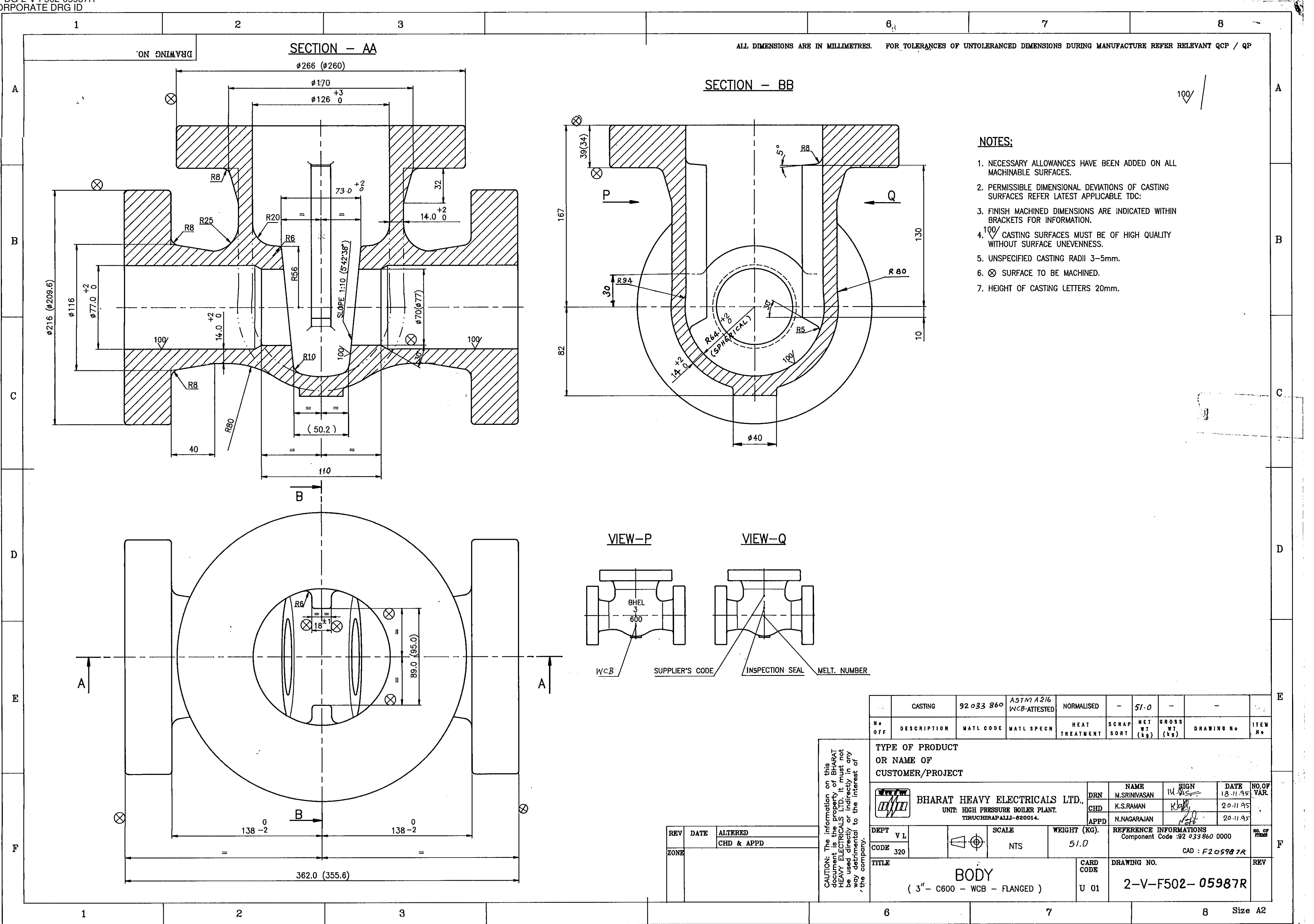


DRAWING RETRACED WITH REV 01 ON 24.06.2000

WC9	01	CASTING	92 033 981	ASTM A217 WC9-CERTIFY	NORMALISED & TEMPERED	-	58.4	-	2.V.F534.06215R	-
WC6	01	CASTING	92 033 960	ASTM A217 WC6-CERTIFY	NORMALISED & TEMPERED	-	58.4	-	2.V.F524.06215R	-
WCC	01	CASTING	92 033 980	ASTM A216 WCC-CERTIFY	NORMALISED	-	58.4	-	2.V.F514.06215R	-
WCB	01	CASTING	92 033 887	ASTM A216 WCB-CERTIFY	NORMALISED	-	58.4	-	2.V.F704.06215R	-
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 BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI-620014.										
DEPT	V L	SCALE	WEIGHT (KG).	REFERENCE INFORMATION						
CODE	320	NTS	58.4	CAD :C206215R						
TITLE							CARD CODE	DRAWING NO.	REV	
YOKE CUM BONNET (6 - 600)							U 01	2-V-0000-06215R	01	

REV	01	DATE	24.06.2K	ALTERED	14.4
ZONE				CHD & APPD	
WCC, WC6 AND WC9 MATERIAL INCLUDED.					

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CASTING	92 033 860	ASTM A216 WCB-ATTENDED	NORMALISED	-	51.0	-	-	-	-
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.									
DEPT	V L	SCALE	WEIGHT (KG)	REFERENCE INFORMATION					
CODE	320	NTS	51.0	Component Code : 92 033 860 0000					
TITLE				DRAWING NO.					
BODY (3" - C600 - WCB - FLANGED)				2-V-F502- 05987R					
CARD CODE				REV					
U 01									

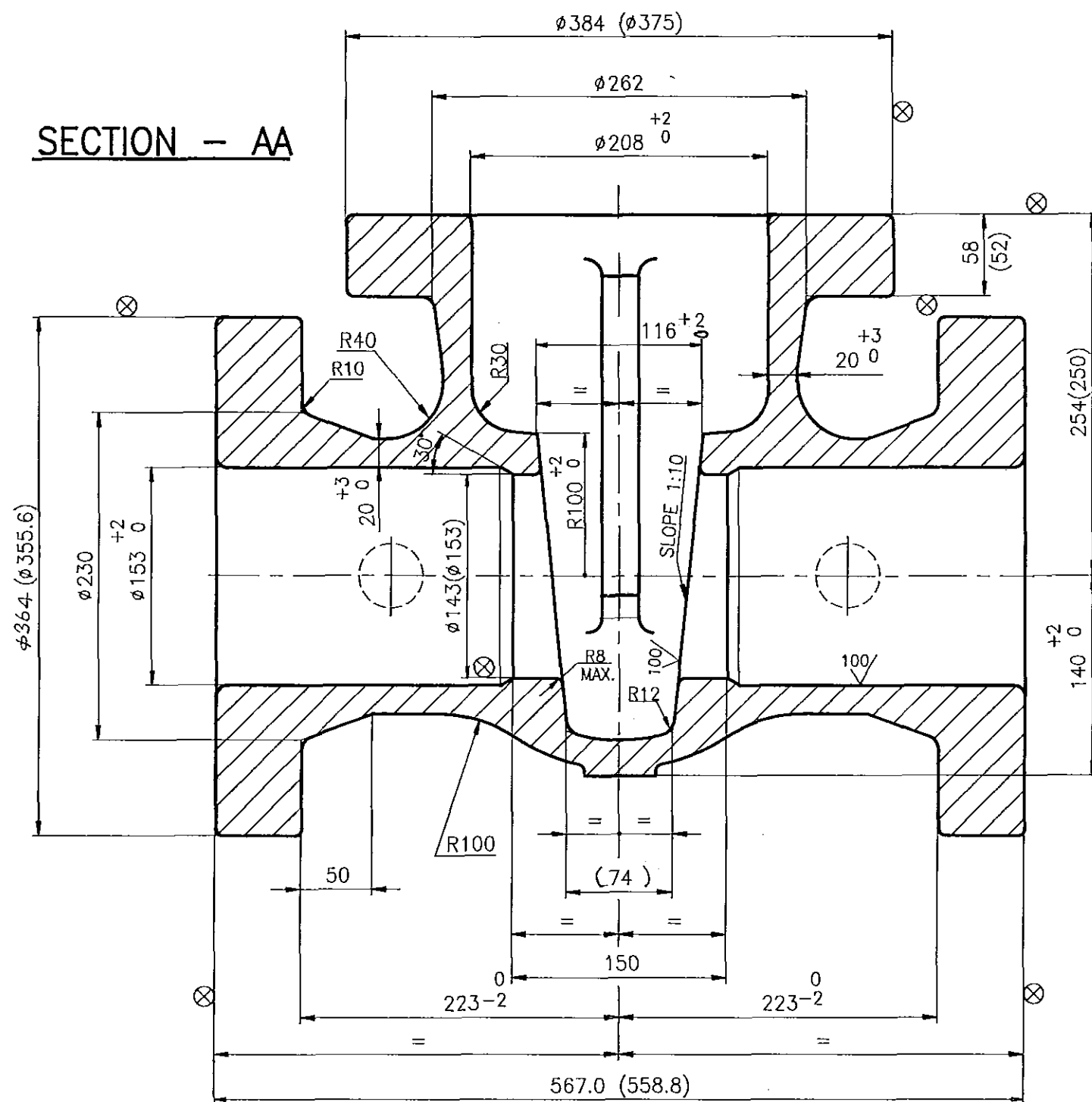
CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.

REV	DATE	ALTERED
		CHD & APPD
ZONE		

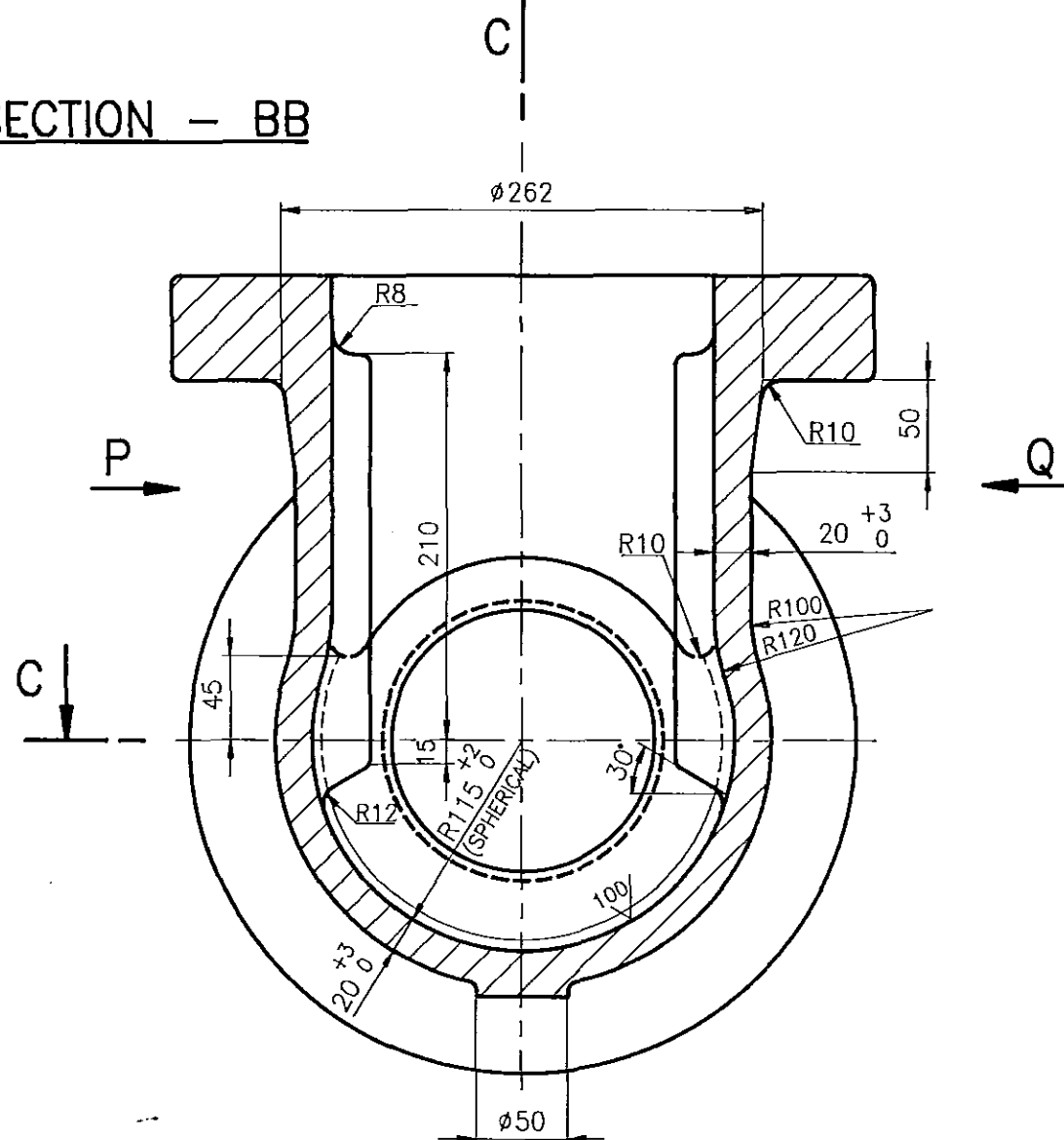
DRAWING NO. 2-V-F504-05835R

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

SECTION - AA



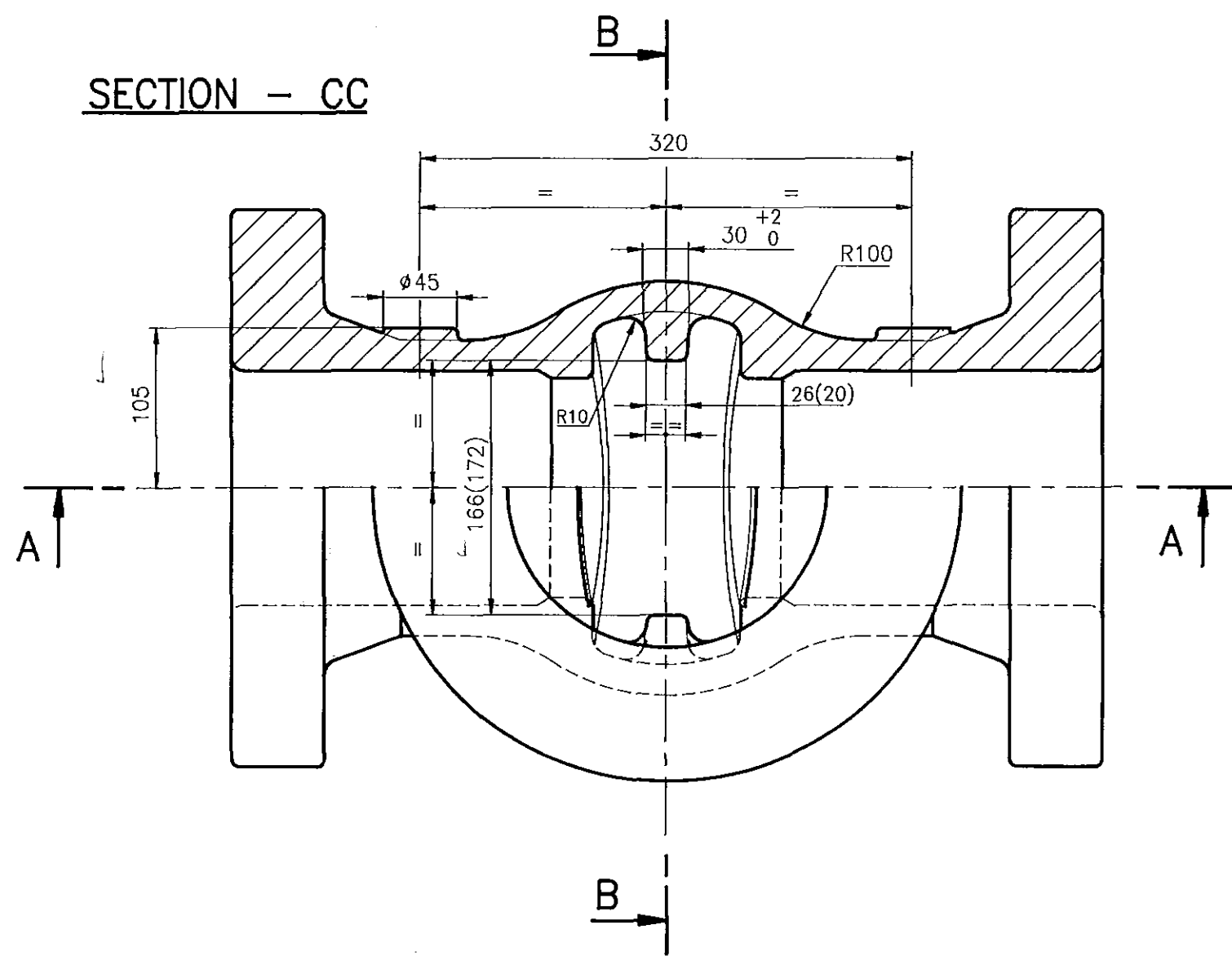
SECTION - BB



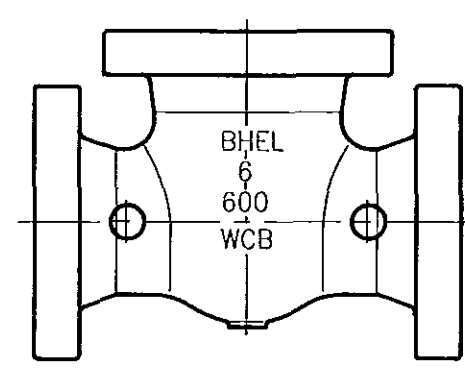
NOTE

- NECESSARY MACHINING ALLOWANCES HAVE BEEN ADDED ON ALL MACHINABLE SURFACES.
- PERMISSIBLE DEVIATIONS OF NON TOLERANCED CASTING DIMENSIONS REFER APPLICABLE TDC
- FINISH MACHINED DIMENSIONS ARE INDICATED WITHIN BRACKETS FOR INFORMATION ONLY.
- LETTERS- BHEL, SIZE, MATL. & SUPPLIERS CODE ARE TO BE CAST IN THE INDICATED ZONE.
- CASTING SHALL COMPLY WITH THE REQUIREMENTS OF APPLICABLE TDC
- UNSPECIFIED CASTING RADII = R3 TO R5
- HEIGHT OF CASTING LETTERS = 15 mm
- ⊗ INDICATES SURFACE TO BE MACHINED.
- 100/ INDICATED CASTING SURFACES SHALL BE OF HIGH QUALITY WITHOUT SURFACE UNEVENNESS.

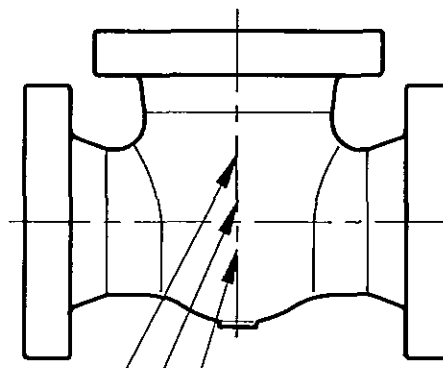
SECTION - CC



VIEW - P



VIEW - Q



SUPPLIER'S CODE
MELT NUMBER
INSPECTION SEAL

CASTING	922002380000	ASTM A216 WCB - ATTESTED	NORMALISED	-	186.0	-	-	-	-
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.									
DEPT	VL	SCALE	WEIGHT (KG).	REFERENCE INFORMATION			NO. OF VAR.		
CODE	320	NTS	186.0	Component Code: 92 200 238 0000			NO. OF VAR.		
TITLE				CARD CODE			REV		
BODY (6" - C 600 - WCB - FL)				U 01			2-V-F504-05835R		

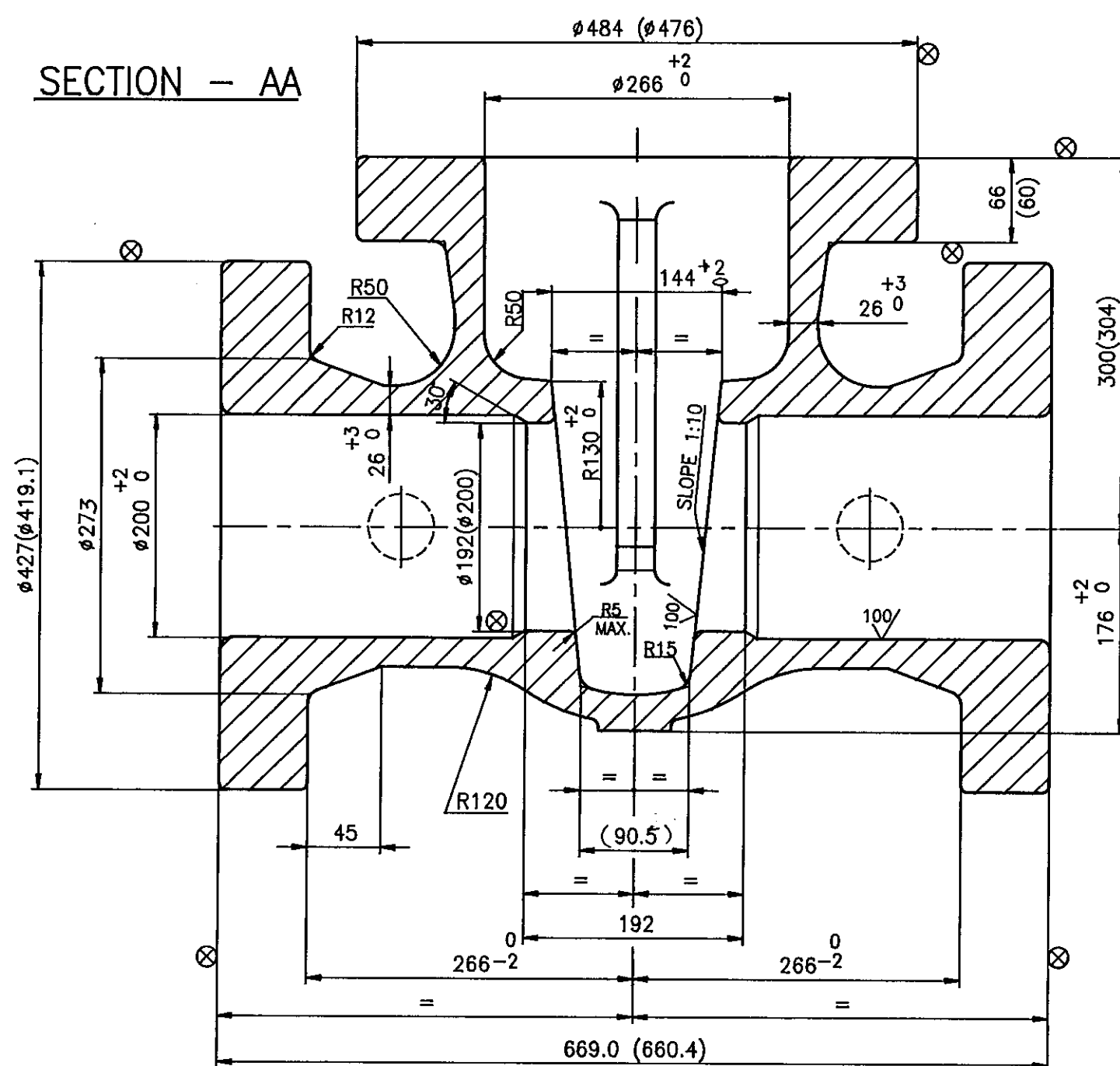
CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.

REV	DATE	ALTERED
ZONE		CHD & APPD

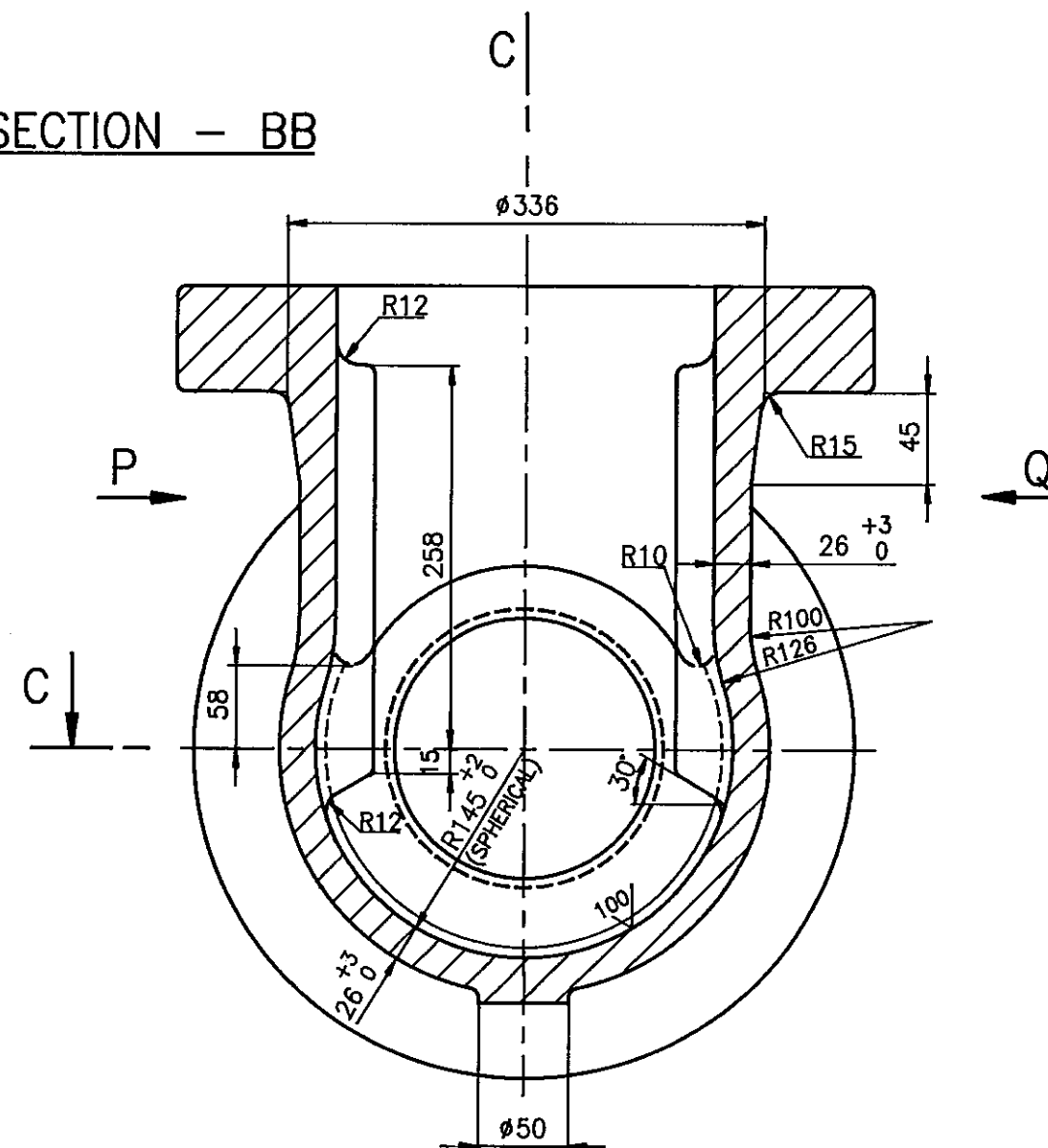
DRAWING NO. 2-V-F505-06042R

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

SECTION - AA



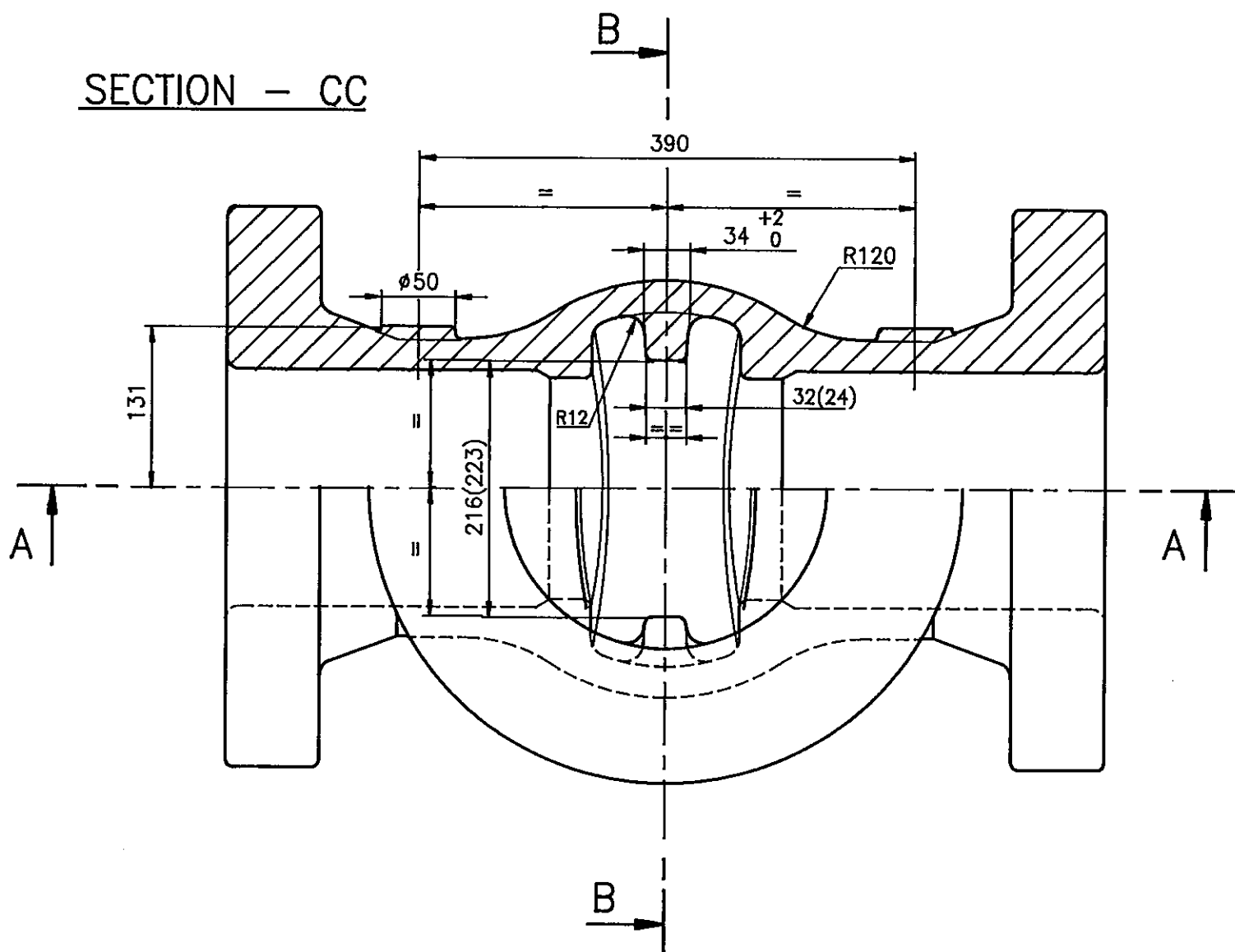
SECTION - BB



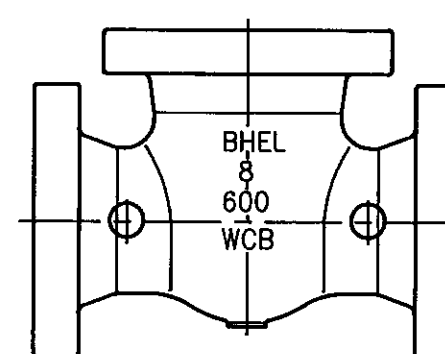
NOTE

- NECESSARY MACHINING ALLOWANCES HAVE BEEN ADDED ON ALL MACHINABLE SURFACES.
- PERMISSIBLE DEVIATIONS OF NON TOLERANCED CASTING DIMENSIONS REFER APPLICABLE TDC
- FINISH MACHINED DIMENSIONS ARE INDICATED WITHIN BRACKETS FOR INFORMATION ONLY.
- LETTERS- BHEL, SIZE, MATL. & SUPPLIERS CODE ARE TO BE CAST IN THE INDICATED ZONE.
- CASTING SHALL COMPLY WITH THE REQUIREMENTS OF APPLICABLE TDC
- UNSPECIFIED CASTING RADII = R3 TO R5
- HEIGHT OF CASTING LETTERS = 20 mm
- ⊗ INDICATES SURFACE TO BE MACHINED.
- ✓ INDICATED CASTING SURFACES SHALL BE OF HIGH QUALITY WITHOUT SURFACE UNEVENNESS.

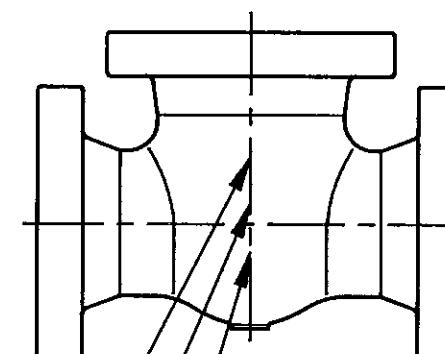
SECTION - CC



VIEW - P



VIEW - Q



SUPPLIER'S CODE
MELT NUMBER
INSPECTION SEAL

CASTING	920338670000	ASTM A216 WCB - ATTESTED	NORMALISED	-	317.0	-	-	-
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 M. SRINIVASAN	SIGN [Signature]	DATE 04.12.95	NO. OF VAR.
				CHD	K.S. RAMAN	[Signature]	05.12.95	
				APPD	N. NAGARAJAN	[Signature]	06.12.95	
DEPT	VL	SCALE	WEIGHT (KG)	REFERENCE INFORMATION			No. of revis	
CODE	320	NTS	317.0	Component Code : 92 033 867 0000			CAD : C206042R	
TITLE			CARD CODE			REV		
BODY (8" - C600 - WCB)			U 01			2-V-F505-06042R		

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REV	DATE	ALTERED
		CHD & APPD
ZONE		

DRAWING NO.
2-V-F602-05990R

SECTION - AA

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

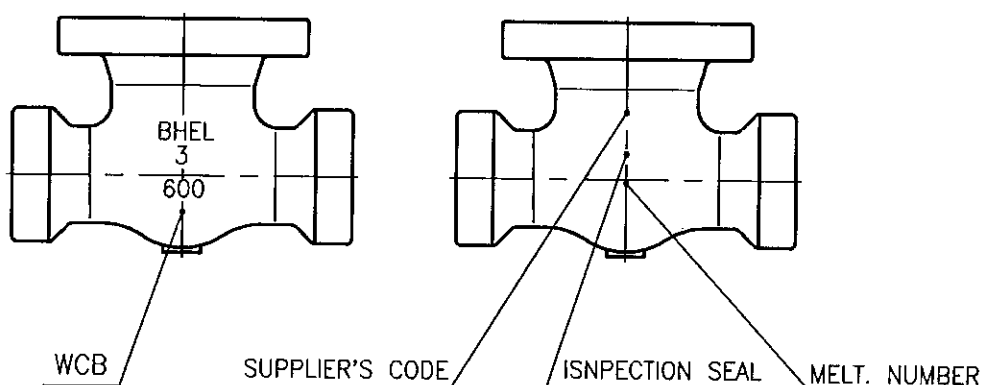
SECTION - BB

NOTES:

1. NECESSARY ALLOWANCES HAVE BEEN ADDED ON ALL MACHINABLE SURFACES.
2. PERMISSIBLE DIMENSIONAL DEVIATIONS OF CASTING SURFACES REFER LATEST APPLICABLE TDC.
3. FINISH MACHINED DIMENSIONS ARE INDICATED WITHIN BRACKETS FOR INFORMATION.
4. $\sqrt{100}$ CASTING SURFACES MUST BE OF HIGH QUALITY WITHOUT SURFACE UNEVENNESS.
5. UNSPECIFIED CASTING RADII 3-5mm.
6. $\otimes$ SURFACE TO BE MACHINED.
7. HEIGHT OF CASTING LETTERS 20mm.

VIEW-P

VIEW-Q



CASTING	92033861	ASTM A216 WCB ATTESTED	NORMALISED	-	41.0	-	-	-	-
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	M.SRINIVASAN	SIGN	DATE	NO. OF VAR.					
CHD	K.S.RAMAN	SIGN	DATE	NO. OF VAR.					
APPD	N.NAGARAJAN	SIGN	DATE	NO. OF VAR.					
DEPT	V L	SCALE	WEIGHT (KG).	REFERENCE INFORMATION			NO. OF ITEMS		
CODE	320	NTS	41.0	Component Code :92 033 861 0000					
TITLE				CARD CODE	DRAWING NO.		REV		
BODY (3 - C600 - WCB - BUTT WELD)				U 01	2-V-F602-05990R				

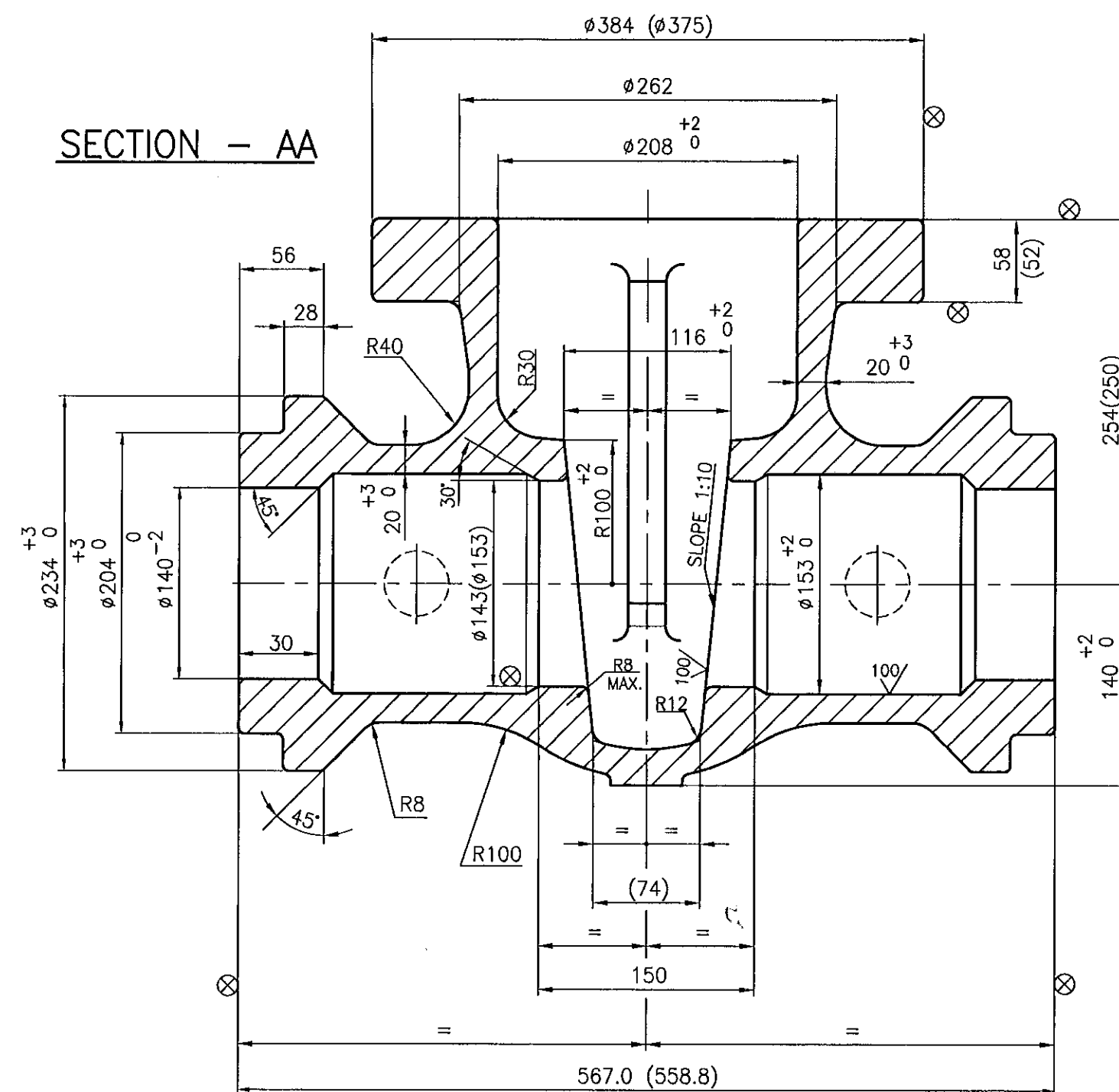
CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.

REV	DATE	ALTERED
		CHD & APPD
ZONE		

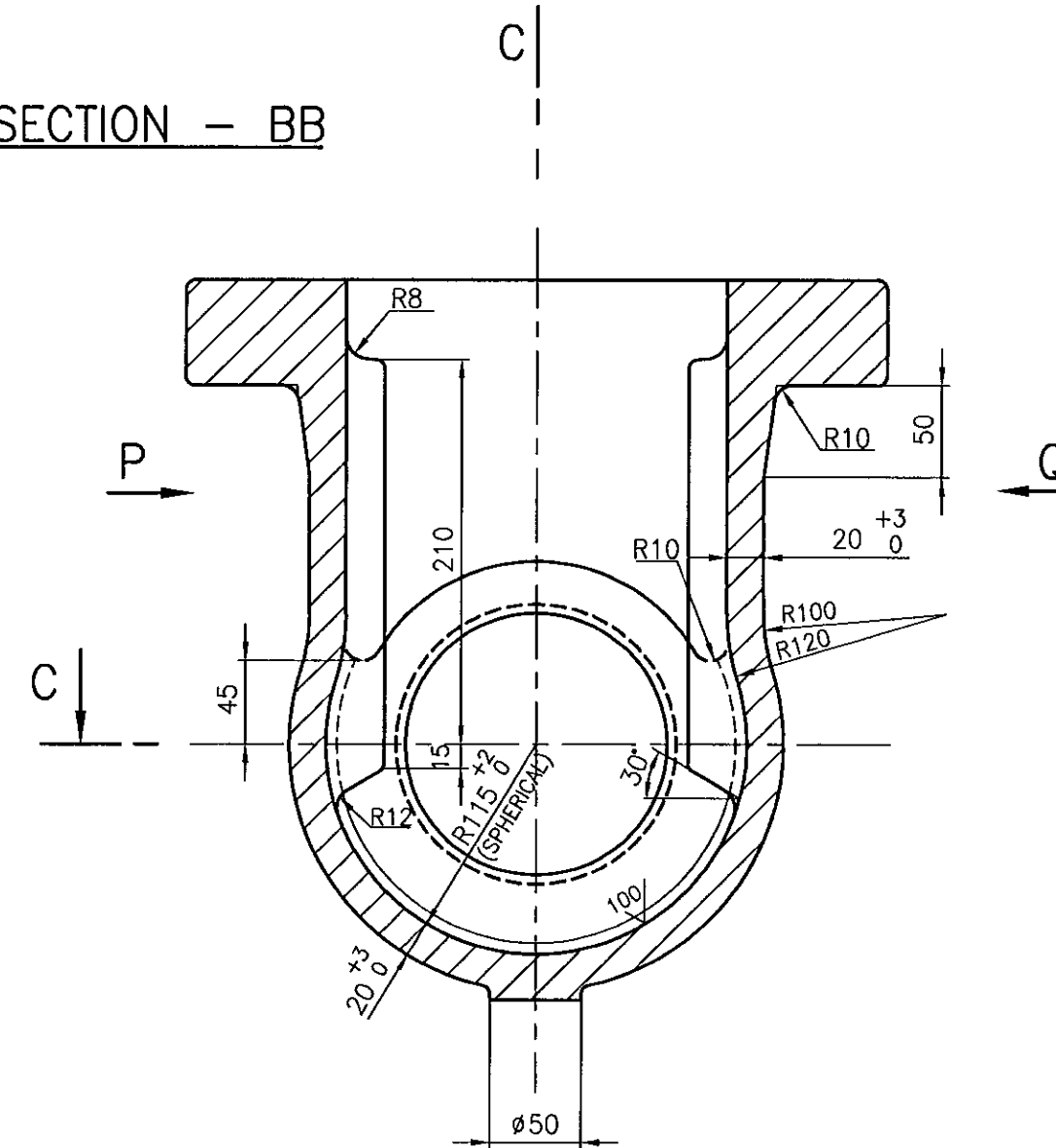
DRAWING NO
2-V-F604-06103R

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

SECTION - AA



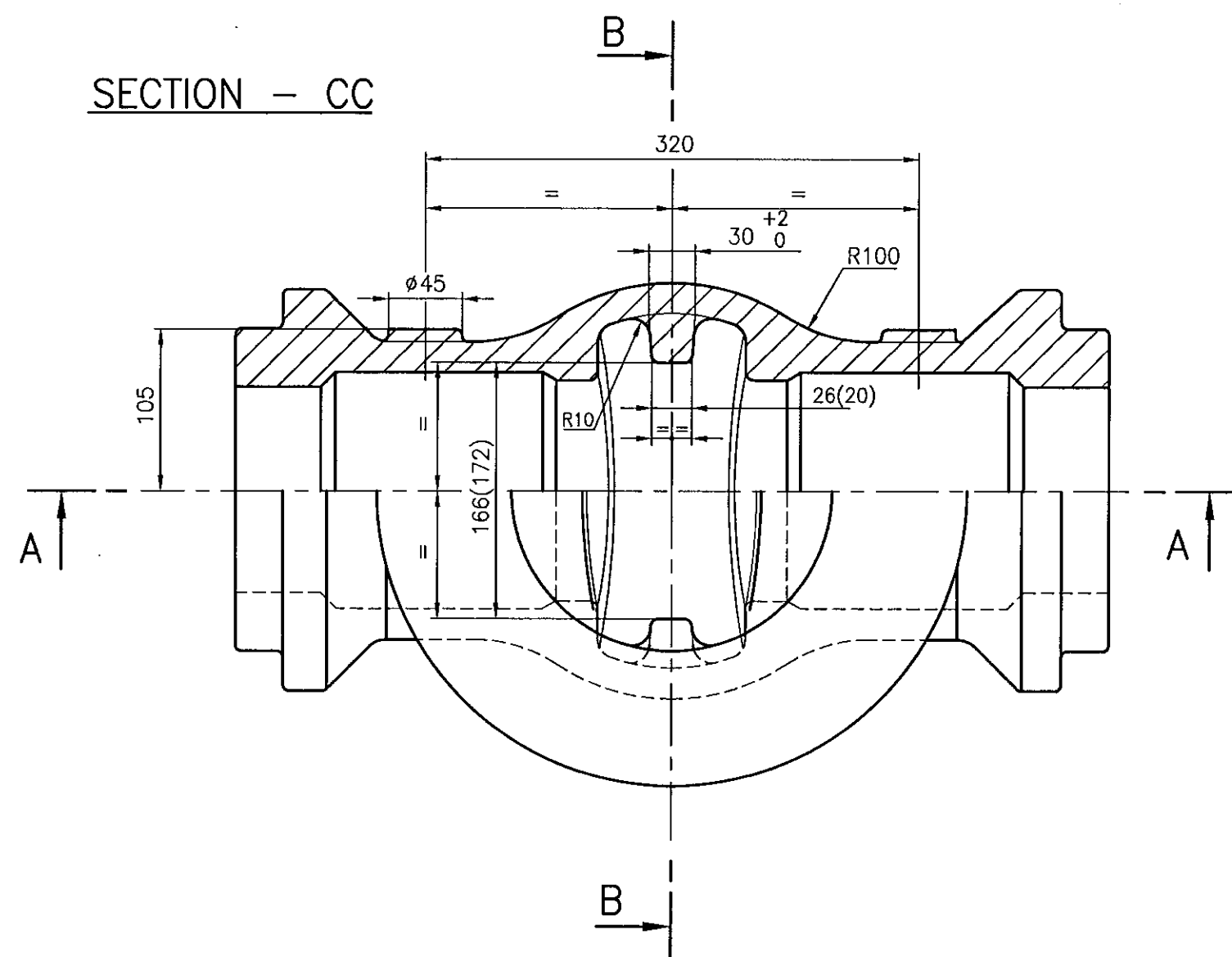
SECTION - BB



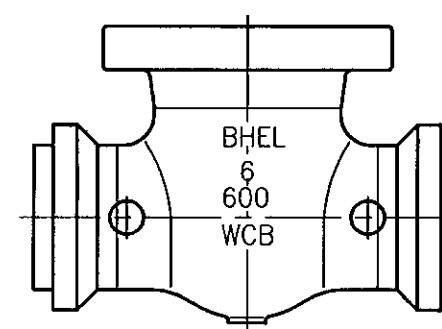
NOTE

- NECESSARY MACHINING ALLOWANCES HAVE BEEN ADDED ON ALL MACHINABLE SURFACES.
- PERMISSIBLE DEVIATIONS OF NON TOLERANCED CASTING DIMENSIONS REFER APPLICABLE TDC
- FINISH MACHINED DIMENSIONS ARE INDICATED WITHIN BRACKETS FOR INFORMATION ONLY.
- LETTERS- BHEL, SIZE, MATL. & SUPPLIERS CODE ARE TO BE CAST IN THE INDICATED ZONE.
- CASTING SHALL COMPLY WITH THE REQUIREMENTS OF APPLICABLE TDC
- UNSPECIFIED CASTING RADII = R3 TO R5
- HEIGHT OF CASTING LETTERS = 15 mm
- $\otimes$ INDICATES SURFACE TO BE MACHINED.
- $\sqrt{100}$ INDICATED CASTING SURFACES SHALL BE OF HIGH QUALITY WITHOUT SURFACE UNEVENNESS.

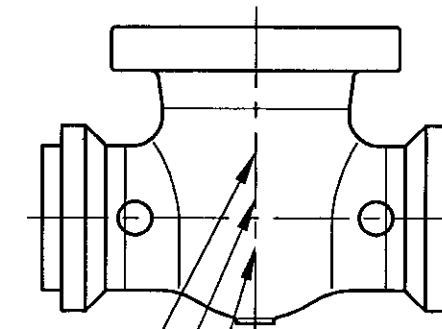
SECTION - CC



VIEW - P



VIEW - Q

SUPPLIER'S CODE
MELT NUMBER
INSPECTION SEAL

CASTING	92 033 879	ASTM A216 WCB - ATTESTED	NORMALISED	-	119.0	-	-	-
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.				NAME	SIGN	DATE	NO. OF VAR.	
365-120				DRN	M. SRINIVASAN	31.3.97		
				CHD	K.S. RAMAN	31.3.97		
				APPD	N. NAGARAJAN	31.3.97		
DEPT	V L	SCALE	WEIGHT (KG)	REFERENCE INFORMATION				NO. OF ITEMS
CODE	320	NTS	119.0	COMP. CODE : 92 033 879 0000				
TITLE				CARD CODE	DRAWING NO.			REV
BODY (6" - C600 - WCB - BW)				U 01	2-V-F604-06103R			

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REV	DATE	ALTERED
ZONE		CHD & APPD

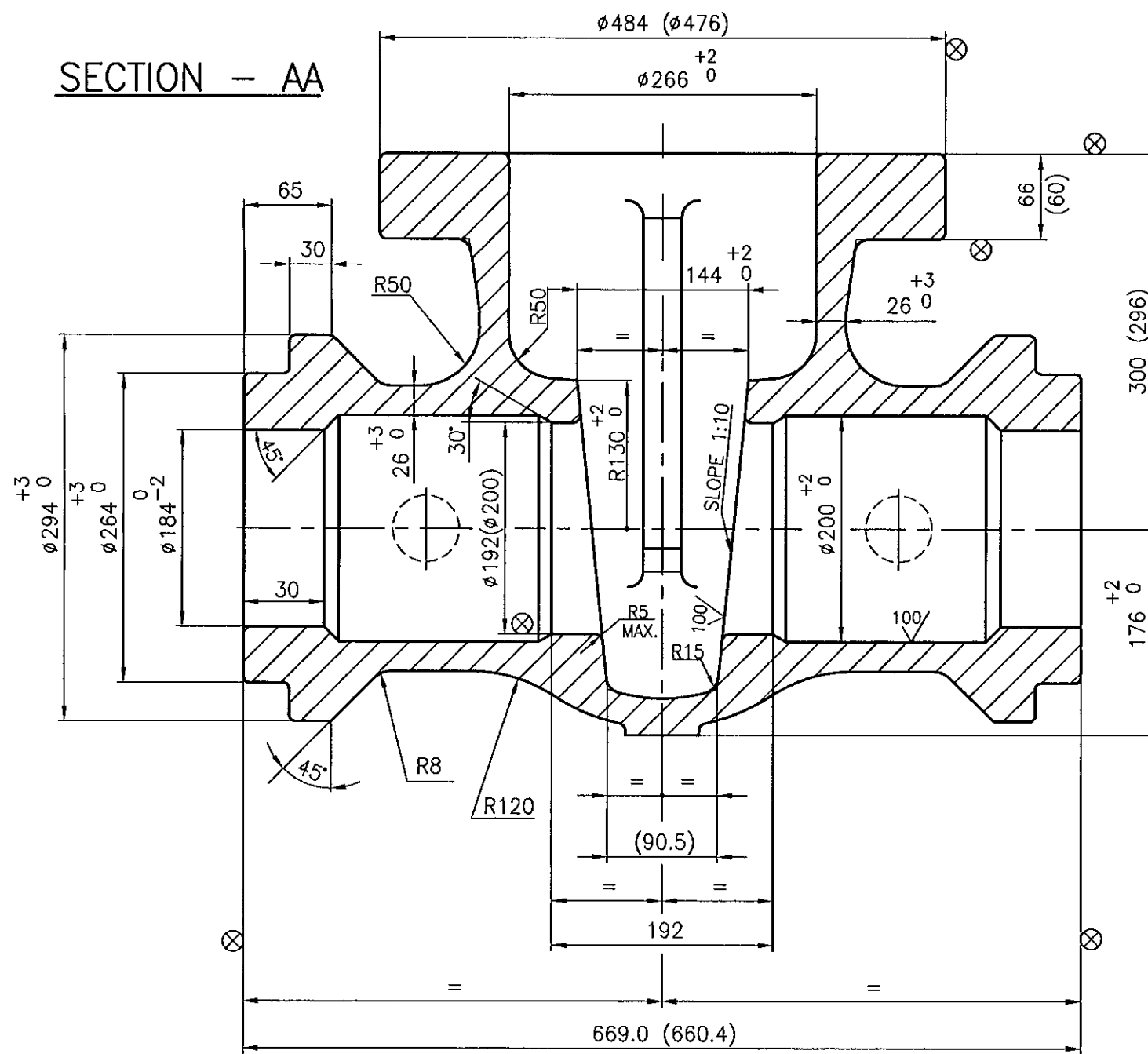
DRAWING NO. 2-V-F605-06104R

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

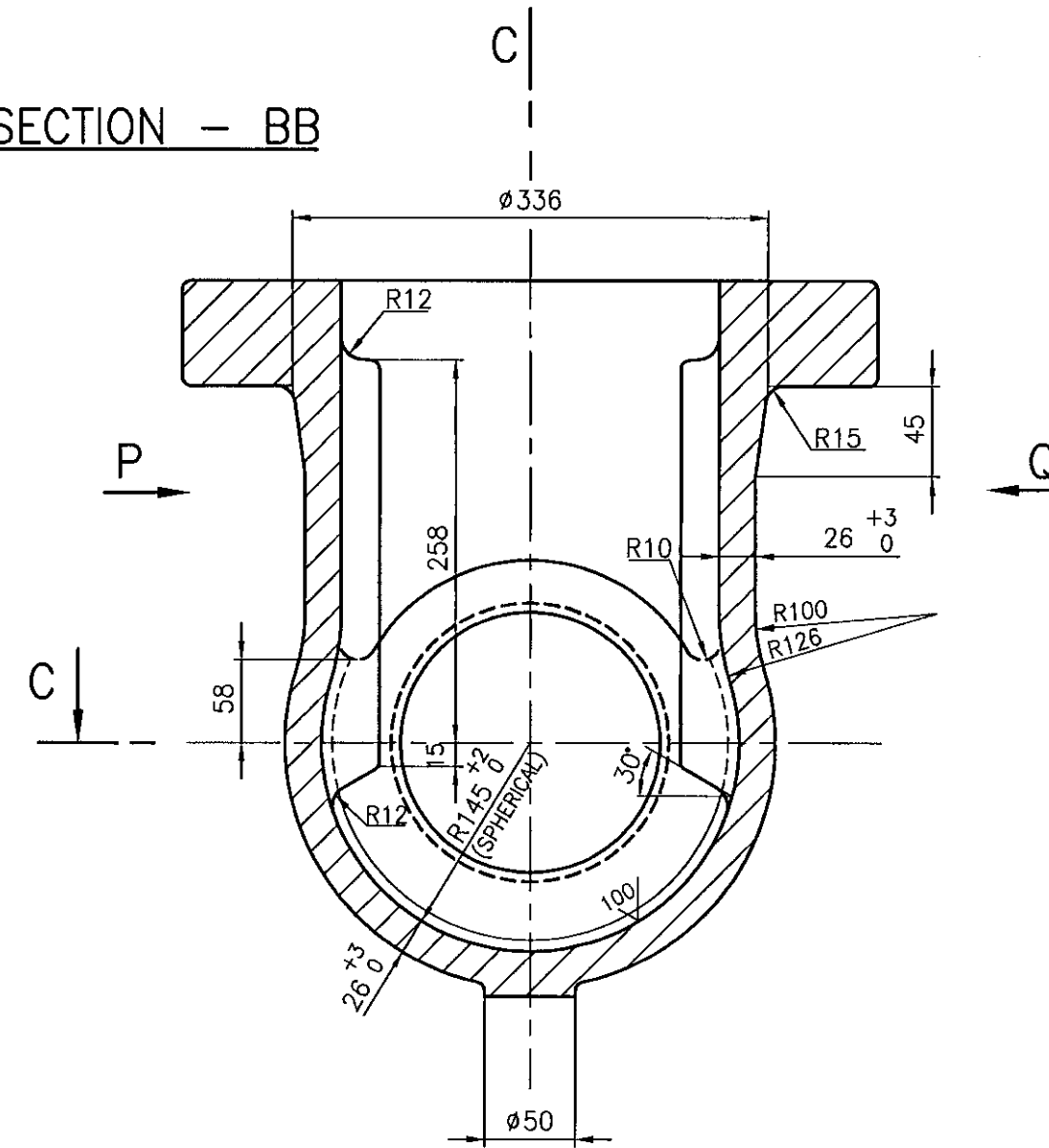
NOTE

- NECESSARY MACHINING ALLOWANCES HAVE BEEN ADDED ON ALL MACHINABLE SURFACES.
- PERMISSIBLE DEVIATIONS OF NON TOLERANCED CASTING DIMENSIONS REFER APPLICABLE TDC
- FINISH MACHINED DIMENSIONS ARE INDICATED WITHIN BRACKETS FOR INFORMATION ONLY.
- LETTERS- BH,EL,SIZE,MATL.& SUPPLIERS CODE ARE TO BE CAST IN THE INDICATED ZONE.
- CASTING SHALL COMPLY WITH THE REQUIREMENTS OF APPLICABLE TDC
- UNSPECIFIED CASTING RADII = R3 TO R5
- HEIGHT OF CASTING LETTERS = 20 mm
- ⊗ INDICATES SURFACE TO BE MACHINED.
- ✓ INDICATED CASTING SURFACES SHALL BE OF HIGH QUALITY WITHOUT SURFACE UNEVENNESS.

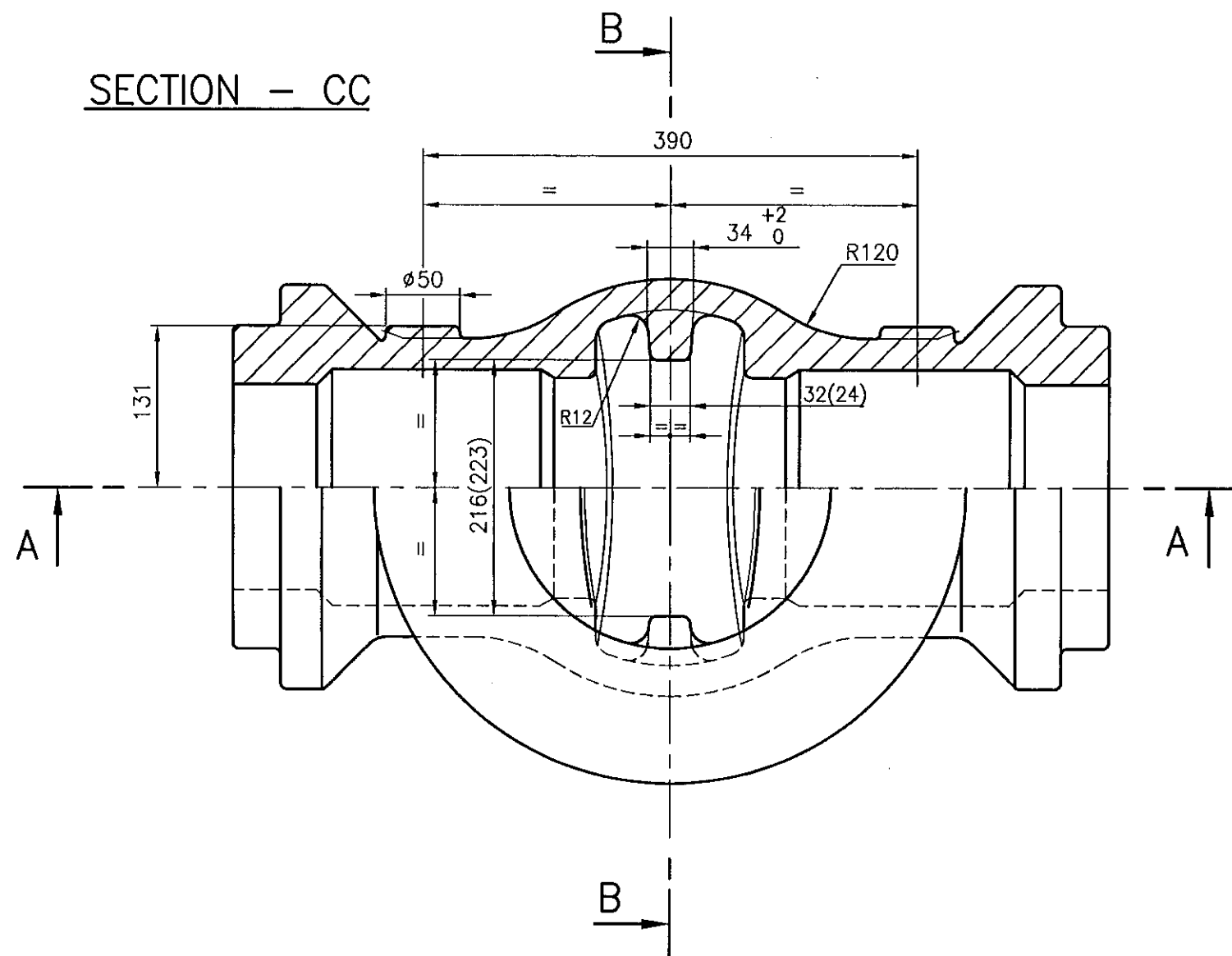
SECTION - AA



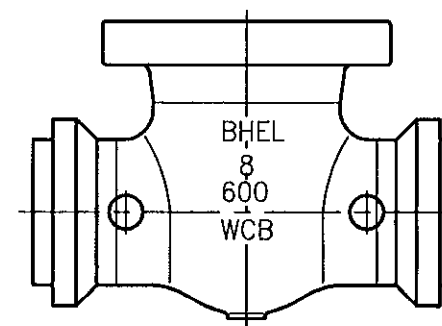
SECTION - BB



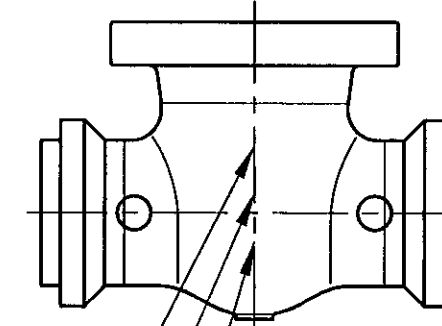
SECTION - CC



VIEW - P



VIEW - Q

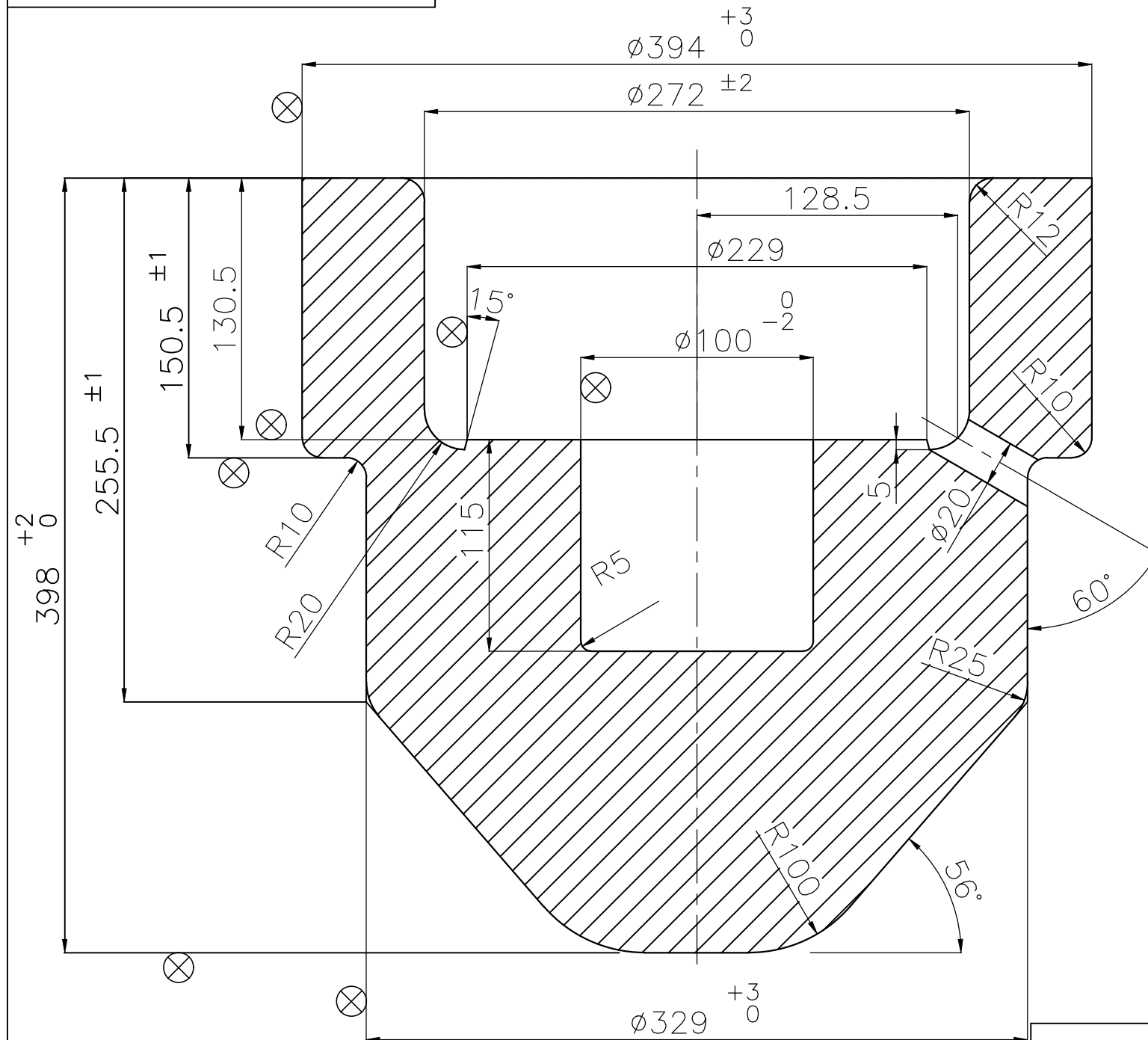


SUPPLIER'S CODE
MELT NUMBER
INSPECTION SEAL

CASTING	92 033 880	ASTM A216 WCB-ATTESTED	NORMALISED	-	225.0	-	-	-	-
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 M.SRINIVASAN	SIGN	DATE 31.3.97	NO.OF VAR.	
				CHD	K.S.RAMAN		31.3.97		
				APPD	N.NAGARAJAN		31.3.97		
REFERENCE INFORMATION COMP. CODE : 92 033 880 0000				DEPT	SCALE	WEIGHT (KG).	NO. OF ITEMS		
				V L	NTS	225.0	CAD :C206104R		
TITLE				CODE	320		DRAWING NO.		
BODY (8" - C600 - WCB - BW)							2-V-F605-06104R		
							CARD CODE		REV
							U 01		

CAUTION: The information on this drawing 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
ZONE		CHD & APPD

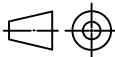


01. NECESSARY ALLOWANCES HAVE BEEN ADDED ON ALL MACHINABLE SURFACES.
02. PERMISSIBLE DIMENSIONAL DEVIATIONS OF CASTING SURFACES REFER LATEST APPLICABLE QUALITY PROCEDURE.
03. FINISH MACHINED DIMENSIONS ARE INDICATED WITHIN BRACKETS FOR INFORMATON.
04. UNSPECIFIED CASTING RADII 3–5mm.
05. ⊗ SURFACE TO BE MACHINED.
06. HEIGHT OF CASTING LETTERS 10 mm.
07. # MARKED ITEMS IGC TEST SHALL BE CONDUCTED.

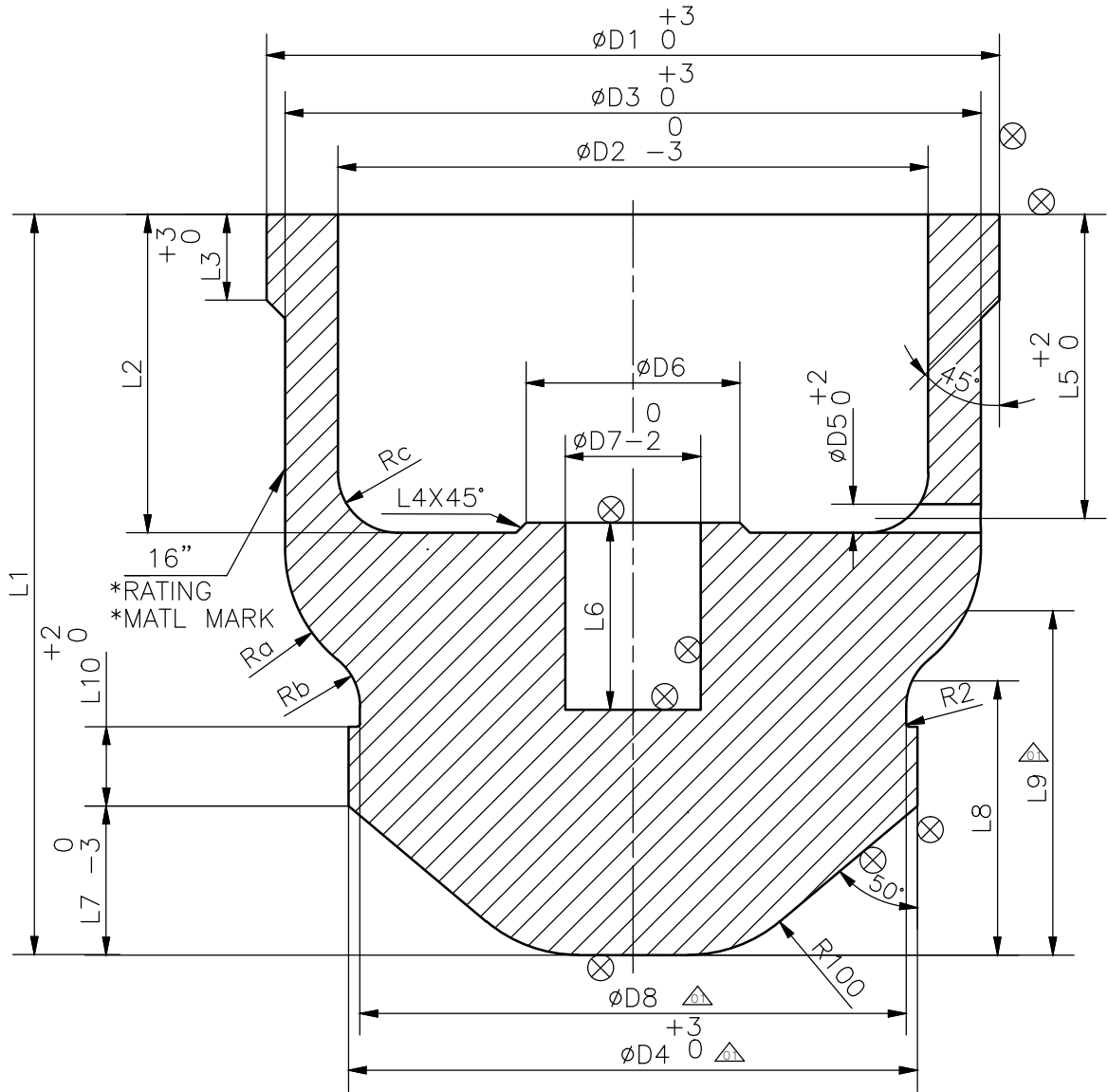
# 04	—	—	SA351 CF8 CERTIFY	SH	—	194.4	—	3-V-U961-25206R 92 203 793 0000	—
03	—	—	SA351 CF8 CERTIFY	SH	—	194.4	—	3-V-P764-25206R 92 203 789 0000	—
02	—	—	ASTM A217 C12A, CERTIFY	NT	—	194.4	—	3-V-NH60-25206R/1 92 203 127 0000	—
01	—	—	ASTM A216 WCB,CERTIFY	NR	—	194.4	—	3-V-NH50-25206R/2 92 203 095 0000	—
NO OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING N o	ITEM N o
								COMP. CODE	

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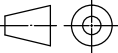
REV 04	DATE 13.12.18	ALTERED R.P.SINGH CHD & APPD SSK & KRS
SL. No. 03 & 04 INCLUDED.		
NOTES No. 07 INCLUDED.		

TYPE OF PRODUCT					DWG. REDRAWN WITH REV. 04 ON 13.12.18						
OR NAME OF											
CUSTOMER/PROJECT											
 BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI-620014.					DRN	NAME GANESH		SIGN	DATE 08.12.12	NO.OF VAR.	
					CHD	GANESH			08.12.12		
365-121					APPD	M.RAJAKUMAR			08.12.12		
DEPT VL			SCALE NTS		WEIGHT (KG). REF.TABLE		REFERENCE INFORMATIONS CAD:C325206R				NO. OF ITEMS
CODE 320											
TITLE DISK (14"-C600-RV)					CARD CODE U 01	DRAWING NO. 3-V-0000-25206R					REV 04

3-V-0000-25211R DRAWING NO.																													
SL.NO.	DRAWNG NO.	MATERIAL CODE	MATERIAL SPEC.	HEAT TREATMENT	ØD1	ØD2	ØD3	ØD4	ØD5	ØD6	ØD7	ØD8	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Ra	Rb	Rc	WEIGHT (kg)	*RATING	*MATL MARK	
01	3-V-NH51-25211R	922030870000	ASTM A216 WCB CERTIFY	NR	530	444	506	410	20	326	85	396	473	199	60	8	189	122	105	205	248	68	60	70	37	337	300	WCB	
02	3-V-NH52-25211R	922030910000			514	414	488	399	20	150	95	383	519	223	60	8	213	131	104	192	241	56	100	42	42	370	600	WCB	
03	3-V-NH63-25211R	922031780000	ASTM A217 WC9 CERTIFY	NT	530	444	506	410	20	326	85	396	473	199	60	8	189	122	105	205	248	68	60	70	37	337	300	WC9	
04	3-V-NJ35-25211R	922033520000	ASTM A217 C12A CERTIFY	NT	530	444	506	410	20	326	85	396	473	199	60	8	189	122	105	205	248	68	60	70	37	337	300	C12A	



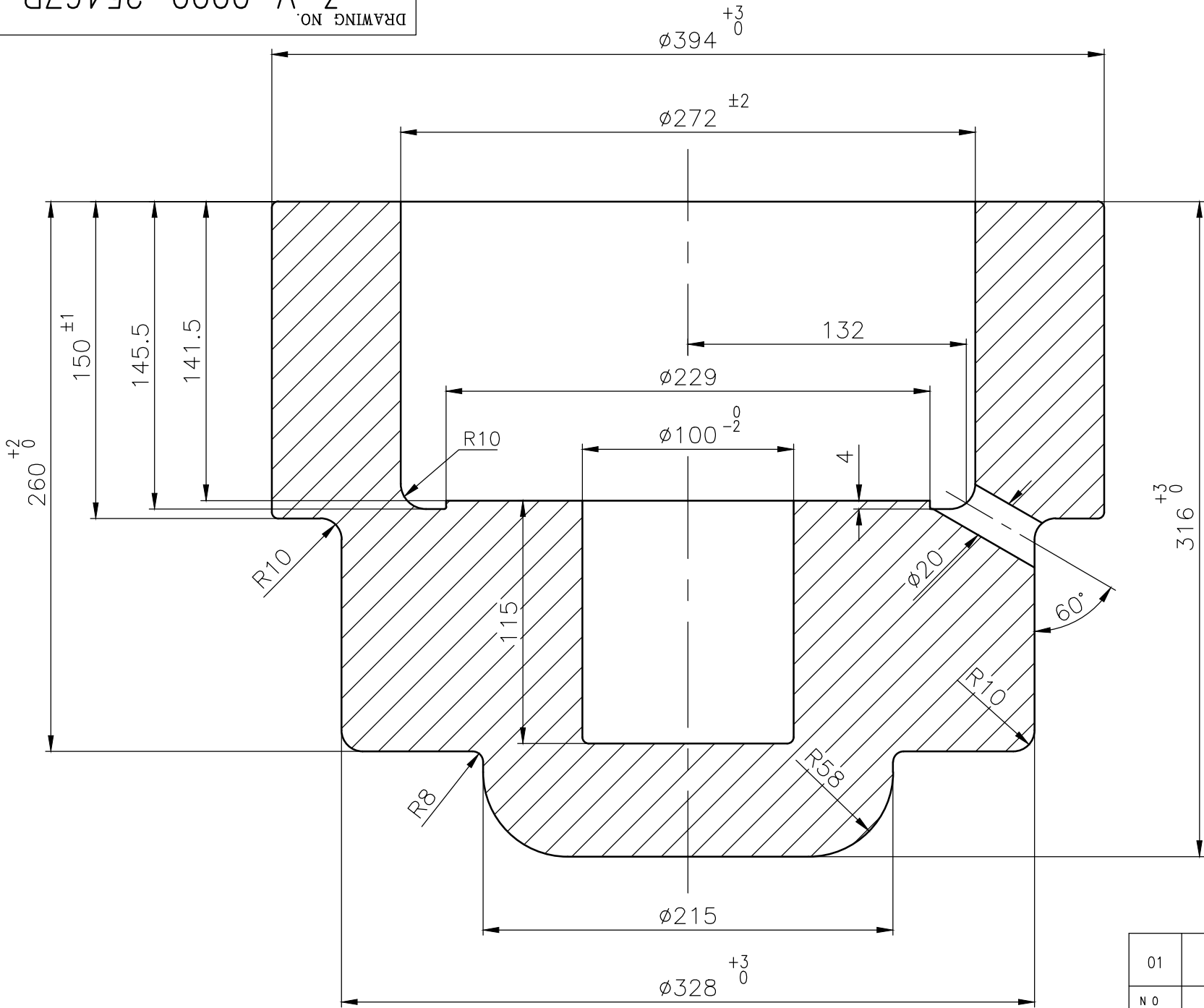
NOTE :
01. UNSPECIFIED RADII TO BE R3-5 MM
02. ⊗ INDICATES THE SURFACES WHICH ARE TO BE MACHINED FURTHER.

—	—	—	—	—	—	—	—	—	—
NO OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREA VEN	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No	ITEM No
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT									
 365-121 BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI-620014.					DRN	NAME ARUN	SIGN	DATE 23.11.12	NO.OF VAR.
					CHD	MRK		23.11.12	
					APPD	MRK		23.11.12	
DEPT VL		SCALE NTS	WEIGHT (KG). REF. TABLE	REFERENCE INFORMATIONS				NO. OF ITEMS	
CODE 320				—					
TITLE DISC CASTING 16"				CARD CODE U 01	DRAWING NO. 3-V-0000-25211R				REV 04

REV 04	DATE 07.09.2016	ALTERED K.NAVIN		REV 03	DATE 20.11.14	ALTERED A.MARIMUTHU	
		CHD & APPD	SSK & KRS			CHD & APPD MS & SSK	
	DRAWING UPDATED			SL.NO. 04 INCLUDED			
REV 02	DATE 03.08.13	ALTERED DEEPAKRAJ		REV 01	DATE 04.03.13	ALTERED ARUN	
		CHD & APPD DEEPAKRAJ & KRS				CHD & APPD MRK	
SL.NO. 3 INCLUDED RATING AND MATL. MARK COLUMN INCLUDED				SYMBOL  INDICATES REVISION IN DIMENSION & PROFILE. DCN: 801469			

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3-V-0000-25467R
DRAWING NO.



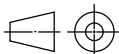
NOTES:

01. NECESSARY ALLOWANCES HAVE BEEN ADDED ON ALL MACHINABLE SURFACES.
02. PERMISSIBLE DIMENSIONAL DEVIATIONS OF CASTING SURFACES REFER LATEST APPLICABLE QUALITY PROCEDURE.
03. FINISH MACHINED DIMENSIONS ARE INDICATED WITHIN BRACKETS FOR INFORMATON.
04. UNSPECIFIED CASTING RADII 3-5mm.
05. ⊗ SURFACE TO BE MACHINED.
06. HEIGHT OF CASTING LETTERS 10 mm.

01	CASTING	-	ASTM A216 WCC, CERTIFY	NR	-	158	-	3-V-P607-25467 92 203 380 0000	-
NO OFF	DESCRIPTION	MATL CODE	MATL SPECN	HEAT TREATMENT	SCRAP SORT	NET WT (kg)	GROSS WT (kg)	DRAWING No COMP. CODE	ITEM No

REV	DATE	ALTERED
		CHD & APPD

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.

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT										
 365-121 BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI-620014.					DRN	NAME M.SELVAM	SIGN	DATE 01.08.15	NO.OF VAR.	
					CHD	M.SRINIVASAN		01.08.15		
					APPD	S.SATHEES		01.08.15		
DEPT VL			SCALE	WEIGHT (KG).	REFERENCE INFORMATIONS				NO. OF ITEMS	
CODE 320			NTS	REF.TABLE	CAD:C325467R					
TITLE DISK (14"-C600-SV)					CARD CODE U 01	DRAWING NO. 3-V-0000-25467R				REV

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

Annexure A

Sr. No.	Description	Vendor to mention
1	Attach list of patterns	
2	Maximum pattern development time for new item	
3	Number of patterns for development that can be taken by vendor/month. Accordingly order for new development will be given.	
4	Maximum weight of single piece casting that can be delivered by vendor (In Kg)	
5	Minimum time after which supply will start after receipt of regular POs for items in which pattern is available.	
6	Typical limitation in some pattern/group of patterns collectively, Please mention the size and quantity per month which can be delivered.	
7	Monthly commitment for IVP Goindwal (MT). PO Delivery time shall be given based on the monthly commitment of castings to IVP Goindwal.	

Signature of vendor with
stamp

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

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%			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		
Document No: TDC:0:433	Rev No : 00	Effective Date: 15.07.2011
		Page 3 of 4

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
Product : STEEL CASTINGS (VALVES)- IMPORTED		
Document No: TDC:0:433	Rev No : 00	Effective Date: 15.07.2011
		Page 4 of 4

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, 2.Specification, grade & Melt number, 3.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 anyother agency approved for PED of CEmarking, 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.

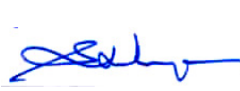
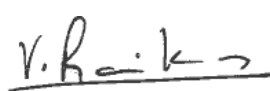
- Purchase Order No.(BHEL),TDC No. & Test certificate number
- Specification and Grade with applicable year of code, Heat Number, Quantity & Size
- Steel making process, Chemistry including incidental elements - Heat wise.
- Heat treatment details of the material and test bars.
- Mechanical test results, 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.

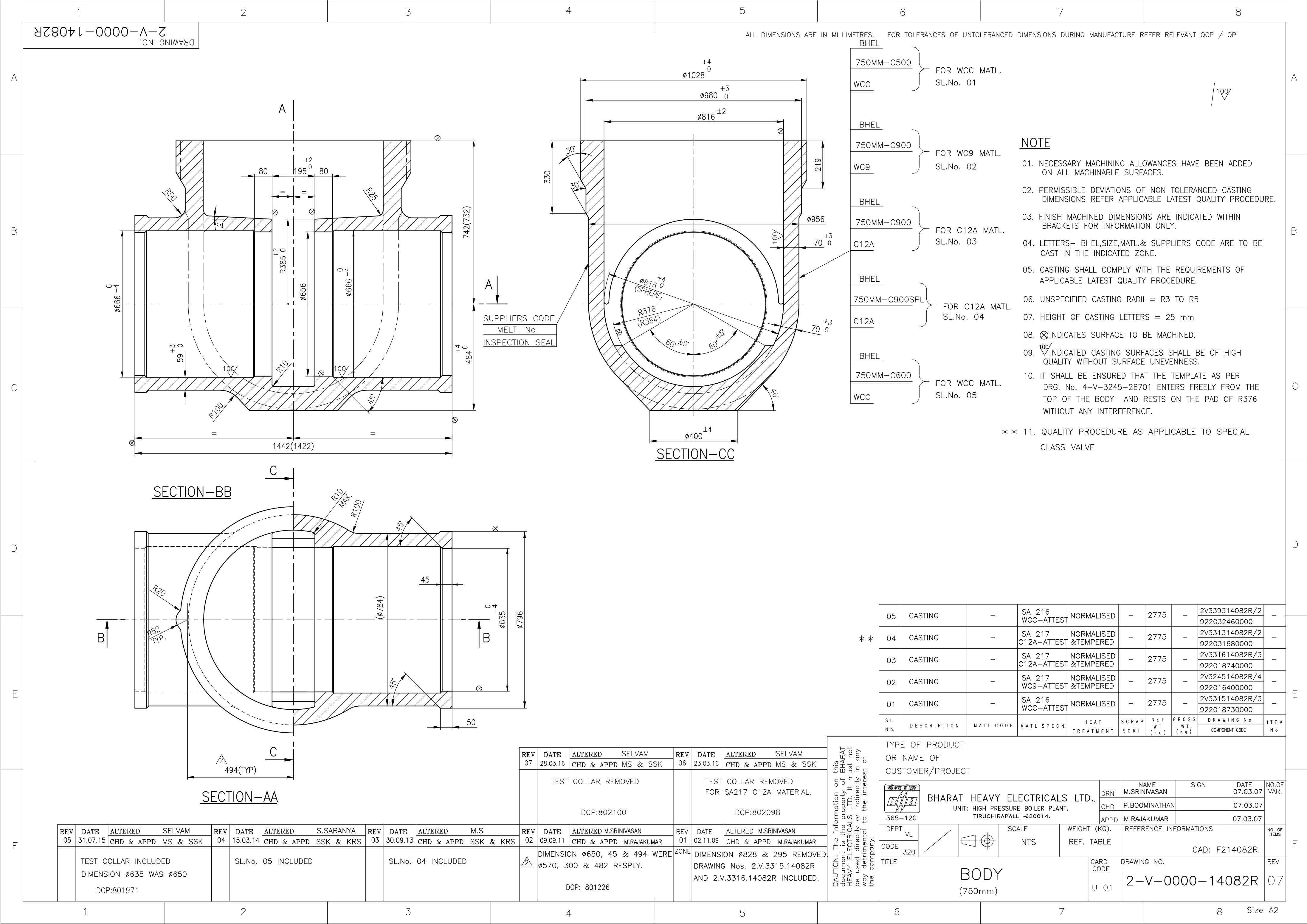
14.0 AUDIT CHECKS AT BHEL:

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 ASSURANCE
PREPARED BY	REVIEWED BY		APPROVED BY



Material	Material Description	S	C	T	DESC	MAT	DSS	Established Weight
922020980000	BODY-2-C600-GV-BW-CF8M-F829	2	600	GV	BODY-BW	CF8M	29.50	-
922015470000	BODY-2-C600-GV-BW-WC6-F621	2	600	GV	BODY-BW	WC6	29.50	-
922015480000	BODY-2-C600-GV-BW-WC9-F631	2	600	GV	BODY-BW	WC9	29.50	-
922015450000	BODY-2-C600-GV-BW-WCB-F601	2	600	GV	BODY-BW	WCB	29.50	-
922015460000	BODY-2-C600-GV-BW-WCC-F611	2	600	GV	BODY-BW	WCC	29.50	-
922015590000	BODY-2-C600-GV-FL-CF8M-F520	2	600	GV	BODY-FL	CF8M	39.00	39.50
920249690000	BODY-2-C600-GV-FL-WC6-B021	2	600	GV	BODY-FL	WC6	39.00	39.50
920249700000	BODY-2-C600-GV-FL-WC9-B031	2	600	GV	BODY-FL	WC9	39.00	39.50
920249670000	BODY-2-C600-GV-FL-WCB-B001	2	600	GV	BODY-FL	WCB	39.50	39.50
920249680000	BODY-2-C600-GV-FL-WCC-B011	2	600	GV	BODY-FL	WCC	39.00	39.50
922015610000	WEDGE- 2-C600-GV-FL-HW-CF8M-F520	2	600	GV	WEDGE	CF8M	3.00	3.40
920342690000	WEDGE-WC6-B021	2	600	GV	WEDGE	WC6	3.00	3.40
920342700000	WEDGE-2-600-GV-FL-WC9	2	600	GV	WEDGE	WC9	3.00	3.40
920342670000	WEDGE-WCB-B001 2-600 -GV	2	600	GV	WEDGE	WCB	3.00	3.40
920342680000	WEDGE-WCC-B011-2-600-GV	2	600	GV	WEDGE	WCC	3.00	3.40
922015600000	YOKE COVER-2-600-GV-FL-HW-CF8M	2	600	GV	YOKE	CF8M	20.00	21.50
920084740000	YOKE COVER-WC6-B021	2	600	GV	YOKE	WC6	20.00	21.50
920084750000	YOKE COVER-2-600-GV-FL-WC9	2	600	GV	YOKE	WC9	20.00	21.50
920084720000	YOKE COVER-2-600-GV-FL-WCB	2	600	GV	YOKE	WCB	21.50	21.50
920084730000	YOKE COVER-2-600-GV-FL-WCC	2	600	GV	YOKE	WCC	20.00	21.50
922034690000	BODY-3-C600-GV-BW-CF3M-F810	3	600	GV	BODY-BW	CF3M	43.00	43.00
922031940000	BODY-3-C600-GV-BW-CF8M-F921	3	600	GV	BODY-BW	CF8M	41.00	43.00
920339200000	BODY-3-C600-GV-BW-WC6-F622	3	600	GV	BODY-BW	WC6	41.00	43.00
920339210000	BODY-3-C600-GV-BW-WC9-F632	3	600	GV	BODY-BW	WC9	41.00	43.00
920338610000	BODY-3-C600-GV-BW-WCB-F602	3	600	GV	BODY-BW	WCB	41.00	43.00
920339190000	BODY-3-C600-GV-BW-WCC-F612	3	600	GV	BODY-BW	WCC	41.00	43.00
922034480000	BODY-3-C600-GV-FL-CF8-F912	3	600	GV	BODY-FL	CF8	51.00	56.50
920339170000	BODY-3-C600-GV-FL-WC6-F522	3	600	GV	BODY-FL	WC6	51.00	56.50
920339180000	BODY-3-C600-GV-FL-WC9-F532	3	600	GV	BODY-FL	WC9	51.00	56.50
920338600000	BODY-3-C600-GV-FL-WCB-F502	3	600	GV	BODY-FL	WCB	51.00	56.50
920339160000	BODY-3-C600-GV-FL-WCC-F512	3	600	GV	BODY-FL	WCC	51.00	56.50
922031930000	SEAT RING-3-C600-GV-CF8M-F921	3	600	GV	SEAT RING	CF8M	0.98	-
922034510000	WEDGE-3-C600-CF8-F912	3	600	GV	WEDGE	CF8	3.20	3.70
922031920000	WEDGE-3-C600-CF8M-F921	3	600	GV	WEDGE	CF8M	3.20	3.70
920339520000	WEDGE-WC6-F522	3	600	GV	WEDGE	WC6	3.20	3.70
920339650000	WEDGE-3-600-GV-FL-WC9	3	600	GV	WEDGE	WC9	3.20	3.70
920338630000	WEDGE-3-C600-WCB-F502	3	600	GV	WEDGE	WCB	3.20	3.70
920339640000	WEDGE-3-C600-WCC-F512	3	600	GV	WEDGE	WCC	3.20	3.70
922034500000	YOKE CUM BONNET-CF8-F912	3	600	GV	YOKE	CF8	22.00	27.00
922031980000	YOKE CUM BONNET-CF8M-F921	3	600	GV	YOKE	CF8M	22.00	27.00
920339580000	YOKE CUM BONNET-WC6-F522	3	600	GV	YOKE	WC6	22.00	27.00
920339770000	YOKE CUM BONNET-WC9-F532	3	600	GV	YOKE	WC9	22.00	27.00
920338620000	YOKE -3-C600-GV-WCB-F502	3	600	GV	YOKE	WCB	22.00	27.00
920339760000	YOKE -3-C600-GV-WCC-F512	3	600	GV	YOKE	WCC	22.00	27.00
922034650000	BODY-4-C600-GV-FL-CF8M-F914	4	600	GV	BODY	CF8M		-
920339260000	BODY-4-C600-GV-BW-WC6-F623	4	600	GV	BODY-BW	WC6	54.00	63.00
920339270000	BODY-4-C600-GV-BW-WC9-F633	4	600	GV	BODY-BW	WC9	54.00	63.00
920338780000	BODY-4-C600-GV-BW-WCB-F603	4	600	GV	BODY-BW	WCB	54.00	63.00
920339250000	BODY-4-C600-GV-BW-WCC-F613	4	600	GV	BODY-BW	WCC	54.00	63.00
920339250005	BODY-4-C600-GV-BW-WCC-U684	4	600	GV	BODY-BW	WCC	54.00	63.00
922034530000	BODY-4-C600-GV-FL-CF8-F913	4	600	GV	BODY-FL	CF8	88.00	102.00
920339240000	BODY-4-C600-GV-FL-WC9-F533	4	600	GV	BODY-FL	WC9	88.00	102.00
920338640000	BODY-4-C600-GV-FL-WCB-F503	4	600	GV	BODY-FL	WCB	88.00	102.00
920339220000	BODY-4-C600-GV-FL-WCC-F513	4	600	GV	BODY-FL	WCC	88.00	102.00
922034520000	4-C600-GV-SEAT RING-CF8	4	600	GV	SEAT RING	CF8	1.67	-
922034620000	4-C600-GV-SEAT RING-CF8M	4	600	GV	SEAT RING	CF8M	1.67	-
922034550000	WEDGE-CF8-F913-4-C600-GV	4	600	GV	WEDGE	CF8	5.60	7.00
922034630000	WEDGE-CF8M-F914-4-C600-GV	4	600	GV	WEDGE	CF8M	5.60	7.00
920339530000	WEDGE-WC6-F523-4-C600-GV	4	600	GV	WEDGE	WC6	5.60	7.00
920339670000	WEDGE-WC9-F533-4-C600-GV	4	600	GV	WEDGE	WC9	5.60	7.00
920338660000	WEDGE-4-C600-WCB-F503	4	600	GV	WEDGE	WCB	5.60	7.00
920339660000	WEDGE-4-600-GV-FL-WCC	4	600	GV	WEDGE	WCC	5.60	7.00
922034540000	YOKE CUM BONNET-CF8-F913	4	600	GV	YOKE	CF8	26.00	33.00
920339590000	YOKE CUM BONNET-WC6-F523	4	600	GV	YOKE	WC6	26.00	33.00

920339790000	YOKE CUM BONNET-WC9-F533	4	600	GV	YOKE	WC9	26.00	33.00
920338650000	YOKE CUM BONNET-4-C600-WCB-F503	4	600	GV	YOKE	WCB	26.00	33.00
920339780000	YOKE CUM BONNET-WCC-F513	4	600	GV	YOKE	WCC	26.00	33.00
920339780005	YOKE CUM BONNET-4-C600-WCC-U68	4	600	GV	YOKE	WCC	26.00	33.00
922034640000	YOKE CUM BONNET-CF8M-F914	4	600	GV	YOKE CUM BONNET	CF8M		-
922012280000	BODY-4-C600-SV-BW-WCB-P504	4	600	SV	BODY-BW	WCB	64.50	-
922034740000	ARM-6-C600-FV-CF8-Z106	6	600	FV	ARM	CF8	4.30	-
922014200000	ARM-6-C600-FV-WC6-Z052	6	600	FV	ARM	WC6	4.30	-
922030100000	ARM-6-C600-FV-WC9-Z075	6	600	FV	ARM	WC9	4.30	-
922010190000	ARM-6-C600-FV-WCB-Z016	6	600	FV	ARM	WCB	4.30	-
922014040000	ARM-6-C600-FV-WCC-Z050	6	600	FV	ARM	WCC	4.30	-
922014210000	BODY-6-C600-FV-BW-WC6-Z052	6	600	FV	BODY-BW	WC6	128.00	129.70
922030080000	BODY-6-C600-FV-BW-WC9-Z075	6	600	FV	BODY-BW	WC9	128.00	129.70
922012160000	BODY-6-C600-FV-BW-WCB-Z038	6	600	FV	BODY-BW	WCB	128.00	129.70
922014020000	BODY-6-C600-FV-BW- WCC-Z050	6	600	FV	BODY-BW	WCC	128.00	129.70
922012870000	BODY-6-C600-FV-BW-WCB-U142	6	600	FV	BODY-BW-U	WCB	128.00	151.00
922010200000	BODY-6-C600-FV-RJT-WCB-Z016	6	600	FV	BODY-FL	WCB	196.00	-
922034230000	BODY-6-C600-FV-FL-WCC-Z103	6	600	FV	BODY-FL	WCC	196.00	200.50
922014240000	COVER-6-C600-FV-WC6-Z052	6	600	FV	COVER	WC6	50.00	51.30
922030090000	COVER-6-C600-FV-WC9-Z075	6	600	FV	COVER	WC9	50.00	51.30
922010170000	COVER_06_600_NRV_WCB-Z016	6	600	FV	COVER	WCB	50.00	51.30
922014030000	COVER-6-C600-FV-WCC-Z050	6	600	FV	COVER	WCC	50.00	51.30
922034750000	FLAP-6-C600-FV-CF8-Z106	6	600	FV	FLAP	CF8	9.50	-
922014230000	FLAP-6-C600-FV-F22-Z052	6	600	FV	FLAP	WC6/9	9.50	-
922010180000	FLAP-6-C600-FV-A105-Z016	6	600	FV	FLAP	WCB	9.50	-
922034760000	SEAT RING-6-C600-FV-CF8-Z106	6	600	FV	SEAT RING	CF8	8.11	-
922010210000	SEAT RING-6-C600-FV-A105-Z016	6	600	FV	SEAT RING	WCB	6.20	-
920339320000	BODY-6-C600-GV-BW-WC6-F624	6	600	GV	BODY-BW	WC6	119.00	135.00
920339330000	BODY-6-C600-GV-BW-WC9-F634	6	600	GV	BODY-BW	WC9	119.00	135.00
920338790000	BODY-6-C600-GV-BW-WCB-F604	6	600	GV	BODY-BW	WCB	119.00	135.00
922012370000	BODY-6-C600-GV-BW-WCB-F804	6	600	GV	BODY-BW	WCB	119.00	135.00
920339310000	BODY-6-C600-GV-BW-WCC-F614	6	600	GV	BODY-BW	WCC	119.00	135.00
920339290000	BODY-6-C600-GV-FL-WC6-F524	6	600	GV	BODY-FL	WC6	186.00	212.00
920339300000	BODY-6-C600-GV-FL-WC9-F534	6	600	GV	BODY-FL	WC9	186.00	212.00
922002380000	BODY-6-C600-GV-FL-WCB-F504	6	600	GV	BODY-FL	WCB	186.00	212.00
920339280000	BODY-6-C600-GV-FL-WCC-F514	6	600	GV	BODY-FL	WCC	186.00	212.00
922034610000	SEAT RING-GV-6-600-CF8	6	600	GV	SEAT RING	CF8	3.80	-
922034590000	WEDGE-6-C600-GV-CF8-F528	6	600	GV	WEDGE	CF8		-
920339540000	WEDGE-6-C600-GV-WC6-F524	6	600	GV	WEDGE	WC6	13.00	15.90
920339690000	WEDGE-6-C600-GV-WC9-F534	6	600	GV	WEDGE	WC9	13.00	15.90
920338520000	WEDGE-6-C600-GV-WCB-F504	6	600	GV	WEDGE	WCB	13.00	15.90
922011230000	WEDGE WCC-N252	6	600	GV	WEDGE	WCC	5.00	15.90
920339680000	WEDGE-6-C600-GV-WCC-F514	6	600	GV	WEDGE	WCC	13.00	15.90
920339600000	YOKE CUM BONNET-6-C600-GV-WC6-F524	6	600	GV	YOKE	WC6	58.40	62.50
920339810000	YOKE CUM BONNET-6-C600-GV-WC9-F534	6	600	GV	YOKE	WC9	58.40	62.50
920338870000	YOKE-6-C600-GV-WCB-F704	6	600	GV	YOKE	WCB	58.40	62.50
922012420000	YOKE CUM BONNET-6-C600-GV-WCB-F804	6	600	GV	YOKE	WCB	58.40	62.50
920339800000	YOKE CUM BONNET-6-C600-GV-WCC-F514	6	600	GV	YOKE	WCC	58.40	62.50
922018080000	ARM-8-C600-FV-WCB-Z068	8	600	FV	ARM	WCB	6.50	-
922033330000	ARM-8-C600-FV-WCC-Z097	8	600	FV	ARM	WCC	6.50	-
922018060000	BODY-8-C600-FV-BW-WCB-Z068	8	600	FV	BODY-BW	WCB	290.00	-
922018100000	BODY-8-C600-FV-BW-WCB-Z068	8	600	FV	BODY-BW	WCB	290.00	-
922033320000	BODY-8-C600-FV-BW-WCC-Z097	8	600	FV	BODY-BW	WCC	290.00	-
922018070000	COVER-8-C600-FV-WCB-Z068	8	600	FV	COVER	WCB	98.00	-
922033340000	COVER-8-C600-FV-WCC-Z097	8	600	FV	COVER	WCC	89.00	-
922018090000	FLAP-8-C600-FV-A105-Z068	8	600	FV	FLAP	WCB	18.00	-
922034790000	BODY-8-C600SPL-GV-BW-WCC-F924	8	600	GV	BODY	WCC	225.00	243.00
922020550000	BODY-8-C600-GV-BW-CF8M-F889	8	600	GV	BODY-BW	CF8M	225.00	243.00
920339380000	BODY-8-C600-GV-BW-WC6-F625	8	600	GV	BODY-BW	WC6	225.00	243.00
920339390000	BODY-8-C600-GV-BW-WC9-F635	8	600	GV	BODY-BW	WC9	225.00	243.00
920338800000	BODY-8-C600-GV-BW-WCB-F605	8	600	GV	BODY-BW	WCB	225.00	243.00
922012380000	BODY-8-C600-GV-BW-WCB-F805	8	600	GV	BODY-BW	WCB	243.00	243.00
920339370000	BODY-8-C600-GV-BW-WCC-F615	8	600	GV	BODY-BW	WCC	225.00	243.00
920339370005	BODY-8-C600-GV-BW-WCC-U694	8	600	GV	BODY-BW	WCC	243.00	243.00
920339350000	BODY-8-C600-GV-FL-WC6-F525	8	600	GV	BODY-FL	WC6	317.00	348.00
920339360000	BODY-8-C600-GV-FL-WC9-F535	8	600	GV	BODY-FL	WC9	317.00	348.00

920338670000	BODY-8-C600-GV-FL-WCB-F505	8	600	GV	BODY-FL	WCB	317.00	348.00
920339340000	BODY-8-C600-GV-FL-WCC-F515	8	600	GV	BODY-FL	WCC	317.00	348.00
922020560000	SEAT RING-8-C600-GV-CF8M-F889	8	600	GV	SEAT RING	CF8M	5.90	-
922020570000	WEDGE-8-C600-GV-CF8M-F889	8	600	GV	WEDGE	CF8M	29.00	30.00
920339550000	WEDGE-8-C600-GV-WC6-F525	8	600	GV	WEDGE	WC6	29.00	30.00
920339710000	WEDGE-8-C600-GV-WC9-F535	8	600	GV	WEDGE	WC9	29.00	30.00
920338690000	WEDGE-8-C600-GV-WCB-F505	8	600	GV	WEDGE	WCB	29.00	30.00
920339700000	WEDGE-8-C600-GV-WCC-F515	8	600	GV	WEDGE	WCC	29.00	30.00
922020580000	YOKE CUM BONNET-8-C600-GV-CF8M-F889	8	600	GV	YOKE	CF8M	106.00	116.00
920339610000	YOKE CUM BONNET-8-C600-GV-WC6-F725	8	600	GV	YOKE	WC6	106.00	116.00
920339830000	YOKE CUM BONNET-8-C600-GV-WC9-F735	8	600	GV	YOKE	WC9	106.00	116.00
920338880000	YOKE CUM BONNET-8-C600-GV-WCB-F705	8	600	GV	YOKE	WCB	106.00	116.00
922012430000	YOKE CUM BONNET-8-C600-GV-WCB-F805	8	600	GV	YOKE	WCB	106.00	116.00
920339820000	YOKE CUM BONNET-8-C600-GV-WCC-F715	8	600	GV	YOKE	WCC	106.00	116.00
920339820005	YOKE CUM BONNET-8-C600-GV-WCC-	8	600	GV	YOKE CUM BONNET	WCC	106.00	116.00
922033360000	ARM-10-C600-FV-WCC-Z098	10	600	FV	ARM	WCC	14.20	-
922033350000	BODY-10-C600-FV-BW-WCC-Z0	10	600	FV	BODY-BW	WCC	373.00	-
922033370000	COVER-10-C600-FV-WCC-Z098	10	600	FV	COVER	WCC	132.00	-
922020510000	FLAP-10-C600-FV-A105-Z071	10	600	FV	FLAP	WCC	27.80	-
920339440000	BODY-10-C600-GV-BW-WC6-F626	10	600	GV	BODY-BW	WC6	312.00	368.70
920339450000	BODY-10-C600-GV-BW-WC9-F636	10	600	GV	BODY-BW	WC9	312.00	368.70
920338810000	BODY-10-C600-GV-BW-WCB-F606	10	600	GV	BODY-BW	WCB	312.00	368.70
920339430000	BODY-10-C600-GV-BW-WCC-F616	10	600	GV	BODY-BW	WCC	312.00	368.70
920339430005	BODY-10-C600-GV-BW-WCC-U693	10	600	GV	BODY-BW	WCC	351.00	368.70
922034880000	BODY-10-C600SPL-GV-BW-WCC-F934	10	600	GV	BODY-BW-SPL	WCC	351.00	368.70
920339410000	BODY-10-C600-GV-FL-WC6-F526	10	600	GV	BODY-FL	WC6	466.00	543.00
920339420000	BODY-10-C600-GV-FL-WC9-F536	10	600	GV	BODY-FL	WC9	466.00	543.00
920338700000	BODY-10-C600-GV-FL-WCB-F506	10	600	GV	BODY-FL	WCB	466.00	543.00
920339400000	BODY-10-C600-GV-FL-WCC-F516	10	600	GV	BODY-FL	WCC	466.00	543.00
920339620000	BONNET-10-C600-GV-WC6-F726	10	600	GV	BONNET	WC6	135.00	142.00
920339850000	BONNET-10-C600-GV-WC9-F736	10	600	GV	BONNET	WC9	135.00	142.00
920338710000	BONNET-F506	10	600	GV	BONNET	WCB	135.00	142.00
920338890000	BONNET-10-C600-GV-WCB-F706	10	600	GV	BONNET	WCB	135.00	142.00
920339840000	BONNET-10-C600-GV-WCC-F716	10	600	GV	BONNET	WCC	135.00	142.00
920339840005	BONNET-10-C600-GV-WCC-U693	10	600	GV	BONNET	WCC	135.00	142.00
922014450000	SEAT RING-10-C600-GV-F6A CL3-F606	10	600	GV	SEAT RING	WCB	7.27	-
922033990000	WEDGE-10-C600-GV-CF8-U556	10	600	GV	WEDGE	CF8	46.00	53.00
922014440000	WEDGE-10-C600-GV-CF8M-F606	10	600	GV	WEDGE	CF8M	46.00	53.00
920339560000	WEDGE-10-C600-GV-WC6-F526	10	600	GV	WEDGE	WC6	46.00	53.00
920339730000	WEDGE-10-C600-GV-WC9-F536	10	600	GV	WEDGE	WC9	46.00	53.00
920338720000	WEDGE-10-C600-GV-WCB-F506	10	600	GV	WEDGE	WCB	46.00	53.00
920339720000	WEDGE-10-C600-GV-WCC-F516	10	600	GV	WEDGE	WCC	46.00	53.00
920338730000	YOKE-10-C600-GV-WCB-F506	10	600	GV	YOKE	WCB	29.00	30.00
920339500000	BODY-12-C600-GV-BW-WC6-F627	12	600	GV	BODY-BW	WC6	464.00	564.00
920339510000	BODY-12-C600-GV-BW-WC9-F637	12	600	GV	BODY-BW	WC9	464.00	564.00
920338820000	BODY-12-C600-GV-BW-WCB-F607	12	600	GV	BODY-BW	WCB	464.00	564.00
922012390000	BODY-12-C600-GV-BW-WCB-F807	12	600	GV	BODY-BW	WCB	464.00	564.00
920339490000	BODY-12-C600-GV-BW-WCC-F617	12	600	GV	BODY-BW	WCC	464.00	564.00
920339490005	BODY-12-C600-GV-BW-WCC-U695	12	600	GV	BODY-BW	WCC	540.00	564.00
922018230000	BODY-12-C600-GV-FL-CF8-F510	12	600	GV	BODY-FL	CF8	640.00	750.00
920339480000	BODY-12-C600-GV-FL-WC9-F537	12	600	GV	BODY-FL	WC9	640.00	750.00
920338740000	BODY-12-C600-GV-FL-WCB-F507	12	600	GV	BODY-FL	WCB	640.00	750.00
920339460000	BODY-12-C600-GV-FL-WCC-F517	12	600	GV	BODY-FL	WCC	640.00	750.00
922018250000	BONNET-12-C600-GV-CF8-F510	12	600	GV	BONNET	CF8	233.00	239.00
920339630000	BONNET-12-C600-GV-WC6-F727	12	600	GV	BONNET	WC6	233.00	239.00
920339870000	BONNET-12-C600-GV-WC9-F737	12	600	GV	BONNET	WC9	233.00	239.00
920338900000	BONNET-12-C600-GV-WCB-F707	12	600	GV	BONNET	WCB	233.00	239.00
922012440000	BONNET-12-C600-GV-WCB-F807	12	600	GV	BONNET	WCB	233.00	239.00
920339860000	BONNET-12-C600-GV-WCC-F717	12	600	GV	BONNET	WCC	233.00	239.00
920339860005	BONNET-12-C600-GV-WCC-U695	12	600	GV	BONNET	WCC	225.00	239.00
922018260000	SEAT RING-12-C600-GV-CF8-F510	12	600	GV	SEAT RING	CF8	8.70	13.65
922018240000	WEDGE-12-C600-GV-CF8-F510	12	600	GV	WEDGE	CF8	69.00	97.00
920339570000	WEDGE-12-C600-GV-WC6-F527	12	600	GV	WEDGE	WC6	69.00	97.00
920339750000	WEDGE-12-C600-GV-WC9-F537	12	600	GV	WEDGE	WC9	69.00	97.00
920338760000	WEDGE-12-C600-GV-WCB-F507	12	600	GV	WEDGE	WCB	69.00	97.00
920339740000	WEDGE-12-C600-GV-WCC-F517	12	600	GV	WEDGE	WCC	69.00	97.00

920338770000	YOKE-12-C600-GV-WCB-F507	12	600	GV	YOKE	WCB	34.00	41.00
922030930000	BODY-14-C600-RV-BW-WCC-NH50	14	600	RV	BODY-BW	WCC	711.00	755.00
922030950000	DISK - NH50	14	600	RV	DISK	WCC	194.40	207.00
922030940000	YOKE COVER-14-C600-RV-WCC-NH50	14	600	RV	YOKE COVER	WCC	340.00	380.00
922033790000	BODY-14-C600-SV-FL-WCC-P607	14	600	SV	BODY FL	WCC	890.00	960.00
922033800000	DISK - P607	14	600	SV	DISK	WCC	194.40	170.00
922030980000	BODY CASTING16-C600-RV-BW-MO-WCC	16	600	RV	BODY-BW	WCC	1198.00	1305.00
922030910000	DISC CASTING - NH52	16	600	RV	DISC	WCC	370.00	390.00
922031090000	YOKE COVER CASTING-16-C600-RV-WCC	16	600	RV	YOKE COVER	WCC	604.00	640.00
922014120000	BODY-32-C600-GV-BW-WCC-NA06	32	600	GV	BODY-BW	WCC	4250.00	-
922014160000	BONNET-32-C600-GV-A105-NA06	32	600	GV	BONNET	WCB	1005.00	-
922014150000	SEAT RING-32-C600-GV-A105-NA06	32	600	GV	SEAT RING	WCB	118.00	-
922014170000	WEDGE-32-C600-GV-WCB-NA06	32	600	GV	WEDGE	WCB	940.00	-
922014140000	YOKE-32-C600-GV-WCB-NA06	32	600	GV	YOKE	WCB	546.00	-
922030810000	BONNET-38-C600-GV-A105-F999	38	600	GV	BONNET	A105	1520.00	-
922035660000	BODY_CRHIV_700_C600SPL_WCC-3398	700	600	CRHIV	BODY	WCC	3015.00	3145.00
922018880000	BODY-CRHIV-700-C600-WCC	700	600	IV	BODY	WCC	3015.00	3145.00
922032460000	BODY_CRHIV_750_C600_WCC_3393	750	600	CRHIV	BODY	WCC	2840.00	3165.00
922032460005	BODY_750_C600-WCC CRHIV-U895	750	600	CRHIV	BODY	WCC	2840.00	3165.00

.(TO BE STAMPED IN ACCORDANCE WITH STAMP ACT AND THE EXPIRY DATE OF BG MUST BE AFTER 60 DAYS FROM THE DATE OF COMPLETION OF WARRANTY PERIOD)

PERFORMANCE BANK GUARANTEE

In accordance of M/s. Bharat Heavy Electricals Limited (A Government of India undertaking, a company incorporated under the Companies Act 1956 having its Registered Office at "BHEL House", SIRI Fort, New Delhi 110 049) through its Industrial Valves Plant located at Goindwal Sahib, Distt. Tarn Taran- 142423 [Punjab] (hereinafter called 'the Company') having entered into a contract withhereinafter called ' the said contractor ' which term includes 'suppliers' for the purpose of this Bond and under the terms and conditions of the contract No..... Dt Between BHEL, Goindwal and as per the contract, the contractor / supplier is to furnish a performance Bank guarantee for Rs. for the due performance of the equipment to be supplied under the above referred contract and for the fulfillment of all the terms and conditions of the contract, We(indicate the name of the bank) (herein after referred to as the bank) at the request of (Contractor(s)) do here by undertake to pay the company an amount not exceeding Rs.....against any loss or damage caused to or suffered or would be caused to or suffered by the company by reason of any breach by the said contractor (s) of any of the terms and conditions contained in the said agreement.

2. We(indicate the name of the bank with full address), do hereby undertake to pay the amounts due and payable under this guarantee without any demur, merely on a demand from the Company stating that the amount claimed is due by way of loss or damage caused to or would be caused to or suffered by the Company by reason of breach by the said Contractor(s) of any of the terms and conditions contained in the said Agreement or by the reason of the contractor(s) 'failure to perform' the said agreement. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs._____.

3. We undertake to pay unconditionally to the Company any money so demanded notwithstanding any dispute(s) raised by the Contractor in any suit, or proceedings pending before any Court or Tribunal or Arbitration or before any other authority relating thereto our liability under this present being absolute and unequivocal. The payment under this guarantee would not wait till the disputes have been decided by any Court or Tribunal or in the arbitration proceedings or by any other authority. The payment so made by us under this Bond shall be a valid discharge of liability for payment thereunder and the Contractor(s) shall have no claim against us for making such payment.

4. We.....(indicate the name of Bank), further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Agreement and that it shall continue to be enforceable till all the dues of the Company under or by virtue of the said Agreement have been fully paid and its claims satisfied or discharged or till_____Office / Department/ Division of the Company certifies that the terms and conditions of the said Agreement have been fully and properly carried out by the said Contractor(s) and accordingly discharges this guarantee.

5. (i) Unless a demand or claim under this guarantee is made on us in writing on or before the _____we shall be discharged from all the liability under this guarantee thereafter. But where such claim or demand has been preferred by the Company with the Bank before the expiry of the said date, the claim shall be enforceable notwithstanding the fact that the said enforcement is effected after the said date.

(ii) For the purpose of this clause, any letter making demand on the Bank by M/s. BHEL dispatched by Registered Post with Ack.Due or by Telegram or by any Electronic media addressed to the above mentioned address of the Bank shall be deemed to be the claim / demand in writing referred to above irrespective of the fact as to whether and when the said

letter reaches the Bank, as also any letter containing the said demand or claim is lodged with the bank personally.

6. We(indicate the name of Bank), further agree with the company that the Company shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said agreement or to extend time of performance by the said Contractor (s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the Company against the said Contractor(s) and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by any reason of any such variation or extension being granted to the said Contractor(s) or for any forbearance, act or omission on the part of the company or any indulgence by the company to the said Contractor(s) or by any such matter or thing whatsoever which under the law relating would, but for this provision, have effect of not so relieving us.
7. This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).
8. It shall not be necessary for the company to proceed against the contractor before proceeding against the guarantor-bank and the guarantee herein contained shall be enforceable against them notwithstanding any security, which the company may have obtained or obtain from the Contractor shall, at the time when proceedings are taken against the guarantor hereunder be outstanding or unrealized.
9. Any claim or dispute arising under the terms of this document shall only be enforced or settled in the Courts at Tarn Taran, Punjab, India.
10. The guarantor hereby declare that it has power to execute this guarantee and the executant has full powers to do so on its behalf under the proper authorities granted to him/them by the guarantor.
11. We(indicate the name of Bank) lastly undertake not to revoke this guarantee during its currency except with the previous consent of the company in writing.

In witness whereof we....., (indicate the name of Bank) have hereunto set out Bank
Seal the _____ day _____ month 200
BANK E-MAIL ID:
BANK PHONE NO.
BANK FAX NO:

LIST OF CONSORTIUM BANKS

Annexure: J

List of consortium bank for getting PBG released

Sl. No.	BANKS
1	STATE BANK OF INDIA
2	PUNJAB NATIONAL BANK
3	HDFC BANK
4	SYNDICATE BANK
5	CANARA BANK
6	INDIAN BANK
7	ST. BANK OF HYDERABAD
8	ICICI BANK
9	STANDARD CHARTERED BANK
10	UCO BANK
11	KOTAK MAHINDRA
12	ORIENTAL BANK OF COMMERCE
13	STATE BANK OF TRAVANCORE
14	CENTRAL BANK
15	IDBI BANK
16	FEDERAL BANK
17	HSBC LTD
18	DEUTSCHE BANK
19	CORPORATION BANK
20	CITI BANK
21	BANK OF BARODA
22	ABN AMRO BANK
23	UNITED BANK OF INDIA
24	VIJAYA BANK
25	UNION BANK OF INDIA
26	PUNJAB & SIND BANK
27	ANDHRA BANK
28	BANK OF INDIA
29	AXIS BANK

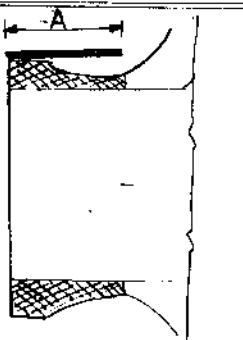
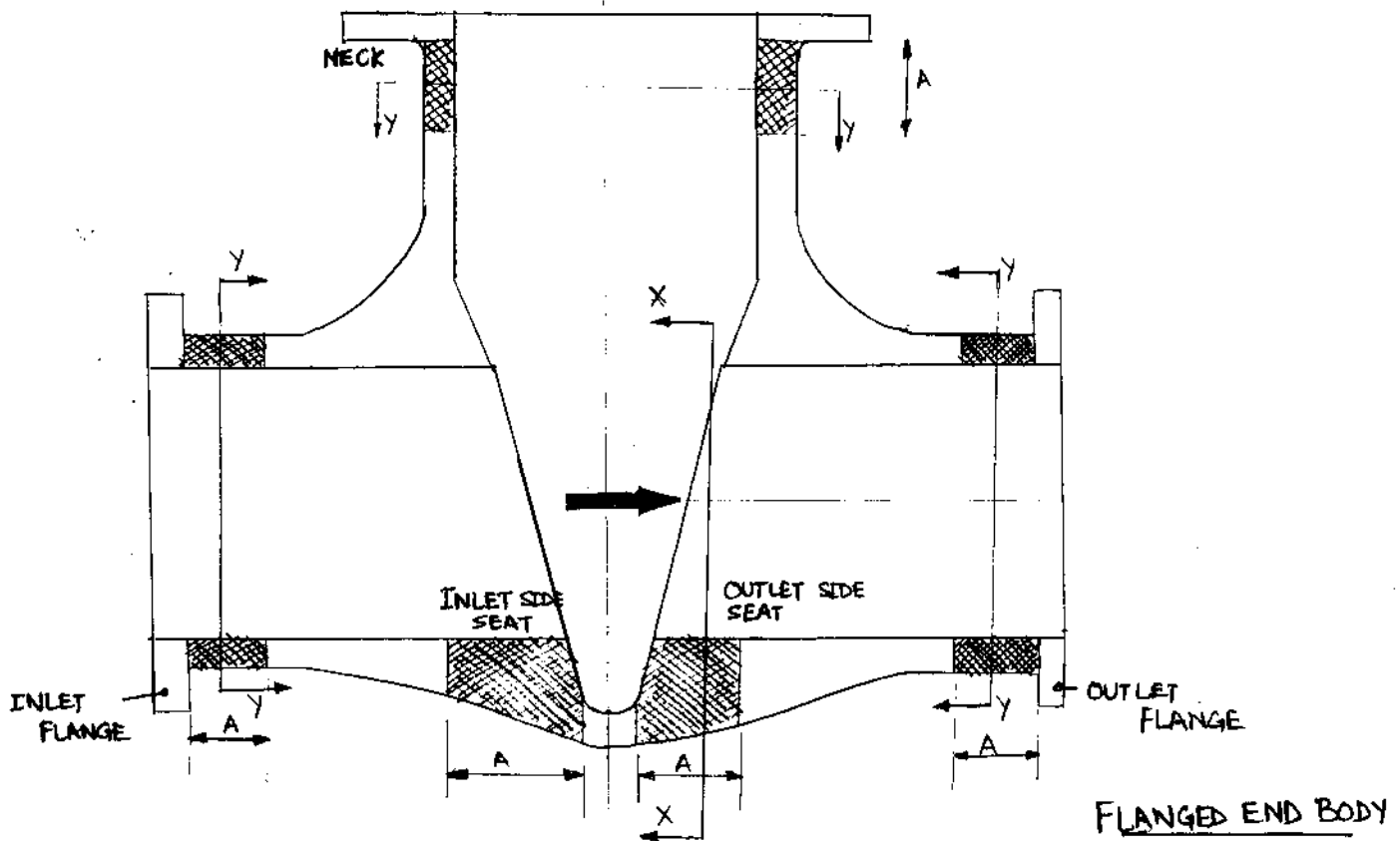


Bharat Heavy Electricals Limited

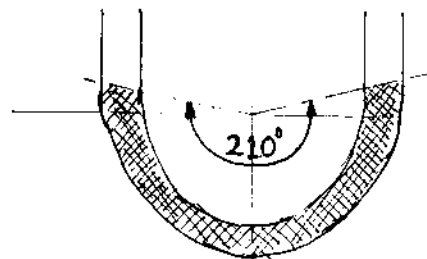
433, Ind. Valves Plant, GOINDWAL SAHIB (Distt. Amritsar)-143 423.

Annexure D

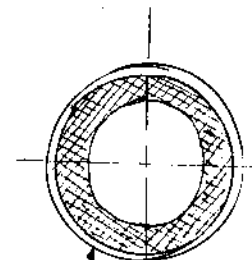
BHE: IVP: RT: PR Rev 03



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 in mm



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SHOOTING LOCATION DESIGNATION

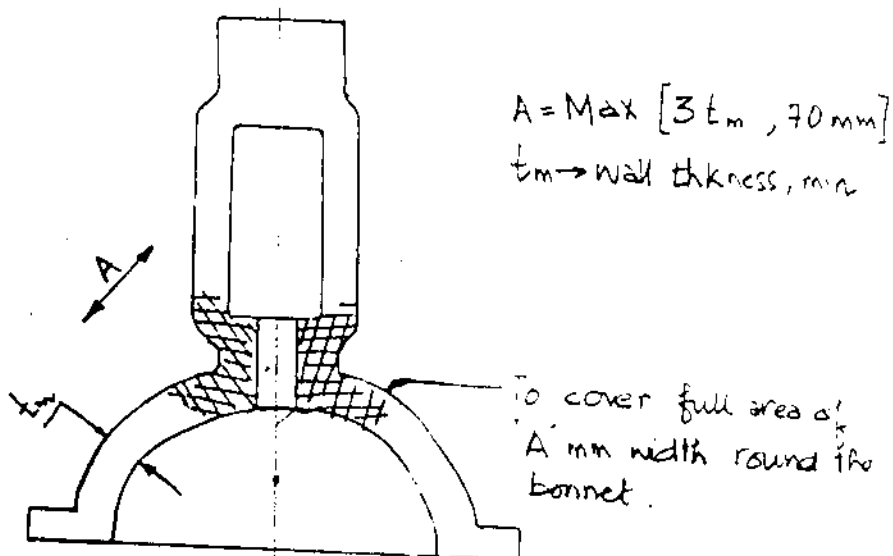
- AT NECK : N1, N2, N3, N4, ...
- AT INLET FLANGE PIPE : A1, A2, A3, A4, ...
- AT INLET SIDE SEAT : SA1, SA2, SA3, SA4, ...
- AT OUTLET SIDE SEAT : SB1, SB2, SB3, SB4, ...
- AT OUTLET FLANGE PIPE : B1, B2, B3, B4, ...
- * AT INLET FLANGE FACE : FA1, FA2, FA3, FA4, ...
- * AT OUTLET FLANGE FACE : FB1,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



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BHEL INP: 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.

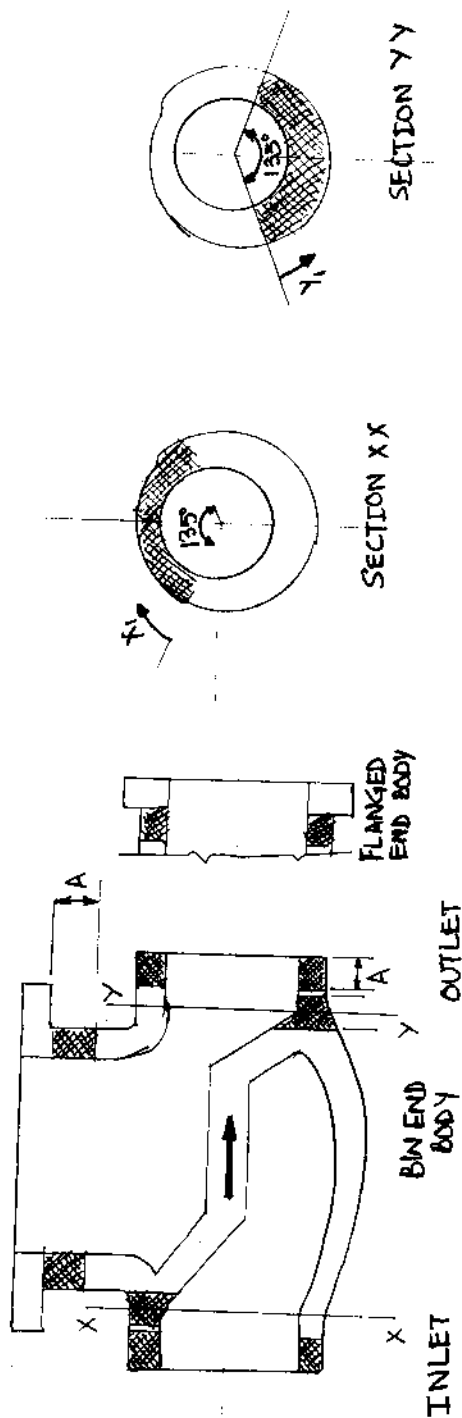
Page 15 of 20



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BHE:IVR: RT: PR: Rev 03



$A = \text{Max} \{ 3.t_m, 70\text{mm} \}$
 $t_m \rightarrow \text{min. wall thickness, mm}$

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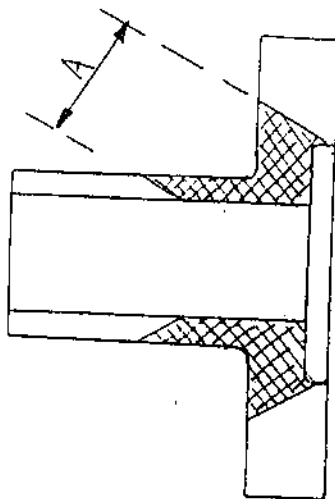
: BHE: E.V.P. RT: PR Rev 3

SHOOTING SKETCH OF CORNER

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

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

To cover full area round the corner



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

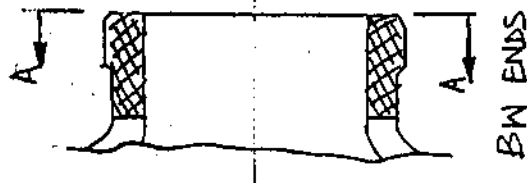
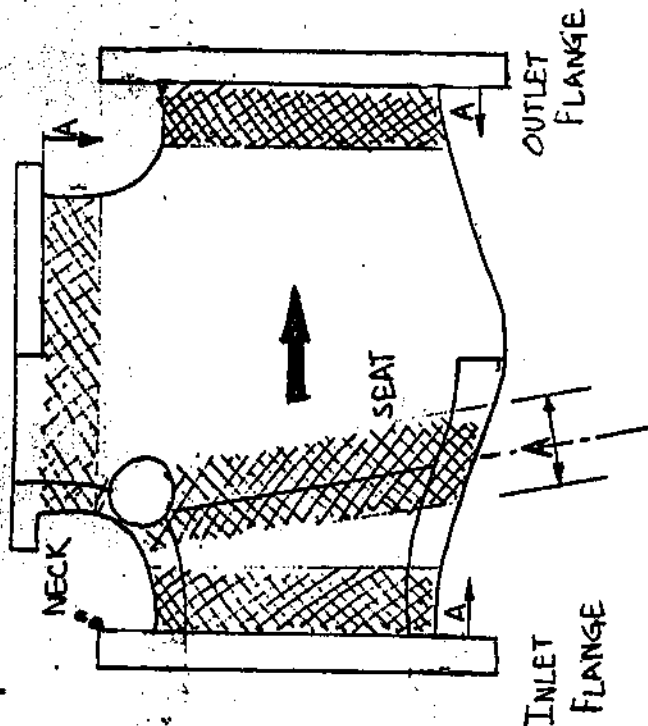


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BHE: IVP: RT: PR Rev 03

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, ...

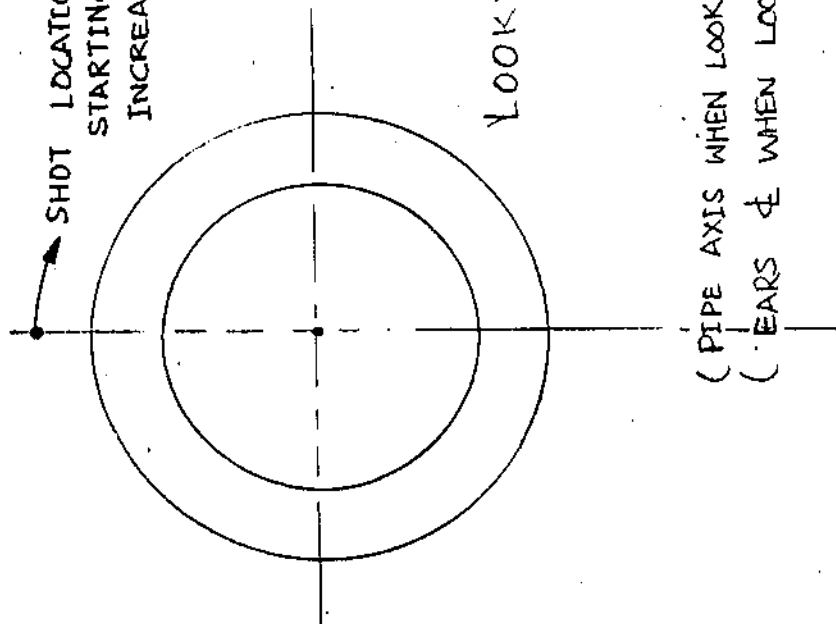


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DIRECTION AND SHOT LOCATION

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)

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



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"				
		Bend Angle	Dia of Pin		
		WCB	90°	2t	
		WCC	90°	2t	
		WC6	120°	3t	
		WC9	90°	3t	
		C12A	90°	2t	
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%		Class-2 of ASTM E446 / E186.	--	--
	Bonnet		10%#			--	--
	SRV Nozzle	All	100%	All area		--	--
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
Product: Steel Castings for Boilers & Valves		

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).



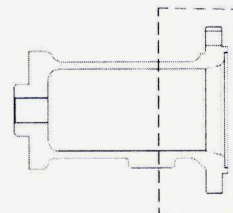
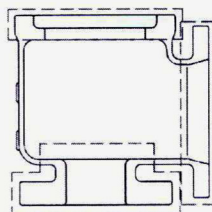
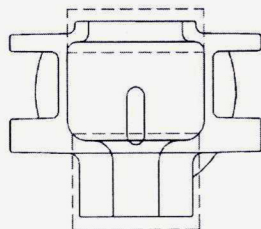
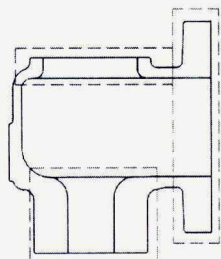
Product: Steel Castings for Boilers & Valves

Sketch of zones for RT

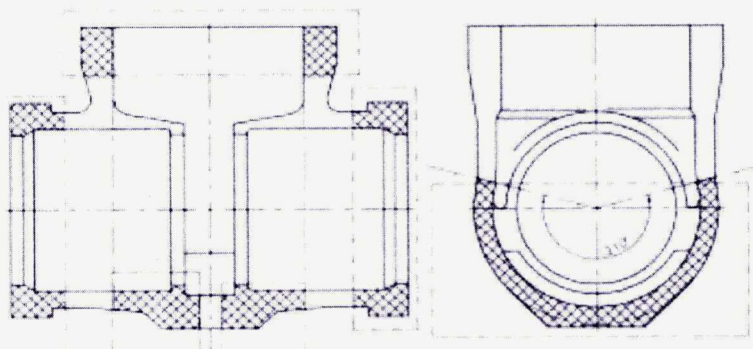
SV and SRV Base castings

Base

Bonnet

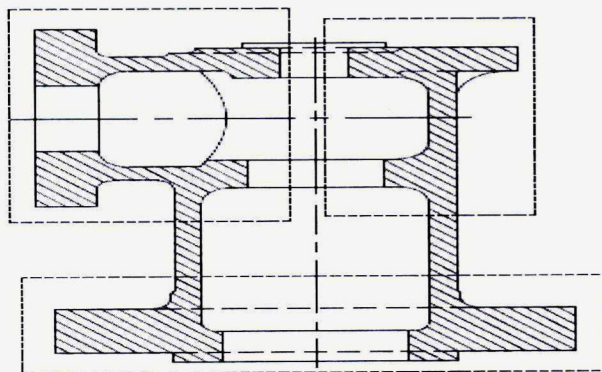


Reheater Isolating Device Body



 Radiography Area

Soot Blower Valve Body



PART CODES : 920243870000, 920131810000, 920243870100, 920131810100

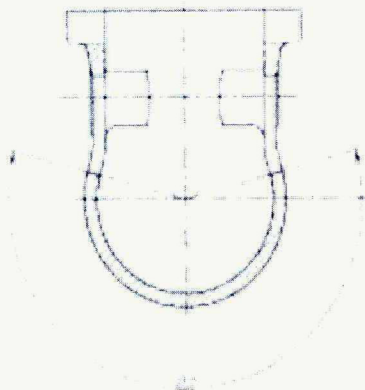
LRD IE, LRD IIE & WB IE - 2.5" 600#

 — RADIOGRAPHY AREA

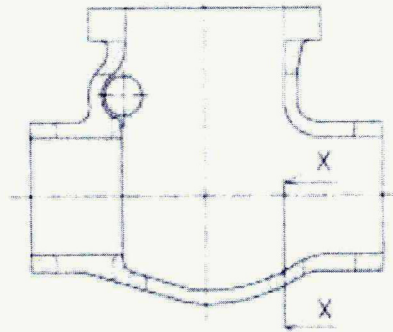
Quick Closing Non Return Valve Body



Product: Steel Castings for Boilers & Valves

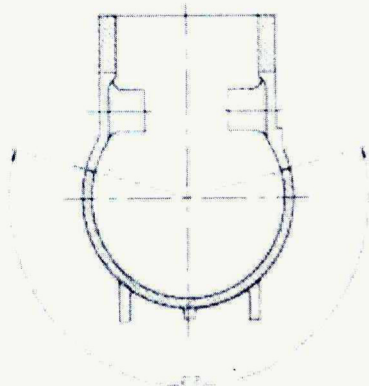


Section-XX

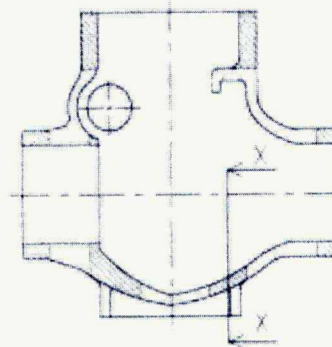


Radiography Area

Cold Reheat Non Return Valve Body

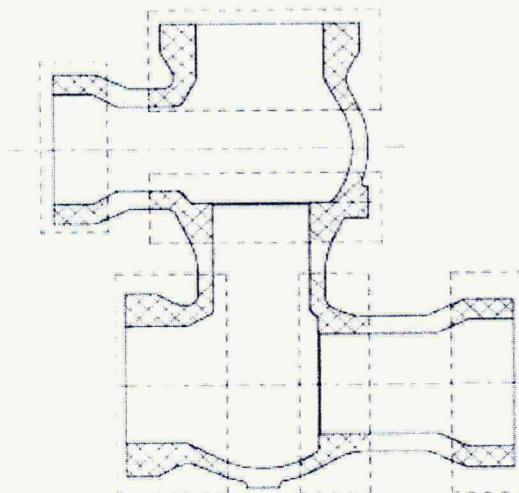


Section-XX



Radiography Area

LP Bypass Stop cum Control Valve Body



Radiography Area

 21/02/2018	 21/02/18	 21/02/18	 21/02/18	 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

	BHEL – Tiruchirappalli - 620014, India. Quality Assurance Department TECHNICAL DELIVERY CONDITIONS	DOC No: TDC:6:396 Rev: 01 Effective Date: 19/02/2019 Page: 1 of 7
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

Rev 01 – Dt: 19/02/2019 – *SA/ASTM A 995 Gr 4A (CD3MN) added in Cl 1 & 5 based on Engineering/Valves input*
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 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(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.

Sl. No	TEST	MATERIAL SPECIFICATION			
		SA/ASTM A216, 217	SA/ASTM A352	SA/ASTM A351	SA/ASTM A995
1	Tension Test	As per Material Specification			
2	Hardness Test	As per the Specification	225 HBW max.	Not applicable	<i>Not applicable</i>



Product: Steel Castings for Boilers & Valves for Maitree Project

CUST: 1725 & 1726

PROJECT: MAITREE (2x660 MW)

3	Bend Test Specimen 1" x 3/4 "		Angle of Bend	Dia of Pin	Not applicable	S3 of SA703	Not applicable
		WCB	90°	2t			
		WCC	90°	2t			
		WC6	120°	3t			
		WC9	90°	3t			
		C12A	90°	2t			
4	Charpy- U Impact for all QCNRV, CRHNRV bodies.	At Room temperature. Acceptance: Avg /Single=36J/32J min.			Not applicable	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	Not applicable

Creep testing and reporting 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	--	All accessible surfaces including belly.
	Body, Bonnet, Cover	600 Class & above	100%			--	
	Body, Bonnet, Cover	1500 Class & above	100%			100%	
	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 Bonnet	All	100% 10%#			--	--
	SRV Nozzle	All	100%			--	--
QC NRV, CRH NRV	Body	150 & 300 Class	100%	Butt Weld Ends	As per Table: 3	100%	All accessible surfaces



Product: Steel Castings for Boilers & Valves for Maitree Project

CUST: 1725 & 1726

PROJECT: MAITREE (2x660 MW)

		600 Class & above		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%	including belly.
	Body (Special)	All	100%				
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.

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.

	BHEL – Tiruchirappalli - 620014, India. Quality Assurance Department TECHNICAL DELIVERY CONDITIONS	DOC No: TDC:6:396 Rev: 01 Effective Date: 19/02/2019 Page: 4 of 7
Product: Steel Castings for Boilers & Valves for Maitree Project		PROJECT: MAITREE (2x660 MW)
CUST: 1725 & 1726		

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 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.

	BHEL – Tiruchirappalli - 620014, India. Quality Assurance Department TECHNICAL DELIVERY CONDITIONS	DOC No: TDC:6:396 Rev: 01 Effective Date: 19/02/2019 Page: 5 of 7
Product: Steel Castings for Boilers & Valves for Maitree Project		
CUST: 1725 & 1726	PROJECT: MAITREE (2x660 MW)	

- 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.
 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:

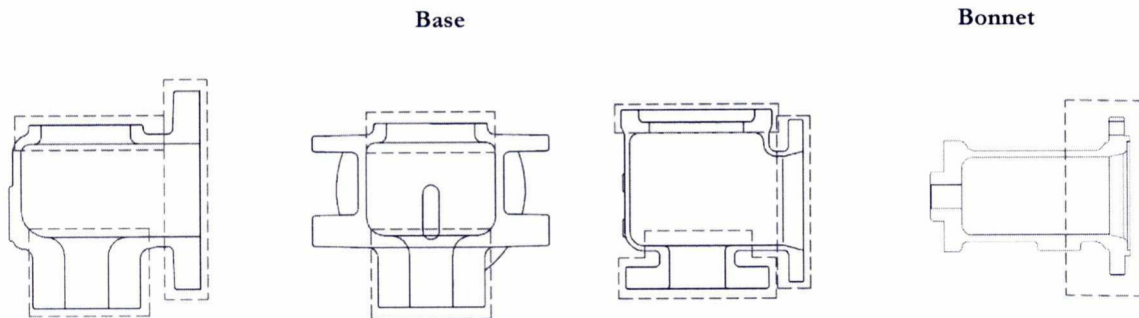
BHEL reserves the right to carry out audit checks for chemistry, HT condition, mechanical test and NDT on representative test bars or job. Items found defective during check or subsequent processing at BHEL will be rejected.

15. END USE:

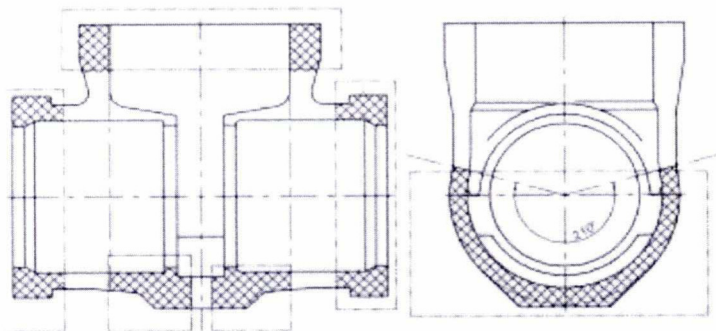
For use in valves and other components like flanges, fittings etc. for high temperature & high pressure applications meeting ASME Section I and ASME B 16.34 for Maitree Project (2x660 MW).

Sketch of zones for RT

SV and SRV Base castings



Reheater Isolating Device Body



 Radiography Area

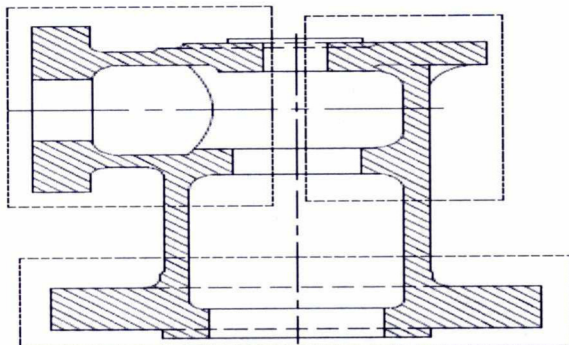


Product: Steel Castings for Boilers & Valves for Maitree Project

CUST: 1725 & 1726

PROJECT: MAITREE (2x660 MW)

Soot Blower Valve Body

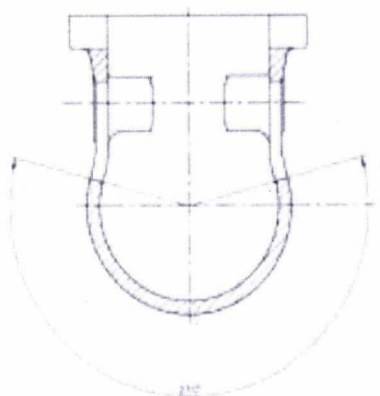


PART CODES : 920243870000, 920131810000, 920243870100, 920131810100

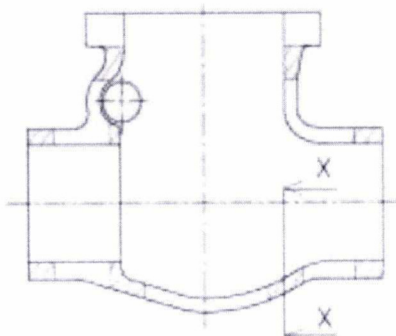
LRD IE, LRD IIE & WB IE - 2.5" 600#

 — RADIOGRAPHY AREA

Quick Closing Non Return Valve Body

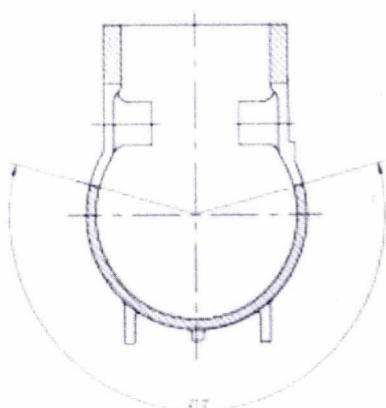


Section-XX

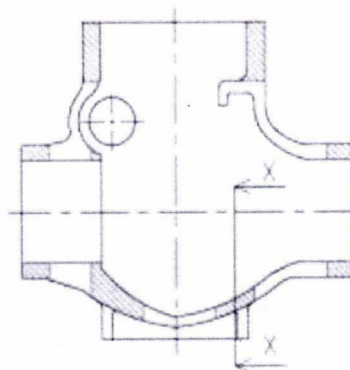


 Radiography Area

Cold Reheat Non Return Valve Body



Section-XX



 Radiography Area



BHEL – Tiruchirappalli - 620014, India.
Quality Assurance Department
TECHNICAL DELIVERY CONDITIONS

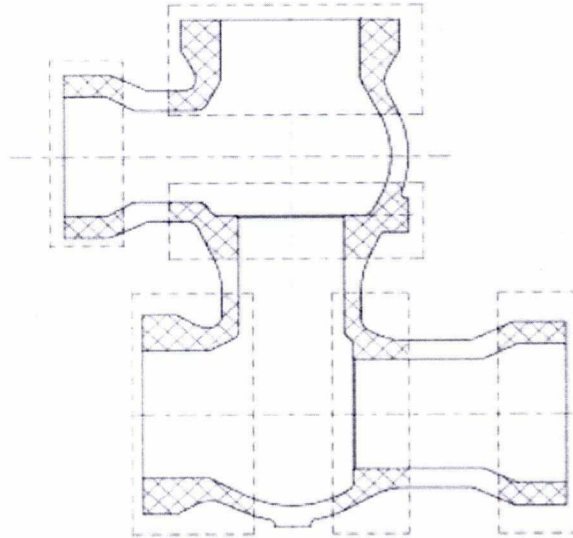
DOC No: TDC:6:396 Rev: 01
Effective Date: 19/02/2019
Page: 7 of 7

Product: Steel Castings for Boilers & Valves for Maitree Project

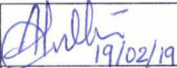
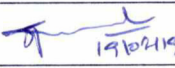
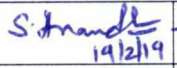
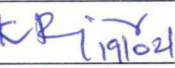
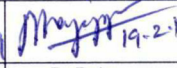
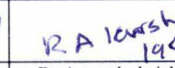
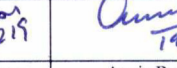
CUST: 1725 & 1726

PROJECT: MAITREE (2x660 MW)

LP Bypass Stop cum Control Valve Body



 Radiography Area

 19/02/19	 19/02/19	 19/02/19	 19/02/19	 19-2-19	 19/02/19	 19/02/19
Abdur Rahman	G. Panneer Selvam	S. Anand Kumar	K. Rajasekaran	R. Rajappan	R. Ananthakrishnan	Amit Roy
Sr. Engr/ QA	DGM/QA	SDGM/PE/FB	DGM/Valves/Engg	SDGM/MM	AGM/Valves/Purchase	AGM/QA& BE
Prepared By	Reviewed By					Approved By

	BHEL – Tiruchirappalli - 620014, India. Quality Assurance Department TECHNICAL DELIVERY CONDITIONS	DOC No: TDC:6:400 Rev: 01 Effective Date: 21/07/2018 Page: 1 of 4
Product: Steel Castings for Valves - Refinery Projects as per EIL Specification 6-44-0052 Rev. 7		

Revisions record:

Rev. 00: Dt-16/05/2018 - Fresh Issue

Rev. 01: Dt-21/07/2018- TDC Title revised to include refinery projects as per EIL Specification

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 / A216 WCB,WCC
Alloy Steel (AS)	:	SA / ASTM A217 WC6, WC9
Stainless Steel (SS)	:	SA / ASTM A351 CF8, CF8M
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:

- 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; S, P Mn- as per IBR
Product Analysis on test bar for each melt including residual elements shall be carried out.
- 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)
- Tolerance for chemistry shall be as per the above applicable material specifications/standards specified in CI 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 – Shall be in Normalized Condition
AS – Castings: Normalized and Tempered.
Normalizing Temperature: SA/ASTM A217 WC6, WC9: 920-950°C
Tempering Temperature: SA/ASTM A217 WC6: 680°C min.; WC9: 720°C min.
SS - All Stainless Steel Castings shall be solution heat treated.
All other materials: Heat treatment shall be 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.

		TABLE 1			
No	TEST	MATERIAL SPECIFICATIONS			
		SA/ASTM A216, 217		SA/ASTM A351	
1	Tension Test	As per the Material Specification			
2	Hardness Test	As per the Material Specification			
3	Bend Test Specimen 1" x ¾ "		Bend Angle	Dia of Pin	S3 of SA703
		WCB	90 ⁰	2t	
		WC6	120 ⁰	3t	
		WC9	90 ⁰	3t	

	BHEL – Tiruchirappalli - 620014, India. Quality Assurance Department TECHNICAL DELIVERY CONDITIONS	DOC No: TDC:6:400 Rev: 01 Effective Date: 21/07/2018 Page: 2 of 4
Product: Steel Castings for Valves - Refinery Projects as per EIL Specification 6-44-0052 Rev. 7		

b) Inter Granular Corrosion (IGC) test shall be conducted for all austenitic stainless steels as follows:

ASTM A262 Practice 'B' with acceptance criteria of '60 mils/year(max)'.

For the IGC test as described above, two sets of samples to be drawn from each solution annealing lot. One set shall correspond to the highest Carbon content and the other to the highest pressure rating.

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
- Radiography shall be done by X Ray /Gamma Ray to get the required sensitivity.

Valve castings shall undergo Radiographic Examination as specified below:

Table: 2

Product	Components	Characteristics	Type of NDE Check		
			RT	RT Area	RT Acc. Std
Conventional Valves and Other valves	ALL	<u>150 Class</u> ≤24"	#	ASME B 16.34	ASME B 16.34
		≥26"	100%		
	ALL	<u>300 Class</u> ≤16"	#		
		≥18"	100%		
	ALL	<u>≥600 Class</u> All sizes	100%		

#Radiographic testing requirements shall be as per Engineering Drawing or Valve material specification (VMS) issued by Customer/Consultant.

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.

7.2 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 ≥ 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

	BHEL – Tiruchirappalli - 620014, India. Quality Assurance Department TECHNICAL DELIVERY CONDITIONS	DOC No: TDC:6:400 Rev: 01 Effective Date: 21/07/2018 Page: 3 of 4
Product: Steel Castings for Valves - Refinery Projects as per EIL Specification 6-44-0052 Rev. 7		

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) $\leq 100\text{mm}$. & 1 casting with NB $> 100\text{ mm}$ 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. 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.

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.

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. MARKING AND PACKING:

1. Vendor's name (Foundry Code) 2. Nominal size 3. Valve body rating 4. Material designation 5. Direction of flow (if any) etc. shall be integral on the body. Castings shall be suitably packed to avoid damage during transit. Additionally, Heat/melt number to be marked on each casting, on a raised pad using low stress stamps.

12. INSPECTION AND CERTIFICATION:

12.1 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. Results of IGC test as per Clause 5 (b).
7. Repair details including HT, if any, Cleaning & Surface treatment details.
8. Any other information like clearance of sample casting.
9. Dimensional Inspection Report, where applicable.
10. **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).

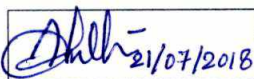
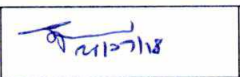
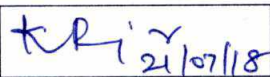
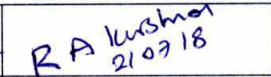
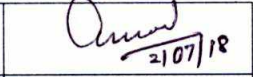
	BHEL – Tiruchirappalli - 620014, India. Quality Assurance Department TECHNICAL DELIVERY CONDITIONS	DOC No: TDC:6:400 Rev: 01 Effective Date: 21/07/2018 Page: 4 of 4
Product: Steel Castings for Valves - Refinery Projects as per EIL Specification 6-44-0052 Rev. 7		

13. 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.

14. END USE:

These castings are intended for use in *refinery projects as per EIL specification 6-44-0052 Rev. 7.*

				
Abdur Rahman Sultan	G. Panneer Selvam	K. Rajasekaran	R. Ananthakrishnan	Amit Roy
Sr.Engineer /QA	DGM/QA	DGM/Valves/Engg	AGM/Valves/Purchase	AGM/QA&BE
Prepared By	Reviewed By			Approved By



70-006

Bharat Heavy Electricals Limited

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PRODUCT ENGINEERING/VALVES

VL:STDC:023

REV.00

PAGE 1 OF 6

TDC FOR UNTOLERANCED DIMENSIONS IN CASTING & FORGING DRAWINGSScope :

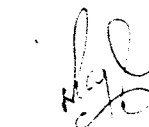
This technical delivery condition specifies the tolerance for the untoleranced dimension for the castings and forgings wherever tolerances are not specified in the applicable drawing applicable material TDC.

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

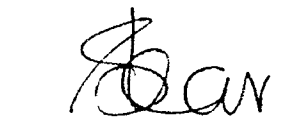

APPROVED
(S. KUMAR)
SM/PE/VSB
28/2/94

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																					
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) NOTE: CENTRE TO SURFACE; STEP IN ONE DIE; + 1/3, - 1/3 OF TOTAL TOLERANCE												
		ASYMMETRIC	STRAIGHT OR SYMMETRIC		M1	M2	S1	S2	S3	S4	INTERNAL DIMENSION: REVERSE + AND - SIGNS.										
											TO (INCL) MM										
												0	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} _{-0.7}	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} _{-0.7}	2 ^{+1.3} _{-0.7}	2.2 ^{+1.5} _{-0.8}							
0.6	0.7			10-18					1.4 ^{+0.9} _{-0.5}	1.6 ^{+1.0} _{-0.6}	1.8 ^{+1.2} _{-0.7}	2 ^{+1.3} _{-0.7}	2.2 ^{+1.5} _{-0.8}	2.5 ^{+1.7} _{-0.9}	2.8 ^{+1.9} _{-1.1}						
0.7	0.8			18-32					1.6 ^{+1.0} _{-0.6}	1.8 ^{+1.2} _{-0.7}	2 ^{+1.3} _{-0.7}	2.2 ^{+1.5} _{-0.8}	2.5 ^{+1.7} _{-0.9}	2.8 ^{+1.9} _{-1.1}	3.2 ^{+2.1} _{-1.1}	3.6 ^{+2.4} _{-1.2}					
0.8	1			32-56					1.8 ^{+1.2} _{-0.7}	2 ^{+1.3} _{-0.7}	2.2 ^{+1.5} _{-0.8}	2.5 ^{+1.7} _{-0.9}	2.8 ^{+1.9} _{-1.1}	3.2 ^{+2.1} _{-1.1}	3.6 ^{+2.4} _{-1.2}	4 ^{+2.7} _{-1.3}	4.5 ^{+3.1} _{-1.5}	5 ^{+3.5} _{-1.7}			
1	1.2			56-10					2 ^{+1.3} _{-0.7}	2.2 ^{+1.5} _{-0.8}	2.5 ^{+1.7} _{-0.9}	2.8 ^{+1.9} _{-1.1}	3.2 ^{+2.1} _{-1.1}	3.6 ^{+2.4} _{-1.2}	4 ^{+2.7} _{-1.3}	4.5 ^{+3.1} _{-1.5}	5 ^{+3.5} _{-1.7}	5.6 ^{+3.9} _{-1.9}			
1.2	1.4			10-20					2.2 ^{+1.5} _{-0.8}	2.5 ^{+1.7} _{-0.9}	2.8 ^{+1.9} _{-1.1}	3.2 ^{+2.1} _{-1.1}	3.6 ^{+2.4} _{-1.2}	4 ^{+2.7} _{-1.3}	4.5 ^{+3.1} _{-1.5}	5 ^{+3.5} _{-1.7}	5.6 ^{+3.9} _{-1.9}	6.3 ^{+4.3} _{-2.1}			
1.4	1.7			20-50					2.5 ^{+1.7} _{-0.9}	2.8 ^{+1.9} _{-1.1}	3.2 ^{+2.1} _{-1.1}	3.6 ^{+2.4} _{-1.2}	4 ^{+2.7} _{-1.3}	4.5 ^{+3.1} _{-1.5}	5 ^{+3.5} _{-1.7}	5.6 ^{+3.9} _{-1.9}	6.3 ^{+4.3} _{-2.1}	7 ^{+4.7} _{-2.3}			
1.7	2			50-120					2.8 ^{+1.9} _{-1.1}	3.2 ^{+2.1} _{-1.1}	3.6 ^{+2.4} _{-1.2}	4 ^{+2.7} _{-1.3}	4.5 ^{+3.1} _{-1.5}	5 ^{+3.5} _{-1.7}	5.6 ^{+3.9} _{-1.9}	6.3 ^{+4.3} _{-2.1}	7 ^{+4.7} _{-2.3}	8 ^{+5.1} _{-2.5}			
2	2.4			120-250					3.2 ^{+2.1} _{-1.1}	3.6 ^{+2.4} _{-1.2}	4 ^{+2.7} _{-1.3}	4.5 ^{+3.1} _{-1.5}	5 ^{+3.5} _{-1.7}	5.6 ^{+3.9} _{-1.9}	6.3 ^{+4.3} _{-2.1}	7 ^{+4.7} _{-2.3}	8 ^{+5.1} _{-2.5}	9 ^{+5.5} _{-2.7}			
2.4	2.8								3.6 ^{+2.4} _{-1.2}	4 ^{+2.7} _{-1.3}	4.5 ^{+3.1} _{-1.5}	5 ^{+3.5} _{-1.7}	5.6 ^{+3.9} _{-1.9}	6.3 ^{+4.3} _{-2.1}	7 ^{+4.7} _{-2.3}	8 ^{+5.1} _{-2.5}	9 ^{+5.5} _{-2.7}	10 ^{+5.9} _{-2.9}			
QUALITY (NORMAL)									4 ^{+2.7} _{-1.3}	4.5 ^{+3.1} _{-1.5}	5 ^{+3.5} _{-1.7}	5.6 ^{+3.9} _{-1.9}	6.3 ^{+4.3} _{-2.1}	7 ^{+4.7} _{-2.3}	8 ^{+5.1} _{-2.5}	9 ^{+5.5} _{-2.7}	10 ^{+5.9} _{-2.9}	11 ^{+6.3} _{-3.1}			
									4.5 ^{+3.1} _{-1.5}	5 ^{+3.5} _{-1.7}	5.6 ^{+3.9} _{-1.9}	6.3 ^{+4.3} _{-2.1}	7 ^{+4.7} _{-2.3}	8 ^{+5.1} _{-2.5}	9 ^{+5.5} _{-2.7}	10 ^{+5.9} _{-2.9}	11 ^{+6.3} _{-3.1}	12 ^{+6.7} _{-3.3}			
									5 ^{+3.5} _{-1.7}	5.6 ^{+3.9} _{-1.9}	6.3 ^{+4.3} _{-2.1}	7 ^{+4.7} _{-2.3}	8 ^{+5.1} _{-2.5}	9 ^{+5.5} _{-2.7}	10 ^{+5.9} _{-2.9}	11 ^{+6.3} _{-3.1}	12 ^{+6.7} _{-3.3}	14 ^{+7.5} _{-3.7}			

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

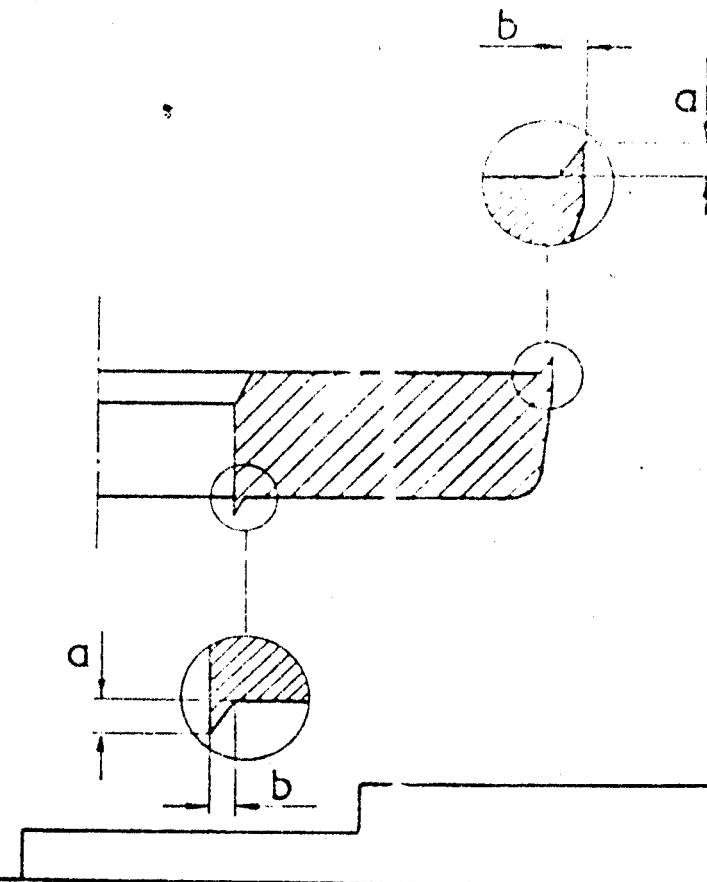
DROP, PRESS & UPSET FORGINGS - TOLERANCES FOR: THICKNESS; EJECTOR MARKS *																	
EJECTOR MARKS	WEIGHT (kg) ABOVE - TO (INCL)	DIFFICULTY OF MATERIAL M1 M2	COMPLEXITY				* (DROP AND PRESS FORGINGS ONLY)										
			S1 ≤ 0.63	S2 0.63 ≤ 0.63	S3 0.63 ≤ 0.32	S4 ≤ 0.15	0 ABOVE TO (INCL)	M M									
								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	±0.6	2	±0.7
1.2	0.4-1.2			1.1	±0.4	1.2	±0.4	1.4	±0.5	1.6	±0.5	1.8	±0.6	2	±0.7	2.2	±0.7
1.6	1.2-2.5			1.2	±0.4	1.4	±0.5	1.6	±0.5	1.8	±0.6	2	±0.7	2.2	±0.7	2.5	±0.8
2	2.5-5			1.4	±0.5	1.6	±0.5	1.8	±0.6	2	±0.7	2.2	±0.7	2.5	±0.8	2.8	±0.9
2.4	5-8			1.6	±0.5	1.8	±0.6	2	±0.7	2.2	±0.7	2.5	±0.8	2.8	±0.9	3.2	±1.1
3.2	8-12			1.8	±0.6	2	±0.7	2.2	±0.7	2.5	±0.8	2.8	±0.9	3.2	±1.1	3.6	±1.2
4	12-20			2	±0.7	2.2	±0.7	2.5	±0.8	2.8	±0.9	3.2	±1.1	3.6	±1.2	4	±1.3
5	20-36			2.2	±0.8	2.5	±0.8	2.8	±0.9	3.2	±1.1	3.6	±1.2	4	±1.3	4.5	±1.5
6.4	36-63			2.5	±0.8	2.8	±0.9	3.2	±1.1	3.6	±1.2	4	±1.3	4.5	±1.5	5	±1.7
8	63-110			2.8	±0.9	3.2	±1.1	3.6	±1.2	4	±1.3	4.5	±1.5	5	±1.7	5.6	±1.9
10	110-200			3.2	±1.1	3.6	±1.2	4	±1.3	4.5	±1.5	5	±1.7	5.6	±1.9	6.3	±2.1
12.6	200-250			3.6	±1.2	4	±1.3	4.5	±1.5	5	±1.7	5.6	±1.9	6.3	±2.1	7	±2.3
QUALITY (NORMAL)			4	±1.3	4.5	±1.5	5	±1.7	5.6	±1.9	6.3	±2.1	7	±2.3	8	±2.5	
			4.5	±1.5	5	±1.7	5.6	±1.9	6.3	±2.1	7	±2.3	8	±2.5	9	±2.7	
			5	±1.7	5.6	±1.9	6.3	±2.1	7	±2.3	8	±2.5	9	±2.7	10	±2.9	
			5.6	±1.9	6.3	±2.1	7	±2.3	8	±2.5	9	±2.7	10	±2.9	11	±3.1	
			6.3	±2.1	7	±2.3	8	±2.5	9	±2.7	10	±2.9	11	±3.1	12	±3.3	

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		MM														
ABOVE TO (INCL)		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		MM														
ABOVE TO (INCL)		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 RADII AND BURRS FOR DROP, PRESS AND UPSET FORGINGS

DROP, 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



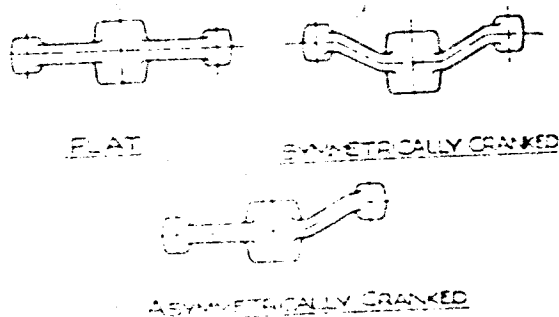


Fig. 1. Die lines

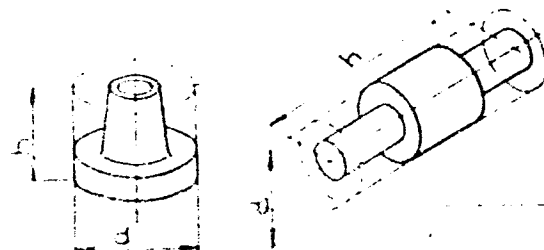


Fig. 2. Enveloping shapes of circular forgings

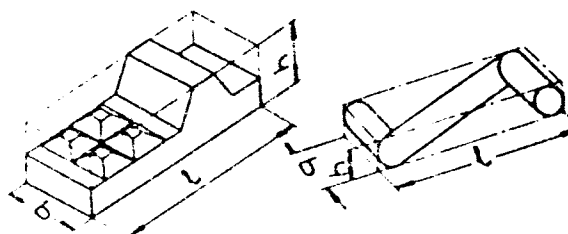


Fig. 3. Enveloping shapes of non-circular forgings

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
