


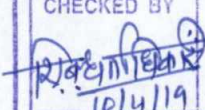
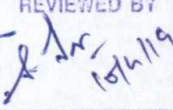
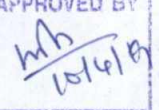
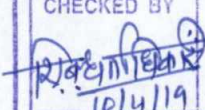
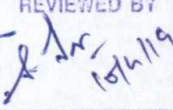
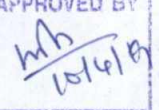
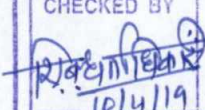
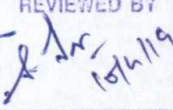
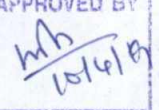
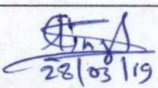
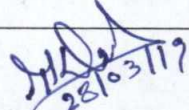
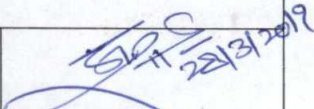

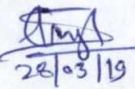
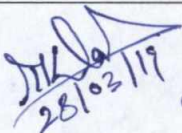
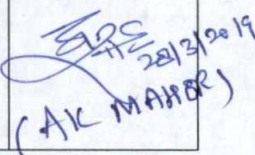



<b>MAIN SUPPLIER'S NAME:</b> <b>BHARAT HEAVY ELECTRICALS LIMITED, BHOPAL</b> (A GOVERNMENT OF INDIA UNDERTAKING)									
NAME OF SUB-VENDOR: N/A									
NPCIL PO NO.: CMM/FTP/10-32-1-1152/e-PO/30447, DTD: 24.01.19									
QA REF. NO.: MAIN VENDOR: <del>QAX-TH-1479</del> 2190191 SUB VENDOR: N/A									
<b>CUSTOMER:</b> <b>NUCLEAR POWER CORPORATION OF INDIA LIMITED</b> (A GOVERNMENT OF INDIA ENTERPRISE)									
<b>PROJECT:</b> <b>2x700MW GORAKHPUR HARYANA ANU VIDYUT PARIYOJANA</b> <b>(UNIT 1&amp;2)</b>									
<b>EQUIPMENT: MODERATOR HEAT EXCHANGER</b>									
<b>DOCUMENT NO.: BHEL / NPCIL / 30447 / CS DISHED END/ CDE-19-3418</b>									
<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR CS DISHED END</b>									
<div style="border: 1px solid black; padding: 5px;"> <p>  <b>न्यूक्लियर पावर कॉर्पोरेशन ऑफ इंडिया लिमिटेड</b>  <b>NUCLEAR POWER CORPORATION OF INDIA LTD.</b> </p> <p> <input checked="" type="checkbox"/> अनुमोदित / APPROVED <i>with minor comments.</i>  <input type="checkbox"/> डिप्पणी के अनुसार अनुमोदित / APPROVED AS NOTED  <input type="checkbox"/> संविचन का आगे बढ़ाए / रोकें ।  <b>PROCEED WITH / HOLD FABRICATION</b>  <input type="checkbox"/> अंतिम ट्रांसपैरेंसी एवं प्रिंटिंग भेजें ।  <b>SEND FINAL TRANSPARENCIES &amp; PRINTS</b>  <input type="checkbox"/> संशोधन करें एवं अनुमोदन के लिए पुनः प्रस्तुत करें।  <b>REVISE AND RESUBMIT FOR APPROVAL</b> </p> <table border="1" style="width: 100%;"> <tr> <td style="width: 33%;"> <b>जाँचकर्ता</b>  <b>CHECKED BY</b>            10/4/19       </td> <td style="width: 33%;"> <b>समीक्षाकर्ता</b>  <b>REVIEWED BY</b>            10/4/19       </td> <td style="width: 33%;"> <b>अनुमोदन कर्ता</b>  <b>APPROVED BY</b>            10/4/19       </td> </tr> </table> <p>         किए जानेवाले कार्य का अनुमोदन आपूर्तिकर्ता को विनिर्देशनों के अनुसार आपूर्ति के उल्लंघन से मुक्त नहीं करता ।          The Approval of the work to be done does not relieve the supplier of responsibility of supply according to specifications.       </p> </div>							<b>जाँचकर्ता</b> <b>CHECKED BY</b>  10/4/19	<b>समीक्षाकर्ता</b> <b>REVIEWED BY</b>  10/4/19	<b>अनुमोदन कर्ता</b> <b>APPROVED BY</b>  10/4/19
<b>जाँचकर्ता</b> <b>CHECKED BY</b>  10/4/19	<b>समीक्षाकर्ता</b> <b>REVIEWED BY</b>  10/4/19	<b>अनुमोदन कर्ता</b> <b>APPROVED BY</b>  10/4/19							
01	28.03.2019	2+3 = 5	 28/03/19	 28/03/19	 28/03/19				
00	08.03.2019	2+3 = 5	-Sd- (DK AUDH)	-Sd- (M WAHAB R)	-Sd- (ASNANI L)				
REV NO.	DATE	PAGES	PREPARED BY	CHECKED BY	APPROVED BY				

	<b>CONDENSER &amp; HEAT EXCHANGER ENGG. DIVISION</b> <b>BHEL BHOPAL</b>	Document No.
		BHEL / NPCIL / 30447 / CS DISHED END / CDE-19-3418
<b>TECHNICAL SPECIFICATION FOR CS DISHED END</b>		

**REVISION CONTROL SHEET**

BHEL					
REV. No Date	PAGES	Description of Revision	Prepared By	Checked By	Approved By
00, 08.03.2019	2+3=5	Original submission.	-Sd- (DK AUDH)	-Sd- (M WAHAB R)	-Sd- (ASNANI L)
01, 28.03.19	2+3=5	Incorporation of NPCIL comments dtd: 18.03.19.	 28/03/19	 28/03/19	 28/3/2019 (AK MAHAR)



	<b>Condenser &amp; Heat Exchanger Engg. Division</b> <b>BHEL BHOPAL</b>	Document No.	
		BHEL / NPCIL / 30447 / CS DISHED ENDS / CDE-19-3418	
	<b>Technical Specification for</b> <b>CS Dished End</b>	Page <b>3</b> of <b>5</b>	Rev. 01

## 1.0 Description

Dished end shall be formed by hot/cold forming process from the single piece plate blank, duly Heat-treated, edge prepared as per the requirements indicated in the respective dished end drawings attached with enquiry/purchase order.

## 2.0 Shape

Torispherical as per drg requirement.

## 3.0 Size

As mentioned in item drawing 2-16503-40494.

## 4.0 Code of Construction

As per **ASME Sec. III ND-4200: latest**

## 5.0 Material of Construction

**Plates:** Carbon steel plates to **SA-516 Gr70** (as specified on the dished end drawing) with **co-related mill test certificates shall be supplied by BHEL.**

## 6.0 Heat Treatment


Dished ends shall be Normalized (as specified in the drawing) after forming along with the test coupon as per approved heat treatment procedure.

## 7.0 Tolerance

As indicated in the drawing.

## 8.0 Forming Process Qualification

Procedure qualification test shall be conducted on test coupons same as portion of component. Testing shall be carried out as per approved material sampling and testing plan. These coupons shall be subjected to same forming process (maximum forming or bending, strain and heat treatment).

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The applicable tests as per Clause no. ND-4200 of Section-III ND, shall be conducted to determine the tensile and impact properties as per material specification. The procedure shall be submitted for NPCIL approval prior to forming / bend qualification.

#### 9.0 **Edge Preparation**

As per details given in item drawing.

#### 10.0 **Minimum Thickness after Forming**

Minimum thickness resulting from the forming (after forming) process shall be in compliance with the requirements indicated in the item drawing.

#### 11.0 **Non-Destructive Examination & Testings**

11.1 **Liquid penetration Examination:** Entire outside surface of formed Dished Ends (both crown & knuckle portion) & the edge prepared ends shall be checked by dye penetration examination as per Article 6 of ASME Sec V & respective ASTM standard; latest edition.

11.2 Only NPCIL approved penetrant & developer agent shall be used.

11.3 Application of penetrant and developer using aerosol type spray cans is preferred.

11.4 The temperature of the area to be examined shall be between 16°C and 52°C.


11.5 All traces of penetrants and of developer shall be removed from the work immediately after the completion of examination.

#### 12.0 **Cleaning & Protection**

After completing the manufacturing activities, cleanliness of both inside & outside surface of the dished ends shall be ensured by sand/shot blasting as per SIS-055900 Finish Sa 2 ½. Cleaned dished ends shall be protected by removable coating at vendor works. Final shot blasting and painting shall be done after completion of fabrication and testing of equipment as per tender specification /drawing at BHEL works.

#### 13.0 **Identification**



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Identification numbers shall be punched on each dish-end (DE no.) for proper identification & co-relation with test certificates. Identification numbers to be punched respectively on each dished end, are indicated in the drawing / Purchase order.

Each Dished End to have at-least following identifications duly punched on the dished end surface, at the location marked in the drawing & shall have same marking on the Test Certificates also;

- a. BHEL Purchase Order No.
- b. Drawing No. with rev. No. & Item No.
- c. Identification mark, D.E. No.
- d. Inspecting officer's Seal

#### 14.0 **Inspection**

Vendor to submit Quality Plan for approval.

Dished ends shall be ***inspected by BHEL-QC/NPCIL-QS, as per approved QA Plan.***

#### 15.0 **Test Certificates**

Six (6) copies of following Test Certificates duly signed by inspection authority shall be furnished.

- a. Test Certificates for Testing of Test Coupons as per clause 8.0
- b. Final Dimensional Measurement Report.
- c. Heat Treatment Chart - for Stress Relieving of Dished Ends
- d. Non-Destructive Examination Reports
  - i. Liquid Penetration Examination.
- e. Dispatch Clearance from NPCIL-QS.

#### 16.0 **Quality Plan**

Vendor to furnish in quality plan indicating manufacturing sequence, identifying the testing involved & inspection stages for the offered dished ends. Manufacturing shall be carried out as per NPCIL approved Q.A. Plan.