



Heat Exchanger Group

STANDARD QUALITY ASSURANCE  
PLAN

QAP No.

CDE-12-2940

Revision No.

08

Date of Issue

21.08.2020

BHEL  
Bhopal

ITEM

C.S. Dished End  
( For Misc. Tanks, F/Tanks & LP Heaters)

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| Sl.No                     | Components & Operations                                 | Characteristics                                                       | Class | Type of Check              | Quantum of check | Reference Document                | Acceptance Norms                  | Format of Records | Agency |   |   | Remarks                                                                                                                                                                                                                                                            |
|---------------------------|---------------------------------------------------------|-----------------------------------------------------------------------|-------|----------------------------|------------------|-----------------------------------|-----------------------------------|-------------------|--------|---|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                         | 2                                                       | 3                                                                     | 4     | 5                          | 6                | 7                                 | 8                                 | 9                 | 1      | 2 | 3 | 11                                                                                                                                                                                                                                                                 |
| 1.0 RAW MATERIAL          |                                                         |                                                                       |       |                            |                  |                                   |                                   |                   |        |   |   |                                                                                                                                                                                                                                                                    |
| 1.1                       | Carbon Steel Plate                                      | Verification & Correlation of MTC for Chemical& Mechanical Properties | Major | Verification               | 100%             | P.O./ Customer Drg.               | Material Spec.                    | MTC               | P      | W | V | As per material spec. (*)                                                                                                                                                                                                                                          |
|                           |                                                         | Physical Condition                                                    | Major | Visual                     | 100%             | Material Spec.                    | Material Spec.                    | TCR               | P      | W | - |                                                                                                                                                                                                                                                                    |
|                           |                                                         | UT of Plates                                                          | Major | NDE                        | 100%             | SA435/ Level-A of SA-578          | SA435/ Level-A of SA-578          | MTC               | P      | V | - | UT of plates shall be done at Dished End suppliers's works. (***)                                                                                                                                                                                                  |
| 2.0 IN PROCESS INSPECTION |                                                         |                                                                       |       |                            |                  |                                   |                                   |                   |        |   |   |                                                                                                                                                                                                                                                                    |
| 2.1                       | Marking & Cutting of Blank Plates & Test Piece          | Transfer of Stamp                                                     | Major | Co-relation & Verification | 100%             | MTC                               | MTC                               | IR                | P      | W | - | <ul style="list-style-type: none"><li>Supplier to ensure transfer of identification mark on each part before use. This mark to be retained after forming also.</li><li>Supplier to ensure the dia of blank to meet final dimensions as per BHEL Drawing.</li></ul> |
|                           |                                                         |                                                                       |       |                            |                  |                                   |                                   |                   |        |   |   |                                                                                                                                                                                                                                                                    |
| 2.2                       | Fit-up (if applicable)                                  | Fit-up & dimensions                                                   | Major | I + Visual                 | 100%             | BHEL Drg.                         | BHEL Drg.                         | IR                | P      | R | - |                                                                                                                                                                                                                                                                    |
| 2.3                       | Welding procedure & welder qualification(if applicable) | WPS/PQR/WQR                                                           | Major | Verification               | Random           | -----                             | ASME Sec.IX                       | ASME Format       | P      | R | - | <ul style="list-style-type: none"><li>All procedure and welder qualification to be qualified by BHEL.</li></ul>                                                                                                                                                    |
| 2.4                       | Welding of blank (if applicable) (**)                   | DPT of weld Seam                                                      | Major | NDE                        | 100%             | Appendix-8 of ASME Sec-VIII Div-I | Appendix-8 of ASME Sec-VIII Div-I | NDE REPORT        | P      | V | - |                                                                                                                                                                                                                                                                    |
|                           |                                                         | RT of Weld Seam                                                       | Major | NDE                        | 100%             | UW-51 of ASME Sec.VIII Div.1      | UW-51 of ASME Sec.VIII Div.1      | NDE REPORT        | P      | V | - |                                                                                                                                                                                                                                                                    |

As per material spec. (\*)

UT of plates shall be done at Dished End suppliers's works. (\*\*\*)

- Supplier to ensure transfer of identification mark on each part before use. This mark to be retained after forming also.
- Supplier to ensure the dia of blank to meet final dimensions as per BHEL Drawing.

- All procedure and welder qualification to be qualified by BHEL.

• All procedure and welder qualification to be qualified by BHEL.

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| 1     | 2                       | 3               | 4     | 5             | 6                | 7                  | 8                | 9                 | 10     | 11      |

|     |                        |                                             |       |                      |      |                               |                               |            |   |   |   |                                                                                                            |
|-----|------------------------|---------------------------------------------|-------|----------------------|------|-------------------------------|-------------------------------|------------|---|---|---|------------------------------------------------------------------------------------------------------------|
| 2.5 | Cold Forming of D/ends | Visual & Profile Verification by Template.  | Major | Visual & Measurement | 100% | As per BHEL Drg..             | As per BHEL Drg..             | IR         | P | W | - |                                                                                                            |
| 2.6 | Heat Treatment         | Normalising/Stress Relieving(as applicable) | Major | -                    | 100% | As per BHEL Drg.. / ASME Std. | As per BHEL Drg.. / ASME Std. | Graph & IR | P | V | V | <ul style="list-style-type: none"> <li>Verification of Heat Treatment Chart</li> <li>See Note-5</li> </ul> |

## 3.0 FINAL INSPECTION

|     |                             |                           |          |            |      |                                                     |                                                      |             |   |   |   |                                                                                                                                |
|-----|-----------------------------|---------------------------|----------|------------|------|-----------------------------------------------------|------------------------------------------------------|-------------|---|---|---|--------------------------------------------------------------------------------------------------------------------------------|
| 3.1 | NDT (before blast cleaning) | Dye Penetration Exam.     | Critical | NDE        | 100% | Appendix-8 of ASME Sec-VIII Div-I & BHEL Appd. Drg. | Appendix-8 of ASME Sec-VIII Div.1. & BHEL Appd. Drg. | DP Report   | P | W | V | To cover inside/outside surface of knuckle and edge preparation of weld joints.                                                |
|     |                             | UT of complete dished end | Major    | NDE        | 100% | SA 435                                              | SA 435                                               | NDE Reports | P | W | V | <ul style="list-style-type: none"> <li>UT of complete dished end</li> </ul>                                                    |
| 3.2 | Test Piece                  | Testing of test pieces    | Major    | Mechanical | 100% | As per BHEL Drg.. / Material Spec.                  | As per BHEL Drg.. / Material Spec.                   | IR          | P | W | V | <ul style="list-style-type: none"> <li>See Note-1</li> <li>Testing of test pieces to be done at NABL accredited lab</li> </ul> |

*Repaired*  
21/08/2020



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|     |                  |                                                                                             |        |                      |      |                       |                       |            |       |                                                                                           |
|-----|------------------|---------------------------------------------------------------------------------------------|--------|----------------------|------|-----------------------|-----------------------|------------|-------|-------------------------------------------------------------------------------------------|
| 3.3 | Final Dimensions | Dimensionally Conformity after Forming, check on layout (circumference check)               | Major  | Visual & Measurement | 100% | BHEL Drg.             | BHEL Drg.             | IR         | P W V | Minimum thickness checked by UT or Ultrasonic D meter and same to be reported in IR also. |
| 3.4 | Documentation    | Verification of Quality Documents (after Shot Blasting & surface protection as per drawing) | Review | 100%                 | 100% | As per P.O./BHEL Drg. | As per P.O./BHEL Drg. | See Note-6 | P W V | Identification number to be punched/paint on each Dish End                                |

**LEGEND:**

1- Dished End Manufacturer  
P - Perform  
IR/TC - Inspection Report/Test Certificate  
(\*) In the absence of original correlated MTC, material to be tested at NABL Approved Lab which are to be witnessed by BHEL Approved IA.  
(\*\*) Welding to be done by Qualified welders and approved procedures only  
(\*\*\*) In case co-related MTC calls the plate as UT tested, requirement of UT at blank stage not required.

2 - BHEL APPROVED IA  
W - Witness  
TCR - Test Certificate Report  
V - Verification  
R - Review  
IA - Inspection Agency

Accepted  
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## NOTES :

1. If dished end blank is made up of more than one plate of different heat lot , no. of test piece shall be taken as applicable. For single Heat Lot Plate and same Heat Charge (during Normalizing of Dished end), no. of test piece can be considered as one.
2. Only ISNT / ASNT Approved NDT personnel (Level-II as minimum) to be employed while carrying out the NDE.
3. BHEL IA to ensure that the Furnace used for Heat Treatment are duly calibrated by NABL approved agency. Proper calibration record to be verified. In case of Temporary furnace, all associated thermocouples (as shall be attached with the job) and temperature recorder to be calibrated by NABL approved agency.
4. Three (03) copies of all MTC, HT Chart, I.R., TCR, Lab. Test Report – as stated in the SQAP (duly signed and stamped by inspection agency) shall be furnished. Sequence of documents shall be as per the QAP only.
5. All other requirements as mentioned in the drawing and checklist to applicable P.I./P.O. shall be complied fully. In case of any conflict between the SQAP & drawing, SQAP shall govern finally.
6. All the IR/TC/TCR shall be reviewed by BHEL IA before submitting to customer (for customer intervention if any) /BHEL.
7. Complete Document verification (if any) by customer shall be done at Dished End suppliers work before final dispatch
8. During manufacturing, only latest revision of drawings / specs / procedures shall be used.
9. Only calibrated instruments / gauges / thermocouples etc. shall be used during inspection and calibration to be done by NABL approved agency.
10. In case heat treatment to be done at a soaking temperature lower than the transformation temperature of the material, requirement of test piece is not required/applicable.

Prepared by:

Reviewed &amp; Approved by:

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