An ISO 9001 Company

Bharat Heavy Electricals Limited
(High Pressure Boiler Plant)
Tiruchirappalli – 620014, TAMIL NADU, INDIA

TITLE **CORRIGENDUM FOR ENQUIRY** **1002100016**	Phone: +**91 431 257 6186 / 4204** Fax : **+91 431 252 0719** Email : **sudheer@bhel.in**

Reference Number Enquiry	**Enquiry Date:**	**Due date for submission of quotation**
1002100016	**07/06/2021**	**19/07/2021**

You are requested to quote the Enquiry number date and due date in all your correspondences. This is only a request for quotation and not an order

Details of Corrigendum

Offers shall be submitted as per revised TDCs attached. Bidders who have already submitted their offers may kindly take note of latest TDCs and quote accordingly.

1. ***TDC:0:211 Rev No. 01 for Cladded plates (For Enquiry SL No. 10 ,20 ,30)***
2. ***TDC:0:212 Rev No. 01 for UNS N 10276 Sheet/plate. (For Enquiry SL No. 40, 50)***

One No. of corrosion test shall be conducted as per clause 6.e of TDC:0:211 Rev 01 for Cladded plates.

Except the above and previously issued corrigenda all other terms & conditions of the tender remain the same.

BHEL commercial terms & conditions and all annexures can be downloaded from BHEL web site http://www.bhel.com or from website http://eprocurebhel.gov.in against Enquiry reference "1002100016"

Yours faithfully,
For **Bharat Heavy Electricals Limited**

SUDHEER APPIRE DDYGARI
Senior Engineer / Purchase
Materials Management / Steel
BHEL, TRICHY - 620 014.

Record of Revision:
Rev 00 dt 03/04/2021 – Fresh issue
Rev 01 dt 12/07/2021 – Clause 3.1 added. Cl 6, 11 modified.

1. SCOPE

This TDC specifies the additional requirements for the delivery of UNS N10276 as per ASTM B575 cladded on one side of carbon steel plates Class 1 conforming to ASTM A265-12 and to the latest edition.

2. MATERIAL SPECIFICATION

ASTM	:	ASTM A265-12 latest edition (UNS N10276 as per ASTM B575 Cladded Carbon Steel plate as per ASTM A36 / IS 2062 E 250 Gr. BR)
Additional Requirement	:	As listed below (supplementary to Specification)
Size and Qty	:	As per Purchase order (PO)

3. CHEMICAL COMPOSITION & PROCESS

Cladding Metal: UNS N10276 as per ASTM B575

Base Plate: Carbon steel as per ASTM A36 / IS 2062 E 250 Gr. BR

3.1. The Cladding and Base Plate shall conform to the chemical and process requirements of respective specifications.

3.2. The method of bonding of cladding metal to base plate shall be Explosion bonding or Hot rolling or combination of both to achieve the required quality as per ASTM A265-12.

3.3. **In the cladded plate, joint is not permitted for width up to 1.2 metre in both base plate and cladding metal sheet. If width of cladded plate is greater than 1.2 metre, there shall not be more than one number of joints in cladding metal sheet before cladding and no joint in Carbon steel base plate.** 100% Radiographic testing of all such joints shall be done by vendor as per ASME, Sec. VIII, Div.1, UW-51. Weld seam location and orientation shall be provided by manufacturer before cladding.

4. DIMENSIONAL TEST

The plates shall be supplied to the dimensions specified in the enquiry/PO.

Enquiry/PO shall state the following

i. Length and width of plate.
ii. Base metal thickness
iii. Clad metal thickness

The following dimensional tolerances shall apply

a.	Thickness	As per Enquiry/ PO
b.	Cladded plate thickness	Composite thickness should not be less than the specified thickness. (+) 2 mm (or) (+) 10% of composite thickness (whichever is greater), (-) 0 mm
c.	Clad Metal thickness	**Thickness should not be less than the specified thickness.** Over tolerance on clad metal thickness shall be as per clad metal specification. Thickness of clad metal in C276 cladded plate shall be measured as per ASTM E 376 or any other equivalent ASTM/ASME/ISO/EN/DIN standard. For the purpose of measurement, the C 276 cladded plate shall be divided into 4 equidistant grid lines (perpendicular to longitudinal axis) and 3 equidistant grid lines (parallel to longitudinal axis). Thickness of clad metal in C 276 cladded plate shall be measured at the intersection points of above referred grid lines.
d.	Base metal thickness	Tolerance on thickness shall be as per Base plate specification and should fulfil Sl No b. specified above
e.	Length	(+)10 mm, (-) 0 mm
f.	Width	(+)10 mm, (-) 0 mm
g.	Flatness	5mm/m and 8mm/2m (max) [throughout the surface]
h.	Edges	Edges shall be smooth trimmed edge. Burrs shall be removed. Edges should be uniform and free from any defects or undulations.

5. HEAT TREATMENT (HT)

5.1. The plates shall be supplied in heat- treated condition

5.2. Cladded plates shall be stress relieved by Heat treatment (as per supplier's procedure) and heat treatment chart / report shall be submitted.

6. MECHANICAL & NON DESTRUCTIVE TEST

Test samples *for the cladded plates* shall be selected and prepared as per ASTM A265. Number of tests and re-tests shall be carried out as per ASTM A265.

a.	Tensile test	The tensile test to be conducted as per Clause 7.1 of ASTM A265 with acceptance norms specified therein.
b.	Ductility	Two bend tests for ductility of cladded plate shall be done, one with the cladding metal in compression and other with the cladding metal in tension. Specimen preparation and procedure for ductility bend test shall be as per ASTM E290 with bend angle and diameter as per Bend test. The convex surface of specimen shall withstand bending without cracking. Any cracks within one thickness of the edge of the specimen are not considered a bend test failure. Cracks occurring in the corners of the bent portion shall not be considered significant.
c.	c. Bond Strength	
	c.1.Shear strength test	The shear strength test shall be carried out as per clause 7.2.1 of ASTM A265. The shear strength of the cladded plate shall not be less than 140 MPa.
	c.2. Bend test	Three bend tests shall be made with the cladding metal in compression to determine the quality of the bond. These bend tests shall be made in the manner of the tension tests indicated in Fig.2 of ASTM A265 and shall be bent through an angle of 180° to the bend diameters provided in either ASTM A6/A6M or specification ASTM A20/A20M. At least two of the three tests shall show not more than 50% separation on both edges of the bent portion.
d.	Ultrasonic test	The cladded plate shall be examined ultrasonically as per ASTM A578/A578 M, with Quality Level Class 1 (ASTM A265).
e.	Corrosion Test	Corrosion test of clad metal (UNS N10276 sheet) as per ASTM G48 Method A (No. of test samples shall be as per Enquiry / P.O, based on project specific requirements)

7. REPAIRS AND FINISH

7.1. The material shall be clean, smooth, sound and free from injurious defects.

7.2. Any repair work on the cladded plate is not allowed as such.

8. INSPECTION AT SUPPLIER'S WORKS

BHEL's representative shall have free access at all times until work on contract of BHEL is being performed, to all parts of the manufacturer's works. The supplier shall offer BHEL's representative all reasonable facilities without any financial implication to satisfy the latter that the material is being furnished in accordance with this specification.

9. PACKING AND MARKING

9.1. The material shall be separated by size and prepared for shipment in such a manner as to ensure acceptance by common carrier transportation and to afford protection from the normal hazards of transportation by sea. Packing shall be of sea worthy packing.

Each package shall be suitably marked with the following details. A metal label shall be securely attached to each package and shall bear the following information:

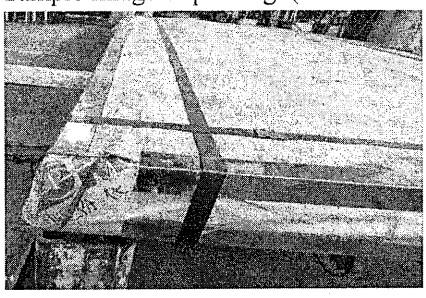
1. C 276 cladded Carbon steel plates
2. BHEL Purchase Order Number
3. Consignment and Identification No.
4. Size, number and Weight
5. Supplier's Name

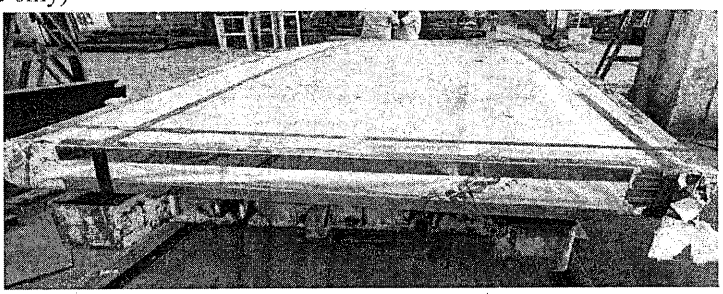
9.2. Identification details like Purchase Order Number, Plate Unique Identification Number, Base metal heat Number, Cladding metal heat number, Material specification, Size of the plate, weight, Supplier Name, etc. shall be stencilled on all the plates.

9.3. The bundle / crate shall be rigid enough to withstand the packed weight.

9.4. Vendor has to provide corner angle (suitable metal strips) on all sides to avoid damages to the edges during transit and handling

Sample Image of packing: (for reference only)





9.5. **Painting-** Non-cladded portion of Carbon steel base plate shall be coated with one coat of Inorganic Zinc silicate primer, DFT- 20μ

10. DESPATCH

It is the responsibility of the supplier to ensure that no damage occurs during transit.

11. INSPECTION AND CERTIFICATION

11.1. Products shall be inspected at works & test certificates (in English only) shall be countersigned by Inspecting Authority (any independent third party).

11.2. All the products shall be accompanied by manufacturer's test certificate (in English only) supplied against every purchase order. Additionally, manufacturer's test certificate (in English only) shall be submitted meeting all the requirements contained in the purchase order, this TDC, and the applicable specification with the following details.

1. *Purchase Order No (BHEL), TDC No & Rev No, Test certificate number & Date, Quantity, Weight.*
2. *Material Specification and Grade, Method of Bonding.*
3. *Heat Treatment details like temperature, soaking time, cooling medium, batch number etc.*
4. *Mechanical test results with reference and acceptance standards*
5. *NDE results with reference & acceptance standards. (including RT report, if applicable)*
6. *Dimensional test reports.*
7. *Material test certificates of base plate and cladding metal sheet*
8. *Print of the stamp of Inspecting Officer, which is used on the plate.*
9. *The manufacturer shall furnish a certificate of compliance stating that the plates have been manufactured, inspected, and tested in accordance with the requirements of the applicable product specification.*

11.3. Test Certificates shall be furnished for our verification. Despatch clearance will be issued after verification of reports and is mandatory before effecting despatch to BHEL stores.

12. END USE

These are intended for lining of absorber in FGD system.

13. REJECTION AND REPLACEMENT

In the event of any cladded plate proving defective in the course of rolling (forming), machining, testing, assembly or erection, such plates shall be rejected notwithstanding, any previous certification of satisfactory testing and/or inspection.

The supplier shall undertake to replace the rejected plates at his own cost and the rejected plates shall be sent back to the supplier after fulfilling the commercial terms and conditions.

12/07/21	12/07/21	12/07/21	12/07/2021		12/07/2021
Shyamaladevi S	N Nagamuthupandian	S Yuvaraj	M.Nadanakumar	S Krishna Kumar	JVV Aruna Kumar
DM/QA	Mgr/QA	Mgr/PE-FB	AGM/MM	SDGM/QC	AGM/QA
Prepared by	Reviewed by				Approved by

Record of Revision:
Rev 00 dt 03/04/2021 – Fresh issue
Rev 01 dt 12/07/2021 – Cl 3.2 added. Cl 1, 4, 6 & 11 modified.

1. SCOPE

This TDC specifies *the additional requirements* for the delivery of UNS N10276 sheets/plates conforming to ASTM B575 and to the latest edition. Sheet/ plate is classified as per ASTM B575 standard. (Sheet- Thk less than 4.76mm and Plate- Thk 4.76mm and more).

2. MATERIAL SPECIFICATION

ASTM	:	UNS N10276 as per ASTM B575 latest edition
Additional Requirement	:	As listed below (supplementary to Specification)
Size and Qty	:	As per Purchase order (PO)

3. CHEMICAL COMPOSITION & PROCESS

Alloy: UNS N10276 as per ASTM B575

3.1. Cold or Hot rolling to achieve desired thickness. Sheet/Plate to be solution annealed and descaled after rolling.

3.2. Ladle analysis: Min one sample per cast. Product Analysis: Min one sample per sheet/plate as rolled.

4. DIMENSIONAL TEST

The sheet/plates shall be supplied to the dimensions specified in the enquiry/PO.
Enquiry/PO shall state the following

i. Length and width of sheet/plate.
ii. Thickness

The following dimensional tolerances shall apply

a.	Thickness Tolerances	As per ASTM B906 Table A2.1 / Table A2.2 as per applicable
b.	Length & Width tolerances	As per ASTM B906 Table A2.3 / Table A2.4 based on method used to cut the sheet.
c.	Straightness	As per clause 8.5 of ASTM B575 (edgewise curvature-depth of chord- of sheet shall not exceed 0.04mm multiplied by the length in cm)
d.	Squareness	*As per clause 8.6 of ASTM B575*
e.	Flatness	*As per clause 8.7 of ASTM B575*
f.	Finish	*Finish shall be as per clause 13.1.1 (No. 1 finish) for Plate and clause 11.1.1 (No. 1 finish) for Hot rolled sheet and clause 11.1.2 (No.2D finish) for cold rolled sheet of ASTM B906.*
g.	Density	*Density as per clause 8.1 of ASTM B575.*

5. HEAT TREATMENT (HT)

5.1. Unless otherwise specified, the sheets and plates shall be supplied in heat- treated condition.

5.2. Heat treatment chart / report shall be submitted.

6. MECHANICAL TEST

Test samples shall be selected and prepared as per ASTM B906. Number of tests and re-tests shall be carried out as per ASTM B906.

a.	Tensile test	*Tension test method shall be as per ASTM E8 & acceptance norms are as per specification ASTM B575.*
b.	Hardness	*Hardness on finished sheet/plate shall be as per ASTM E18 & acceptance norms are as per specification ASTM B575.*
c.	Grain size test (only for sheet and strip)	*Grain size test shall be as per ASTM E112 and acceptance norms are as per specification as applicable ASTM B575.*

7. REPAIRS AND FINISH

7.1. The material shall be clean, smooth, sound and free from injurious defects.

7.2. All sheets/plates shall be free from harmful defects like cracks, lamination. The edges of sheets/plates shall be slit without fish tails and kinks. The sheets/plates should not contain any weld seam. The surface shall be free from scales, rust, pitting, wrinkles

7.3. Repair on finished sheet/plate is prohibited and shall not be accepted.

8. INSPECTION AT SUPPLIER'S WORKS

BHEL's representative shall have free access at all times until work on contract of BHEL is being performed, to all parts of the manufacturer's works. The supplier shall offer BHEL's representative all reasonable facilities without any financial implication to satisfy the latter that the material is being furnished in accordance with this specification.

9. PACKING AND MARKING

9.1. The material shall be separated by size and prepared for shipment in such a manner as to ensure acceptance by common carrier transportation and to afford protection from the normal hazards of transportation by sea. Packing shall be of sea worthy packing.

Each package shall be suitably marked with the following details. A metal label shall be securely attached to each package and shall bear the following information:

1. N 10276 plates as per ASTM B575
2. BHEL Purchase Order Number
3. Consignment and Identification No.
4. Size, number and Weight
5. Supplier's Name

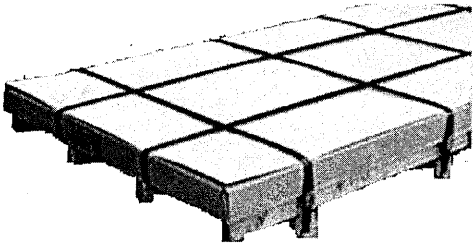
9.2. <u>Marking on the face of plate</u>:
Marking on the plate lengthwise on one face as per clause 22 of ASTM B906.

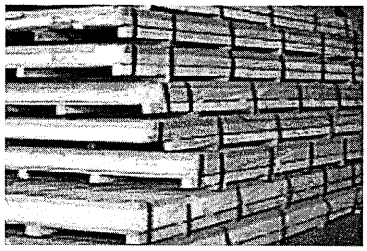
9.3. <u>Marking over the plate/sheet:</u>
Each sheet shall be identified by Tag & also permanent marking on each bundle of sheet on the packed crate.

9.4. The bundle / crate shall be rigid enough to withstand the packed weight.

9.5. Each bundle shall weigh approximately 2MT.

Sample Image of packing: (for reference only)





10. DESPATCH

It is the responsibility of the supplier to ensure that no damage occurs during transit.

11. INSPECTION AND CERTIFICATION

11.1. Products shall be inspected at works & test certificates (in English only) shall be countersigned by Inspecting Authority (any independent third party).

11.2. All the products shall be accompanied by manufacturer's mill test certificate (in English only) supplied against every purchase order. Additionally, manufacturer's test certificate (in English only) shall be submitted meeting all the requirements contained in the purchase order, this TDC, and the applicable specification with the following details.

1. *Purchase Order No (BHEL), TDC No & Rev No, Test certificate number & Date, Quantity.*
2. *Specification and Grade with applicable year of code, Heat Number, Sheet/Plate number.*
3. *Steel making process, Chemistry including incidental elements - Ladle and Product analysis*
4. *Heat Treatment details like temperature, soaking time, cooling medium, batch number etc.*
5. *Mechanical test results including Hardness, Grain size (as applicable) with reference and acceptance standards*
6. *Dimensional test Reports.*
7. *Print of the stamp of Inspecting Officer, which is used on the plate.*
8. *The manufacturer shall furnish a certificate of compliance stating that the sheets/plates have been manufactured, inspected, and tested in accordance with the requirements of the applicable product specification.*

11.3. Test Certificates shall be furnished for our verification. Despatch clearance will be issued after verification of reports and is mandatory before effecting despatch to BHEL stores.

12. END USE

These are intended for Wet-dry interface zone in Absorber.

13. REJECTION AND REPLACEMENT

In the event of any sheet/plate proving defective in the course of rolling (forming), machining, testing, assembly or erection, such sheets/plates shall be rejected notwithstanding, any previous certification of satisfactory testing and/or inspection.

The supplier shall undertake to replace the rejected sheets/plates at his own cost and the rejected sheets/plates shall be sent back to the supplier after fulfilling the commercial terms and conditions.

12/07/21	12/07/21	12/07/21	12/07/2021		12/7/2021
Shyamaladevi S	N Nagamuthupandian	S Yuvaraj	M Nadanakumar	S Krishna Kumar	JVV Aruna Kumar
DM/QA	Mgr/QA	Mgr/PE-FB	AGM/MM	SDGM/QC	AGM/QA
Prepared by	Reviewed by				Approved by