

|   |  |  |                                     |                          |  |      |                              |                                  |        |                         |                    |                            |                    |                         |
|---|--|--|-------------------------------------|--------------------------|--|------|------------------------------|----------------------------------|--------|-------------------------|--------------------|----------------------------|--------------------|-------------------------|
| <div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: left;"> </div> <div style="text-align: center;"> <h2 style="margin: 0;">GERDAU STEEL INDIA PVT LIMITED</h2> </div> </div>   |  |  |                                     |                          |  |      |                              |                                  |        |                         |                    |                            |                    |                         |
| PLANT: TADIPATRI. DIST.: ANANTPUR. A.P.: 515411   |  |  |                                     |                          |  |      |                              |                                  |        |                         |                    |                            |                    |                         |
| <b>TEST CERTIFICATE</b>   |  |  |                                     |                          |  |      |                              |                                  |        | F/QA-TC/12 Rev. 01      |                    |                            |                    |                         |
| TC No : 2018/00093551   |  |  |                                     |                          | Invoice No. : ST2017005434                       |      |                              |                                  |        | Quantity : 15.883 t     |                    | Rolling Input : 160X160 mm |                    |                         |
| Customer : GERDAU STEEL INDIA PVT. LTD  |  |  |                                     |                          |  |      |                              |                                  |        | S.O. No. / Date : 51218 |                    |                            |                    |                         |
| PROCESS ROUTE :- BF>>BOF>>LRF>>VD>>CCM(EMS & AMLC)>>RM  |  |  |                                     |                          |  |      |                              |                                  |        | Size : 27 Dia           |                    | Truck No.: AP02TE 1477     |                    |                         |
| Heat No:- 34825   |  |  |                                     |                          |  |      |                              |                                  |        | Product : Rolled bar    |                    | Colour Code:               |                    | BASE<br>PURPUL/BLACKDOT |
| NO OF BUNDLES: 7<br>NO OF BARS: 639   |  |  |                                     |                          | Grade :- 16MNCr5                                 |      |                              |                                  |        |                         |                    |                            |                    |                         |
| TAS No. : 2278/2016   |  |  |                                     |                          | TDC No :- MAC-TS-039, Rev: 02, Dated: 04.05.2017 |      |                              |                                  |        | Condition :As Rolled    |                    | Reduction Ratio:           |                    | 44.71:1                 |
| <b>CHEMICAL COMPOSITION</b>   |  |  |                                     |                          |  |      |                              |                                  |        |                         |                    |                            |                    |                         |
| Element   | %C   | %Mn  | %Si                                 | %P                       | %S   | %Cr  | %Ni                          | %Cu                              | %Mo    | %Al                     | %Pb                | %V                         | %Ti                | %Ca                     |
| Min.  | 0.14   | 1.00   | -                                   | -                        | -  | 0.80 | -                            | -                                | -      | -                       | -                  | -                          | -                  | -                       |
| Max.  | 0.19   | 1.30   | 0.40                                | 0.035                    | 0.035  | 1.10 | -                            | -                                | -      | 0.040                   | -                  | -                          | -                  | -                       |
| Actual  | 0.14   | 1.20   | 0.28                                | 0.015                    | 0.017  | 1.05 | -                            | -                                | -      | 0.023                   | -                  | -                          | -                  | -                       |
| <b>OTHER ELEMENTS</b>   |  |  |                                     |                          |  |      |                              |                                  |        |                         |                    | <b>GAS LEVEL</b>           |                    |                         |
| Element   | %B   | %Nb  | %As                                 | %Sb                      | %Sn  | %W   | %Bi                          |                                  |        |                         | O <sub>2</sub> PPM | H <sub>2</sub> PPM         | N <sub>2</sub> PPM |                         |
| Min.  | -  | -  | -                                   | -                        | -  | -    | -                            |                                  |        |                         | Min                | -                          | -                  | -                       |
| Max.  | -  | -  | -                                   | -                        | -  | -    | -                            |                                  |        |                         | Max                | 20                         | 2                  | 100                     |
| Actual  | -  | -  | -                                   | -                        | -  | -    | -                            |                                  |        |                         | Actual             | 15                         | 0.9                | 79                      |
| <b>MECHANICAL PROPERTIES</b>  |  |  |                                     |                          |  |      |                              |                                  |        |                         |                    |                            |                    |                         |
| Requirement   | Hardness (BHN)   | Impact Strength (IZOD/CHARPY)  | Yield Strength (N/mm <sup>2</sup> ) | UTS (N/mm <sup>2</sup> ) | %Elong.  | %RA  | JOMINY HARDENABILITY ( HRC ) |                                  |        |                         |                    |                            |                    |                         |
|   |  |  |                                     |                          |  |      | J1/16"                       | J3/16"                           | J4/16" | -                       | -                  | -                          |                    |                         |
| Min.  | -  | -  | 600                                 | 800                      | 9  | 35   | Min.                         | -                                | -      | 33                      | -                  | -                          | -                  | -                       |
| Max.  | 240  | -  | -                                   | 1100                     | -  | -    | Max.                         | 42                               | -      | 37                      | -                  | -                          | -                  | -                       |
| Actual  | 166  | -  | 796                                 | 1047                     | 13   | 38   | Actual                       | 41.5                             | 37.7   | 35                      | -                  | -                          | -                  | -                       |
| <b>METALLURGICAL PROPERTIES</b>   |  |  |                                     |                          |  |      |                              |                                  |        |                         |                    |                            |                    |                         |
| Requirement   | Depth of Decarb (mm) (SAE J419 TYPE III)   | Macro Etch (ASTM E 381)  | Max. Depth of Surface Defect (mm)   | Grain Size (ASTM E 112)  | INCLUSION RATING AS PER ASTM E45 (METHOD A)      |      |                              |                                  |        |                         |                    |                            |                    |                         |
|   |  |  |                                     |                          | A  |      | B                            |                                  | C      |                         | D                  |                            |                    |                         |
|   |  |  |                                     |                          | T  | H    | T                            | H                                | T      | H                       | T                  | H                          |                    |                         |
| Min.  | -  | -  | -                                   | 6                        | Min  | -    | -                            | -                                | -      | -                       | -                  | -                          |                    |                         |
| Max.  | 1% of dia max  | -  | -                                   | 8                        | Max  | 2.0  | 1.5                          | 2.0                              | 1.5    | 2.0                     | 1.5                | 2.0                        |                    |                         |
| Actual  | 0.18   | C1R1S1   | -                                   | 7-8                      | Actual   | 1.5  | 0.5                          | 1.0                              | -      | -                       | -                  | 1.0                        |                    |                         |
| <div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <b>Spark &amp; Spectral Test:</b> 100% OK<br/> <b>Surface Inspection:</b> 100% OK<br/> <b>Ultrasonic Test:</b> 100% OK<br/> <b>MPI:</b> -                         </div> <div style="width: 30%;"> <b>Other Tests:</b> -<br/> <b>1. MFL:</b> 100% OK<br/> <b>2. Step Turn:</b> Found Satisfactory<br/> <b>3. Blue Fracture:</b> -<br/> <b>4. Upset Test:</b> -                         </div> <div style="width: 30%;"> <b>Oil Quenched Core Hardness:</b><br/> <b>Min. in HRC</b> -<br/> <b>Actual in HRC</b> -                         </div> </div> |  |  |                                     |                          |  |      |                              |                                  |        |                         |                    |                            |                    |                         |
| Remarks   | Microstructure : Pearlite + Ferrite.      Mechanical Properties Afier H&T.      Ultrasonic Test: 0.8x15 mm, SDH , MFL: 0.3x10 mm , |  |                                     |                          |  |      |                              |                                  |        |                         |                    |                            |                    |                         |
| Length of Bar :-6000MM  |  | "We certify that the contents of this report are correct & accurate & meet the requirements of the purchase order, technical delivery conditions, general steel requirements & the material certification requirements". Supplied material is free from radioactive element. |                                     |                          |  |      |                              | <br>Technical Service 05.01.2018 |        |                         |                    |                            |                    |                         |
| Corporate Office: 304/305 World Trade Centre. Brigade Gateway Complex. Malleswaram (West). Bangalore: 560046. India   |  |  |                                     |                          |  |      |                              |                                  |        |                         |                    |                            |                    |                         |
| Please contact in case of query e-mail id: inml.techservice@gerdau.com  |  |  |                                     |                          |  |      |                              |                                  |        |                         |                    |                            |                    |                         |