



# M M FORGINGS LIMITED

## INCOMING METALLURGICAL INSPECTION REPORT

Lot No : 010000347479

QA 007 REV 0

No. Of. Bars: 40

Mat. Des : RM - SCR420H, 56DIA REV.03

|                         |                       |  |                      |                     |
|-------------------------|-----------------------|--|----------------------|---------------------|
| ICIN Number: 5000362414 | Matl : MA044A03056.0D | Supplier : Sunflag Iron & Steel Co Ltd | Supp TC No : 0016534 | Heat Number : 08683 |
| PO Number : 4500013110  | Size : 56.000 DIA     | Supp TC date : 14:03:2018              | Qty in MT : 4.030    | Batch : 0000674147  |

### Chemical composition in %

|               |     | C      | Mn     | Si     | P      | S      | Ni     | Cr     | Mo     | V      | Cu     | Nb     | B      | Al     | Ti     | Co | Sn     | Fe | Sb     | Pb | As     | Ca | W | Zr | Ta | N2     | H2     | O2     | CE1 | CE2 |
|---------------|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|----|--------|----|--------|----|--------|----|---|----|----|--------|--------|--------|-----|-----|
| As per Spec.  | Min | 0.1700 | 0.5500 | 0.1500 |        |        |        | 0.8500 |        |        |        |        |        | 0.0200 |        |    |        |    |        |    |        |    |   |    |    |        |        |        |     |     |
|               | Max | 0.2300 | 0.9000 | 0.3500 | 0.0300 | 0.0300 | 0.2500 | 1.0500 | 0.0600 | 0.0200 | 0.3000 | 0.0100 | 0.0006 |        | 0.0200 |    | 0.0200 |    | 0.0100 |    | 0.0100 |    |   |    |    | 0.0100 | 0.0002 | 0.0020 |     |     |
| Act. Analysis | 1   | 0.1950 | 0.8380 | 0.2440 | 0.0160 | 0.0090 | 0.0190 | 0.9770 | 0.0050 | 0.0020 | 0.0240 | 0.0020 | 0.0001 | 0.0210 | 0.0020 |    | 0.0020 |    |        |    | 0.0050 |    |   |    |    |        |        |        |     |     |
|               | 2   | 0.2080 | 0.8370 | 0.2540 | 0.0160 | 0.0070 | 0.0240 | 0.9870 | 0.0050 | 0.0020 | 0.0250 | 0.0020 | 0.0001 | 0.0250 | 0.0020 |    | 0.0020 |    |        |    | 0.0050 |    |   |    |    |        |        |        |     |     |
|               | 3   |        |        |        |        |        |        |        |        |        |        |        |        |        |        |    |        |    |        |    |        |    |   |    |    |        |        |        |     |     |
|               | 4   |        |        |        |        |        |        |        |        |        |        |        |        |        |        |    |        |    |        |    |        |    |   |    |    |        |        |        |     |     |
|               | 5   |        |        |        |        |        |        |        |        |        |        |        |        |        |        |    |        |    |        |    |        |    |   |    |    |        |        |        |     |     |
| As per Tc     | 1   | 0.1900 | 0.8400 | 0.2400 | 0.0170 | 0.0130 | 0.0240 | 0.9800 | 0.0030 | 0.0060 | 0.0280 | 0.0030 | 0.0002 | 0.0240 | 0.0032 |    | 0.0011 |    | 0.0007 |    | 0.0055 |    |   |    |    | 0.0089 | 0.0001 | 0.0017 |     |     |

|                    |                             |              |    |              |    |
|--------------------|-----------------------------|--------------|----|--------------|----|
| Visual inspection: | Size & Surface satisfactory | Shearability | OK | Forgeability | OK |
|--------------------|-----------------------------|--------------|----|--------------|----|

### Mechanical properties

|              |     | UTS<br>(Mpa) | YS<br>(Mpa) | El<br>(%) | RA<br>(%) | Izod  |        | Charpy Impact -1 |        | Charpy Ipmaact -2 |        | RM<br>Hardness(HBW) | Upset<br>Hardness(HBW) | H/T<br>Hardness(HBW) |
|--------------|-----|--------------|-------------|-----------|-----------|-------|--------|------------------|--------|-------------------|--------|---------------------|------------------------|----------------------|
|              |     |              |             |           |           | Joule | T(° C) | Joule            | T(° C) | Joule             | T(° C) |                     |                        |                      |
| As per Spec. | Min |              |             |           |           |       |        |                  |        |                   |        |                     |                        | 143                  |
|              | Max |              |             |           |           |       |        |                  |        |                   |        | 229                 | 229                    | 187                  |
| Tested Value |     |              |             |           |           |       |        |                  |        |                   |        | 149,149,156,156,156 | 156,156,156,149,149    | 156,156,163,156,152  |
| As per TC    |     |              |             |           |           |       |        |                  |        |                   |        |                     |                        |                      |

### Micro

| Inclusion rating (%) | A<br>Thin/Thick | B<br>Thin/Thick | C<br>Thin/Thick | D<br>Thin/Thick | Grain size<br>(ASTM) | Decarb<br>(mm) | Macro  | Step Down | Bend Test |
|----------------------|-----------------|-----------------|-----------------|-----------------|----------------------|----------------|--------|-----------|-----------|
| As per Spec. Min     |                 |                 |                 |                 | 6.00                 |                |        |           |           |
| Max                  | 2.00 /1.00      | 2.00 /1.00      | 0.50 /0.50      | 2.00 /1.00      | 8.00                 | 0.50           |        |           |           |
| Tested Value         | 1.00 /-         | 0.50 /-         | - /-            | 1.00 /-         | 7                    | 0.14           | C1S1R1 |           |           |
| As Per TC Value      | 1.00 /-         | 0.50 /-         | - /-            | 1.50 /-         | 7-7.5                | 0.24           | C2S1R1 |           |           |

|                           |      |      |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---------------------------|------|------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Jominy hardenability (MM) | 5.0  | 7.0  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| As per spec min           | 32.0 | 29.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| max                       | 37.0 | 34.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Tested Value              | 34.0 | 30.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| As per TC Value           | 34.0 | 31.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

|                            |  |
|----------------------------|--|
| Any other test specified : | Our RM color code: Light Brown / White |
|----------------------------|--|

|                              |                          |
|------------------------------|--------------------------|
| Remarks : Material Accepted. | Heat code allocated: ZIP |
|------------------------------|--------------------------|

|                  |                              |                 |
|------------------|------------------------------|-----------------|
| Tested By : LAB1 | Lot Cleared Date: 25.03.2018 | Head Metallurgy |
|------------------|------------------------------|-----------------|