

LABORATORIO DE CALIDAD LAMINADOS

LUGAR: ALOAG, km 1 ½ Vía Aloag - Santo Domingo  
 FECHA DE EMISION: 08.03.2017  
 NOMBRE DEL CLIENTE: GLOBAL QUALITY STEEL ECUADOR GQS S.A  
 DIRECCION DEL CLIENTE: AV. AMAZONAS N21-252 Y J. CARRION  
 LOTE DE INSPECCION: 030000047980  
 NRO DE COLADA: 701895  
 ID: 562

PRODUCTO: 71 VARILLA LAM CORRUG AS42 16X12  
 No PEDIDO: 10007418  
 CONDICIONES DE ENSAYO: TEMP AMB 21 °C

| Fecha           | Características de Inspección | Max    | Min    | Resultado de Analisis | UN  | Observaciones |
|-----------------|-------------------------------|--------|--------|-----------------------|-----|---------------|
| <b>QUIMICO</b>  |                               |        |        |                       |     |               |
| 05.03.2017      | % CARBON (C)                  | 0,300  | 0,260  | 0,274                 | %   | ASTME415      |
| 05.03.2017      | % SILICIO (Si)                | 0,300  | 0,100  | 0,128                 | %   | ASTME415      |
| 05.03.2017      | % MANGANESO (Mn)              | 1,200  | 1,050  | 1,077                 | %   | ASTME415      |
| 05.03.2017      | % FOSFORO (P)                 | 0,035  | 0,000  | 0,017                 | %   | ASTME415      |
| 05.03.2017      | % AZUFRE (S)                  | 0,045  | 0,000  | 0,025                 | %   | ASTME415      |
| 05.03.2017      | % BORO (B)                    | 0,100  | 0,000  | 0,001                 | %   | ASTME415      |
| 05.03.2017      | % CARBON EQUIVALENTE (CE)     | 0,550  | 0,000  | 0,465                 | %   | ASTME415      |
| <b>MECANICO</b> |                               |        |        |                       |     |               |
| 05.03.2017      | AREA NOM                      | 201,06 | 201,06 | 201,062               | mm2 | NTE INEN 2167 |
| 05.03.2017      | FLUENCIA                      | 550,0  | 420,0  | 470,132               | MPa | NTE INEN 2167 |
| 05.03.2017      | RESISTENCIA                   |        | 560,0  | 620,599               | MPa | NTE INEN 2167 |
| 05.03.2017      | ALARGAMIENTO                  |        | 14,00  | 16,600                | %   | NTE INEN 2167 |
| 05.03.2017      | REL RESIST/FLUENCIA           |        | 1,25   | 1,320                 |     | NTE INEN 2167 |
| 05.03.2017      | DOBLADO                       |        |        | Conforme              |     | NTE INEN 2167 |
| <b>FISICO</b>   |                               |        |        |                       |     |               |
| 05.03.2017      | ESPACIO R TRANSV              | 11,20  |        | 11,056                | mm  | NTE INEN 2167 |
| 05.03.2017      | ALTURA R TRANSV               |        | 0,72   | 0,847                 | mm  | NTE INEN 2167 |
| 05.03.2017      | ANCHO BASE R LONG             | 6,20   | 0,10   | 1,715                 | mm  | NTE INEN 2167 |
| 05.03.2017      | LONG 12m                      | 12,050 | 11,950 | 12,010                | m   | NTE INEN 2167 |
| 05.03.2017      | APARIENCIA                    |        |        | Conforme              |     | NTE INEN 2167 |



**Observación:**

ADELCA tiene certificación ISO 9001:2008, OHSAS 18001:2007 e ISO 14001:2004 y cuenta con el certificado de conformidad con Sello de Calidad NTE INEN 2167, para VARILLAS DE ACERO CON RESALTES, LAMINADAS EN CALIENTE, SOLDABLES, TERMOTRATADAS, PARA HORMIGON ARMADO.

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Firma:   
 VANESSA VALLADARES  
 JEFE DE CALIDAD LAMINADOS

Lugar y fecha impresión:  
Aloag, 24/02/2017

Norma referencia:  
NTE INEN 2167:2011

| colada          | ID       | φ         | ENSAYOS DIMENSIONALES |                |                   |           | ENSAYOS MECANICOS |                |               |                |              |           |
|-----------------|----------|-----------|-----------------------|----------------|-------------------|-----------|-------------------|----------------|---------------|----------------|--------------|-----------|
|                 |          |           | espac. resalt         | altura resalt  | ancho base resalt | α         | tol masa          | Fy             | Fu            | Fu / Fy        | alargamiento | doblado   |
|                 |          |           | mm                    | mm             | mm                | °         | %                 | MPa            | MPa           |                | %            | 180°      |
|                 |          |           | <b>max11,2</b>        | <b>min0,72</b> | <b>max6,2</b>     |           | <b>+/- 6</b>      | <b>420-540</b> | <b>min550</b> | <b>min1,25</b> | <b>min14</b> |           |
| 16306733        | 1        | 16        | 10,31                 | 0,96           | 1,73              | 70        | -0,1%             | 440,4          | 637,0         | 1,45           | 16,8         | ok        |
| 16306733        | 2        | 16        | 10,34                 | 0,92           | 1,72              | 70        | 0,5%              | 438,0          | 637,5         | 1,46           | 19,6         | ok        |
| 16306733        | 3        | 16        | 10,34                 | 0,94           | 1,70              | 70        | -0,1%             | 437,5          | 645,8         | 1,48           | 18,3         | ok        |
| 16306733        | 4        | 16        | 10,34                 | 1,00           | 1,71              | 70        | 0,3%              | 435,6          | 640,9         | 1,47           | 19,2         | ok        |
| 16306733        | 5        | 16        | 10,38                 | 0,98           | 1,84              | 70        | 0,4%              | 435,6          | 639,9         | 1,47           | 18,8         | ok        |
| 16306733        | 6        | 16        | 10,33                 | 0,96           | 1,73              | 70        | 0,2%              | 453,1          | 640,4         | 1,41           | 19,2         | ok        |
| 16306733        | 7        | 16        | 10,34                 | 0,96           | 1,70              | 70        | 1,9%              | 456,0          | 656,0         | 1,44           | 15,0         | ok        |
| <b>16306733</b> | <b>x</b> | <b>16</b> | <b>10,3</b>           | <b>0,96</b>    | <b>1,7</b>        | <b>70</b> | <b>0,4%</b>       | <b>442,3</b>   | <b>642,5</b>  | <b>1,45</b>    | <b>18,1</b>  | <b>ok</b> |
| colada: 128ton  |          | max       | 10,4                  | 1,0            | 1,8               | 70        | 1,9%              | 456            | 656           | 1,48           | 19,6         |           |
|                 |          | min       | 10,3                  | 0,9            | 1,7               | 70        | -0,1%             | 436            | 637           | 1,41           | 15,0         |           |

Method: Fe-10-F  
Comment: Aceros Baja Aleacion Type corr.concentr.  
Type Standard SAE-1026 NUEVO

2/10/2017 3:25:50 PM

ASTM: E415 Sample: 16306733 Quality: ANALISIS COMPROBACION

|           | C            | Si           | Mn           | P             | S             | Cu           | Cr           | Ni           |
|-----------|--------------|--------------|--------------|---------------|---------------|--------------|--------------|--------------|
|           | %            | %            | %            | %             | %             | %            | %            | %            |
| min       |              |              |              |               |               |              |              |              |
| < x > (7) | <b>0.285</b> | <b>0.182</b> | <b>0.857</b> | <b>0.0154</b> | <b>0.0274</b> | <b>0.367</b> | <b>0.095</b> | <b>0.123</b> |
| max       | 0.330        | 0.550        | 1.560        | 0.0430        | 0.0530        |              |              |              |

|           | Mo           | Al            | V            | B             | Fe           | C.E.         |  |  |
|-----------|--------------|---------------|--------------|---------------|--------------|--------------|--|--|
|           | %            | %             | %            | %             | %            |              |  |  |
| min       |              |               |              |               |              |              |  |  |
| < x > (7) | <b>0.021</b> | <b>0.0018</b> | <b>0.037</b> | <b>0.0005</b> | <b>97.91</b> | <b>0.445</b> |  |  |
| max       |              |               |              |               |              |              |  |  |

ACERIA DEL ECUADOR C.A.

*[Signature]*

CONTROL DE CALIDAD

Vanessa Valladares  
Jefe de Calidad Laminados

Lugar y fecha impresión:  
Aloag, 10/10/2016

Norma referencia:  
NTE INEN 2167:2011

| colada          | ID       | φ         | ENSAYOS DIMENSIONALES |                |                   |           |              | ENSAYOS MECANICOS |               |                |              |           |
|-----------------|----------|-----------|-----------------------|----------------|-------------------|-----------|--------------|-------------------|---------------|----------------|--------------|-----------|
|                 |          |           | espac. resalt         | altura resalt  | ancho base resalt | α         | tol masa     | Fy                | Fu            | Fu / Fy        | alargamiento | doblado   |
|                 |          |           | mm                    | mm             | mm                | °         | %            | MPa               | MPa           |                | %            | 180°      |
|                 |          |           | <b>max7,0</b>         | <b>min0,40</b> | <b>max3,9</b>     |           | <b>+/- 6</b> | <b>420-540</b>    | <b>min550</b> | <b>min1,25</b> | <b>min14</b> |           |
| 16306665        | 1        | 10        | 6,50                  | 0,52           | 1,45              | 70        | 1,0%         | 448,4             | 707,9         | 1,58           | 15,0         | ok        |
| 16306665        | 2        | 10        | 6,50                  | 0,55           | 1,35              | 70        | 0,7%         | 453,1             | 709,2         | 1,57           | 16,4         | ok        |
| 16306665        | 3        | 10        | 6,50                  | 0,57           | 1,40              | 70        | 1,0%         | 467,3             | 702,5         | 1,50           | 15,2         | ok        |
| 16306665        | 4        | 10        | 6,51                  | 0,56           | 1,39              | 70        | 0,9%         | 483,0             | 701,1         | 1,45           | 15,4         | ok        |
| 16306665        | 5        | 10        | 6,50                  | 0,53           | 1,35              | 70        | 1,0%         | 475,3             | 699,8         | 1,47           | 16,4         | ok        |
| 16306665        | 6        | 10        | 6,50                  | 0,54           | 1,39              | 70        | 0,8%         | 483,4             | 708,2         | 1,47           | 17,7         | ok        |
| 16306665        | 7        | 10        | 6,48                  | 0,54           | 1,34              | 70        | 1,0%         | 481,3             | 710,2         | 1,48           | 16,1         | ok        |
| <b>16306665</b> | <b>x</b> | <b>10</b> | <b>6,5</b>            | <b>0,54</b>    | <b>1,4</b>        | <b>70</b> | <b>0,9%</b>  | <b>470,2</b>      | <b>705,5</b>  | <b>1,50</b>    | <b>16,0</b>  | <b>ok</b> |
| colada: 125ton  |          | max       | 6,5                   | 0,57           | 1,5               | 70        | 1,0%         | 483               | 710           | 1,58           | 17,7         |           |
|                 |          | min       | 6,5                   | 0,52           | 1,3               | 70        | 0,7%         | 448               | 700           | 1,45           | 15,0         |           |



9/29/2016 11:13:18 AM



Method: Fe-10-F  
Comment: Aceros Baja Aleacion Type corr.concentr.  
Type Standard SAE-1026 NUEVO

9/29/2016 11:13:12 AM

ASTM: **E415** Quality: **ANALISIS COMPROBACION** Sample: **16306665**

|           | C     | Si    | Mn    | P      | S      | Cu    | Cr    | Ni    |
|-----------|-------|-------|-------|--------|--------|-------|-------|-------|
|           | %     | %     | %     | %      | %      | %     | %     | %     |
| min       |       |       |       |        |        |       |       |       |
| < x > (1) | 0.289 | 0.142 | 0.886 | 0.0184 | 0.0345 | 0.471 | 0.099 | 0.119 |
| max       | 0.330 | 0.550 | 1.560 | 0.0430 | 0.0530 |       |       |       |

|           | Mo    | Al     | V     | B      | Fe    | C.E.  |  |  |
|-----------|-------|--------|-------|--------|-------|-------|--|--|
|           | %     | %      | %     | %      | %     |       |  |  |
| min       |       |        |       |        |       |       |  |  |
| < x > (1) | 0.021 | 0.0021 | 0.036 | 0.0003 | 97.81 | 0.461 |  |  |
| max       |       |        |       |        |       |       |  |  |

ACERIA DEL ECUADOR C.A.

CONTROL DE CALIDAD

Vanessa Valladares  
Jefe de Calidad Laminados

Lugar y fecha impresión:  
Aloag, 07/10/2016

Norma referencia:  
NTE INEN 2167:2011

| colada          | ID       | φ         | ENSAYOS DIMENSIONALES |                |                   |           |              | ENSAYOS MECANICOS |               |                |              | doblado   |
|-----------------|----------|-----------|-----------------------|----------------|-------------------|-----------|--------------|-------------------|---------------|----------------|--------------|-----------|
|                 |          |           | espac. resalt         | altura resalt  | ancho base resalt | α         | tol masa     | Fy                | Fu            | Fu / Fy        | alargamiento |           |
|                 |          |           | mm                    | mm             | mm                | °         | %            | MPa               | MPa           |                | %            | 180°      |
|                 |          |           | <b>max11,2</b>        | <b>min0,72</b> | <b>max6,2</b>     |           | <b>+/- 6</b> | <b>420-540</b>    | <b>min550</b> | <b>min1,25</b> | <b>min14</b> |           |
| 16306827        | 1        | 16        | 10,25                 | 0,93           | 0,93              | 70        | 0,5%         | 482,8             | 719,9         | 1,49           | 14,5         | ok        |
| 16306827        | 2        | 16        | 10,25                 | 0,91           | 0,93              | 70        | 0,4%         | 505,2             | 727,6         | 1,44           | 14,0         | ok        |
| 16306827        | 3        | 16        | 10,25                 | 0,91           | 0,95              | 70        | 0,5%         | 454,1             | 712,4         | 1,57           | 16,5         | ok        |
| 16306827        | 4        | 16        | 10,25                 | 0,96           | 0,97              | 70        | -0,1%        | 469,1             | 716,7         | 1,53           | 17,5         | ok        |
| 16306827        | 5        | 16        | 10,25                 | 0,89           | 0,97              | 70        | 0,3%         | 501,1             | 723,7         | 1,44           | 17,0         | ok        |
| 16306827        | 6        | 16        | 10,25                 | 0,92           | 0,95              | 70        | 0,5%         | 466,7             | 724,7         | 1,55           | 18,5         | ok        |
| 16306827        | 7        | 16        | 10,23                 | 0,88           | 0,93              | 70        | 0,2%         | 500,2             | 722,6         | 1,44           | 18,5         | ok        |
| <b>16306827</b> | <b>x</b> | <b>16</b> | <b>10,2</b>           | <b>0,91</b>    | <b>0,9</b>        | <b>70</b> | <b>0,3%</b>  | <b>482,8</b>      | <b>721,1</b>  | <b>1,50</b>    | <b>16,6</b>  | <b>ok</b> |
| colada: 129ton  |          | max       | 10,3                  | 0,96           | 1,0               | 70        | 0,5%         | 505               | 728           | 1,57           | 18,5         |           |
|                 |          | min       | 10,2                  | 0,88           | 0,9               | 70        | -0,1%        | 454               | 712           | 1,44           | 14,0         |           |

Method: Fe-10-F  
Comment: Aceros Baja Aleacion Type corr.concentr.  
Type Standard: SAE-1026 NUEVO

9/30/2016 10:28:17 AM

ASTM: E415 Quality: ANALISIS COMPROBACION Sample: 16306827

|           | C     | Si    | Mn    | P      | S      | Cu    | Cr    | Ni    |
|-----------|-------|-------|-------|--------|--------|-------|-------|-------|
|           | %     | %     | %     | %      | %      | %     | %     | %     |
| min       |       |       |       |        |        |       |       |       |
| < x > (7) | 0.303 | 0.179 | 0.845 | 0.0189 | 0.0232 | 0.454 | 0.136 | 0.137 |
| max       | 0.330 | 0.550 | 1.560 | 0.0430 | 0.0530 |       |       |       |

|           | Mo    | Al     | V     | B      | Fe    | C.E.  |  |  |
|-----------|-------|--------|-------|--------|-------|-------|--|--|
|           | %     | %      | %     | %      | %     |       |  |  |
| min       |       |        |       |        |       |       |  |  |
| < x > (7) | 0.020 | 0.0024 | 0.043 | 0.0007 | 97.76 | 0.471 |  |  |
| max       |       |        |       |        |       |       |  |  |

Lugar y fecha impresión:  
Aloag, 07/10/2016

Norma referencia:  
NTE INEN 2167:2011

| colada          | ID       | φ         | ENSAYOS DIMENSIONALES |               |                   |           |             | ENSAYOS MECANICOS |              |             |              |           | doblado |
|-----------------|----------|-----------|-----------------------|---------------|-------------------|-----------|-------------|-------------------|--------------|-------------|--------------|-----------|---------|
|                 |          |           | espac. resalt         | altura resalt | ancho base resalt | α         | tol masa    | Fy                | Fu           | Fu / Fy     | alargamiento |           |         |
|                 |          |           | mm                    | mm            | mm                | °         | %           | MPa               | MPa          |             | %            | 180°      |         |
|                 |          |           | max11,2               | min0,72       | max6,2            |           | +/- 6       | 420-540           | min550       | min1,25     | min14        |           |         |
| 16306741        | 1        | 16        | 10,3                  | 0,90          | 1,79              | 70        | 0,5%        | 443,1             | 694,2        | 1,57        | 18,6         | ok        |         |
| 16306741        | 2        | 16        | 10,3                  | 0,93          | 1,89              | 70        | 0,4%        | 435,5             | 674,5        | 1,55        | 17,2         | ok        |         |
| 16306741        | 3        | 16        | 10,3                  | 0,95          | 1,93              | 70        | 0,4%        | 508,3             | 690,5        | 1,36        | 17,9         | ok        |         |
| 16306741        | 4        | 16        | 10,3                  | 0,89          | 1,85              | 70        | 0,6%        | 490,4             | 686,1        | 1,40        | 17,2         | ok        |         |
| 16306741        | 5        | 16        | 10,3                  | 0,93          | 1,90              | 70        | 1,1%        | 470,5             | 691,5        | 1,47        | 14,0         | ok        |         |
| 16306741        | 6        | 16        | 10,3                  | 0,91          | 1,88              | 70        | 0,8%        | 467,2             | 696,1        | 1,49        | 14,6         | ok        |         |
| 16306741        | 7        | 16        | 10,3                  | 0,97          | 1,82              | 70        | 0,5%        | 475,5             | 695,0        | 1,46        | 14,0         | ok        |         |
| <b>16306741</b> | <b>x</b> | <b>16</b> | <b>10,3</b>           | <b>0,93</b>   | <b>1,9</b>        | <b>70</b> | <b>0,6%</b> | <b>470,1</b>      | <b>689,7</b> | <b>1,47</b> | <b>16,2</b>  | <b>ok</b> |         |
| colada: 129ton  |          | max       | 10,3                  | 0,97          | 1,9               | 70        | 1,1%        | 508               | 696          | 1,57        | 18,6         |           |         |
|                 |          | min       | 10,3                  | 0,89          | 1,8               | 70        | 0,4%        | 436               | 675          | 1,36        | 14,0         |           |         |

Method: Fe-10-F  
Comment: Aceros Baja Aleacion Type corr.concentr.  
Type Standard: SAE-1026 NUEVO

9/30/2016 9:24:07 AM

ASTM: E415 Quality: ANALISIS COMPROBACION Sample: 16306741

|           | C     | Si    | Mn    | P      | S      | Cu    | Cr    | Ni    |
|-----------|-------|-------|-------|--------|--------|-------|-------|-------|
|           | %     | %     | %     | %      | %      | %     | %     | %     |
| min       |       |       |       |        |        |       |       |       |
| < x > (7) | 0.284 | 0.172 | 0.923 | 0.0139 | 0.0282 | 0.338 | 0.108 | 0.113 |
| max       | 0.330 | 0.550 | 1.560 | 0.0430 | 0.0530 |       |       |       |

|           | Mo    | Al     | V     | B      | Fe    | C.E.  |  |  |
|-----------|-------|--------|-------|--------|-------|-------|--|--|
|           | %     | %      | %     | %      | %     |       |  |  |
| min       |       |        |       |        |       |       |  |  |
| < x > (7) | 0.018 | 0.0045 | 0.042 | 0.0007 | 97.88 | 0.458 |  |  |
| max       |       |        |       |        |       |       |  |  |

ACERIA DEL ECUADOR C.A.



CONTROL DE CALIDAD

Vanessa Valladares  
Jefe de Calidad Laminados

Lugar y fecha impresión:  
Aloag, 07/10/2016

Norma referencia:  
NTE INEN 2167:2011

| colada          | ID       | φ         | ENSAYOS DIMENSIONALES |                |                   |           |              | ENSAYOS MECANICOS |               |                |              |           | doblado |
|-----------------|----------|-----------|-----------------------|----------------|-------------------|-----------|--------------|-------------------|---------------|----------------|--------------|-----------|---------|
|                 |          |           | espac. resalt         | altura resalt  | ancho base resalt | α         | tol masa     | Fy                | Fu            | Fu / Fy        | alargamiento |           |         |
|                 |          |           | mm                    | mm             | mm                | °         | %            | MPa               | MPa           |                | %            | 180°      |         |
|                 |          |           | <b>max11,2</b>        | <b>min0,72</b> | <b>max6,2</b>     |           | <b>+/- 6</b> | <b>420-540</b>    | <b>min550</b> | <b>min1,25</b> | <b>min14</b> |           |         |
| 16306730        | 1        | 16        | 10,35                 | 0,75           | 1,90              | 70        | 0,5%         | 450,1             | 702,5         | 1,56           | 14,0         | ok        |         |
| 16306730        | 2        | 16        | 10,35                 | 0,74           | 2,00              | 70        | 0,3%         | 542,5             | 713,2         | 1,31           | 14,3         | ok        |         |
| 16306730        | 3        | 16        | 10,35                 | 0,74           | 1,90              | 70        | 0,1%         | 513,4             | 716,8         | 1,40           | 16,2         | ok        |         |
| 16306730        | 4        | 16        | 10,30                 | 0,75           | 1,94              | 70        | -0,1%        | 531,2             | 717,1         | 1,35           | 14,0         | ok        |         |
| 16306730        | 5        | 16        | 10,30                 | 0,79           | 1,94              | 70        | -0,3%        | 532,5             | 718,0         | 1,35           | 14,0         | ok        |         |
| 16306730        | 6        | 16        | 10,31                 | 0,84           | 2,00              | 70        | 0,2%         | 510,4             | 723,0         | 1,42           | 15,6         | ok        |         |
| <b>16306730</b> | <b>x</b> | <b>16</b> | <b>10,3</b>           | <b>0,77</b>    | <b>1,9</b>        | <b>70</b> | <b>0,1%</b>  | <b>513,3</b>      | <b>715,1</b>  | <b>1,40</b>    | <b>14,7</b>  | <b>ok</b> |         |
| colada: 121ton  |          | max       | 10,4                  | 0,84           | 2,0               | 70        | 0,5%         | 543               | 723           | 1,56           | 16,2         |           |         |
|                 |          | min       | 10,3                  | 0,74           | 1,9               | 70        | -0,3%        | 450               | 703           | 1,31           | 14,0         |           |         |

Method: Fe-10-F

9/30/2016 9:44:58 AM

Comment: Aceros Baja Aleacion

Type corr.concentr.

Type Standard: SAE-1026 NUEVO

ASTM:  
**E415**

Quality:  
**ANALISIS COMPROBACION**

Sample:  
**16306730**

|           | C     | Si    | Mn    | P      | S      | Cu    | Cr    | Ni    |
|-----------|-------|-------|-------|--------|--------|-------|-------|-------|
|           | %     | %     | %     | %      | %      | %     | %     | %     |
| min       |       |       |       |        |        |       |       |       |
| < x > (1) | 0.293 | 0.145 | 0.850 | 0.0157 | 0.0254 | 0.393 | 0.184 | 0.123 |
| max       | 0.330 | 0.550 | 1.560 | 0.0430 | 0.0530 |       |       |       |

|           | Mo    | Al     | V     | B      | Fe    | C.E.  |  |  |
|-----------|-------|--------|-------|--------|-------|-------|--|--|
|           | %     | %      | %     | %      | %     |       |  |  |
| min       |       |        |       |        |       |       |  |  |
| < x > (1) | 0.018 | 0.0020 | 0.044 | 0.0006 | 97.84 | 0.464 |  |  |
| max       |       |        |       |        |       |       |  |  |

ACERIA DEL ECUADOR C.A.



CONTROL DE CALIDAD

Vanessa Valladares  
Jefe de Calidad Laminados

Lugar y fecha impresión:  
Aloag, 10/10/2016

Norma referencia:  
NTE INEN 2167:2011

| colada          | ID       | φ         | ENSAYOS DIMENSIONALES |               |                   |           |             | ENSAYOS MECANICOS |              |             |              |           |
|-----------------|----------|-----------|-----------------------|---------------|-------------------|-----------|-------------|-------------------|--------------|-------------|--------------|-----------|
|                 |          |           | espac. resalt         | altura resalt | ancho base resalt | α         | tol masa    | Fy                | Fu           | Fu / Fy     | alargamiento | doblado   |
|                 |          |           | mm                    | mm            | mm                | °         | %           | MPa               | MPa          |             | %            | 180°      |
|                 |          |           | max7,0                | min0,40       | max3,9            |           | +/- 6       | 420-540           | min550       | min1,25     | min14        |           |
| 16306691        | 1        | 10        | 6,50                  | 0,56          | 1,22              | 70        | 1,8%        | 438,2             | 669,8        | 1,53        | 16,8         | ok        |
| 16306691        | 2        | 10        | 6,50                  | 0,57          | 1,12              | 70        | 0,4%        | 499,5             | 667,8        | 1,34        | 17,1         | ok        |
| 16306691        | 3        | 10        | 6,49                  | 0,51          | 1,19              | 70        | -0,2%       | 446,6             | 663,7        | 1,49        | 16,3         | ok        |
| 16306691        | 4        | 10        | 6,49                  | 0,54          | 1,17              | 70        | 0,6%        | 451,2             | 668,2        | 1,48        | 16,0         | ok        |
| 16306691        | 5        | 10        | 6,50                  | 0,52          | 1,15              | 70        | -0,1%       | 453,2             | 675,5        | 1,49        | 15,0         | ok        |
| 16306691        | 6        | 10        | 6,52                  | 0,58          | 1,11              | 70        | 0,5%        | 450,66            | 652,3        | 1,45        | 15,6         | ok        |
| 16306691        | 7        | 10        | 6,52                  | 0,56          | 1,13              | 70        | -1,0%       | 460,3             | 681,6        | 1,48        | 14,8         | ok        |
| <b>16306691</b> | <b>x</b> | <b>10</b> | <b>6,5</b>            | <b>0,55</b>   | <b>1,2</b>        | <b>70</b> | <b>0,3%</b> | <b>457,1</b>      | <b>668,4</b> | <b>1,47</b> | <b>15,9</b>  | <b>ok</b> |
| colada: 126ton  |          | max       | 6,5                   | 0,58          | 1,2               | 70        | 1,8%        | 500               | 682          | 1,53        | 17,1         |           |
|                 |          | min       | 6,5                   | 0,51          | 1,1               | 70        | -1,0%       | 438               | 652          | 1,34        | 14,8         |           |

Method: Fe-10-F  
Comment: Aceros Baja Aleacion Type corr.concentr.  
Type Standard SAE-1026 NUEVO

9/29/2016 10:53:51 AM

ASTM: E415 Quality: ANALISIS COMPROBACION Sample: 16306691

|           | C     | Si    | Mn    | P      | S      | Cu    | Cr    | Ni    |
|-----------|-------|-------|-------|--------|--------|-------|-------|-------|
|           | %     | %     | %     | %      | %      | %     | %     | %     |
| min       |       |       |       |        |        |       |       |       |
| < x > (7) | 0.293 | 0.140 | 0.838 | 0.0152 | 0.0359 | 0.469 | 0.076 | 0.112 |
| max       | 0.330 | 0.550 | 1.560 | 0.0430 | 0.0530 |       |       |       |

|           | Mo    | Al     | V     | B        | Fe    | C.E.  |  |  |
|-----------|-------|--------|-------|----------|-------|-------|--|--|
|           | %     | %      | %     | %        | %     |       |  |  |
| min       |       |        |       |          |       |       |  |  |
| < x > (7) | 0.016 | 0.0039 | 0.035 | < 0.0002 | 97.89 | 0.454 |  |  |
| max       |       |        |       |          |       |       |  |  |

ACERIA DEL ECUADOR C.A.



CONTROL DE CALIDAD

Vanessa Valladares  
Jefe de Calidad Laminados

Lugar y fecha impresión:  
Aloag, 30/09/2016

Norma referencia:  
NTE INEN 2167:2011

| colada          | ID       | φ         | ENSAYOS DIMENSIONALES |                |                   |           |              | ENSAYOS MECANICOS |               |                |              |           | doblado |
|-----------------|----------|-----------|-----------------------|----------------|-------------------|-----------|--------------|-------------------|---------------|----------------|--------------|-----------|---------|
|                 |          |           | espac. resalt         | altura resalt  | ancho base resalt | α         | tol masa     | Fy                | Fu            | Fu / Fy        | alargamiento |           |         |
|                 |          |           | mm                    | mm             | mm                | °         | %            | MPa               | MPa           |                | %            | 180°      |         |
|                 |          |           | <b>max8,4</b>         | <b>min0,48</b> | <b>max4,7</b>     |           | <b>+/- 6</b> | <b>420-540</b>    | <b>min550</b> | <b>min1,25</b> | <b>min14</b> |           |         |
| 16306863        | 1        | 12        | 7,74                  | 0,67           | 1,50              | 70        | 0,0%         | 463,9             | 673,0         | 1,45           | 16,0         | ok        |         |
| 16306863        | 2        | 12        | 7,74                  | 0,95           | 1,30              | 70        | 0,1%         | 459,7             | 677,1         | 1,47           | 18,0         | ok        |         |
| 16306863        | 3        | 12        | 7,74                  | 0,60           | 1,31              | 70        | 0,2%         | 472,5             | 671,4         | 1,42           | 16,7         | ok        |         |
| 16306863        | 4        | 12        | 7,74                  | 0,70           | 1,40              | 70        | 0,1%         | 468,1             | 674,4         | 1,44           | 15,1         | ok        |         |
| 16306863        | 5        | 12        | 7,74                  | 0,68           | 1,50              | 70        | 0,1%         | 470,8             | 677,5         | 1,44           | 16,9         | ok        |         |
| 16306863        | 6        | 12        | 7,74                  | 0,67           | 1,45              | 70        | 0,3%         | 450,9             | 674,9         | 1,50           | 16,9         | ok        |         |
| 16306863        | 7        | 12        | 7,76                  | 0,68           | 1,33              | 70        | 0,2%         | 472,1             | 680,9         | 1,44           | 16,5         | ok        |         |
| <b>16306863</b> | <b>x</b> | <b>12</b> | <b>7,7</b>            | <b>0,71</b>    | <b>1,4</b>        | <b>70</b> | <b>0,1%</b>  | <b>465,4</b>      | <b>675,6</b>  | <b>1,45</b>    | <b>16,6</b>  | <b>ok</b> |         |
| colada: 129ton  | max      |           | 7,8                   | 1,0            | 1,5               | 70        | 0,3%         | 472               | 681           | 1,50           | 18,0         |           |         |
|                 | min      |           | 7,7                   | 0,6            | 1,3               | 70        | 0,0%         | 451               | 671           | 1,42           | 15,1         |           |         |

Method: Fe-10-F  
Comment: Aceros Baja Aleacion Type corr.concentr.  
Type Standard: SAE-1026 NUEVO

9/28/2016 2:01:36 PM

ASTM: E415 Quality: ANALISIS COMPROBACION Sample: 16306863

|           | C     | Si    | Mn    | P      | S      | Cu    | Cr    | Ni    |
|-----------|-------|-------|-------|--------|--------|-------|-------|-------|
|           | %     | %     | %     | %      | %      | %     | %     | %     |
| min       |       |       |       |        |        |       |       |       |
| < x > (7) | 0.292 | 0.148 | 0.782 | 0.0185 | 0.0177 | 0.441 | 0.107 | 0.117 |
| max       | 0.330 | 0.550 | 1.560 | 0.0430 | 0.0530 |       |       |       |

|           | Mo    | Al     | V     | B        | Fe    | C.E.  |  |  |
|-----------|-------|--------|-------|----------|-------|-------|--|--|
|           | %     | %      | %     | %        | %     |       |  |  |
| min       |       |        |       |          |       |       |  |  |
| < x > (7) | 0.024 | 0.0027 | 0.031 | < 0.0002 | 97.94 | 0.447 |  |  |
| max       |       |        |       |          |       |       |  |  |



Lugar y fecha impresión:  
Aloag, 10/10/2016

Norma referencia:  
NTE INEN 2167:2011

| colada          | ID       | φ         | ENSAYOS DIMENSIONALES |                |                   |           |              | ENSAYOS MECANICOS |               |                |              |           |
|-----------------|----------|-----------|-----------------------|----------------|-------------------|-----------|--------------|-------------------|---------------|----------------|--------------|-----------|
|                 |          |           | espac. resalt         | altura resalt  | ancho base resalt | α         | tol masa     | Fy                | Fu            | Fu / Fy        | alargamiento | doblado   |
|                 |          |           | mm                    | mm             | mm                | °         | %            | MPa               | MPa           |                | %            | 180°      |
|                 |          |           | <b>max7,0</b>         | <b>min0,40</b> | <b>max3,9</b>     |           | <b>+/- 6</b> | <b>420-540</b>    | <b>min550</b> | <b>min1,25</b> | <b>min14</b> |           |
| 16106566        | 1        | 10        | 6,47                  | 0,49           | 1,21              | 70        | 0,5%         | 452,2             | 669,1         | 1,48           | 15,7         | ok        |
| 16106566        | 2        | 10        | 6,47                  | 0,55           | 1,05              | 70        | 2,3%         | 469,1             | 687,5         | 1,47           | 15,9         | ok        |
| 16106566        | 3        | 10        | 6,47                  | 0,57           | 1,10              | 70        | 0,2%         | 463,3             | 653,2         | 1,41           | 14,8         | ok        |
| 16106566        | 4        | 10        | 6,49                  | 0,55           | 1,16              | 70        | 0,6%         | 433,4             | 666,5         | 1,54           | 15,9         | ok        |
| 16106566        | 5        | 10        | 6,49                  | 0,48           | 1,15              | 70        | 1,0%         | 439,2             | 708,3         | 1,61           | 14,8         | ok        |
| 16106566        | 6        | 10        | 6,46                  | 0,58           | 1,19              | 70        | 0,0%         | 446,1             | 664,1         | 1,49           | 15,6         | ok        |
| 16106566        | 7        | 10        | 6,46                  | 0,56           | 1,20              | 70        | 0,5%         | 475,0             | 670,7         | 1,41           | 15,1         | ok        |
| <b>16106566</b> | <b>x</b> | <b>10</b> | <b>6,5</b>            | <b>0,54</b>    | <b>1,2</b>        | <b>70</b> | <b>0,7%</b>  | <b>454,0</b>      | <b>674,2</b>  | <b>1,49</b>    | <b>15,4</b>  | <b>ok</b> |
| colada: 126ton  |          | max       | 6,5                   | 0,58           | 1,2               | 70        | 2,3%         | 475               | 708           | 1,61           | 15,9         |           |
|                 |          | min       | 6,5                   | 0,48           | 1,1               | 70        | 0,0%         | 433               | 653           | 1,41           | 14,8         |           |



9/29/2016 11:10:46 AM



Method: Fe-10-F 9/29/2016 11:10:40 AM  
 Comment: Aceros Baja Aleacion Type corr.concentr.  
 Type Standard SAE-1026 NUEVO

ASTM: **E415** Quality: **ANALISIS COMPROBACION** Sample: **16106566**

|           | C     | Si    | Mn    | P      | S      | Cu    | Cr    | Ni    |
|-----------|-------|-------|-------|--------|--------|-------|-------|-------|
|           | %     | %     | %     | %      | %      | %     | %     | %     |
| min       |       |       |       |        |        |       |       |       |
| < x > (7) | 0.306 | 0.160 | 0.896 | 0.0144 | 0.0378 | 0.389 | 0.055 | 0.109 |
| max       | 0.330 | 0.550 | 1.560 | 0.0430 | 0.0530 |       |       |       |

|           | Mo    | Al     | V     | B      | Fe    | C.E.  |  |  |
|-----------|-------|--------|-------|--------|-------|-------|--|--|
|           | %     | %      | %     | %      | %     |       |  |  |
| min       |       |        |       |        |       |       |  |  |
| < x > (7) | 0.016 | 0.0026 | 0.034 | 0.0004 | 97.91 | 0.472 |  |  |
| max       |       |        |       |        |       |       |  |  |

ACERIA DEL ECUADOR C.A.



CONTROL DE CALIDAD

Vanessa Valladares  
Jefe de Calidad Laminados

Lugar y fecha impresión:  
Aloag, 10/10/2016

Norma referencia:  
NTE INEN 2167:2011

| colada          | ID       | φ         | ENSAYOS DIMENSIONALES |                |                   |           |              | ENSAYOS MECANICOS |               |                |              |           |
|-----------------|----------|-----------|-----------------------|----------------|-------------------|-----------|--------------|-------------------|---------------|----------------|--------------|-----------|
|                 |          |           | espac. resalt         | altura resalt  | ancho base resalt | α         | tol masa     | Fy                | Fu            | Fu / Fy        | alargamiento | doblado   |
|                 |          |           | mm                    | mm             | mm                | °         | %            | MPa               | MPa           |                | %            | 180°      |
|                 |          |           | <b>max7,0</b>         | <b>min0,40</b> | <b>max3,9</b>     |           | <b>+/- 6</b> | <b>420-540</b>    | <b>min550</b> | <b>min1,25</b> | <b>min14</b> |           |
| 16306686        | 1        | 10        | 6,48                  | 0,49           | 1,33              | 70        | 0,6%         | 433,2             | 661,9         | 1,53           | 15,0         | ok        |
| 16306686        | 2        | 10        | 6,51                  | 0,60           | 1,35              | 70        | 0,4%         | 434,1             | 654,6         | 1,51           | 15,1         | ok        |
| 16306686        | 3        | 10        | 6,48                  | 0,50           | 1,40              | 70        | 0,2%         | 437,6             | 651,9         | 1,49           | 15,4         | ok        |
| 16306686        | 4        | 10        | 6,48                  | 0,51           | 1,39              | 70        | 0,2%         | 423,0             | 659,1         | 1,63           | 14,6         | ok        |
| 16306686        | 5        | 10        | 6,50                  | 0,55           | 1,37              | 70        | -0,1%        | 451,1             | 656,5         | 1,46           | 15,0         | ok        |
| 16306686        | 6        | 10        | 6,48                  | 0,52           | 1,35              | 70        | 0,2%         | 440,2             | 644,3         | 1,46           | 15,5         | ok        |
| 16306686        | 7        | 10        | 6,50                  | 0,49           | 1,33              | 70        | 0,0%         | 420,0             | 658,3         | 1,57           | 16,6         | ok        |
| <b>16306686</b> | <b>x</b> | <b>10</b> | <b>6,5</b>            | <b>0,52</b>    | <b>1,4</b>        | <b>70</b> | <b>0,2%</b>  | <b>443,5</b>      | <b>664,3</b>  | <b>1,50</b>    | <b>15,5</b>  | <b>ok</b> |
| colada: 126ton  |          | max       | 6,5                   | 0,60           | 1,4               | 70        | 0,6%         | 504               | 700           | 1,63           | 17,5         |           |
|                 |          | min       | 6,5                   | 0,49           | 1,3               | 70        | -0,1%        | 420               | 644           | 1,37           | 14,6         |           |



9/29/2016 11:18:40 AM



Method: Fe-10-F  
Comment: Aceros Baja Aleacion Type corr.concentr.  
Type Standard SAE-1026 NUEVO

9/29/2016 11:18:36 AM

ASTM: E415 Quality: ANALISIS COMPROBACION Sample: 16306686

|           | C     | Si    | Mn    | P      | S      | Cu    | Cr    | Ni    |
|-----------|-------|-------|-------|--------|--------|-------|-------|-------|
|           | %     | %     | %     | %      | %      | %     | %     | %     |
| min       |       |       |       |        |        |       |       |       |
| < x > (7) | 0.283 | 0.152 | 0.853 | 0.0157 | 0.0320 | 0.293 | 0.060 | 0.082 |
| max       | 0.330 | 0.550 | 1.560 | 0.0430 | 0.0530 |       |       |       |

|           | Mo    | Al     | V     | B        | Fe    | C.E.  |  |  |
|-----------|-------|--------|-------|----------|-------|-------|--|--|
|           | %     | %      | %     | %        | %     |       |  |  |
| min       |       |        |       |          |       |       |  |  |
| < x > (7) | 0.012 | 0.0027 | 0.036 | < 0.0002 | 98.10 | 0.438 |  |  |
| max       |       |        |       |          |       |       |  |  |

ACERIA DEL ECUADOR C.A.

CONTROL DE CALIDAD

Vanessa Valladares  
Jefe de Calidad Laminados

Lugar y fecha impresión:  
Aloag, 30/09/2016

Norma referencia:  
NTE INEN 2167:2011

| colada          | ID       | φ         | ENSAYOS DIMENSIONALES |                |                   |           |              | ENSAYOS MECANICOS |               |                |              |           | doblado |
|-----------------|----------|-----------|-----------------------|----------------|-------------------|-----------|--------------|-------------------|---------------|----------------|--------------|-----------|---------|
|                 |          |           | espac. resalt         | altura resalt  | ancho base resalt | α         | tol masa     | Fy                | Fu            | Fu / Fy        | alargamiento |           |         |
|                 |          |           | mm                    | mm             | mm                | °         | %            | MPa               | MPa           |                | %            | 180°      |         |
|                 |          |           | <b>max8,4</b>         | <b>min0,48</b> | <b>max4,7</b>     |           | <b>+/- 6</b> | <b>420-540</b>    | <b>min550</b> | <b>min1,25</b> | <b>min14</b> |           |         |
| 16106593        | 1        | 12        | 7,8                   | 0,71           | 1,65              | 70        | 0,6%         | 472,6             | 693,3         | 1,47           | 18,2         | ok        |         |
| 16106593        | 2        | 12        | 7,8                   | 0,64           | 1,70              | 70        | 0,6%         | 474,5             | 684,2         | 1,44           | 16,0         | ok        |         |
| 16106593        | 3        | 12        | 7,8                   | 0,55           | 1,66              | 70        | 1,5%         | 474,3             | 692,6         | 1,46           | 16,3         | ok        |         |
| 16106593        | 4        | 12        | 7,8                   | 0,7            | 1,67              | 70        | 2,0%         | 467,0             | 691,0         | 1,48           | 14,0         | ok        |         |
| 16106593        | 5        | 12        | 7,8                   | 0,71           | 1,65              | 70        | 0,6%         | 467,8             | 689,9         | 1,47           | 18,5         | ok        |         |
| 16106593        | 6        | 12        | 7,8                   | 0,70           | 1,70              | 70        | 0,4%         | 486,0             | 687,0         | 1,41           | 14,0         | ok        |         |
| 16106593        | 7        | 12        | 8,0                   | 0,64           | 1,42              | 70        | 0,6%         | 461,3             | 666,8         | 1,45           | 16,0         | ok        |         |
| 16106593        | 8        | 12        | 8,0                   | 0,64           | 1,42              | 70        | 1,8%         | 444,0             | 652,9         | 1,47           | 16,0         | ok        |         |
| 16106593        | 9        | 12        | 8,0                   | 0,71           | 1,32              | 70        | 0,8%         | 448,3             | 660,7         | 1,47           | 18,5         | ok        |         |
| 16106593        | 10       | 12        | 8,0                   | 0,60           | 1,51              | 70        | 0,5%         | 447,4             | 652,9         | 1,46           | 14,5         | ok        |         |
| 16106593        | 11       | 12        | 8,0                   | 0,66           | 1,48              | 70        | 0,7%         | 458,7             | 652,9         | 1,42           | 16,0         | ok        |         |
| 16106593        | 12       | 12        | 8,0                   | 0,64           | 1,42              | 70        | 0,9%         | 457,8             | 664,2         | 1,45           | 15,0         | ok        |         |
| <b>16106593</b> | <b>x</b> | <b>12</b> | <b>7,9</b>            | <b>0,66</b>    | <b>1,5</b>        | <b>70</b> | <b>0,9%</b>  | <b>463,3</b>      | <b>674,0</b>  | <b>1,45</b>    | <b>16,1</b>  | <b>ok</b> |         |
| colada: 131ton  | max      |           | 8,0                   | 0,7            | 1,7               | 70        | 2,0%         | 486               | 693           | 1,48           | 18,5         |           |         |
|                 | min      |           | 7,8                   | 0,6            | 1,3               | 70        | 0,4%         | 444               | 653           | 1,41           | 14,0         |           |         |

Method: Fe-10-F

9/28/2016 3:24:51 PM

Comment: Aceros Baja Aleacion

Type corr.concentr.

Type Standard: SAE-1026 NUEVO

ASTM:  
**E415**

Quality:  
**ANALISIS COMPROBACION**

Sample:  
**16106593**

|           | C            | Si           | Mn           | P             | S             | Cu           | Cr           | Ni           |
|-----------|--------------|--------------|--------------|---------------|---------------|--------------|--------------|--------------|
|           | %            | %            | %            | %             | %             | %            | %            | %            |
| min       |              |              |              |               |               |              |              |              |
| < x > (7) | <b>0.270</b> | <b>0.167</b> | <b>0.870</b> | <b>0.0198</b> | <b>0.0474</b> | <b>0.448</b> | <b>0.104</b> | <b>0.130</b> |
| max       | 0.330        | 0.550        | 1.560        | 0.0430        | 0.0530        |              |              |              |

|           | Mo           | Al            | V            | B             | Fe           | C.E.         |  |  |
|-----------|--------------|---------------|--------------|---------------|--------------|--------------|--|--|
|           | %            | %             | %            | %             | %            | I            |  |  |
| min       |              |               |              |               |              |              |  |  |
| < x > (7) | <b>0.022</b> | <b>0.0018</b> | <b>0.042</b> | <b>0.0005</b> | <b>97.79</b> | <b>0.439</b> |  |  |
| max       |              |               |              |               |              |              |  |  |

ACERIA DEL ECUADOR C.A.



CONTROL DE CALIDAD

Vanessa Valladares  
Jefe de Calidad Laminados

Lugar y fecha impresión:  
Aloag, 31/01/2017

Norma referencia:  
NTE INEN 2167:2011

| colada          | ID       | φ         | ENSAYOS DIMENSIONALES |               |                   |           |             | ENSAYOS MECANICOS |              |             |              |           | doblado |
|-----------------|----------|-----------|-----------------------|---------------|-------------------|-----------|-------------|-------------------|--------------|-------------|--------------|-----------|---------|
|                 |          |           | espac. resalt         | altura resalt | ancho base resalt | α         | tol masa    | Fy                | Fu           | Fu / Fy     | alargamiento |           |         |
|                 |          |           | mm                    | mm            | mm                | °         | %           | MPa               | MPa          |             | %            | 180°      |         |
|                 |          |           | max8,4                | min0,48       | max4,7            |           | +/- 6       | 420-540           | min550       | min1,25     | min14        |           |         |
| 16306817        | 1        | 12        | 8,0                   | 0,65          | 1,66              | 70        | 1,4%        | 441,8             | 684,5        | 1,55        | 15,6         | ok        |         |
| 16306817        | 2        | 12        | 8,0                   | 0,68          | 1,62              | 70        | -0,3%       | 436,8             | 665,8        | 1,52        | 16,8         | ok        |         |
| 16306817        | 3        | 12        | 7,9                   | 0,64          | 1,76              | 70        | -0,1%       | 438,0             | 679,1        | 1,55        | 15,8         | ok        |         |
| 16306817        | 4        | 12        | 7,7                   | 0,69          | 1,68              | 70        | -0,2%       | 437,5             | 671,1        | 1,53        | 15,0         | ok        |         |
| 16306817        | 5        | 12        | 7,9                   | 0,65          | 1,69              | 70        | 1,0%        | 434,2             | 667,7        | 1,54        | 16,6         | ok        |         |
| 16306817        | 6        | 12        | 8,0                   | 0,64          | 1,75              | 70        | -0,1%       | 444,2             | 675,0        | 1,52        | 17,0         | ok        |         |
| 16306817        | 7        | 12        | 7,9                   | 0,61          | 1,71              | 70        | -0,1%       | 433,8             | 659,2        | 1,52        | 14,7         | ok        |         |
| <b>16306817</b> | <b>x</b> | <b>12</b> | <b>7,9</b>            | <b>0,65</b>   | <b>1,7</b>        | <b>70</b> | <b>0,2%</b> | <b>438,0</b>      | <b>671,8</b> | <b>1,53</b> | <b>15,9</b>  | <b>ok</b> |         |
| colada: 128ton  | max      |           | 8,0                   | 0,7           | 1,8               | 70        | 1,4%        | 444               | 685          | 1,55        | 17,0         |           |         |
|                 | min      |           | 7,7                   | 0,6           | 1,6               | 70        | -0,3%       | 434               | 659          | 1,52        | 14,7         |           |         |

Method: Fe-10-F  
Comment: Aceros Baja Aleacion Type corr.concentr.  
Type Standard SAE-1026 NUEVO

9/7/2016 2:52:35 PM


Area Id: **VARILLA DE ROLLO** Head Id: **16306817** Sample: **12 mm**  
Quality: Orden De Produccion: **80000329** Turno: **2**

|           | C            | Si           | Mn           | P             | S             | Cu           | Cr           | Ni           |
|-----------|--------------|--------------|--------------|---------------|---------------|--------------|--------------|--------------|
|           | %            | %            | %            | %             | %             | %            | %            | %            |
| 1         | 0.304        | 0.147        | 0.833        | 0.0201        | 0.0181        | 0.444        | 0.105        | 0.116        |
| 2         | 0.310        | 0.147        | 0.823        | 0.0209        | 0.0186        | 0.443        | 0.103        | 0.114        |
| < x > (2) | <b>0.307</b> | <b>0.147</b> | <b>0.828</b> | <b>0.0205</b> | <b>0.0184</b> | <b>0.443</b> | <b>0.104</b> | <b>0.115</b> |
| sd        | 0.004        | 0.000        | 0.007        | 0.0006        | 0.0004        | 0.001        | 0.001        | 0.001        |
| rsd       | 1.4          | 0.2          | 0.8          | 2.8           | 2.1           | 0.2          | 1.0          | 1.1          |

|           | Mo           | Al            | Co            | Ti                | Nb           | V            | W                 | Pb                 |
|-----------|--------------|---------------|---------------|-------------------|--------------|--------------|-------------------|--------------------|
|           | %            | %             | %             | %                 | %            | %            | %                 | %                  |
| 1         | 0.026        | 0.0029        | 0.0043        | < 0.001           | 0.003        | 0.036        | < 0.001           | < 0.0030           |
| 2         | 0.025        | 0.0031        | 0.0049        | < 0.001           | 0.001        | 0.035        | < 0.001           | < 0.0030           |
| < x > (2) | <b>0.026</b> | <b>0.0030</b> | <b>0.0046</b> | <b>&lt; 0.001</b> | <b>0.002</b> | <b>0.035</b> | <b>&lt; 0.001</b> | <b>&lt; 0.0030</b> |

|           | La                | Fe           | C.E.         |  |  |  |  |  |
|-----------|-------------------|--------------|--------------|--|--|--|--|--|
|           | %                 | %            |              |  |  |  |  |  |
| 1         | < 0.001           | 97.88        | 0.461        |  |  |  |  |  |
| 2         | < 0.001           | 97.88        | 0.466        |  |  |  |  |  |
| < x > (2) | <b>&lt; 0.001</b> | <b>97.88</b> | <b>0.463</b> |  |  |  |  |  |

ACERIA DEL ECUADOR C.A.

  
CONTROL DE CALIDAD

Vanessa Valladares  
Jefe de Calidad Laminados

Lugar y fecha impresión:  
Aloag, 14/12/2016

Norma referencia:  
NTE INEN 2167:2011

| colada          | ID       | φ         | ENSAYOS DIMENSIONALES |               |                   |           |              | ENSAYOS MECANICOS |              |             |              |           | doblado |
|-----------------|----------|-----------|-----------------------|---------------|-------------------|-----------|--------------|-------------------|--------------|-------------|--------------|-----------|---------|
|                 |          |           | espac. resalt         | altura resalt | ancho base resalt | α         | tol masa     | Fy                | Fu           | Fu / Fy     | alargamiento |           |         |
|                 |          |           | mm                    | mm            | mm                | °         | %            | MPa               | MPa          |             | %            | 180°      |         |
|                 |          |           | max8,4                | min0,48       | max4,7            |           | +/- 6        | 420-540           | min550       | min1,25     | min14        |           |         |
| 16306820        | 1        | 12        | 8,0                   | 0,61          | 1,49              | 70        | -0,4%        | 437,3             | 688,4        | 1,57        | 14,2         | ok        |         |
| 16306820        | 2        | 12        | 8,0                   | 0,73          | 1,46              | 70        | -0,6%        | 465,8             | 673,7        | 1,45        | 14,6         | ok        |         |
| 16306820        | 3        | 12        | 7,8                   | 0,69          | 1,50              | 70        | -0,6%        | 455,6             | 677,3        | 1,49        | 14,0         | ok        |         |
| 16306820        | 4        | 12        | 7,9                   | 0,69          | 1,42              | 70        | -0,1%        | 468,8             | 699,5        | 1,49        | 16,7         | ok        |         |
| 16306820        | 5        | 12        | 7,9                   | 0,71          | 1,49              | 70        | -0,6%        | 452,6             | 697,6        | 1,54        | 14,0         | ok        |         |
| 16306820        | 6        | 12        | 8,0                   | 0,65          | 1,46              | 70        | -0,1%        | 453,6             | 696,0        | 1,53        | 18,5         | ok        |         |
| 16306820        | 7        | 12        | 8,0                   | 0,72          | 1,42              | 70        | 1,9%         | 466,5             | 710,1        | 1,52        | 14,2         | ok        |         |
| <b>16306820</b> | <b>x</b> | <b>12</b> | <b>7,9</b>            | <b>0,69</b>   | <b>1,5</b>        | <b>70</b> | <b>-0,1%</b> | <b>457,2</b>      | <b>691,8</b> | <b>1,51</b> | <b>15,2</b>  | <b>ok</b> |         |
| colada: 127ton  |          | max       | 8,0                   | 0,7           | 1,5               | 70        | 1,9%         | 469               | 710          | 1,57        | 18,5         |           |         |
|                 |          | min       | 7,8                   | 0,6           | 1,4               | 70        | -0,6%        | 437               | 674          | 1,45        | 14,0         |           |         |

Method: Fe-10-F

9/28/2016 11:08:28 AM

Comment: Aceros Baja Aleacion

Type corr.concentr.

Type Standard SAE-1026 NUEVO

ASTM:

Quality:

Sample:

**E415**

**ANALISIS COMPROBACION**

**16306820**

|           | C     | Si    | Mn    | P      | S      | Cu    | Cr    | Ni    |
|-----------|-------|-------|-------|--------|--------|-------|-------|-------|
|           | %     | %     | %     | %      | %      | %     | %     | %     |
| min       |       |       |       |        |        |       |       |       |
| < x > (7) | 0.282 | 0.131 | 0.848 | 0.0142 | 0.0248 | 0.344 | 0.074 | 0.122 |
| max       | 0.330 | 0.550 | 1.560 | 0.0430 | 0.0530 |       |       |       |

|           | Mo    | Al     | V     | B      | Fe    | C.E.  |  |  |
|-----------|-------|--------|-------|--------|-------|-------|--|--|
|           | %     | %      | %     | %      | %     |       |  |  |
| min       |       |        |       |        |       |       |  |  |
| < x > (7) | 0.018 | 0.0026 | 0.040 | 0.0007 | 98.02 | 0.441 |  |  |
| max       |       |        |       |        |       |       |  |  |

ACERIA DEL ECUADOR C.A.



CONTROL DE CALIDAD

Vanessa Valladares  
Jefe de Calidad Laminados

LABORATORIO DE CALIDAD LAMINADOS

LUGAR: ALOAG, km 1 ½ Vía Aloag - Santo Domingo  
 FECHA DE EMISION: 28.02.2017  
 NOMBRE DEL CLIENTE: GLOBAL QUALITY STEEL ECUADOR GQS S.A  
 DIRECCION DEL CLIENTE: AV. AMAZONAS N21-252 Y J. CARRION  
 LOTE DE INSPECCION: 030000047066  
 NRO DE COLADA: 701486  
 ID: 5510

PRODUCTO: 63 VARILLA LAM CORRUG AS42 12X12  
 No PEDIDO: 10007313  
 CONDICIONES DE ENSAYO: TEMP AMB 22 °C

| Fecha      | Características de Inspeccion | Max    | Min    | Resultado de Analisis | UN  | Observaciones |
|------------|-------------------------------|--------|--------|-----------------------|-----|---------------|
| QUIMICO    |                               |        |        |                       |     |               |
| 06.02.2017 | % CARBON (C)                  | 0,300  | 0,260  | 0,274                 | %   | ASTME415      |
| 06.02.2017 | % SILICIO (Si)                | 0,300  | 0,100  | 0,201                 | %   | ASTME415      |
| 06.02.2017 | % MANGANESO (Mn)              | 1,200  | 1,050  | 1,057                 | %   | ASTME415      |
| 06.02.2017 | % FOSFORO (P)                 | 0,035  | 0,000  | 0,014                 | %   | ASTME415      |
| 06.02.2017 | % AZUFRE (S)                  | 0,045  | 0,000  | 0,032                 | %   | ASTME415      |
| 06.02.2017 | % BORO (B)                    | 0,100  | 0,000  | 0,001                 | %   | ASTME415      |
| 06.02.2017 | % CARBON EQUIVALENTE (CE)     | 0,550  | 0,000  | 0,465                 | %   | ASTME415      |
| MECANICO   |                               |        |        |                       |     |               |
| 06.02.2017 | AREA NOM                      | 113,10 | 113,10 | 113,098               | mm2 | NTE INEN 2167 |
| 06.02.2017 | FLUENCIA                      | 550,0  | 420,0  | 450,541               | MPa | NTE INEN 2167 |
| 06.02.2017 | RESISTENCIA                   |        | 560,0  | 612,860               | MPa | NTE INEN 2167 |
| 06.02.2017 | ALARGAMIENTO                  |        | 14,00  | 17,000                | %   | NTE INEN 2167 |
| 06.02.2017 | REL RESIST/FLUENCIA           |        | 1,25   | 1,360                 |     | NTE INEN 2167 |
| 06.02.2017 | DOBLADO                       |        |        | Conforme              |     | NTE INEN 2167 |
| FISICO     |                               |        |        |                       |     |               |
| 06.02.2017 | ESPACIO R TRANSV              | 8,40   |        | 8,211                 | mm  | NTE INEN 2167 |
| 06.02.2017 | ALTURA R TRANSV               |        | 0,48   | 0,597                 | mm  | NTE INEN 2167 |
| 06.02.2017 | ANCHO BASE R LONG             | 4,70   | 0,10   | 1,285                 | mm  | NTE INEN 2167 |
| 06.02.2017 | LONG 12m                      | 12,050 | 11,950 | 12,010                | m   | NTE INEN 2167 |
| 06.02.2017 | APARIENCIA                    |        |        | Conforme              |     | NTE INEN 2167 |



**Observación:**

ADELCA tiene certificación ISO 9001:2008, OHSAS 18001:2007 e ISO 14001:2004 y cuenta con el certificado de conformidad con Sello de Calidad NTE INEN 2167, para VARILLAS DE ACERO CON RESALTE, LAMINADAS EN CALIENTE, SOLDABLES, TERMOTRATADAS, PARA HORMIGON ARMADO.

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Firma:   
 VANESSA VALLADARES  
 CONTROL DE CALIDAD  
 JEFE DE CALIDAD LAMINADOS

Lugar y fecha impresión:  
Aloag, 14/12/2016

Norma referencia:  
NTE INEN 2167:2011

| colada          | ID       | φ         | ENSAYOS DIMENSIONALES |                |                   |           |              | ENSAYOS MECANICOS |               |                |              |           | doblado |
|-----------------|----------|-----------|-----------------------|----------------|-------------------|-----------|--------------|-------------------|---------------|----------------|--------------|-----------|---------|
|                 |          |           | espac. resalt         | altura resalt  | ancho base resalt | α         | tol masa     | Fy                | Fu            | Fu / Fy        | alargamiento |           |         |
|                 |          |           | mm                    | mm             | mm                | °         | %            | MPa               | MPa           |                | %            | 180°      |         |
|                 |          |           | <b>max8,4</b>         | <b>min0,48</b> | <b>max4,7</b>     |           | <b>+/- 6</b> | <b>420-540</b>    | <b>min550</b> | <b>min1,25</b> | <b>min14</b> |           |         |
| 16306820        | 1        | 12        | 8,0                   | 0,61           | 1,49              | 70        | -0,4%        | 437,3             | 688,4         | 1,57           | 14,2         | ok        |         |
| 16306820        | 2        | 12        | 8,0                   | 0,73           | 1,46              | 70        | -0,6%        | 465,8             | 673,7         | 1,45           | 14,6         | ok        |         |
| 16306820        | 3        | 12        | 7,8                   | 0,69           | 1,50              | 70        | -0,6%        | 455,6             | 677,3         | 1,49           | 14,0         | ok        |         |
| 16306820        | 4        | 12        | 7,9                   | 0,69           | 1,42              | 70        | -0,1%        | 468,8             | 699,5         | 1,49           | 16,7         | ok        |         |
| 16306820        | 5        | 12        | 7,9                   | 0,71           | 1,49              | 70        | -0,6%        | 452,6             | 697,6         | 1,54           | 14,0         | ok        |         |
| 16306820        | 6        | 12        | 8,0                   | 0,65           | 1,46              | 70        | -0,1%        | 453,6             | 696,0         | 1,53           | 18,5         | ok        |         |
| 16306820        | 7        | 12        | 8,0                   | 0,72           | 1,42              | 70        | 1,9%         | 466,5             | 710,1         | 1,52           | 14,2         | ok        |         |
| <b>16306820</b> | <b>x</b> | <b>12</b> | <b>7,9</b>            | <b>0,69</b>    | <b>1,5</b>        | <b>70</b> | <b>-0,1%</b> | <b>457,2</b>      | <b>691,8</b>  | <b>1,51</b>    | <b>15,2</b>  | <b>ok</b> |         |
| colada: 127ton  |          | max       | 8,0                   | 0,7            | 1,5               | 70        | 1,9%         | 469               | 710           | 1,57           | 18,5         |           |         |
|                 |          | min       | 7,8                   | 0,6            | 1,4               | 70        | -0,6%        | 437               | 674           | 1,45           | 14,0         |           |         |

Method: Fe-10-F

9/28/2016 11:08:28 AM

Comment: Aceros Baja Aleacion

Type corr.concentr.

Type Standard SAE-1026 NUEVO

ASTM:

Quality:

Sample:

**E415**

**ANALISIS COMPROBACION**

**16306820**

|           | C     | Si    | Mn    | P      | S      | Cu    | Cr    | Ni    |
|-----------|-------|-------|-------|--------|--------|-------|-------|-------|
|           | %     | %     | %     | %      | %      | %     | %     | %     |
| min       |       |       |       |        |        |       |       |       |
| < x > (7) | 0.282 | 0.131 | 0.848 | 0.0142 | 0.0248 | 0.344 | 0.074 | 0.122 |
| max       | 0.330 | 0.550 | 1.560 | 0.0430 | 0.0530 |       |       |       |

|           | Mo    | Al     | V     | B      | Fe    | C.E.  |  |  |
|-----------|-------|--------|-------|--------|-------|-------|--|--|
|           | %     | %      | %     | %      | %     |       |  |  |
| min       |       |        |       |        |       |       |  |  |
| < x > (7) | 0.018 | 0.0026 | 0.040 | 0.0007 | 98.02 | 0.441 |  |  |
| max       |       |        |       |        |       |       |  |  |

ACERIA DEL ECUADOR C.A.



CONTROL DE CALIDAD

Vanessa Valladares  
Jefe de Calidad Laminados





