



**tube forgings**  
OF AMERICA, INC

5200 NW Front Avenue  
Portland, OR 97210



Certificate #: 30248

|                   |                     |                   |          |
|-------------------|---------------------|-------------------|----------|
| <b>TFA Heat:</b>  | J004                | <b>Mill:</b>      | KAWASAKI |
| <b>TFA Grade:</b> | WPB                 | <b>Mill Heat:</b> | 69995-02 |
| <b>Product:</b>   | 18" STD 45 LR ELBOW |                   |          |

*Chemical Properties*

|          |            |
|----------|------------|
| C: 0.15  | CU: 0.01   |
| MN: 0.99 | V: 0.049   |
| P: 0.011 | CB: 0.003  |
| S: 0.004 | B:         |
| SI: 0.23 | TI:        |
| MO: 0.01 | AL:        |
| CR: 0.03 | CE: 0.3341 |
| NI: 0.01 |            |

*Physical Properties*

|                              |       |
|------------------------------|-------|
| <b>Yield PSI:</b>            | 46700 |
| <b>Tensile PSI:</b>          | 72100 |
| <b>Test Bar Type:</b>        | STRIP |
| <b>Tensile Orientation:</b>  | LONG  |
| <b>% Elongation in 2.0":</b> | 48    |
| <b>Brinnell Hardness:</b>    |       |

**Coupon Size:**

**Charpy V Notch Text @:** °

**Charpy Orientation:**

**% Shear**

|    |    |    |             |
|----|----|----|-------------|
| 1: | 2: | 3: | <b>Avg:</b> |
|----|----|----|-------------|

**Joules**

|    |    |    |             |
|----|----|----|-------------|
| 1: | 2: | 3: | <b>Avg:</b> |
|----|----|----|-------------|

**Lateral Expansion (Mils)**

|    |    |    |
|----|----|----|
| 1: | 2: | 3: |
|----|----|----|

1. THESE FITTINGS WERE HOT FORMED BETWEEN 1150F AND 1800F AND AIR COOLED. 2. THE HARDNESS DOES NOT EXCEED 197 BHN PART TO PART. 3. STARTING MATERIAL IS ASTM A 106 GRB SEAMLESS PIPE. 4. THIS PRODUCT IS SEAMLESS.

1. THE MATERIAL IS MANUFACTURED TO ASTM A 234 GRWPB FROM THE 1997 VOLUME, REV 96 A. 2. DESIGN AND DIMENSIONS TO ASME B16.9-93 OR ASME B16.28-94. 3. PER NACE MR-01-75, 98 REVISION.

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