LESCALLOY® 4330+V VAC-ARC®
HIGH STRENGTH ALLOY STEEL

Typical Composition

<table>
<thead>
<tr>
<th></th>
<th>C</th>
<th>Mn</th>
<th>Si</th>
<th>Cr</th>
<th>Ni</th>
<th>Mo</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.30</td>
<td>0.85</td>
<td>0.30</td>
<td>0.85</td>
<td>1.80</td>
<td>0.40</td>
<td>0.07</td>
</tr>
</tbody>
</table>

GENERAL CHARACTERISTICS
LESCALLOY 4330+V VAC-ARC steel is a modification of 4330 steel with hardenability and other properties improved by the addition of vanadium. It is a low alloy steel capable of being heat treated to high strength levels. The alloy is primarily used in the 220 to 240 ksi (1517-1655 MPa) strength range. The comparatively low carbon content of the alloy makes it particularly useful in applications involving shock loading or stress concentration.

PHYSICAL PROPERTIES
Density: 0.283 lb/in³ (7.84 g/cm³)
Specific Heat: 0.16 Btu/lb./°F (0.16 cal/g/°C)

HEAT TREATMENT
Normalize: 1600-1700°F (871-927°C), air cool.
Austenitize: 1550-1600°F (843-871°C), 15 minutes per inch of thickness, oil quench.
Temper: 500-1100°F (260-593°C), depending on desired strength. Temper between 500-700°F (260-371°C) to obtain tensile strengths of 220-240 ksi (1517-1655 MPa).

WORKABILITY
Forging: Forge between 1950 and 2250°F (1066-1232°C). Because of the high hardening capability of the material, preheating and furnace cooling or cooling in ash or lime after forging is recommended.
Machining: Normalize and temper at 1250°F (677°C) maximum prior to rough machining. This steel may also be machined at maximum strength, but machining must then be followed with a stress relieving at approximately 400°F (204°C).
Weldability: The steel has good welding characteristics and can be welded by resistance flash welding.

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MECHANICAL PROPERTIES

TYPICAL TRANSVERSE MECHANICAL PROPERTIES DATA

<table>
<thead>
<tr>
<th>Temperature</th>
<th>U.T.S</th>
<th>0.2% Y.S.</th>
<th>Elong.</th>
<th>R.A.</th>
<th>Hardness</th>
<th>Notched UTS K,7</th>
</tr>
</thead>
<tbody>
<tr>
<td>540°F</td>
<td>282°C</td>
<td>235</td>
<td>1621</td>
<td>195</td>
<td>1345</td>
<td>11.0</td>
</tr>
<tr>
<td>600°F</td>
<td>316°C</td>
<td>225</td>
<td>1552</td>
<td>193</td>
<td>1331</td>
<td>11.0</td>
</tr>
</tbody>
</table>

These data were obtained by averaging the tensile results obtained during an extended program that produced large block sizes of 4330+V steel. Testing was at mid-radius in the transverse direction. The samples were austenitized at 1600°F (871°C) for 1 hour and oil quenched prior to tempering at the above temperatures.

ACTUAL ROOM TEMPERATURE TENSILE AND CHARPY V IMPACT DATA

<table>
<thead>
<tr>
<th>Direction</th>
<th>U.T.S</th>
<th>0.2% Y.S.</th>
<th>Elong.</th>
<th>R.A.</th>
<th>Impact Energy*</th>
<th>Range of Impact Energy*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long.</td>
<td>226</td>
<td>1559</td>
<td>188</td>
<td>1297</td>
<td>13.0</td>
<td>26</td>
</tr>
<tr>
<td>Trans.</td>
<td>222</td>
<td>1531</td>
<td>185</td>
<td>1276</td>
<td>11.5</td>
<td>17</td>
</tr>
</tbody>
</table>

* Average of 8 samples
Samples were obtained from a mid-radius location and heat treated to 45 HRC as follows:
1700°F (927°C) - ½ hour - air cool
1600°F (871°C) - ¼ hour - oil quench
600°F (316°C) - 2 hours

HARDENABILITY

This set of curves relates to the general hardening characteristics of the alloy throughout the cross sections of various size bars. This information covers material austenitized at 1550°F (843°C) and then oil quenched.

SPECIFICATIONS

The following list of popular industry specifications is a general reference. This should not be considered a complete listing.

AMS 6411          BMS 7-27 (Boeing)
AMS 6427          FMS 1012 (General Dynamics)
CE-0906 (Bendix)  EMS 96242 (Honeywell)
BMS 7-122 (Boeing)