

Table 3 Chemical Requirements for Alloy Steels

| Grade Designation ^{A B} | Chemical Composition Limits, % | | | | | | | |
|----------------------------------|--------------------------------|----------------|------------------------------------|----------------------------------|--------------|-------------|---------------|-----------------|
| | C (Carbon) | Mn (Manganese) | P (Phosphorus) ^C max | S (Sulfur) ^{C D} max | Si (Silicon) | Ni (Nickel) | Cr (Chromium) | Mo (Molybdenum) |
| 1330 | 0.28-0.33 | 1.60-1.90 | 0.04 | 0.04 | 0.15-0.35 | - | - | - |
| 1335 | 0.33-0.38 | 1.60-1.90 | 0.04 | 0.04 | 0.15-0.35 | - | - | - |
| 1340 | 0.38-0.43 | 1.60-1.90 | 0.04 | 0.04 | 0.15-0.35 | - | - | - |
| 1345 | 0.43-0.48 | 1.60-1.90 | 0.04 | 0.04 | 0.15-0.35 | - | - | - |
| 3140 | 0.38-0.43 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | 1.10-1.40 | 0.55-0.75 | - |
| E3310 | 0.08-0.13 | 0.45-0.60 | 0.025 | 0.025 | 0.15-0.35 | 3.25-3.75 | 1.40-1.75 | - |
| 4012 | 0.09-0.14 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | - | - | 0.15-0.25 |
| 4023 | 0.20-0.25 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | - | - | 0.20-0.30 |
| 4024 | 0.20-0.25 | 0.70-0.90 | 0.04 | 0.035-0.050 | 0.15-0.35 | - | - | 0.20-0.30 |
| 4027 | 0.25-0.30 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | - | - | 0.20-0.30 |
| 4028 | 0.25-0.30 | 0.70-0.90 | 0.04 | 0.035-0.050 | 0.15-0.35 | - | - | 0.20-0.30 |
| 4037 | 0.35-0.40 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | - | - | 0.20-0.30 |
| 4042 | 0.40-0.45 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | - | - | 0.20-0.30 |
| 4047 | 0.45-0.50 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | - | - | 0.20-0.30 |
| 4063 | 0.60-0.67 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | - | - | 0.20-0.30 |
| 4118 | 0.18-0.23 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | - | 0.40-0.60 | 0.08-0.15 |

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| | C(Carbon) | Mn (Manganese) | P (Phosphorus) ^C max | S (Sulfur) ^{C D} max | Si (Silicon) | Ni (Nickel) | Cr (Chromium) | Mo (Molybdenum) |
| 4130 | 0.28-0.33 | 0.40-0.60 | 0.04 | 0.04 | 0.15-0.35 | - | 0.80-1.10 | 0.15-0.25 |
| 4135 | 0.33-0.39 | 0.65-0.95 | 0.04 | 0.04 | 0.15-0.35 | - | 0.80-1.10 | 0.15-0.25 |
| 4137 | 0.35-0.40 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | - | 0.80-1.10 | 0.15-0.25 |
| 4140 | 0.38-0.43 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | - | 0.80-1.10 | 0.15-0.25 |
| 4142 | 0.40-0.45 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | - | 0.80-1.10 | 0.15-0.25 |
| 4145 | 0.43-0.48 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | - | 0.80-1.10 | 0.15-0.25 |
| 4147 | 0.45-0.50 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | - | 0.80-1.10 | 0.15-0.25 |
| 4150 | 0.48-0.53 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | - | 0.80-1.10 | 0.15-0.25 |
| 4320 | 0.17-0.22 | 0.45-0.65 | 0.04 | 0.04 | 0.15-0.35 | 1.65-2.00 | 0.40-0.60 | 0.20-0.30 |
| 4337 | 0.35-0.40 | 0.60-0.80 | 0.04 | 0.04 | 0.15-0.35 | 1.65-2.00 | 0.70-0.90 | 0.20-0.30 |
| E4337 | 0.35-0.40 | 0.65-0.85 | 0.025 | 0.025 | 0.15-0.35 | 1.65-2.00 | 0.70-0.90 | 0.20-0.30 |
| 4340 | 0.38-0.43 | 0.60-0.80 | 0.04 | 0.04 | 0.15-0.35 | 1.65-2.00 | 0.70-0.90 | 0.20-0.30 |
| E4340 | 0.38-0.43 | 0.65-0.85 | 0.025 | 0.025 | 0.15-0.35 | 1.65-2.00 | 0.70-0.90 | 0.20-0.30 |
| 4422 | 0.20-0.25 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | - | - | 0.35-0.45 |
| 4427 | 0.24-0.29 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | - | - | 0.35-0.45 |
| 4520 | 0.18-0.23 | 0.45-0.65 | 0.04 | 0.04 | 0.15-0.35 | - | - | 0.45-0.60 |

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| Grade Designation ^{A B} | Chemical Composition Limits, % | | | | | | | |
|----------------------------------|--------------------------------|----------------|------------------------------------|----------------------------------|--------------|-------------|---------------|-----------------|
| | C(Carbon) | Mn (Manganese) | P (Phosphorus) ^C max | S (Sulfur) ^{C D} max | Si (Silicon) | Ni (Nickel) | Cr (Chromium) | Mo (Molybdenum) |
| 4615 | 0.13-0.18 | 0.45-0.65 | 0.04 | 0.04 | 0.15-0.35 | 1.65-2.00 | - | 0.20-0.30 |
| 4617 | 0.15-0.20 | 0.45-0.65 | 0.04 | 0.04 | 0.15-0.35 | 1.65-2.00 | - | 0.20-0.30 |
| 4620 | 0.17-0.22 | 0.45-0.65 | 0.04 | 0.04 | 0.15-0.35 | 1.65-2.00 | - | 0.20-0.30 |
| 4621 | 0.18-0.23 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | 1.65-2.00 | - | 0.20-0.30 |
| 4718 | 0.16-0.21 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | 0.90-1.20 | 0.35-0.55 | 0.30-0.40 |
| 4720 | 0.17-0.22 | 0.50-0.70 | 0.04 | 0.04 | 0.15-0.35 | 0.90-1.20 | 0.35-0.55 | 0.15-0.25 |
| 4815 | 0.13-0.18 | 0.40-0.60 | 0.04 | 0.04 | 0.15-0.35 | 3.25-3.75 | - | 0.20-0.30 |
| 4817 | 0.15-0.20 | 0.40-0.60 | 0.04 | 0.04 | 0.15-0.35 | 3.25-3.75 | - | 0.20-0.30 |
| 4820 | 0.18-0.23 | 0.50-0.70 | 0.04 | 0.04 | 0.15-0.35 | 3.25-3.75 | - | 0.20-0.30 |
| 5015 | 0.12-0.17 | 0.30-0.50 | 0.04 | 0.04 | 0.15-0.35 | - | 0.30-0.50 | - |
| 5046 | 0.43-0.50 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | - | 0.20-0.35 | - |
| 5115 | 0.13-0.18 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | - | 0.70-0.90 | - |
| 5120 | 0.17-0.22 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | - | 0.70-0.90 | - |
| 5130 | 0.28-0.33 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | - | 0.80-1.10 | - |
| 5132 | 0.30-0.35 | 0.60-0.80 | 0.04 | 0.04 | 0.15-0.35 | - | 0.75-1.00 | - |
| 5135 | 0.33-0.38 | 0.60-0.80 | 0.04 | 0.04 | 0.15-0.35 | - | 0.80-1.05 | - |

Table 3 Chemical Requirements for Alloy Steels

| Grade Designation ^{A B} | Chemical Composition Limits, % | | | | | | | |
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| | C(Carbon) | Mn (Manganese) | P (Phosphorus) ^C max | S (Sulfur) ^{C D} max | Si (Silicon) | Ni (Nickel) | Cr (Chromium) | Mo (Molybdenum) |
| 5140 | 0.38-0.43 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | - | 0.70-0.90 | - |
| 5145 | 0.43-0.48 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | - | 0.70-0.90 | - |
| 5147 | 0.46-0.51 | 0.70-0.95 | 0.04 | 0.04 | 0.15-0.35 | - | 0.85-1.15 | - |
| 5150 | 0.48-0.53 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | - | 0.70-0.90 | - |
| 5155 | 0.51-0.59 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | - | 0.70-0.90 | - |
| 5160 | 0.56-0.64 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | - | 0.70-0.90 | - |
| 52100 ^E | 0.93-1.05 | 0.25-0.45 | 0.025 | 0.015 | 0.15-0.35 | 0.25 max | 1.35-1.60 | 0.01 max |
| E50100 | 0.98-1.10 | 0.25-0.45 | 0.025 | 0.025 | 0.15-0.35 | - | 0.40-0.60 | - |
| E51100 | 0.98-1.10 | 0.25-0.45 | 0.025 | 0.025 | 0.15-0.35 | - | 0.90-1.15 | - |
| E52100 | 0.98-1.10 | 0.25-0.45 | 0.025 | 0.025 | 0.15-0.35 | - | 1.30-1.60 | - |
| 6118 | 0.16-0.21 | 0.50-0.70 | 0.04 | 0.04 | 0.15-0.35 | - | 0.50-0.70 | 0.10-0.15 (Vanadium) |
| 6120 | 0.17-0.22 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | - | 0.70-0.90 | 0.10 min (Vanadium) |
| 6150 | 0.48-0.53 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | - | 0.80-1.10 | 0.15 min (Vanadium) |
| E7140 | 0.38-0.43 | 0.50-0.70 | 0.025 | 0.025 | 0.15-0.40 | 0.95-1.30 (Aluminum) | 1.40-1.80 | 0.30-0.40 |
| 8115 | 0.13-0.18 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | 0.20-0.40 | 0.30-0.50 | 0.08-0.15 |
| 8615 | 0.13-0.18 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | 0.40-0.70 | 0.40-0.60 | 0.15-0.25 |

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| Grade Designation ^{A B} | Chemical Composition Limits, % | | | | | | | |
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| | C (Carbon) | Mn (Manganese) | P (Phosphorus) ^C max | S (Sulfur) ^{C D} max | Si (Silicon) | Ni (Nickel) | Cr (Chromium) | Mo (Molybdenum) |
| 8617 | 0.15-0.20 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | 0.40-0.70 | 0.40-0.60 | 0.15-0.25 |
| 8620 | 0.18-0.23 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | 0.40-0.70 | 0.40-0.60 | 0.15-0.25 |
| 8622 | 0.20-0.25 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | 0.40-0.70 | 0.40-0.60 | 0.15-0.25 |
| 8625 | 0.23-0.28 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | 0.40-0.70 | 0.40-0.60 | 0.15-0.25 |
| 8627 | 0.25-0.30 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | 0.40-0.70 | 0.40-0.60 | 0.15-0.25 |
| 8630 | 0.28-0.33 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | 0.40-0.70 | 0.40-0.60 | 0.15-0.25 |
| 8637 | 0.35-0.40 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | 0.40-0.70 | 0.40-0.60 | 0.15-0.25 |
| 8640 | 0.38-0.43 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | 0.40-0.70 | 0.40-0.60 | 0.15-0.25 |
| 8642 | 0.40-0.45 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | 0.40-0.70 | 0.40-0.60 | 0.15-0.25 |
| 8645 | 0.43-0.48 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | 0.40-0.70 | 0.40-0.60 | 0.15-0.25 |
| 8650 | 0.48-0.53 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | 0.40-0.70 | 0.40-0.60 | 0.15-0.25 |
| 8655 | 0.51-0.59 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | 0.40-0.70 | 0.40-0.60 | 0.15-0.25 |
| 8660 | 0.55-0.65 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | 0.40-0.70 | 0.40-0.60 | 0.15-0.25 |
| 8720 | 0.18-0.23 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | 0.40-0.70 | 0.40-0.60 | 0.20-0.30 |
| 8735 | 0.33-0.38 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | 0.40-0.70 | 0.40-0.60 | 0.20-0.30 |
| 8740 | 0.38-0.43 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | 0.40-0.70 | 0.40-0.60 | 0.20-0.30 |

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| Grade Designation ^{A B} | Chemical Composition Limits, % | | | | | | | |
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| | C (Carbon) | Mn (Manganese) | P (Phosphorus) ^C max | S (Sulfur) ^{C D} max | Si (Silicon) | Ni (Nickel) | Cr (Chromium) | Mo (Molybdenum) |
| 8742 | 0.40-0.45 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | 0.40-0.70 | 0.40-0.60 | 0.20-0.30 |
| 8822 | 0.20-0.25 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | 0.40-0.70 | 0.40-0.60 | 0.30-0.40 |
| 9255 | 0.51-0.59 | 0.60-0.80 | 0.04 | 0.04 | 1.80-2.20 | - | 0.60-0.80 | - |
| 9260 | 0.55-0.65 | 0.70-1.00 | 0.04 | 0.04 | 1.80-2.20 | - | - | - |
| 9262 | 0.55-0.65 | 0.75-1.00 | 0.04 | 0.04 | 1.80-2.20 | - | 0.25-0.40 | - |
| E9310 | 0.08-0.13 | 0.45-0.65 | 0.025 | 0.025 | 0.15-0.35 | 3.00-3.50 | 1.00-1.40 | 0.08-0.15 |
| 9840 | 0.38-0.42 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | 0.85-1.15 | 0.70-0.90 | 0.20-0.30 |
| 9850 | 0.48-0.53 | 0.70-0.90 | 0.04 | 0.04 | 0.15-0.35 | 0.85-1.15 | 0.70-0.90 | 0.20-0.30 |
| 50B40 | 0.38-0.42 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | - | 0.40-0.60 | - |
| 50B44 | 0.43-0.48 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | - | 0.40-0.60 | - |
| 50B46 | 0.43-0.50 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | - | 0.20-0.35 | - |
| 50B50 | 0.48-0.53 | 0.74-1.00 | 0.04 | 0.04 | 0.15-0.35 | - | 0.40-0.60 | - |
| 50B60 | 0.55-0.65 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | - | 0.40-0.60 | - |
| 51B60 | 0.55-0.65 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | - | 0.70-0.90 | - |
| 81B45 | 0.43-0.48 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | 0.20-0.40 | 0.35-0.55 | 0.08-0.15 |
| 86B45 | 0.43-0.48 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | 0.40-0.70 | 0.40-0.60 | 0.15-0.25 |

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| Grade Designation ^{A B} | Chemical Composition Limits, % | | | | | | | |
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| | C(Carbon) | Mn (Manganese) | P (Phosphorus) ^C max | S (Sulfur) ^{C D} max | Si (Silicon) | Ni (Nickel) | Cr (Chromium) | Mo (Molybdenum) |
| 94B15 | 0.13-0.18 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | 0.30-0.60 | 0.30-0.50 | 0.08-0.15 |
| 94B17 | 0.15-0.20 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | 0.30-0.60 | 0.30-0.50 | 0.08-0.15 |
| 94B30 | 0.28-0.33 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | 0.30-0.60 | 0.30-0.50 | 0.08-0.15 |
| 94B40 | 0.38-0.43 | 0.75-1.00 | 0.04 | 0.04 | 0.15-0.35 | 0.30-0.60 | 0.30-0.50 | 0.08-0.15 |

A Grades shown in this table with prefix letter E generally are manufactured by the basic-electric-furnace process. All others may be manufactured by any commercially viable steel making process or by the basic-electric-furnace process with adjustments in phosphorus and sulfur.

B Grades shown in this table with the letter B, such as 50B40, can be expected to have 0.0005 % minimum boron control.

C The phosphorus sulfur limitations for each process are as follows:

Basic electric furnace 0.025 max % Acid electric furnace 0.050 max %

D Minimum and maximum sulfur content indicates resulturized steels.

E The purchaser may specify the following maximum amounts: copper, 0.30 %; aluminum, 0.050 %; and oxygen, 0.0015%.