

**Table 1**  
**Material Specification List: Applicable ASTM Specifications**

(25)

| Material<br>Group<br>No. | Nominal<br>Designation | Forgings     |           | Castings     |       | Plates       |         | Bars         |           | Tubular      |       |
|--------------------------|------------------------|--------------|-----------|--------------|-------|--------------|---------|--------------|-----------|--------------|-------|
|                          |                        | Spec.<br>No. | Grade     | Spec.<br>No. | Grade | Spec.<br>No. | Grade   | Spec.<br>No. | Grade     | Spec.<br>No. | Grade |
| Group 1 Materials        |                        |              |           |              |       |              |         |              |           |              |       |
| 1.1                      | C-Si                   | A105         | ...       | A216         | WCB   | A515         | 70      | A105         | ...       | ...          | ...   |
|                          | C-Mn-Si                | A350         | LF2       | ...          | ...   | A516         | 70      | A350         | LF2       | A672         | C 70  |
|                          | C-Mn-Si                | ...          | ...       | ...          | ...   | A537         | Cl. 1   | A696         | C         | A672         | B 70  |
|                          | 3½Ni                   | A350         | LF3       | ...          | ...   | ...          | ...     | A350         | LF3       | ...          | ...   |
|                          | C-Mn-Si-V              | A350         | LF6 Cl. 1 | ...          | ...   | ...          | ...     | A350         | LF6 Cl. 1 | ...          | ...   |
| 1.2                      | C-Si                   | ...          | ...       | ...          | ...   | ...          | ...     | ...          | ...       | A106         | C     |
|                          | 2½Ni                   | ...          | ...       | A352         | LC2   | A203         | B       | ...          | ...       | ...          | ...   |
|                          | 3½Ni                   | ...          | ...       | A352         | LC3   | A203         | E       | ...          | ...       | ...          | ...   |
|                          | C-Mn-Si                | ...          | ...       | A216         | WCC   | ...          | ...     | ...          | ...       | ...          | ...   |
|                          | C-Mn-Si                | ...          | ...       | A352         | LCC   | ...          | ...     | ...          | ...       | ...          | ...   |
|                          | C-Mn-Si-V              | A350         | LF6 Cl. 2 | ...          | ...   | ...          | ...     | A350         | LF6 Cl. 2 | ...          | ...   |
| 1.3                      | C                      | ...          | ...       | ...          | ...   | ...          | ...     | A675         | 70        | ...          | ...   |
|                          | C-Si                   | ...          | ...       | A352         | LCB   | A515         | 65      | ...          | ...       | A672         | B 65  |
|                          | 2½Ni                   | ...          | ...       | ...          | ...   | A203         | A       | ...          | ...       | ...          | ...   |
|                          | 3½Ni                   | ...          | ...       | ...          | ...   | A203         | D       | ...          | ...       | ...          | ...   |
|                          | C-Mn-Si                | ...          | ...       | ...          | ...   | A516         | 65      | ...          | ...       | A672         | C 65  |
|                          | C-½Mo                  | ...          | ...       | A217         | WC1   | ...          | ...     | ...          | ...       | ...          | ...   |
|                          | C-½Mo                  | ...          | ...       | A352         | LC1   | ...          | ...     | ...          | ...       | ...          | ...   |
| 1.4                      | C                      | ...          | ...       | ...          | ...   | ...          | ...     | A675         | 60        | ...          | ...   |
|                          | C                      | ...          | ...       | ...          | ...   | ...          | ...     | A675         | 65        | ...          | ...   |
|                          | C-Si                   | ...          | ...       | ...          | ...   | A515         | 60      | ...          | ...       | A106         | B     |
|                          | C-Si                   | ...          | ...       | ...          | ...   | ...          | ...     | ...          | ...       | A672         | B 60  |
|                          | C-Mn-Si                | A350         | LF1 Cl. 1 | ...          | ...   | A516         | 60      | A350         | LF1 Cl. 1 | A672         | C 60  |
|                          | C-Mn-Si                | ...          | ...       | ...          | ...   | ...          | ...     | A696         | B         | ...          | ...   |
|                          | C-Mn-Si                | ...          | ...       | ...          | ...   | ...          | ...     | ...          | ...       | A333         | 6     |
| 1.5                      | C-½Mo                  | A182         | F1        | ...          | ...   | A204         | A       | A182         | F1        | A691         | CM-70 |
|                          | C-½Mo                  | ...          | ...       | ...          | ...   | A204         | B       | ...          | ...       | ...          | ...   |
| 1.6                      | ½ Cr-½Mo               | ...          | ...       | ...          | ...   | A387         | 2 Cl. 1 | ...          | ...       | A691         | ½CR   |
|                          | ½Cr-½Mo                | ...          | ...       | ...          | ...   | A387         | 2 Cl. 2 | ...          | ...       | ...          | ...   |

**Table 1**  
**Material Specification List: Applicable ASTM Specifications (Cont'd)**

| Material<br>Group<br>No.   | Nominal<br>Designation | Forgings     |            | Castings     |       | Plates       |          | Bars         |            | Tubular      |            |
|----------------------------|------------------------|--------------|------------|--------------|-------|--------------|----------|--------------|------------|--------------|------------|
|                            |                        | Spec.<br>No. | Grade      | Spec.<br>No. | Grade | Spec.<br>No. | Grade    | Spec.<br>No. | Grade      | Spec.<br>No. | Grade      |
| Group 1 Materials (Cont'd) |                        |              |            |              |       |              |          |              |            |              |            |
| 1.7                        | C-½Mo                  | ...          | ...        | ...          | ...   | ...          | ...      | ...          | ...        | A691         | CM-75      |
|                            | ½Cr-½Mo                | A182         | F2         | ...          | ...   | ...          | ...      | A182         | F2         | ...          | ...        |
|                            | Ni-½Cr-½Mo             | ...          | ...        | A217         | WC4   | ...          | ...      | ...          | ...        | ...          | ...        |
|                            | ¾Ni-Mo-¾Cr             | ...          | ...        | A217         | WC5   | ...          | ...      | ...          | ...        | ...          | ...        |
| 1.8                        | 1Cr-½Mo                | ...          | ...        | ...          | ...   | A387         | 12 Cl. 2 | ...          | ...        | ...          | ...        |
|                            | 1 ¼Cr-½Mo-Si           | ...          | ...        | ...          | ...   | A387         | 11 Cl. 1 | ...          | ...        | A691         | 1 ¼CR      |
|                            | 2 ¼ Cr-1Mo             | ...          | ...        | ...          | ...   | A387         | 22 Cl. 1 | ...          | ...        | A691         | 2 ¼CR      |
|                            | 2 ¼ Cr-1Mo             | ...          | ...        | ...          | ...   | ...          | ...      | ...          | ...        | A335         | P22        |
|                            | 2 ¼ Cr-1Mo             | ...          | ...        | ...          | ...   | ...          | ...      | ...          | ...        | A369         | FP22       |
| 1.9                        | 1 ¼Cr-½Mo-Si           | A182         | F11 Cl. 2  | ...          | ...   | A387         | 11 Cl. 2 | A182         | F11 Cl. 2  | ...          | ...        |
|                            | 1 ¼Cr-½Mo              | ...          | ...        | A217         | WC6   | ...          | ...      | A739         | B11        | ...          | ...        |
| 1.10                       | 2 ¼Cr-1Mo              | A182         | F22 Cl. 3  | A217         | WC9   | A387         | 22 Cl. 2 | A182         | F22 Cl. 3  | ...          | ...        |
|                            | 2 ¼Cr-1Mo              | ...          | ...        | ...          | ...   | ...          | ...      | A739         | B22        | ...          | ...        |
| 1.11                       | 3Cr-1Mo                | A182         | F21        | ...          | ...   | A387         | 21 Cl. 2 | A182         | F21        | ...          | ...        |
|                            | Mn-½Mo                 | ...          | ...        | ...          | ...   | A302         | A & B    | ...          | ...        | ...          | ...        |
|                            | Mn-½Mo-½Ni             | ...          | ...        | ...          | ...   | A302         | C        | ...          | ...        | ...          | ...        |
|                            | Mn-½Mo-¾Ni             | ...          | ...        | ...          | ...   | A302         | D        | ...          | ...        | ...          | ...        |
|                            | C-Mn-Si                | ...          | ...        | ...          | ...   | A537         | CL2      | ...          | ...        | ...          | ...        |
|                            | C-½Mo                  | ...          | ...        | ...          | ...   | A204         | C        | ...          | ...        | ...          | ...        |
| 1.12                       | 5Cr-½Mo                | ...          | ...        | ...          | ...   | A387         | 5 Cl. 1  | ...          | ...        | A691         | 5CR        |
|                            | 5Cr-½Mo                | ...          | ...        | ...          | ...   | A387         | 5 Cl. 2  | ...          | ...        | A335         | P5         |
|                            | 5Cr-½Mo                | ...          | ...        | ...          | ...   | ...          | ...      | ...          | ...        | A369         | FP5        |
|                            | 5Cr-½Mo-Si             | ...          | ...        | ...          | ...   | ...          | ...      | ...          | ...        | A335         | P5b        |
| 1.13                       | 5Cr-½Mo                | A182         | F5a        | A217         | C5    | ...          | ...      | A182         | F5a        | ...          | ...        |
| 1.14                       | 9Cr-1Mo                | A182         | F9         | A217         | C12   | ...          | ...      | A182         | F9         | ...          | ...        |
| 1.15                       | 9Cr-1Mo-V              | A182         | F91 Type 1 | A217         | C12A  | A387         | 91 Cl. 2 | A182         | F91 Type 1 | A335         | P91 Type 1 |

**Table 1**  
**Material Specification List: Applicable ASTM Specifications (Cont'd)**

| Material Group No.         | Nominal Designation                                                 | Forgings  |           | Castings  |       | Plates    |          | Bars      |           | Tubular   |        |
|----------------------------|---------------------------------------------------------------------|-----------|-----------|-----------|-------|-----------|----------|-----------|-----------|-----------|--------|
|                            |                                                                     | Spec. No. | Grade     | Spec. No. | Grade | Spec. No. | Grade    | Spec. No. | Grade     | Spec. No. | Grade  |
| Group 1 Materials (Cont'd) |                                                                     |           |           |           |       |           |          |           |           |           |        |
| 1.16                       | C- <sup>1</sup> / <sub>2</sub> Mo                                   | ...       | ...       | ...       | ...   | ...       | ...      | ...       | ...       | A335      | P1     |
|                            | C- <sup>1</sup> / <sub>2</sub> Mo                                   | ...       | ...       | ...       | ...   | ...       | ...      | ...       | ...       | A369      | FP1    |
|                            | 1Cr- <sup>1</sup> / <sub>2</sub> Mo                                 | ...       | ...       | ...       | ...   | A387      | 12 Cl. 1 | ...       | ...       | A691      | 1CR    |
|                            | 1Cr- <sup>1</sup> / <sub>2</sub> Mo                                 | ...       | ...       | ...       | ...   | ...       | ...      | ...       | ...       | A335      | P12    |
|                            | 1Cr- <sup>1</sup> / <sub>2</sub> Mo                                 | ...       | ...       | ...       | ...   | ...       | ...      | ...       | ...       | A369      | FP12   |
|                            | 1 <sup>1</sup> / <sub>4</sub> Cr- <sup>1</sup> / <sub>2</sub> Mo-Si | ...       | ...       | ...       | ...   | ...       | ...      | ...       | ...       | A335      | P11    |
|                            | 1 <sup>1</sup> / <sub>4</sub> Cr- <sup>1</sup> / <sub>2</sub> Mo-Si | ...       | ...       | ...       | ...   | ...       | ...      | ...       | ...       | A369      | FP11   |
| 1.17                       | 1Cr- <sup>1</sup> / <sub>2</sub> Mo                                 | A182      | F12 Cl. 2 | ...       | ...   | ...       | ...      | A182      | F12 Cl. 2 | ...       | ...    |
|                            | 5Cr- <sup>1</sup> / <sub>2</sub> Mo                                 | A182      | F5        | ...       | ...   | ...       | ...      | A182      | F5        | ...       | ...    |
| 1.18                       | 9Cr-2W-V                                                            | A182      | F92       | ...       | ...   | ...       | ...      | A182      | F92       | A335      | P92    |
|                            | 9Cr-2W-V                                                            | ...       | ...       | ...       | ...   | ...       | ...      | ...       | ...       | A369      | FP92   |
| Group 2 Materials          |                                                                     |           |           |           |       |           |          |           |           |           |        |
| 2.1                        | 18Cr-8Ni                                                            | ...       | ...       | A351      | CF3   | ...       | ...      | ...       | ...       | ...       | ...    |
|                            | 18Cr-8Ni                                                            | A182      | F304      | A351      | CF8   | A240      | 304      | A182      | F304      | A312      | TP304  |
|                            | 18Cr-8Ni                                                            | A182      | F304H     | A351      | CF10  | A240      | 304H     | A182      | F304H     | A312      | TP304H |
|                            | 18Cr-8Ni                                                            | ...       | ...       | ...       | ...   | ...       | ...      | A479      | 304       | A358      | 304    |
|                            | 18Cr-8Ni                                                            | ...       | ...       | ...       | ...   | ...       | ...      | A479      | 304H      | A376      | TP304  |
|                            | 18Cr-8Ni                                                            | ...       | ...       | ...       | ...   | ...       | ...      | ...       | ...       | A376      | TP304H |
| 2.2                        | 16Cr-12Ni-2Mo                                                       | ...       | ...       | A351      | CF3M  | ...       | ...      | ...       | ...       | ...       | ...    |
|                            | 16Cr-12Ni-2Mo                                                       | A182      | F316      | A351      | CF8M  | A240      | 316      | A182      | F316      | A312      | TP316  |
|                            | 16Cr-12Ni-2Mo                                                       | A182      | F316H     | A351      | CF10M | A240      | 316H     | A182      | F316H     | A312      | TP316H |
|                            | 16Cr-12Ni-2Mo                                                       | ...       | ...       | ...       | ...   | ...       | ...      | A479      | 316       | A358      | 316    |
|                            | 16Cr-12Ni-2Mo                                                       | ...       | ...       | ...       | ...   | ...       | ...      | A479      | 316H      | A376      | TP316  |
|                            | 16Cr-12Ni-2Mo                                                       | ...       | ...       | ...       | ...   | ...       | ...      | ...       | ...       | A376      | TP316H |
|                            | 18Cr-8Ni                                                            | ...       | ...       | A351      | CF3A  | ...       | ...      | ...       | ...       | ...       | ...    |
|                            | 18Cr-8Ni                                                            | ...       | ...       | A351      | CF8A  | ...       | ...      | ...       | ...       | ...       | ...    |
|                            | 18Cr-13Ni-3Mo                                                       | A182      | F317      | ...       | ...   | A240      | 317      | ...       | ...       | A312      | TP317  |
|                            | 19Cr-10Ni-3Mo                                                       | ...       | ...       | A351      | CG8M  | ...       | ...      | ...       | ...       | ...       | ...    |
|                            | 19Cr-10Ni-3Mo                                                       | ...       | ...       | A351      | CG3M  | ...       | ...      | ...       | ...       | ...       | ...    |

**Table 1**  
**Material Specification List: Applicable ASTM Specifications (Cont'd)**

| Material<br>Group<br>No.   | Nominal<br>Designation | Forgings     |       | Castings     |         | Plates       |        | Bars         |        | Tubular      |        |
|----------------------------|------------------------|--------------|-------|--------------|---------|--------------|--------|--------------|--------|--------------|--------|
|                            |                        | Spec.<br>No. | Grade | Spec.<br>No. | Grade   | Spec.<br>No. | Grade  | Spec.<br>No. | Grade  | Spec.<br>No. | Grade  |
| Group 2 Materials (Cont'd) |                        |              |       |              |         |              |        |              |        |              |        |
| 2.3                        | 18Cr-8Ni               | A182         | F304L | ...          | ...     | A240         | 304L   | A182         | F304L  | A312         | TP304L |
|                            | 18Cr-8Ni               | ...          | ...   | ...          | ...     | ...          | ...    | A479         | 304L   | ...          | ...    |
|                            | 16Cr-12Ni-2Mo          | A182         | F316L | ...          | ...     | A240         | 316L   | A182         | F316L  | A312         | TP316L |
|                            | 16Cr-12Ni-2Mo          | ...          | ...   | ...          | ...     | ...          | ...    | A479         | 316L   | ...          | ...    |
|                            | 18Cr-13Ni-3Mo          | A182         | F317L | ...          | ...     | ...          | ...    | A182         | F317L  | ...          | ...    |
| 2.4                        | 18Cr-10Ni-Ti           | A182         | F321  | ...          | ...     | A240         | 321    | A182         | F321   | A312         | TP321  |
|                            | 18Cr-10Ni-Ti           | A182         | F321H | ...          | ...     | A240         | 321H   | A479         | 321    | A312         | TP321H |
|                            | 18Cr-10Ni-Ti           | ...          | ...   | ...          | ...     | ...          | ...    | A182         | F321H  | A358         | 321    |
|                            | 18Cr-10Ni-Ti           | ...          | ...   | ...          | ...     | ...          | ...    | A479         | 321H   | A376         | TP321  |
|                            | 18Cr-10Ni-Ti           | ...          | ...   | ...          | ...     | ...          | ...    | ...          | ...    | A376         | TP321H |
| 2.5                        | 18Cr-10Ni-Cb           | A182         | F347  | ...          | ...     | A240         | 347    | A182         | F347   | A312         | TP347  |
|                            | 18Cr-10Ni-Cb           | A182         | F347H | ...          | ...     | A240         | 347H   | A182         | F347H  | A312         | TP347H |
|                            | 18Cr-10Ni-Cb           | A182         | F348  | ...          | ...     | A240         | 348    | A182         | F348   | A312         | TP348  |
|                            | 18Cr-10Ni-Cb           | A182         | F348H | ...          | ...     | A240         | 348H   | A182         | F348H  | A312         | TP348H |
|                            | 18Cr-10Ni-Cb           | ...          | ...   | ...          | ...     | ...          | ...    | A479         | 347    | A358         | TP347  |
|                            | 18Cr-10Ni-Cb           | ...          | ...   | ...          | ...     | ...          | ...    | A479         | 347H   | A376         | TP347  |
|                            | 18Cr-10Ni-Cb           | ...          | ...   | ...          | ...     | ...          | ...    | A479         | 348    | A376         | TP347H |
|                            | 18Cr-10Ni-Cb           | ...          | ...   | ...          | ...     | ...          | ...    | A479         | 348H   | A376         | TP348  |
|                            | 18Cr-10Ni-Cb           | ...          | ...   | ...          | ...     | ...          | ...    | ...          | ...    | A376         | TP348H |
| 2.6                        | 23Cr-12Ni              | ...          | ...   | ...          | ...     | ...          | ...    | ...          | ...    | A312         | TP309H |
|                            | 23Cr-12Ni              | ...          | ...   | ...          | ...     | A240         | 309H   | ...          | ...    | A358         | 309H   |
| 2.7                        | 25Cr-20Ni              | A182         | F310H | ...          | ...     | A240         | 310H   | A182         | F310H  | A312         | TP310H |
|                            | 25Cr-20Ni              | ...          | ...   | ...          | ...     | ...          | ...    | A479         | 310H   | A358         | 310H   |
| 2.8                        | 20Cr-18Ni-6Mo          | A182         | F44   | A351         | CK3MCuN | A240         | S31254 | A182         | F44    | A312         | S31254 |
|                            | 20Cr-18Ni-6Mo          | ...          | ...   | ...          | ...     | ...          | ...    | A479         | S31254 | A358         | S31254 |
| 2.9                        | 23Cr-12Ni              | ...          | ...   | ...          | ...     | A240         | 309S   | ...          | ...    | ...          | ...    |
|                            | 25Cr-20Ni              | ...          | ...   | ...          | ...     | A240         | 310S   | A479         | 310S   | ...          | ...    |
| 2.10                       | 25Cr-12Ni              | ...          | ...   | A351         | CH8     | ...          | ...    | ...          | ...    | ...          | ...    |
|                            | 25Cr-12Ni              | ...          | ...   | A351         | CH20    | ...          | ...    | ...          | ...    | ...          | ...    |
| 2.11                       | 18Cr-10Ni-Cb           | ...          | ...   | A351         | CF8C    | ...          | ...    | ...          | ...    | ...          | ...    |
| 2.12                       | 25Cr-20Ni              | ...          | ...   | A351         | CK20    | ...          | ...    | ...          | ...    | ...          | ...    |

**Table 1**  
**Material Specification List: Applicable ASTM Specifications (Cont'd)**

| Material<br>Group<br>No.   | Nominal<br>Designation  | Forgings     |        | Castings     |          | Plates       |        | Bars         |        | Tubular      |        |
|----------------------------|-------------------------|--------------|--------|--------------|----------|--------------|--------|--------------|--------|--------------|--------|
|                            |                         | Spec.<br>No. | Grade  | Spec.<br>No. | Grade    | Spec.<br>No. | Grade  | Spec.<br>No. | Grade  | Spec.<br>No. | Grade  |
| Group 2 Materials (Cont'd) |                         |              |        |              |          |              |        |              |        |              |        |
| 2.13                       | 22Cr-5Ni-3Mo-N          | A182         | F51    | A995         | CD3MN    | A240         | S31803 | A182         | F51    | A789         | S31803 |
|                            | 22Cr-5Ni-3Mo-N          | A182         | F60    | ...          | ...      | ...          | ...    | A182         | F60    | A790         | S31803 |
|                            | 22Cr-5Ni-3Mo-N          | ...          | ...    | ...          | ...      | ...          | ...    | A479         | S31803 | ...          | ...    |
|                            | 22Cr-5Ni-3Mo-N          | ...          | ...    | ...          | ...      | A240         | S32205 | A479         | S32205 | A789         | S32205 |
|                            | 22Cr-5Ni-3Mo-N          | ...          | ...    | ...          | ...      | ...          | ...    | ...          | ...    | A790         | S32205 |
|                            | 25Cr-5Ni-3Mo-2Cu        | ...          | ...    | ...          | ...      | A240         | S32550 | A479         | S32550 | A789         | S32550 |
|                            | 25Cr-5Ni-3Mo-2Cu        | ...          | ...    | ...          | ...      | ...          | ...    | ...          | ...    | A790         | S32550 |
|                            | 25Cr-7Ni-4Mo-N          | A182         | F53    | ...          | ...      | A240         | S32750 | A182         | F53    | A789         | S32750 |
|                            | 25Cr-7Ni-4Mo-N          | ...          | ...    | ...          | ...      | ...          | ...    | A479         | S32750 | A790         | S32750 |
|                            | 24Cr-10Ni-4Mo-N         | ...          | ...    | A995         | CE8MN    | ...          | ...    | ...          | ...    | ...          | ...    |
|                            | 25Cr-5Ni-3Cu-2Mo-N      | ...          | ...    | A995         | CD4MCuN  | ...          | ...    | ...          | ...    | ...          | ...    |
|                            | 25Cr-7Ni-3.5Mo-W-N      | ...          | ...    | A995         | CD3MWCuN | ...          | ...    | ...          | ...    | ...          | ...    |
|                            | 25Cr-7.5Ni-3.5Mo-N-Cu-W | A182         | F55    | ...          | ...      | A240         | S32760 | A479         | S32760 | A789         | S32760 |
|                            | 25Cr-7.5Ni-3.5Mo-N-Cu-W | ...          | ...    | ...          | ...      | ...          | ...    | ...          | ...    | A790         | S32760 |
| Group 3 Materials          |                         |              |        |              |          |              |        |              |        |              |        |
| 3.1                        | 35Ni-35Fe-20Cr-Cb       | A182         | N08020 | ...          | ...      | A240         | N08020 | A182         | N08020 | A213         | N08020 |
|                            | 35Ni-35Fe-20Cr-Cb       | ...          | ...    | ...          | ...      | ...          | ...    | A479         | N08020 | A312         | N08020 |
|                            | 35Ni-35Fe-20Cr-Cb       | B462         | N08020 | ...          | ...      | B463         | N08020 | B462         | N08020 | ...          | ...    |
|                            | 35Ni-35Fe-20Cr-Cb       | ...          | ...    | ...          | ...      | ...          | ...    | B473         | N08020 | B464         | N08020 |
|                            | 35Ni-35Fe-20Cr-Cb       | ...          | ...    | ...          | ...      | ...          | ...    | ...          | ...    | B468         | N08020 |
| 3.2                        | 99Ni                    | B564         | N02200 | ...          | ...      | B162         | N02200 | B160         | N02200 | B161         | N02200 |
|                            | 99Ni                    | ...          | ...    | ...          | ...      | ...          | ...    | ...          | ...    | B163         | N02200 |
| 3.3                        | 99Ni-Low C              | ...          | ...    | ...          | ...      | B162         | N02201 | B160         | N02201 | ...          | ...    |
| 3.4                        | 67Ni-30Cu               | B564         | N04400 | ...          | ...      | B127         | N04400 | B164         | N04400 | B165         | N04400 |
|                            | 67Ni-30Cu               | ...          | ...    | A494         | M-35-1   | ...          | ...    | ...          | ...    | B163         | N04400 |
|                            | 67Ni-30Cu-S             | ...          | ...    | A494         | M-35-2   | ...          | ...    | B164         | N04405 | ...          | ...    |
| 3.5                        | 72Ni-15Cr-8Fe           | B564         | N06600 | ...          | ...      | B168         | N06600 | B166         | N06600 | ...          | ...    |
|                            | 72Ni-15Cr-8Fe           | ...          | ...    | ...          | ...      | ...          | ...    | ...          | ...    | B163         | N06600 |
| 3.6                        | 33Ni-42Fe-21Cr          | A182         | N08800 | ...          | ...      | A240         | N08800 | A182         | N08800 | A213         | N08800 |
|                            | 33Ni-42Fe-21Cr          | ...          | ...    | ...          | ...      | ...          | ...    | A479         | N08800 | A312         | N08800 |
|                            | 33Ni-42Fe-21Cr          | B564         | N08800 | ...          | ...      | B409         | N08800 | B408         | N08800 | B163         | N08800 |



**Table 1**  
**Material Specification List: Applicable ASTM Specifications (Cont'd)**

| Material Group No.         | Nominal Designation        | Forgings  |        | Castings  |       | Plates    |        | Bars      |        | Tubular   |        |
|----------------------------|----------------------------|-----------|--------|-----------|-------|-----------|--------|-----------|--------|-----------|--------|
|                            |                            | Spec. No. | Grade  | Spec. No. | Grade | Spec. No. | Grade  | Spec. No. | Grade  | Spec. No. | Grade  |
| Group 3 Materials (Cont'd) |                            |           |        |           |       |           |        |           |        |           |        |
| 3.7                        | 65Ni-28Mo-2Fe              | B462      | N10665 | ...       | ...   | B333      | N10665 | B335      | N10665 | ...       | ...    |
|                            | 65Ni-28Mo-2Fe              | ...       | ...    | ...       | ...   | ...       | ...    | B462      | N10665 | B622      | N10665 |
|                            | 65Ni-28Mo-2Fe              | B564      | N10665 | ...       | ...   | ...       | ...    | ...       | ...    | ...       | ...    |
|                            | 64Ni-29.5Mo-2Cr-2Fe-Mn-W   | B462      | N10675 | ...       | ...   | B333      | N10675 | B335      | N10675 | ...       | ...    |
|                            | 64Ni-29.5Mo-2Cr-2Fe-Mn-W   | ...       | ...    | ...       | ...   | ...       | ...    | B462      | N10675 | B622      | N10675 |
|                            | 64Ni-29.5Mo-2Cr-2Fe-Mn-W   | B564      | N10675 | ...       | ...   | ...       | ...    | ...       | ...    | ...       | ...    |
| 3.8                        | 54Ni-16Mo-15Cr             | B462      | N10276 | ...       | ...   | B575      | N10276 | B462      | N10276 | ...       | ...    |
|                            | 54Ni-16Mo-15Cr             | ...       | ...    | ...       | ...   | ...       | ...    | B574      | N10276 | B622      | N10276 |
|                            | 54Ni-16Mo-15Cr             | B564      | N10276 | ...       | ...   | ...       | ...    | ...       | ...    | ...       | ...    |
|                            | 60Ni-22Cr-9Mo-3.5Cb        | B564      | N06625 | ...       | ...   | B443      | N06625 | B446      | N06625 | ...       | ...    |
|                            | 62Ni-28Mo-5Fe              | ...       | ...    | ...       | ...   | B333      | N10001 | B335      | N10001 | B622      | N10001 |
|                            | 70Ni-16Mo-7Cr-5Fe          | ...       | ...    | ...       | ...   | B434      | N10003 | B573      | N10003 | ...       | ...    |
|                            | 61Ni-16Mo-16Cr             | ...       | ...    | ...       | ...   | B575      | N06455 | B574      | N06455 | B622      | N06455 |
|                            | 42Ni-21.5Cr-3Mo-2.3Cu      | B564      | N08825 | ...       | ...   | B424      | N08825 | B425      | N08825 | B423      | N08825 |
|                            | 55Ni-21Cr-13.5Mo           | B462      | N06022 | ...       | ...   | B575      | N06022 | B462      | N06022 | B622      | N06022 |
|                            | 55Ni-21Cr-13.5Mo           | B564      | N06022 | ...       | ...   | ...       | ...    | B574      | N06022 | ...       | ...    |
|                            | 55Ni-23Cr-16Mo-1.6Cu       | B462      | N06200 | ...       | ...   | B575      | N06200 | B574      | N06200 | B622      | N06200 |
|                            | 55Ni-23Cr-16Mo-1.6Cu       | B564      | N06200 | ...       | ...   | ...       | ...    | ...       | ...    | ...       | ...    |
| 3.9                        | 47Ni-22Cr-9Mo-18Fe         | ...       | ...    | ...       | ...   | B435      | N06002 | B572      | N06002 | B622      | N06002 |
|                            | 21Ni-30Fe-22Cr-18Co-3Mo-3W | ...       | ...    | ...       | ...   | B435      | R30556 | B572      | R30556 | B622      | R30556 |
| 3.10                       | 25Ni-47Fe-21Cr-5Mo         | A182      | N08700 | ...       | ...   | ...       | ...    | A182      | N08700 | ...       | ...    |
|                            | 25Ni-47Fe-21Cr-5Mo         | ...       | ...    | ...       | ...   | A240      | N08700 | A479      | N08700 | ...       | ...    |
|                            | 25Ni-47Fe-21Cr-5Mo         | ...       | ...    | ...       | ...   | B599      | N08700 | B672      | N08700 | ...       | ...    |
| 3.11                       | 44Fe-25Ni-21Cr-Mo          | A182      | N08904 | ...       | ...   | A240      | N08904 | A182      | N08904 | A213      | N08904 |
|                            | 44Fe-25Ni-21Cr-Mo          | ...       | ...    | ...       | ...   | ...       | ...    | A479      | N08904 | A312      | N08904 |

**Table 1**  
**Material Specification List: Applicable ASTM Specifications (Cont'd)**

| Material<br>Group<br>No.   | Nominal<br>Designation      | Forgings     |        | Castings     |         | Plates       |        | Bars         |        | Tubular      |        |
|----------------------------|-----------------------------|--------------|--------|--------------|---------|--------------|--------|--------------|--------|--------------|--------|
|                            |                             | Spec.<br>No. | Grade  | Spec.<br>No. | Grade   | Spec.<br>No. | Grade  | Spec.<br>No. | Grade  | Spec.<br>No. | Grade  |
| Group 3 Materials (Cont'd) |                             |              |        |              |         |              |        |              |        |              |        |
| 3.12                       | 26Ni-43Fe-22Cr-5Mo          | ...          | ...    | ...          | ...     | B620         | N08320 | B621         | N08320 | B622         | N08320 |
|                            | 47Ni-22Cr-20Fe-7Mo          | ...          | ...    | ...          | ...     | B582         | N06985 | B581         | N06985 | B622         | N06985 |
|                            | 46Fe-24Ni-21Cr-6Mo-Cu-N     | A182         | N08367 | ...          | ...     | A240         | N08367 | A182         | N08367 | A213         | N08367 |
|                            | 46Fe-24Ni-21Cr-6Mo-Cu-N     | ...          | ...    | ...          | ...     | ...          | ...    | A479         | N08367 | A312         | N08367 |
|                            | 46Fe-24Ni-21Cr-6Mo-Cu-N     | B462         | N08367 | A351         | CN3MN   | B688         | N08367 | B462         | N08367 | ...          | ...    |
|                            | 46Fe-24Ni-21Cr-6Mo-Cu-N     | ...          | ...    | ...          | ...     | ...          | ...    | B691         | N08367 | ...          | ...    |
|                            | 58Ni-33Cr-8Mo               | B462         | N06035 | ...          | ...     | B575         | N06035 | B462         | N06035 | B622         | N06035 |
|                            | 58Ni-33Cr-8Mo               | B564         | N06035 | ...          | ...     | ...          | ...    | B574         | N06035 | ...          | ...    |
| 3.13                       | 49Ni-25Cr-18Fe-6Mo          | ...          | ...    | ...          | ...     | B582         | N06975 | B581         | N06975 | B622         | N06975 |
|                            | 31Ni-33Fe-27Cr-6.6Mo-Cu-C-N | B564         | N08031 | ...          | ...     | B625         | N08031 | B649         | N08031 | B622         | N08031 |
| 3.14                       | 47Ni-22Cr-19Fe-6Mo          | ...          | ...    | ...          | ...     | B582         | N06007 | B581         | N06007 | B622         | N06007 |
|                            | 40Ni-29Cr-15Fe-5Mo          | B462         | N06030 | ...          | ...     | B582         | N06030 | B462         | N06030 | ...          | ...    |
|                            | 40Ni-29Cr-15Fe-5Mo          | ...          | ...    | ...          | ...     | ...          | ...    | B581         | N06030 | B622         | N06030 |
| 3.15                       | 42Ni-2Fe-21Cr               | ...          | ...    | ...          | ...     | A240         | N08810 | A479         | N08810 | A213         | N08810 |
|                            | 42Ni-2Fe-21Cr               | ...          | ...    | ...          | ...     | ...          | ...    | ...          | ...    | A312         | N08810 |
|                            | 33Ni-42Fe-21Cr              | B564         | N08810 | ...          | ...     | B409         | N08810 | B408         | N08810 | B407         | N08810 |
|                            | 62Ni-28Mo-5Fe               | ...          | ...    | A494         | N-12MV  | ...          | ...    | ...          | ...    | ...          | ...    |
|                            | 53Ni-17Mo-16Cr-6Fe-5W       | ...          | ...    | A494         | CW-12MW | ...          | ...    | ...          | ...    | ...          | ...    |
| 3.16                       | 35Ni-19Cr-1¼Si              | ...          | ...    | ...          | ...     | B536         | N08330 | B511         | N08330 | B535         | N08330 |
| 3.17                       | 29Ni-20½Cr-3½Cu-2½Mo        | ...          | ...    | A351         | CN7M    | ...          | ...    | ...          | ...    | ...          | ...    |
| 3.18                       | 72Ni-15Cr-8Fe               | ...          | ...    | ...          | ...     | ...          | ...    | ...          | ...    | B167         | N06600 |
| 3.19                       | 57Ni-22Cr-14W-2Mo-La        | B564         | N06230 | ...          | ...     | B435         | N06230 | B572         | N06230 | B622         | N06230 |

**Bolting Materials [Note (1)]**

| Specification Number     | Grade | Notes         | Specification Number | Grade  | Notes      |
|--------------------------|-------|---------------|----------------------|--------|------------|
| <b>Group 4 Materials</b> |       |               |                      |        |            |
| A193                     | ...   | (2), (3)      | B164                 | ...    | (10)-(12)  |
| A307B                    | ...   | (4), (5)      | B166                 | ...    | (10), (11) |
| A320                     | ...   | (2), (3), (6) | B335                 | N10665 | (10)       |
| A354                     | ...   | ...           | B335                 | N10675 | (10)       |
| A449                     | ...   | (7), (8)      | B408                 | ...    | (10)-(12)  |

**Table 1**  
**Material Specification List: Applicable ASTM Specifications (Cont'd)**

| Bolting Materials [Note (1)]      |             |       |                      |        |       |
|-----------------------------------|-------------|-------|----------------------|--------|-------|
| Specification Number              | Grade       | Notes | Specification Number | Grade  | Notes |
| <b>Group 4 Materials (Cont'd)</b> |             |       |                      |        |       |
| A453                              | 651 and 660 | (9)   | B511                 | N08830 | (10)  |
|                                   |             |       | B572                 | N06230 | (10)  |
|                                   |             |       | B473                 | ...    | (10)  |
| A540                              | ...         | ...   | B574                 | N10276 | (10)  |
| A564                              | 630         | (7)   | B574                 | N06022 | (10)  |
|                                   |             |       | B637                 | N07718 | (10)  |
|                                   |             |       | B637                 | N07740 | (10)  |

GENERAL NOTES:

- The user is responsible for assuring that bolting material is not used beyond limits specified in governing codes or regulations.
- ASME BPVC Section II materials that also meet the requirements of the listed ASTM specification may also be used.
- Material limitations, restrictions, and special requirements are shown in the pressure-temperature tables, [Tables 2-1.1](#) through [2-3.19](#) ([Tables 2-1.1C](#) through [2-3.19C](#)).

NOTES:

- Repair welding of bolting material is not permitted.
- Where austenitic bolting materials have been carbide-solution treated but not strain hardened, they are designated Class 1 or Class 1A in ASTM A193. ASTM A194 nuts of corresponding material are recommended.
- Where austenitic bolting materials have been carbide-solution treated and strain hardened, they are designated Class 2, 2B, or 2C in ASTM A193. ASTM A194 nuts of corresponding material are recommended.
- For limitations of usage and strength level, see [para. 5.1.2](#).
- Bolts with drilled or undersize heads shall not be used.
- For ferritic bolting materials intended for service at low temperature, ASTM A194 Grade 4, Grade 7, Grade 7M, or Grade 2HM nuts are recommended.
- Acceptable nuts for use with quenched and tempered steel bolts are ASTM A194 Grade 2 and 2H.
- Mechanical property requirements for studs shall be the same as for bolts.
- Bolting materials suitable for high-temperature service with austenitic stainless steel valve materials.
- Nuts may be of the same material or may be of compatible grade of ASTM A194.
- Forging quality not permitted unless the producer last heating or working these parts tests them as required for other permitted conditions in the same specification and certifies their final tensile, yield, and elongation properties to equal or exceed the requirements for one of the other permitted conditions.
- Maximum operating temperature is arbitrarily set at 260°C (500°F), unless material has been annealed, solution annealed, or hot finished, because hard temper adversely affects design stress in the creep-rupture temper range.