### Table KM-400-1
Carbon and Low Alloy Steels (Cont'd)

**NOTES (CONT'D):**

(a) In fulfilling the requirements of Articles KT-1 and KT-2, sufficient tensile tests shall be made to represent postweld heat treatment at both the minimum and maximum times at temperature, and impact tests shall be made to represent the minimum time at temperature. The results of the tensile tests shall meet the tensile requirements of the material specification. The number and orientation of the impact specimens, the testing temperature, and the acceptance criteria shall meet the impact test requirements of Part KM.

(b) Welding procedure qualification tensile tests shall meet both the minimum and maximum tensile strength requirements of the material specification.

(c) Each heat or lot of consumable welding electrodes and each heat or lot of filler wire and flux combination shall be tested to meet the requirements of (a) above.

(16) Caution is advised when using these materials as they are more susceptible than lower strength materials to environmental stress corrosion cracking and/or embrittlement due to hydrogen exposure. This susceptibility increases as yield strength increases. The designer shall consider these effects and their influence on the vessel. See Section II, Part D, Non-mandatory Appendix A, A-330.

(17) These materials shall not be used for applications when the material, when loaded, is in contact with water or an aqueous environment.

(a) These materials are permitted if the material is protected from contact by water or an aqueous environment.

(b) This restriction does not apply to components that are in hydrostatic compression during all loading cycles. Hydrostatic compression is assumed to exist if the sum of the three principal stresses is negative (compressive) at all locations within the component.

(18) The actual measured yield strength for these materials shall not be greater than 25 ksi (172 MPa) above the minimum specified value.

(19) These wire materials are suitable only for use in special closure parts designed in accordance with Article KD-6, for which it is impractical or impossible to obtain yield strength data.

The materials shall not be used for fabrication of other pressure-retaining components, such as bolting, wire-wound vessels, or wire-wound frames.

(20) For these wire materials, the value shown in the "Thickness" column is the wire diameter. The wire may be reshaped for final use from a round to some other cross section, provided the processing does not adversely affect the tensile strength of the material.

(21) Tensile strength values for intermediate diameters may be interpolated. The values at intermediate diameters shall be rounded to the same number of decimal places as the value at the lesser diameter between which values are being interpolated. The rounding rule is: when the next digit beyond the last place to be retained is less than 5, retain unchanged the digit in the last place retained; when the digit next beyond the last place to be retained is 5 or greater, increase by 1 the digit in the last place retained.

(22) These wire materials have maximum tensile strength requirements. See Section II, Part A, SA-231 or SA-232, as applicable.

(23) Welding of this material by the electroslag or electrogas process is not permitted. Except for local heating such as cutting and welding, heating of this material above 1,200°F (650°C) during fabrication is also not permitted.

(24) This material is permitted only when used in the fabrication of external yokes.
NOTES (CONT'D):

(17) These materials shall not be used for applications when the material, when loaded, is in contact with water or an aqueous environment.

(a) These materials are permitted if the material is protected from contact by water or an aqueous environment.

(b) This restriction does not apply to components that are in hydrostatic compression during all loading cycles. Hydrostatic compression is assumed to exist if the sum of the three principal stresses is negative (compressive) at all locations within the component.

(18) The actual measured yield strength for these materials shall not be greater than 25 ksi (172 MPa) above the minimum specified value.

(19) These wire materials are suitable only for use in special closure parts designed in accordance with Article KD-6, for which it is impractical or impossible to obtain yield strength data. The materials shall not be used for fabrication of other pressure-retaining components, such as bolting, wire-wound vessels, or wire-wound frames.

(20) For these wire materials, the value shown in the "Thickness" column is the wire diameter. The wire may be reshaped for final use from a round to some other cross section, provided the processing does not adversely affect the tensile strength of the material.

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(22) These wire materials have maximum tensile strength requirements. See Section II, Part A, SA-231 or SA-232, as applicable.

(23) Welding of this material by the electroslag or electrogas process is not permitted. Except for local heating such as cutting and welding, heating of this material above 1,200°F (650°C) during fabrication is also not permitted.

(24) This material is permitted only when used in the fabrication of external yokes.

Table KM-400-1M
Carbon and Low Alloy Steels (Metric) (Cont'd)
The actual measured yield strength for these materials shall not be greater than 25 ksi (172 MPa) above the minimum specified value.

These materials shall not be used for applications when the material, when loaded, is in contact with water or an aqueous environment.

Caution is advised when using these materials as they are more susceptible than lower strength materials to environmental stress corrosion cracking and/or embrittlement due to hydrogen exposure. This susceptibility increases as yield strength increases. The designer shall consider these effects and their influence on the vessel. See Section II, Part D, Nonmandatory Appendix A, Article 2.

This material shall only be used in the seamless condition.

This material has reduced toughness at room temperature after exposure at high temperature. The degree of embrittlement depends on composition, heat treatment, time, and temperature. The lowest temperature of concern is about 550°F (288°C). See Section II, Part D, Nonmandatory Appendix A, Article 1.

Yield strength values listed in Section II, Part D, Subpart 1, Table Y-1 are for material in the annealed condition.

A tensile strength of 70 ksi (485 MPa) minimum is permitted for extruded shapes.

No welding is permitted on this material.

For all design temperatures, the maximum hardness shall be Rockwell C35 immediately under thread roots. The hardness shall be taken on a flat area at least 1/8 in. (3 mm) across, prepared by removing threads; no more material than necessary shall be removed to prepare the flat area. Hardness determinations shall be made at the same frequency as tensile tests.

This restriction does not apply to inner layers in a vessel whose design meets the leak-before-burst criteria of KD-141.

This restriction does not apply to components that are in hydrostatic compression during all loading cycles. Hydrostatic compression is assumed to exist if the sum of the three principal stresses is negative (compressive) at all locations within the component.

The actual measured yield strength for these materials shall not be greater than 25 ksi (172 MPa) above the minimum specified value.

NOTES:

1. This material is permitted only when used as an inner layer in a vessel whose design meets the leak-before-burst criteria of KD-141.
2. No welding is permitted on this material.
3. A tensile strength of 70 ksi (485 MPa) minimum is permitted for extruded shapes.
4. Yield strength values listed in Section II, Part D, Subpart 1, Table Y-1 are for material in the annealed condition.
5. For all design temperatures, the maximum hardness shall be Rockwell C35 immediately under thread roots. The hardness shall be taken on a flat area at least 1/8 in. (3 mm) across, prepared by removing threads; no more material than necessary shall be removed to prepare the flat area. Hardness determinations shall be made at the same frequency as tensile tests.
6. This material has reduced toughness at room temperature after exposure at high temperature. The degree of embrittlement depends on composition, heat treatment, time, and temperature. The lowest temperature of concern is about 550°F (288°C). See Section II, Part D, Nonmandatory Appendix A, Article 1.
7. This material shall only be used in the seamless condition.
8. Caution is advised when using these materials as they are more susceptible than lower strength materials to environmental stress corrosion cracking and/or embrittlement due to hydrogen exposure. This susceptibility increases as yield strength increases. The designer shall consider these effects and their influence on the vessel. See Section II, Part D, Nonmandatory Appendix A, Article 1.
9. These materials shall not be used for applications when the material, when loaded, is in contact with water or an aqueous environment.
10. The actual measured yield strength for these materials shall not be greater than 25 ksi (172 MPa) above the minimum specified value.

GENERAL NOTE: The P-Nos. and Group Nos. listed for some of these materials are for information only. For welded construction in this Division, Section IX, Table QW/QB-422 shall be consulted for P-Nos. and Group Nos.

Table KM-400-2
High Alloy Steels (Cont’d)

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NOTES:

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(b) This restriction does not apply to components that are in hydrostatic compression during all loading cycles. Hydrostatic compression is assumed to exist if the sum of the three principal stresses is negative (compressive) at all locations within the component.

(c) This restriction does not apply to inner layers in a vessel whose design meets the leak-before-burst criteria of KD-141.
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