Designation: A 690/A 690M – 07

Standard Specification for High-Strength Low-Alloy Nickel, Copper, Phosphorus Steel H-Piles and Sheet Piling with Atmospheric Corrosion Resistance for Use in Marine Environments[1]

This standard is issued under the fixed designation A 690/A 690M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope*

1.1 This specification covers high-strength low-alloy nickel, copper, phosphorus steel H-piles and sheet piling of structural quality for use in the construction of dock walls, sea walls, bulkheads, excavations, and like applications in marine environments.

1.2 The atmospheric corrosion resistance of this steel is substantially better than that of ordinary carbon steels with or without copper addition (see Note 1). The steel has also shown to have substantially greater resistance to seawater "Splash Zone" corrosion than ordinary carbon steel (Specifications A 36/A 36M and A 328/A 328M) where exposed to the washing action of rain and the drying action of the wind or sun, or both. Where the steel is not boldly exposed, the usual provisions for the protection of ordinary carbon steel should be considered.

NOTE 1—For methods of estimating atmospheric corrosion resistance of low-alloy steels, see Guide G 101.

1.3 When the steel is to be welded, it is presupposed that a welding procedure suitable for the grade of steel and intended use or service will be utilized. See Appendix X 3 of Specification A 6/A 6M for information on weldability.

1.4 The values stated in either inch-pound units or SI units are to be regarded as standard. Within the text, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system must be used independently of the other. Combining values from the two systems may result in nonconformance with the specification.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

A 6/A 6M Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling

A 36/A 36M Specification for Carbon Structural Steel

A 328/A 328M Specification for Steel Sheet Piling

G 101 Guide for Estimating the Atmospheric Corrosion Resistance of Low-Alloy Steels

3. General Requirements for Delivery

3.1 Structural products furnished under this specification shall conform to the requirements of the current edition of Specification A 6/A 6M, for the specific structural product ordered, unless a conflict exists in which case this specification shall prevail.

3.2 Coils are excluded from qualification to this specification until they are processed into a finished structural product. Structural products produced from coil means structural products that have been cut to individual lengths from a coil. The processor directly controls, or is responsible for, the operations involved in the processing of a coil into finished structural product. Such operations include decoiling, leveling or straightening, hot-forming or cold-forming (if applicable), cutting to length, testing, inspection, conditioning, heat treatment (if applicable), packaging, marking, loading for shipment, and certification.

NOTE 2—For structural products produced from coil and furnished without heat treatment or with stress relieving only, two test results are to be reported for each qualifying coil. Additional requirements regarding structural products produced from coil are described in Specification A 6/A 6M.

4. Materials and Manufacture

4.1 The steel shall be semi-killed or killed.

5. Chemical Composition

5.1 The heat analysis shall conform to the requirements prescribed in Table 1.

5.2 The steel shall conform on product analysis to the requirements prescribed in Table 1, subject to the product analysis tolerances in Specification A 6/A 6M.

[1] This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee A01.02 on Structural Steel for Bridges, Buildings, Rolling Stock and Ships.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

***A Summary of Changes section appears at the end of this standard.**

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TABLE 1 Chemical Requirements

Element	Composition, % Heat Analysis
Carbon, max	0.22
Manganese[A]	0.60–0.90
Phosphorus	0.08–0.15
Sulfur, max	0.04
Silicon, max	0.40
Copper, min	0.50
Nickel	0.40–0.75

[A] Manganese, for each reduction of 0.01 percentage point below the specified carbon maximum, an increase of 0.06 percentage points manganese above the specified maximum is permitted, up to a maximum of 1.10 %.

5.3 Choice and use of alloying elements, combined with the listed element requirements prescribed in 5.1 to give the mechanical properties prescribed in Section 6.1, shall be made by the manufacturer and included and reported in the heat analysis of the steel.

5.4 When specified in the purchaser order or contract, the atmospheric corrosion resistance index, calculated on the basis of the heat analysis of the steel, as described in section 6.3.2 of Guide G 101, shall be determined, the minimum index value shall be by agreement between purchaser and manufacturer.

TABLE 2 Tensile Requirements

Tensile strength, min, ksi [MPa]	70 [485]
Yield point, min, ksi [MPa]	50 [345]
Elongation in 8 in. [200 mm], min, %	18[A]
Elongation in 2 in. [50 mm], min, %	21

[A] See elongation requirement adjustments under the Tension Tests section of Specification A 6/A 6M. See specimen orientation under the tension tests section of Specification A 6/A 6M.

NOTE 3—The user is cautioned that the Guide G 101 section 6.3.1 predictive equation (predictive method based upon the data of Larabee and Coburn) is not applicable to this steel, due to composition limits listed for this method.

6. Tension Test

6.1 The material, as represented by the test specimens, shall conform to the requirements as to tensile properties prescribed in Table 2.

7. Keywords

7.1 bulkheads; corrosion resistance; dock walls; excavations; high-strength; H-piles; low-alloy; marine environments; sea walls; sheet piling; steel; structural steel

SUPPLEMENTARY REQUIREMENTS

Supplementary requirements shall not apply unless specified in the purchase order or contract. Standardized supplementary requirements for use at the option of the purchaser are listed in Specification A 6/A 6M. In addition, the following supplementary requirement is also suitable for use with this specification.

S99. The minimum strength of the interlocked joint required for certain services may be specified for certain sheet piling sections subject to specific agreement between the material purchaser and the manufacturer.

SUMMARY OF CHANGES

Committee A01 has identified the location of selected changes to this standard since the last issue (A 690/A 690M – 05) that may impact the use of this standard. (Approved March 1, 2007.)

(1) Deleted unnecessary references from 2.
(2) Deleted Section 4 Appurtenant Materials.
(3) Deleted Table 1 on Appurtenant Materials.

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