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Standard Test Methods for Testing Multi-Wire Steel Prestressing Strand[1]

This standard is issued under the fixed designation A1061/A1061M; 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.

1. Scope

1.1 These test methods describe procedures for testing the mechanical ~~as well as relaxation~~ properties of multi-wire steel prestressing strand.

1.2 These test methods are intended for use in evaluating specific strand properties prescribed in specifications for multi-wire steel prestressing strand, but they do not quantify acceptance criteria specified in the applicable specification for the strand being tested.

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

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A370 Test Methods and Definitions for Mechanical Testing of Steel Products
E4 Practices for Force Verification of Testing Machines
E83 Practice for Verification and Classification of Extensometer Systems
E328 Test Methods for Stress Relaxation for Materials and Structures

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *breaking strength, n*—maximum force at or after which one or more wires fracture.

3.1.2 *free span, n*—the distance between the gripping jaws occupied by the length of strand to be tested in which the strand is not contacted or detrimentally influenced by the gripping system.

3.1.3 ~~*length of lay,*~~ *lay length, n*—the axial distance required to make one complete revolution of any wire of a strand.

3.1.4 *strand, n*—~~two or more~~a group of two, three or seven steel wires wound together in a helical ~~form.~~form with uniform lay length of not less than 12 and not more than 16 times the nominal diameter of the strand.

3.1.5 *yield strength, n*—measured force at 1.0 % extension under load (EUL).

4. Significance and Use

4.1 The ~~mechanical properties~~ breaking strength and elongation of the strand are determined by ~~a test~~ one or more tensile tests in which fracture of the specimen ideally occurs in the free ~~span between the jaws of the testing machine.~~span.

4.2 Mechanical properties of the strand will be negatively affected if proper care is not taken to prevent damage such as severe bending, abrasion, or nicking of the strand during sampling.

[1] These test methods are under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee A01.05 on Steel Reinforcement.

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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.

4.3 Premature failure of the test specimens may result if there is appreciable notching, cutting, or bending of the specimen by the gripping devices of the testing machine.

4.4 Errors in testing will result if the wires constituting the strand are not loaded uniformly.

4.5 The mechanical properties of the strand will be materially affected by excessive heating during test specimen collection or preparation.

~~4.6 Gripping difficulties will be minimized by following the suggested methods of gripping described in Section 7.~~

5. Apparatus

5.1 Tensile ~~test~~testing machine calibrated in accordance with Practices E4.

5.2 Class B-1 extensometer as described in Practice E83.

5.3 Class D extensometer as described in Practice E83~~.~~; alternately, a linear dial gauge or ruler with precision of ±1⁄16 in. [1.5 mm].

6. Sampling

6.1 Unless otherwise specified in the ~~material standard,~~ applicable specification for the strand being tested, test specimens shall be taken from the finished ~~product~~strand prior to packaging. The number of test ~~specimen(s)~~specimens shall be taken as specified in the applicable specification for the ~~material~~ strand being tested.

7. Gripping Devices

7.1 Due to inherent physical characteristics of individual tensile testing machines, it is not practical to recommend a universal gripping ~~procedure~~method that is suitable for all tensile testing machines. Therefore, it is necessary to determine which of the methods of gripping described in 7.1.1 – 7.1.3~~7.1.5~~ is most suitable for the tensile testing ~~equipment~~machine available. The gripping devices shall be designed such that during testing the load is distributed along the entire length of the grips. The minimum effective gripping length ~~as a minimum shall~~ should be equal to ~~the~~ or greater than the lay length of ~~lay of~~ the strand.

7.1.1 *Standard V-Grips with Serrated Teeth (Note 1).*

7.1.2 *Standard V-Grips with Serrated Teeth (Note 1), Using Cushioning Material*—In this method, material is placed between the grips and the test specimen to minimize the notching effect of the teeth. Materials that have been used include, but are not limited to lead foil, aluminum foil, carborundum cloth, and brass shims. The type and thickness of material required is dependent on the shape, condition, and coarseness of the teeth.

7.1.3 *Special Grips with Smooth, Semi-Cylindrical Grooves (Note 2, Fig. 1)*—The grips can be used as is or in conjunction with an abrasive slurry applied to the grooves of the grips and the gripped portion of the test specimen to prevent slippage. The slurry consists of abrasive such as Grade 3-F aluminum oxide and a carrier such as water or glycerin.

~~7.1.4 *Dead-End Eye Splices*—These devices are available in sizes designed to fit each size of strand to be tested.~~

7.1.4 *Chucking Devices*—Use of chucking devices of the type generally used for applying tension to strands in casting beds ~~is not recommended~~ or post-tensioning anchorages shall not be used as primary gripping devices for testing purposes. Tests involving chuck devices or post-tensioning anchorages as the primary gripping device shall be considered invalid. It shall be permissible to use chucking devices or post-tensioning anchorages as a secondary gripping system, coupled with one of the methods listed above, to prevent strand slippage.

NOTE 1—The number of teeth should be ~~15~~10 to 30 per inch [25 mm].

NOTE 2—The radius of curvature of the grooves should be approximately the same as the radius of the strand being tested. To prevent the two grips from closing tightly when the test specimen is in place, ~~the~~each groove should be located 1⁄32 in. [0.79 mm] above the flat face of the ~~grip.~~grip (see Fig. 1).

8. Speed of Testing

8.1 The speed of testing shall not be greater than that at which load and strain readings can be made accurately. Refer to speed of testing in Test Methods A370 on Testing Apparatus and Operations.

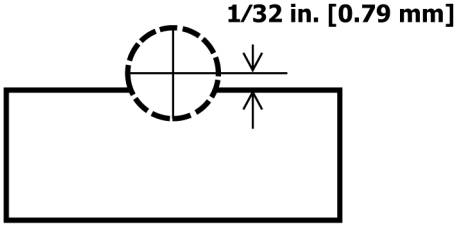

FIG. 1 Note the 1⁄32 in. [0.79 mm] Spacing Between the Flat Face and the Radius of the Grip