Designation: D7737 – 11

StandardTest Method for Individual Geogrid Junction Strength[1]

This standard is issued under the fixed designation D7737; 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 This test method is an index test which provides a procedure for determining the strength of an individual geogrid junction, also called a node. The test is configured such that a single rib is pulled from its junction with a cross-rib to obtain the maximum force, or strength of the junction. The procedure allows for the use of two different clamps with the appropriate clamp selected to minimize the influence of the clamping mechanism on the specific type of geogrid to be tested.

1.2 The values stated in SI units are to be regarded as the standard.

1.3 *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]

D4354 Practice for Sampling of Geosynthetics and Rolled Erosion Control Products(RECPs) for Testing

D4439 Terminology for Geosynthetics

D5262 Test Method for Evaluating the Unconfined Tension Creep and Creep Rupture Behavior of Geosynthetics

3. Terminology

3.1 Definitions of other terms applying to this test method appear in Terminology D4439.

3.2 *Definitions:*

3.2.1 *atmosphere for testing geosynthetics, n*—air maintained at a relative humidity of 50 to 70 % and a temperature of 21 ± 2°C (70 ± 4°F).

3.2.2 *breaking force, (F), n*—the force at failure.

3.2.3 *geogrid, n*—the force at failure.

3.2.4 *integral, adj*—a geosynthetic formed by a regular network of integrally connected elements with apertures greater than 6.35 mm (1⁄4 inch) to allow interlocking with surrounding soil, rock, earth, and other surrounding materials to primarily function as reinforcement. (D5262)

3.2.5 *index test, n*—a test procedure which may contain known bias, but which may be used to establish an order for a set of specimens with respect to the property of interest.

3.2.6 *junction, n*—the point where geogrid ribs are interconnected to provide structure and dimensional stability.

3.2.7 *rib, n*—for geogrids, the continuous elements of a geogrid which are interconnected to a node or junction.

3.2.8 *rupture, n*—for geogrids, the breaking or tearing apart of ribs.

4. Summary of Test Method

4.1 This standard proposes a test method for performing tension tests on geogrid junctions. The procedure provides two clamping techniques for the junction to be tested including: Method A in which the clamps firmly grip the ribs transverse to the test direction on each side of the junction; and, Method B in which the ribs transverse to the test direction are constrained in a slot, constraining rotation of the junction, while the rib in the test direction passes through the slot without the junction clamp applying confinement to the junction. The junction clamping technique is selected for the specific type of geogrid in order to minimize rotation and corresponding peal of the junction during the test. The rib in the test direction going through the junction is then clamped at a distance from the junction and the system tensioned until junction (or rib) failure occurs. This forces a tension or shear force to occur within the junction in the direction of the applied load. The junction has no normal pressure on it, i.e., it is horizontally unconfined.

5. Significance and Use

5.1 This index test method is to be used to determine the strength of an individual junction in a geogrid product. The test is performed in isolation, while in service the junction is typically confined. Thus the results from this test method are not anticipated to be related to design performance.

5.2 The value of junction strength can be used for manufacturing quality control, development of new products, or a

[1] This test method is under the jurisdiction of ASTM Committee D35 on Geosynthetics and is the direct responsibility of Subcommittee D35.01 on Mechanical Properties.

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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.

general understanding of the in-isolation behavior of a particular geogrid's junction (for example., in relation to handling during shipment and placement of the geogrid).

5.3 This test method is applicable to geogrid products with essentially orthogonal ribs, yarns or straps, that is, geogrids which are composed of ribs, yarns or straps that are entangled through weaving or knitting, welded, bonded or formed through drawing.

6. Apparatus

6.1 The test apparatus for this method consists of three parts; the tensile testing machine, the junction clamp and the rib clamp.

6.2 Tensile Testing Machine - The testing machine should operate under a constant rate of extension. It should have the capabilities of measuring the tensile force, typically with a load cell having an adequate load capacity to cover the full range of products to be tested. The test recorder must be able to adequately record the complete force-elongation curve during the test.

6.3 Method A: Junction Clamp (Rotation is Unconstrained) - The clamp assembly which holds the geogrid junction shall be of the same design or equivalent to that shown in Fig. 1. The clamp must only confine the horizontal rib on each side of the junction and not the junction itself. The ribs transverse to the test direction should be placed horizontally level such that torsion is not applied to the junction. The clamp cannot hinder or influence the junction. The two movable parts of the restraining clamp should be adjustable to allow the bearing surfaces to fit snugly without touching the junction of the geogrid product being tested. The clamp assembly should provide the appropriate clamping power to prevent slipping or

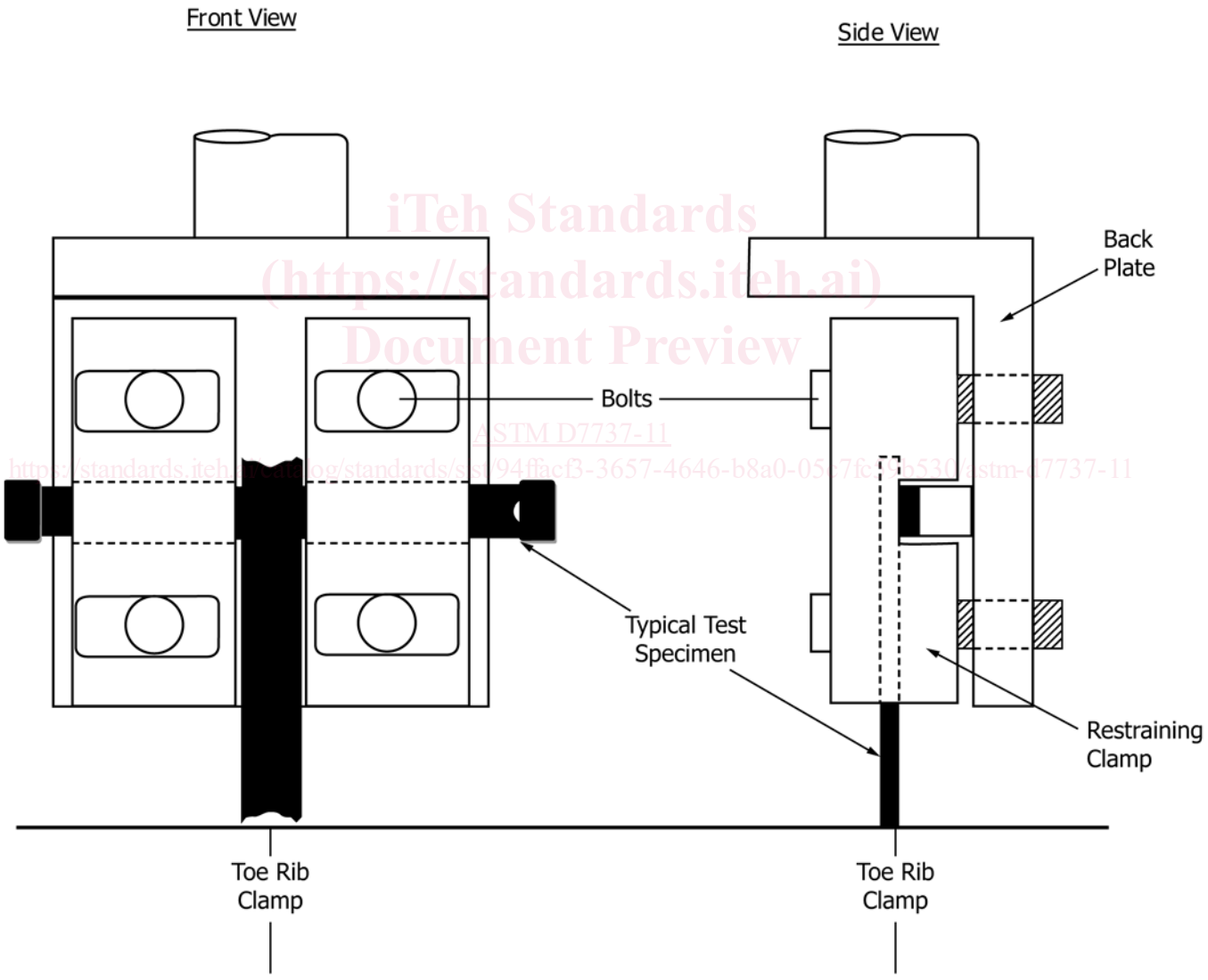

FIG. 1 Typical Junction Strength Test Specimen Test Setup [Rotation is not Constrained per Section 6.3]

crushing (damage) of the horizontal rib. The entire clamp assembly is to be placed in the upper portion of the testing machine.

NOTE 1—These clamps are particularly well suited for homogeneous extruded and woven geogrids with longitudinal ribs concentric with transverse ribs.

6.4 Method B: Junction Clamp (Rotation is Constrained) - The clamps according to Fig. 3 must only confine the horizontal rib on each side of the junction and not the junction itself. The clamps should continuously support the transverse rib to the test direction such that torsion is not applied. The clamp cannot hinder or influence the junction. The insert clamp shall fit snugly into the opening of the restraining clamp. Fig. 3a is for geogrids with two straps welded together in one junction, Fig. 3b is for geogrids with two horizontal straps welded to one vertical strap. The screws in Fig. 3a and Fig. 3b are not needed if the insert clamp fits snugly into the opening of the restraining clamp. The entire clamp assembly is to be placed in the upper portion of the testing machine. The dimensions of the insert clamp as stated in Fig. 3a and Fig. 3b should be as follows:

a - average width of vertical strap [mm] (readability 0.1 mm) + 0.6 mm

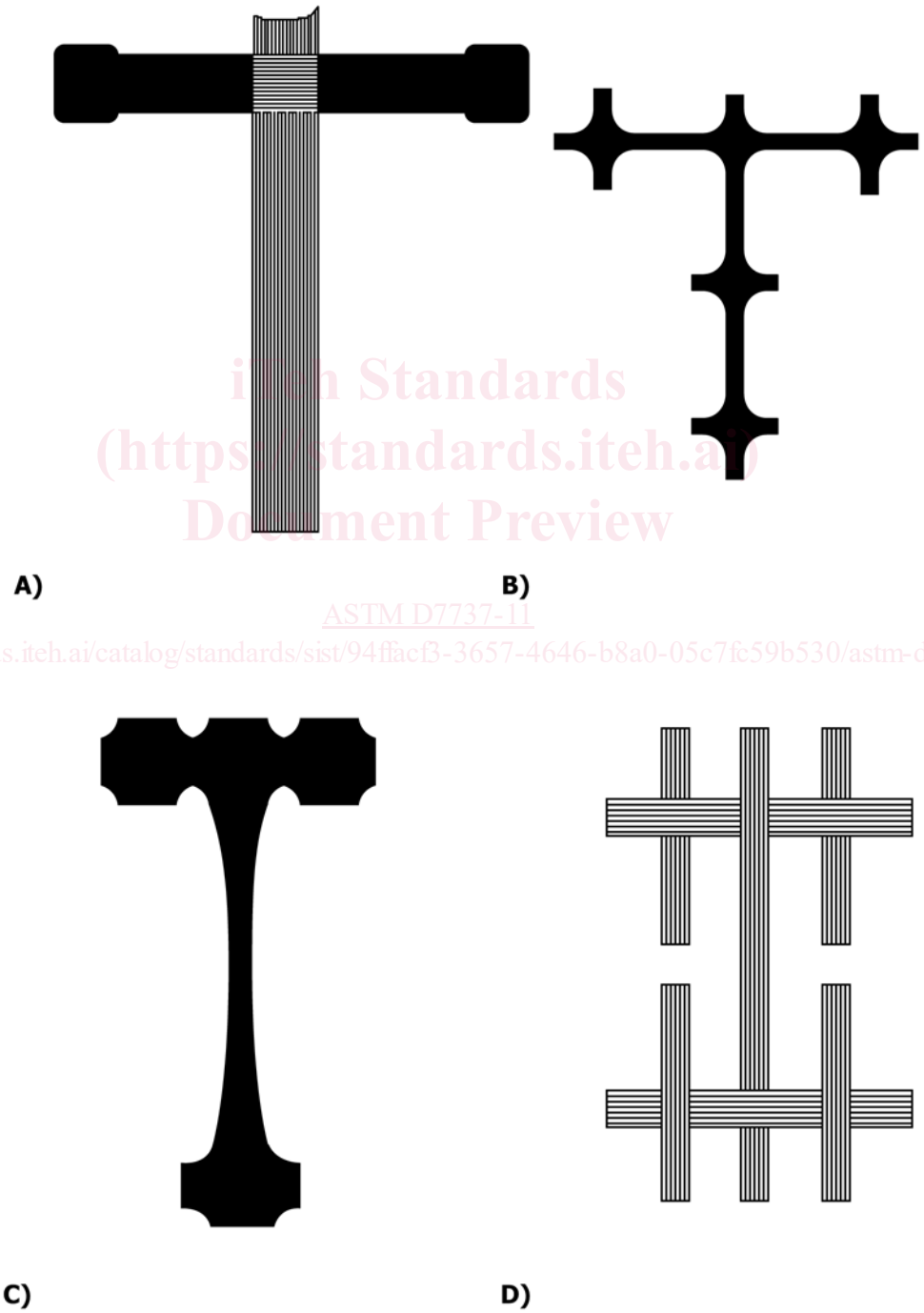

FIG. 2 Typical Junction Strength Specimens for Various Geogrid Products