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Standard Practice for Specifying Rock to Fill Gabions, Revet Mattresses, and Gabion Mattresses¹

This standard is issued under the fixed designation ~~D6711~~; D6711/D6711M; 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.

^{ε1} NOTE—Editorially corrected units of measurement statement in June 2021.

1. Scope—Scope*

1.1 This practice covers the sizes and quality of rock to fill gabions and mattresses. ~~The term mattress as used in this standard shall include the terminology of gabion mattresses and revet mattresses used in Specifications A974 and A975.~~

1.2 This practice does not cover the sizes and quality of rock for other erosion control uses such as riprap or drainage.

1.3 This practice does not cover the material properties or construction of gabions or mattresses.

1.4 *Units*—The values stated in either inch-pound units or SI units are to be regarded separately as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered 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 nonconformance with the standard.

1.5 *This practice offers a set of instructions for performing one or more specific operations. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this practice may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "Standard" in the title of this document means only that the document has been approved through the ASTM consensus process.*

1.6 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

¹ This practice is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.25 on Erosion and Sediment Control Technology.

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

2. Referenced Documents

2.1 *ASTM Standards*:²

- [A974 Specification for Welded Wire Fabric Gabions and Gabion Mattresses \(Metallic-Coated or Polyvinyl Chloride \(PVC\) Coated\)](#)
- [A975 Specification for Double-Twisted Hexagonal Mesh Gabions and Revet Mattresses \(Metallic-Coated Steel Wire or Metallic-Coated Steel Wire With Poly\(Vinyl Chloride\) \(PVC\) Coating\)](#)
- [D653 Terminology Relating to Soil, Rock, and Contained Fluids](#)
- [D4992 Practice for Evaluation of Rock to be Used for Erosion Control](#)
- [D5519 Test Methods for Particle Size Analysis of Natural and Man-Made Riprap Materials](#)

3. Terminology Terminology: Definitions, Symbols, Acronyms, and Abbreviations

3.1 *gabion, n—in erosion control*, a wire mesh container of variable size and interconnected with other similar containers. It is filled with rock to form flexible, permeable, monolithic structures.

3.1 For definitions of common technical terms used in this standard, refer to Terminology [D653](#).

3.2 *mattress, n—in erosion control*, a wire mesh container uniformly partitioned into internal cells with relatively small height in relation to other dimensions. Mattresses have smaller mesh openings than the mesh used for gabions.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *gabion, n—in erosion control*, a wire mesh container of variable size and interconnected with other similar containers. It is filled with rock to form flexible, permeable, monolithic structures.

3.2.2 *mattress, n—in erosion control*, a wire mesh container uniformly partitioned into internal cells with relatively small height in relation to other dimensions. Mattresses have smaller mesh openings than the mesh used for gabions.

3.2.2.1 Discussion—

The term mattress as used in this standard shall include the terminology of gabion mattresses and revet mattresses used in Specifications [A974](#) and [A975](#).

4. Summary of Practice

4.1 The designer shall establish establishes the suitable sizes, weight, and quality of rock for project use, and examine sources to ensure that the required rock is available.

4.2 Rock is delivered to the work site and handled in a manner to minimize its reduction in sizes (breakdown).

4.3 Rock shall be delivered to the work site in a manner to minimize its reduction in sizes (breakdown) during the handling of the rock, and then The rock is placed and secured within the assembled and interconnected gabion or mattress.

NOTE 1—Clean crushed concrete may be used as an alternative when rock is not available.

5. Significance and Use

5.1 Gabions and mattresses, mattresses are described in Specifications [A974](#) and [A975](#), are placed on sites for soil stabilization and to prevent soil erosion. Gabions and mattresses are primarily used for earth retaining walls, erosion mitigation and scour protection works. Their ability to function properly depends on their stability, which is partly dependent upon the rocks filling them. Rock sizes should be chosen to prevent individual rocks from falling through the mesh of the gabions or mattresses. The rock also has to withstand natural weathering processes during the life of the project that would cause it to breakdown to sizes smaller than the wire mesh opening dimensions.

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.



TABLE 1 Recommended Rock Sizes

Type of Structure	Nominal Thickness		Rock Sizes	
	in.	[mm]	in.	[mm]
Gabion Mattress or Revet Mattress	6	170	3–5	76–127
Gabion Mattress or Revet Mattress	9	230	3–5	76–127
Gabion Mattress or Revet Mattress	12	300	4–8	102–203
Gabion Mattress or Revet Mattress	12	300	4–8	102–203
Gabion	18	500	4–8	102–203
Gabion	36	1000	4–8	102–203

6. Bulk Filling Materials

6.1 Rock to fill gabions or mattresses may be any natural deposit of the required sizes or may be crushed rock produced by any suitable method and by the use of any device that yields the required size limits chosen in Section 7.

6.2 Rocks shall be hard, angular to round, durable, and of such quality that they shall not disintegrate on exposure to water or weathering during the life of the structure. Guidance for selecting durable rock is given in Practice D4992.

7. Standard Sizes of Rock

7.1 Guidance for measurement of rock sizes is given in Test Method D5519. Sizes of rock to fill gabions and mattresses are chosen on the basis of the mesh sizes, the structure's thickness, and the limits shown in 7.4. Fabrication of sieves to determine particle size is given in Test Method D5519.

7.2 Within each range of sizes, the rock shall be large enough to prevent individual pieces from passing through the mesh openings stated in Specifications A974 and A975. Each range of sizes may allow for a variation of 5% oversize rock by number of particles, or 5% undersize rock by number of particles, or both.

7.3 In all cases, the sizes of any oversize rock shall allow for the placement of two or more layers of rock within each gabion compartment, and two or more layers of rock within each mattress compartment dependent upon the height of the mattresses. In all cases, undersize and oversize rock shall be placed within the interior of the gabion or mattress compartment and shall not be placed on the exposed surface of the structure. There shall be a maximum limit of 5% undersize or 5% oversize rock, or both, within each gabion or mattress compartment.

7.4 The recommended dimensions of rock sizes are given in Table 1 the following:

Type of Structure	Nominal Thickness		Rock Sizes	
	in.	(mm)	in.	(mm)
Gabion Mattress or Revet Mattress	6	(152.4)	3–5	(76.2–127)
Gabion Mattress or Revet Mattress	9	(228.6)	3–5	(76.2–127)
Gabion Mattress or Revet Mattress	12	(304.8)	4–8	(102.6–203)
Gabion	12	(304.8)	4–8	(102.6–203)
Gabion	18	(457.2)	4–8	(102.6–203)
Gabion	36	(914.4)	4–8	(102.6–203)

7.5 Within the table, there shall be a full range of sizes between the upper and lower limits.

8. Keywords

8.1 erosion control; gabions; mattresses; rock