



Designation: D7014 – 22

Standard Practice for Installation of Double-Twisted Wire Mesh Gabions and Revet Mattresses¹

This standard is issued under the fixed designation D7014; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope*

1.1 This specification covers standard practice for foundation preparation, assembly, placement and filling of double-twisted wire mesh gabions and revet mattresses used for various erosion control, soil retention or freestanding structures.

1.2 This guide offers an organized collection of information or a series of options and does not recommend a specific course of action. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this guide 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."

1.3 *Units*—The values stated in SI units are to be regarded as standard. The values given in parentheses are provided for information only and are not considered standard.

1.4 *This standard may involve hazardous materials, operations, and equipment. 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.*

1.5 *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.

Current edition approved June 1, 2022. Published June 2022. Originally approved in 2004. Last previous edition approved in 2018 as D7014–18^{ε1}. DOI: 10.1520/D7014-22.

2. Referenced Documents

2.1 *ASTM Standards*:²

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

D6711 Practice for Specifying Rock to Fill Gabions, Revet Mattresses, and Gabion Mattresses

3. Terminology

3.1 *Definitions*:

3.1.1 For definitions of common technical terms in this standard, refer to Terminology D653.

3.2 *Definitions of Terms Specific to This Standard*:

3.2.1 *selvedge wire, n*—a terminal wire used to edge the wire mesh perpendicular to the double twist by mechanically wrapping the mesh wires around it at least 2.5 times or by inserting it through the twists and folding one mesh length.

3.2.2 *edge wire, n*—a terminal wire used to edge the wire mesh parallel to the double twist by continuously weaving it into the wire mesh.

3.2.3 *lacing wire, n*—for gabions and revet mattresses, a metallic coated steel wire or metallic coated steel wire with PVC coating used to assemble and interconnect empty units, to close and secure stone filled units and for internal stiffeners.

3.2.4 *fastener, n*—an alternate connector to lacing wire, used for binding operations for gabions and revet mattresses.

3.2.5 *stiffener, n*—for gabions, a length of metallic coated steel wire or metallic coated steel wire with PVC coating used for support of facing.

3.2.5.1 *Discussion*—Stiffeners can be formed at project site using lacing wire by connecting the front panel to the back panel of a gabion cell. Alternatively, preformed stiffeners can

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

be installed across the corner of a gabion cell or connecting the front panel to the back panel of a gabion cell as specified in Specification A975.

3.2.6 *diaphragm, n—in erosion control*, wire mesh panel used to partition the gabions and revet mattresses into compartments.

4. Significance and Use

4.1 Gabions and Revet Mattresses, as described in Specification A975, are used to achieve soil stability and prevent soil erosion and are also used as retaining wall structures to resist movements due to gravity. Their ability to function properly depends on correct design and installation. This standard practice describes the proper installation of gabions and revet mattresses to ensure the products function as intended by the manufacturers.

5. Material Delivery

5.1 Gabions and revet mattresses are manufactured with all components mechanically connected at the production facility with the exception of the mattress lid, which is produced separately from the base, as per Specification A975. All gabions and revet mattresses shall be labeled to show their dimensions, the number of pieces, and the manufacturer’s color code if applicable.

5.2 All gabions and revet mattresses are supplied in the collapsed form, either folded and bundled or rolled, for shipping. The bundles are banded together at the factory for shipping and handling. Revet mattress bases and lids may be packed in separate bundles. Lacing wire is shipped in coils having a diameter approximately 0.60 m (2 ft). Fasteners are shipped in boxes. Preformed stiffeners are shipped in bundles.

6. Assembly

6.1 *Gabions:*

6.1.1 The folded units shall be taken out from the bundle and placed on a hard, flat surface. Gabions shall be unfolded and pressed out to their original shape (Fig. 1). Front, back and end panels shall be lifted to a vertical position to form an open box shape (Fig. 2).

6.1.2 Panels shall be fastened together with the projecting heavier gauge selvedge wire by firmly wrapping the selvedge wire around the selvedge or edge wire of the intersecting panel or the back panel (Fig. 3). Inner diaphragm panels shall be lifted into a vertical position and secured in the same manner. All edges of the diaphragms and end panels shall be tied or fastened to the front and back of the gabion as specified in Section 7.

6.2 *Revet Mattresses:*

6.2.1 The folded units shall be taken out from the bundle and placed on a hard, flat surface. Revet mattresses shall be opened, unfolded and pressed out to their original shape. Front, back and end panels shall be lifted to a vertical position to form an open box shape (Fig. 4).

6.2.2 End flaps shall be folded and/or overlapped, as appropriate. All edges of the diaphragms and end panels shall be tied or fastened to the front and back of the mattress, as specified in Section 7.

7. Fastening Procedure

7.1 All gabions and revet mattresses must be fastened as specified in 7.2 and 7.3 at each step of construction. Initial assembly, tying of adjacent units along the contacting edges, tying of the lid to sides, tying of lid to top of diaphragms, and re-tying of cut gabions or revet mattresses.

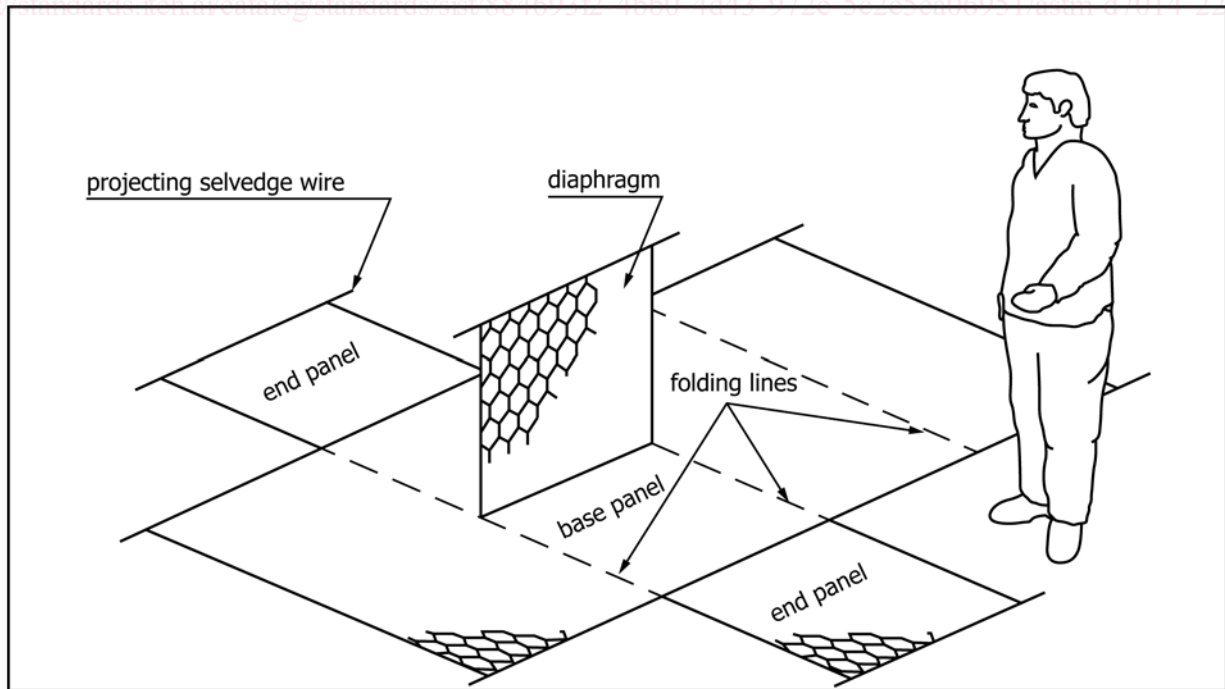


FIG. 1 Unfolding Gabion

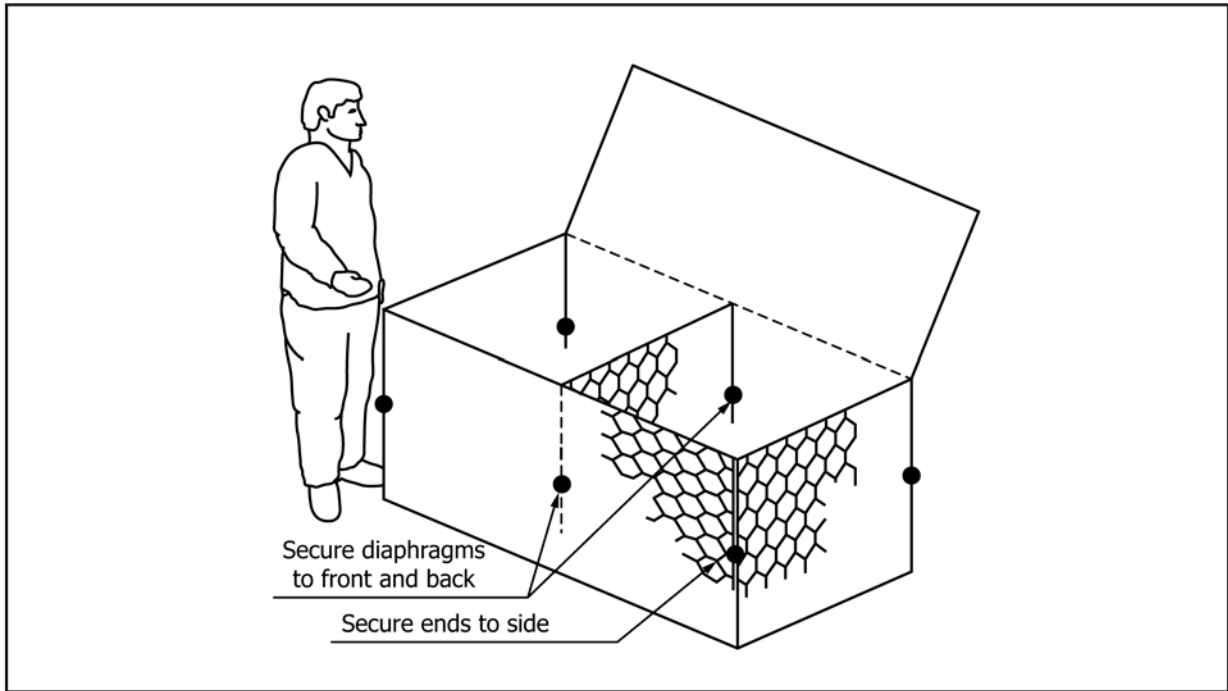


FIG. 2 Assembled Gabion

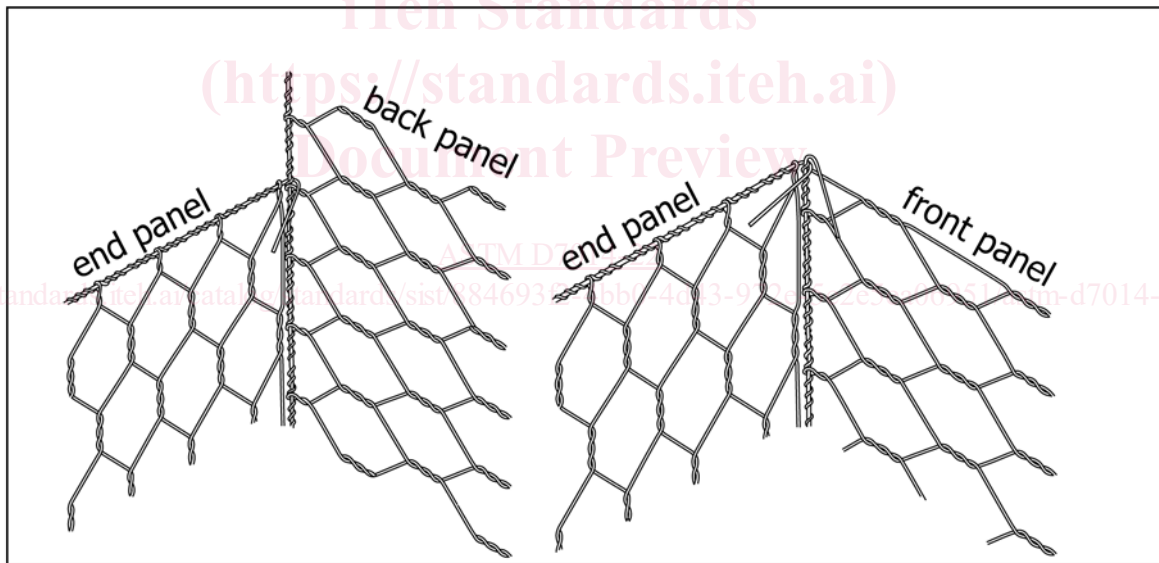


FIG. 3 Selvedge Connection—End and Front Panel to Back Panel

7.2 When using tie wire, cut a piece of wire approximately 1.5 times the length of the edge to be tied. The maximum length of the edge to be tied at one time shall not exceed 1 m (or 3 ft). Longer edges shall be joined by several lengths of wire. Tie wires shall be secured around the selvedge wire or heavier edge wire, where present, by looping and twisting the lacing wire around itself. Proceed tying with alternate double and single loops. Double loops shall be made at intervals not greater than 0.10 m to 0.15 m (4 in. to 6 in.) (Fig. 5). The basket pieces should be pulled tightly together during the tying operation. The other end of the tie wire shall be secured again by looping and twisting the wire around itself. When using tie

wire to assemble the units, pliers may be used to create tight joints. Care should be taken to avoid damaging the wire coating. Minimum requirements for panel to panel joint strength using tie wire shall be as specified in Specification A975.

7.3 When steel wire ring fasteners are used, the use of either a mechanical or a pneumatic fastening tool is required. Rings shall be installed at the top and the bottom connections of the end and center diaphragms and then a maximum nominal spacing required to conform panel to panel connection strength outlined in Specification A975 along all edges shall be used

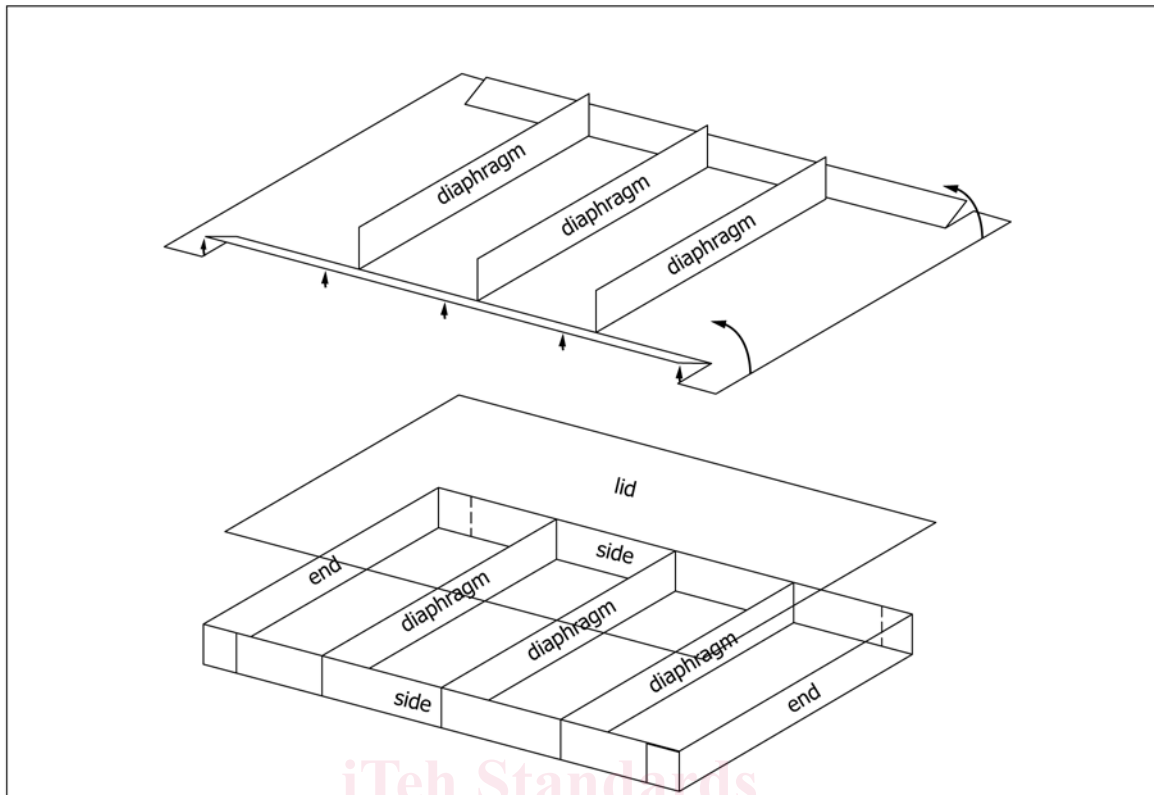


FIG. 4 Assembly—Revet Mattresses

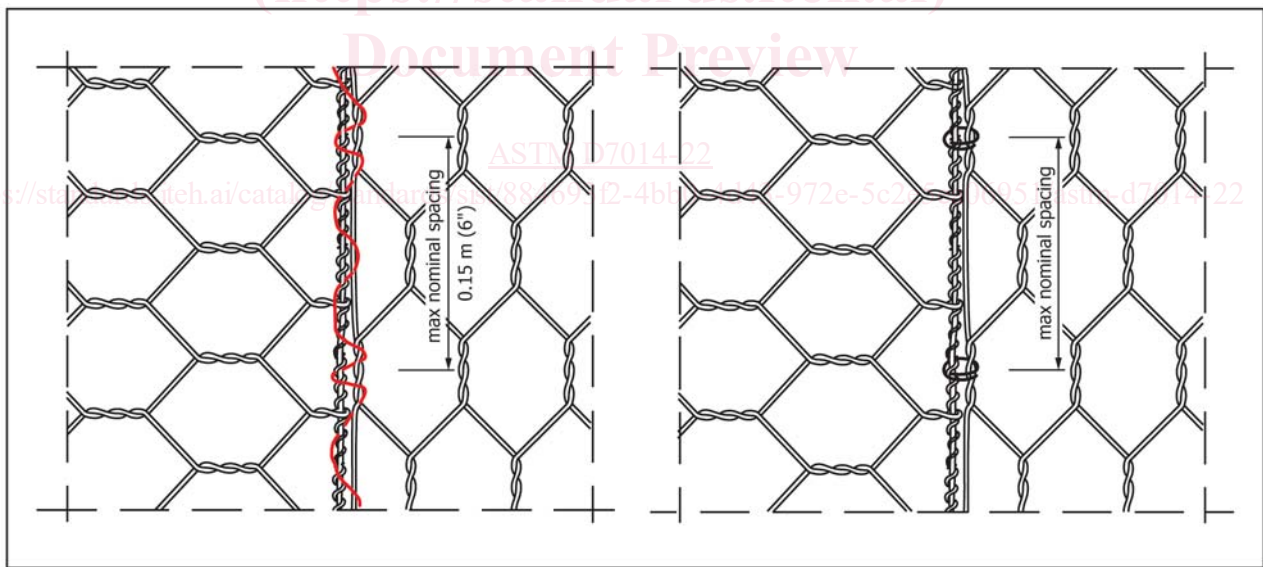


FIG. 5 Fastening Procedure—Connection Using Lacing Wire or Ring Fasteners

(Fig. 5). Ring fasteners can be galvanized, stainless steel or Zinc-5 % aluminum-mischmetal alloy coated, depending on the type of wire specified in Specification A975, section 6.3. Minimum requirements for the panel to panel joint strength using ring fasteners, as well as the mechanical and physical characteristics of the ring fasteners shall be as specified in Specification A975, section 7.2.

8. Foundation Preparation

8.1 The foundation for gabions shall be level, smooth, free of surface irregularities, loosed materials, vegetation, and graded to the elevations as shown on the project construction drawings.

8.2 The foundation for revet mattress shall be smooth and free of surface irregularities, loose material, and vegetation, and graded to the elevations as shown on the project construction drawings.

8.3 Appropriate measures shall be taken for filtering and drainage of the foundation, (geotextile or graded aggregate filters, drain pipes, etc.). Geotextiles required to be installed behind or underneath gabion or revet mattress structures shall comply with the local standard requirements for subsurface drainage applications.

9. Installation and Filling

9.1 Gabions:

9.1.1 After the foundation has been prepared, the pre-assembled gabions shall be placed in position empty, and shall be tied or fastened to adjacent gabions along all containing edges in order to form a continuously connected, monolithic structural unit. All connections shall be in accordance with Section 7. Gabions shall be placed front to front and back to back in order to expedite the stone filling and lid lacing operations (Fig. 6).

9.1.2 Rock sizes shall be in accordance with Practice D6711. Rocks shall be placed in 0.30 m (1 ft) lifts for 0.91 m (3 ft) or 1 m high gabions, and 0.23 m (9 in) lifts for 0.46 m (1.5 ft) or 0.50 m high gabions. The fill layer shall never be more than 0.30 m (1 ft) higher than any adjoining cell (Fig. 7). Care shall be taken when placing the stone to ensure that the PVC coating on gabions is not damaged. After a layer of rock has been placed in the cell, sufficient hand manipulation of the rock shall be performed to minimize voids and achieve a maximum density of rock in the gabion. The rock in exposed vertical faces shall be hand placed to reduce voids on the outer face.

9.1.3 Stiffeners shall be installed as indicated (Figs. 8 and 9) at the vertical third points of any unsupported or exposed face for a gabion 0.91 m (3 ft) or 1 m high, as the cell is being filled.

Gabion units installed at the wall ends, having two exposed sides, shall also include stiffeners installed perpendicularly to the lateral exposed face. For 0.3 m (1 ft) or 0.46 m (1.5 ft) high baskets when used as revetment, stiffeners are not required. When more than one vertical layer of gabions is installed, units shall be overfilled to approximately 0.025 m (1 in) to 0.04 m (1.5 in) to allow for natural settlement. The top surface shall be smoothly leveled, minimizing voids. Ensure that diaphragm tops are accessible for connecting.

9.2 Revet Mattresses:

9.2.1 The pre-assembled revet mattresses shall be placed in position empty and shall be tied or fastened to adjacent revet mattresses along all contacting edges in order to form a continuously connected monolithic structural unit. On slopes, the mattress shall be laid with the width perpendicular to the slope, except for very small channels. Mattresses shall be placed and securely attached while empty. All connections shall be in accordance with Section 7. Where mattresses are to be placed on steep slopes (1.5 Horizontal to 1 Vertical or steeper), the unit may be secured by anchoring systems (hardwood pegs, galvanized pipes, steel bars, etc.) driven into the ground just below the upper end panel. Diameter, location and the length of the anchoring system shall be established by the engineer based on the slope, mesh opening and strength, mattress height or as specified in the project specifications.

9.2.2 Rock sizes shall be in accordance with Practice D6711. Mattresses can be filled by any suitable appropriate size machine, such as a backhoe, crane, etc. Care shall be taken when placing the stone to ensure that the PVC coating on mattresses is not damaged. Sufficient hand manipulation of the rock shall be performed to minimize voids and result in a maximum density of rock in the mattress. Filling shall be done unit by unit, but several units shall be ready for filling at any one time.

9.2.3 Ensure that the diaphragm tops are accessible for wiring. Securely attach the lids to the ends of the mattresses

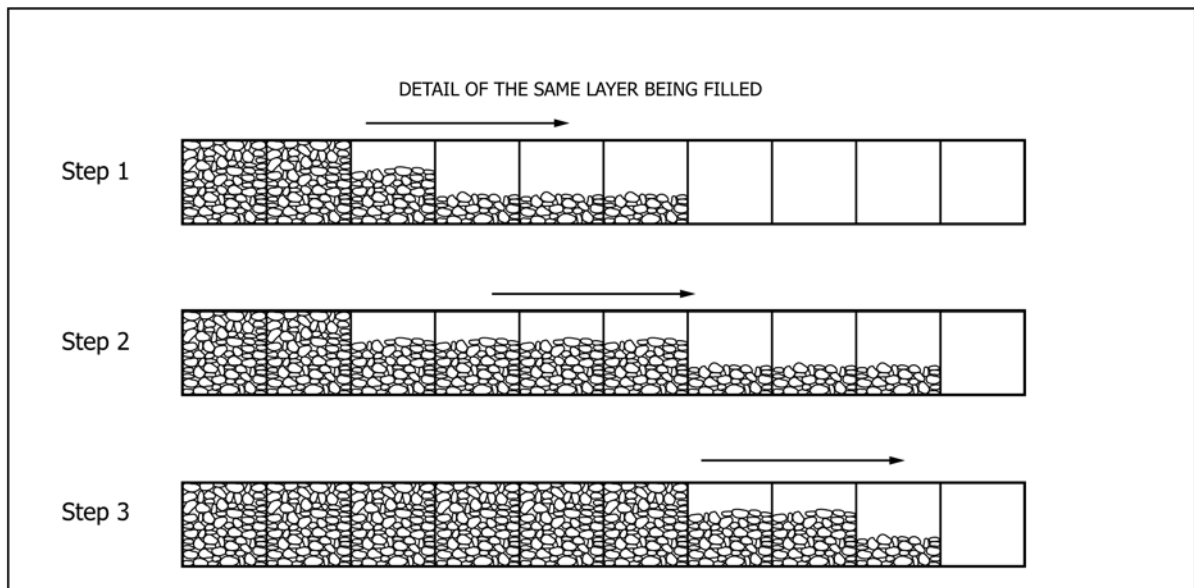


FIG. 6 Installation and Filling—Gabions