

ARTWELD GABIONS & GABION FACED M.S.E. Construction Guide



HILFIKER RETAINING WALLS

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The **ArtWeld Gabion** is named for our friend and coworker, Arthur Lee Hilfiker, who originated, developed and tested the gabions before his untimely death in June 1986. Arthur's idea was to develop a gabion that was easily shipped, quickly assembled and structurally superior to conventional gabions. He succeeded admirably.

*The possible uses of **ArtWeld Gabions** are so varied that this guide can not show them all. This guide details only the assembly process. Follow your plans for the structural design and site placement.*

ArtWeld Gabions are factory cut from galvanized or non-galvanized 3" x 3" Welded Wire Mesh. The main panel components are fastened together at our facilities with galvanized clips and spiral binders. They are then folded and shipped flat to the site. No flattening, bending, stretching or folding is required in the field. The sides are simply raised and connected together with spiral binders. Because the wire is not bent, no cracking of the galvanized coating can occur. Typically, a 6' x 3' x 3' gabion takes less than 5 minutes to make ready for filling.

The strength of Welded Wire Mesh offers many advantages. It allows careful machine filling. It is easy to hold the alignment of the face. The manufacture of large gabions is possible, up to 24' x 6' x 3', meaning fewer seams to be joined in the field. Also, if a gabion must be cut to fit site conditions, the wire can be cut with bolt cutters without losing structural strength.

ArtWeld Gabions can be manufactured in conventional sizes, or custom sizes for special site conditions. Wire diameter and thickness of galvanizing, if any, can be varied to suit job requirements.

For your next gabion project, contact Hilfiker Retaining Walls for a quote on a product we are proud to manufacture. We look forward to being of service to you and your clients.

9th Edition
Dec 2001

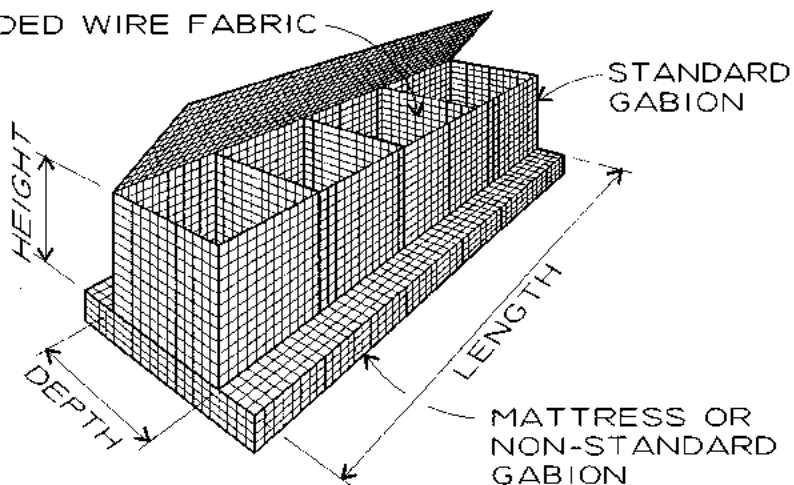


3" = 76MM	6' = 1.83M
3' = 914MM	24' = 7.32M



ARTWELD GABIONS CAN BE MANUFACTURED IN BOTH ENGLISH AND METRIC UNITS. FOR SIMPLICITY, DIMENSIONS IN THIS GUIDE REFER ONLY TO *ENGLISH UNITS*. CONSTRUCTION METHODS FOR BOTH TYPES ARE IDENTICAL.

WELDED WIRE FABRIC



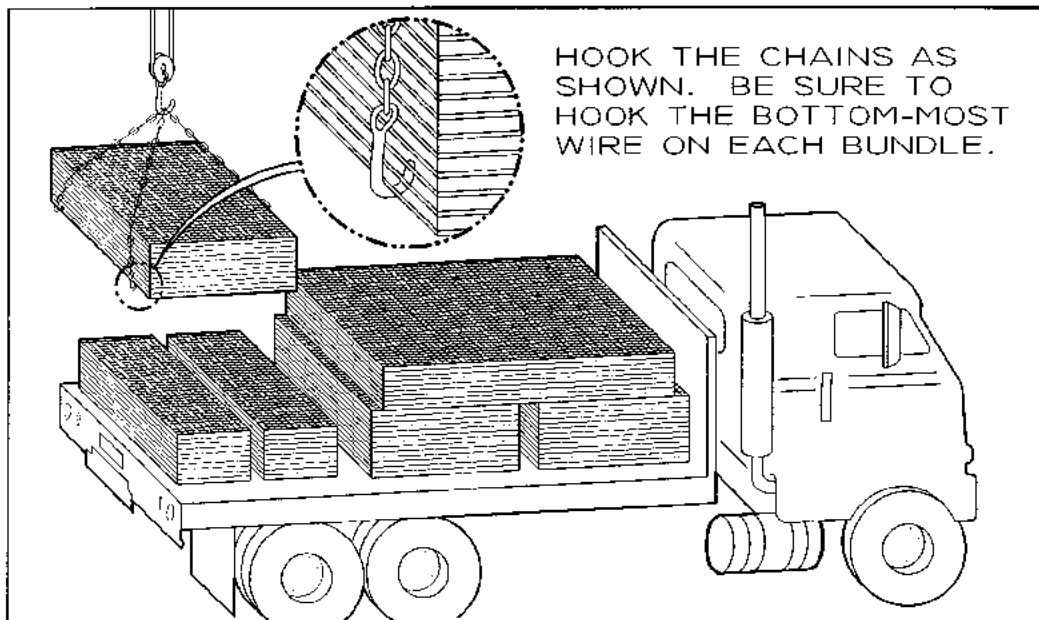
STANDARD *ENGLISH* UNIT GABIONS ARE SIZED IN MULTIPLES OF 3 FEET (0.914 METERS). THEY ARE MANUFACTURED OF 3"X3" (76MM X 76MM) WELDED WIRE FABRIC.

STANDARD *METRIC* UNIT GABIONS ARE SIZED IN MULTIPLES OF 1 METER (3.28 FEET). THEY ARE MANUFACTURED OF 83MM X 83MM (3.25" X 3.25") WELDED WIRE FABRIC.

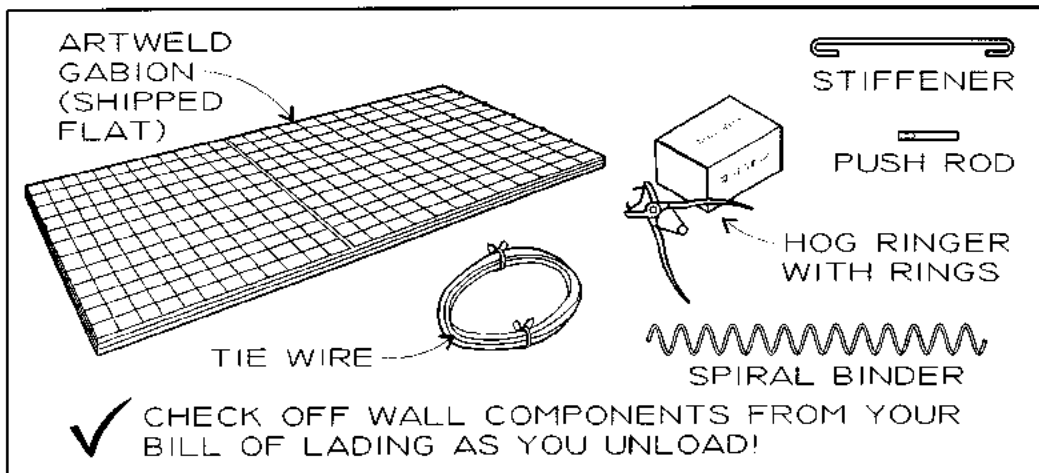
BOTH ENGLISH UNIT AND METRIC UNIT GABIONS ARE SUPPLIED IN 9 GA AND 11 GA GALVANIZED, AND 9 GA NON-GALVANIZED WELDED WIRE FABRIC.

NON-STANDARD SIZES, AND MATTRESSES, CAN BE SPECIAL-ORDERED TO FIT PROJECT REQUIREMENTS.

RECOMMENDED UNLOADING PROCEDURE

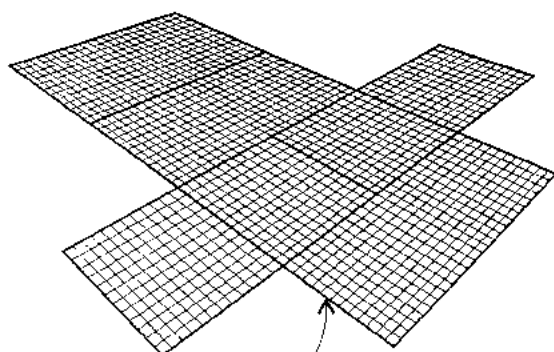


G A B I O N P A R T S

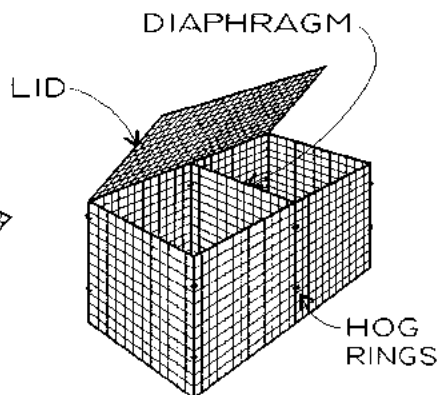


ON-SITE ASSEMBLY

1

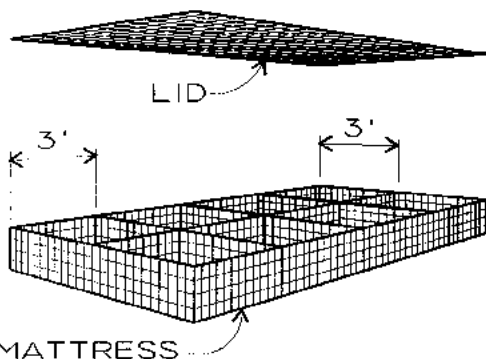


FIRST, UNFOLD THE GABION



THEN STAND THE SIDES UP AND JOIN THE EDGES TEMPORARILY WITH HOG RINGS

THIS GUIDE SHOWS ASSEMBLY WITH HOG RINGS AND SPIRAL BINDERS BECAUSE THAT IS THE EASIEST AND FASTEST ASSEMBLY METHOD.



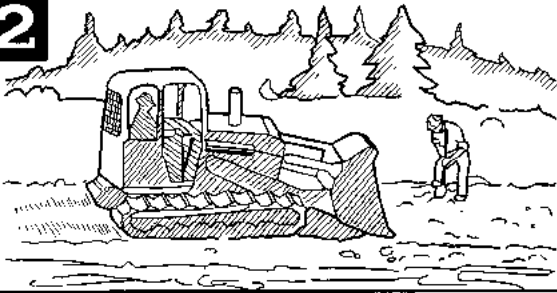
YOU MAY USE TIE WIRE AND HALF-HITCH LACING FOR ALL CONNECTIONS IF DESIRED.

HOG RINGS ARE **NOT** PERMANENT CONNECTIONS AND MUST BE FOLLOWED BY SPIRAL BINDERS OR TIE WIRE.

LIDS ARE NOT FACTORY ATTACHED ON GABIONS WIDER THAN 3'.

3' = 914MM

2

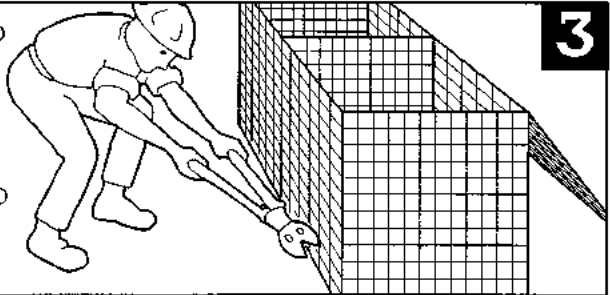


EXCAVATE AND FINE-
GRADE THE
FOUNDATION.

FOUNDATION MUST
BE REASONABLY
LEVEL AND
CAPABLE OF
SUPPORTING
IMPOSED LOADS

GABIONS MAY BE FIELD
CUT TO FIT CURVES,
CULVERTS OR ANGLES.

RECONNECT THE ENDS
OF THE GABIONS THE
SAME WAY YOU WOULD
ASSEMBLE AN UNCUT
GABION



3

4

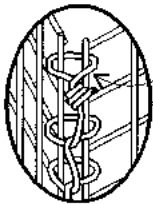
CLIP
TOP
EDGES
OF THE
BASKETS
TOGETHER
WITH HOG
RINGS

USE ONE SPIRAL
AT *EVERY*
VERTICAL
CONNECTION.

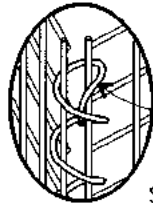
PLACE THE FIRST
COURSE OF
GABIONS ON THE
FOUNDATION.

BIND ALL
EXTERIOR
CORNERS &
DIAPHRAGMS

YOU MAY CLIP THE
SIDES TOGETHER
WITH HOG RINGS
TO HOLD THEM
TEMPORARILY.

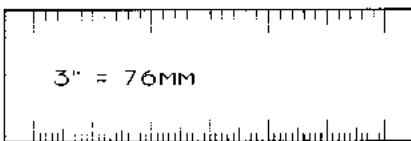


IF YOU ARE
USING TIE
WIRE, USE
HALF-HITCH
LACING AT 3"



CRIMP
ENDS
OF ALL
SPIRAL
BINDERS

PERMANENTLY
BIND THE GABIONS
TOGETHER AS
SHOWN FOR THE
FULL HEIGHT
AT ALL CORNERS
AND DIAPHRAGMS.

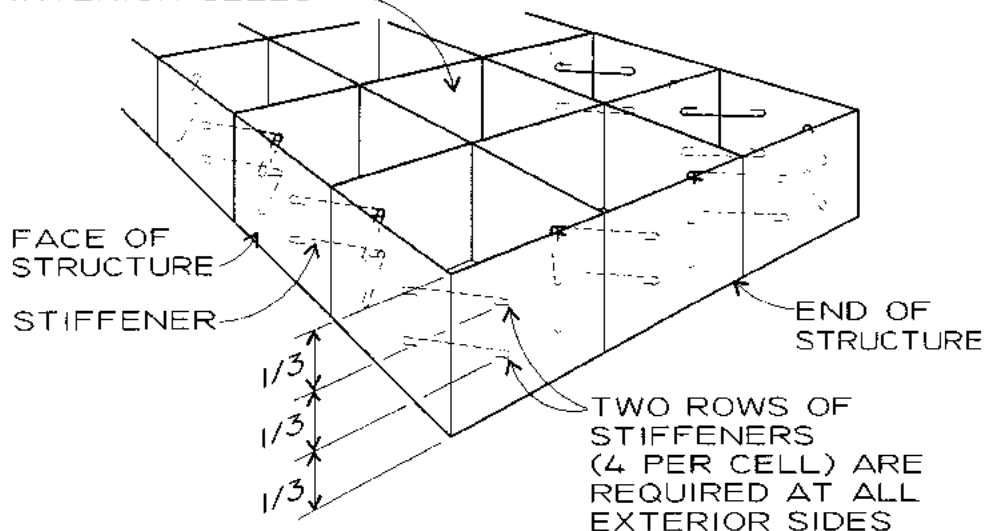


STIFFENER INSTALLATION

5

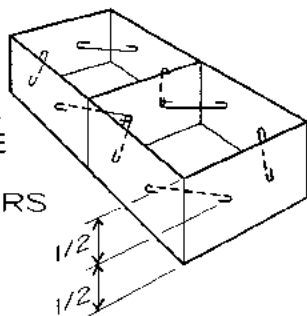
BEFORE FILLING, INSTALL STIFFENERS
ACROSS THE CORNERS OF THE GABIONS
ON ALL EXTERIOR SIDES
OF THE STRUCTURE

NO STIFFENERS IN
INTERIOR CELLS

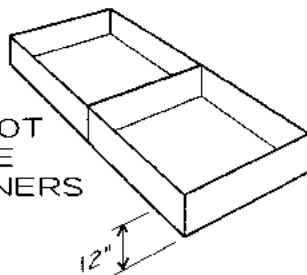


6

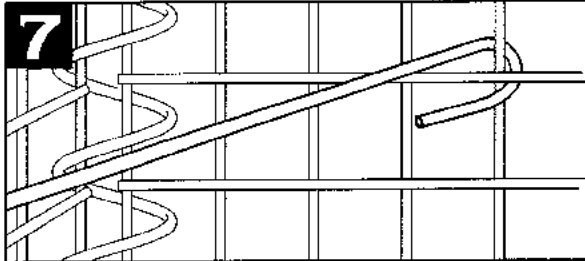
AN 18" GABION
REQUIRES
ONLY ONE
ROW OF
STIFFENERS



A 12" GABION
DOES NOT
REQUIRE
STIFFENERS



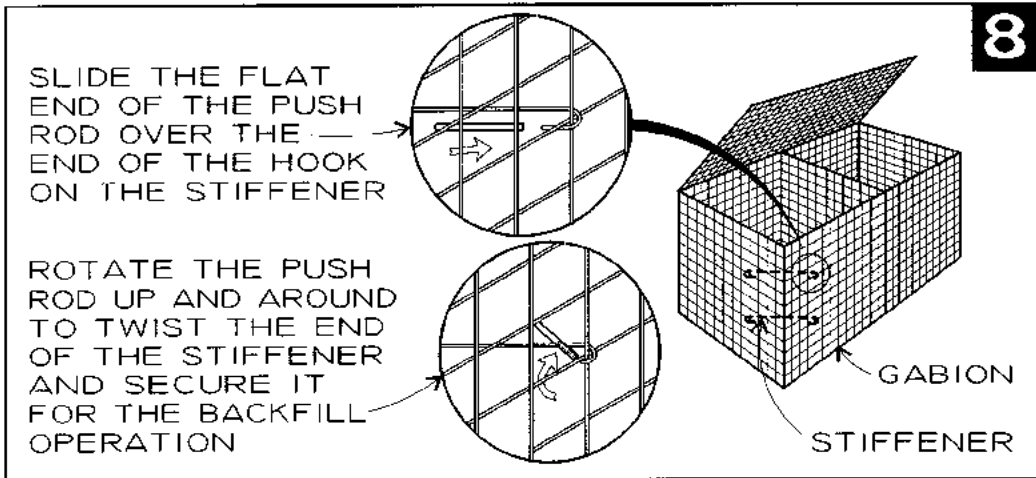
12" = 305MM
18" = 457MM



7 BE SURE TO HOOK THE STIFFENERS ACROSS A WELD INTERSECTION AS SHOWN.

CRIMP BOTH ENDS OF THE STIFFENERS CLOSED.

USING THE PUSH RODS

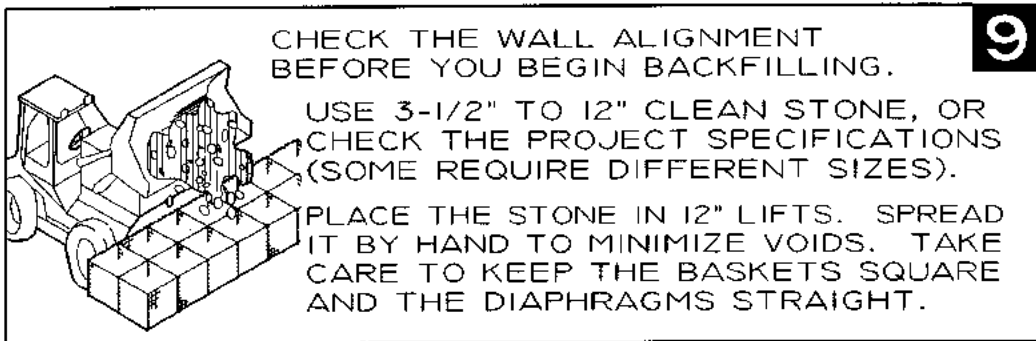


8 SLIDE THE FLAT END OF THE PUSH ROD OVER THE — END OF THE HOOK ON THE STIFFENER

ROTATE THE PUSH ROD UP AND AROUND TO TWIST THE END OF THE STIFFENER AND SECURE IT FOR THE BACKFILL OPERATION

GABION
STIFFENER

BEGIN THE FILL

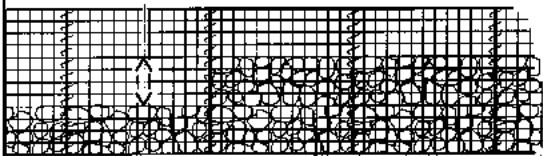


9 CHECK THE WALL ALIGNMENT BEFORE YOU BEGIN BACKFILLING.

USE 3-1/2" TO 12" CLEAN STONE, OR CHECK THE PROJECT SPECIFICATIONS (SOME REQUIRE DIFFERENT SIZES).

PLACE THE STONE IN 12" LIFTS. SPREAD IT BY HAND TO MINIMIZE VOIDS. TAKE CARE TO KEEP THE BASKETS SQUARE AND THE DIAPHRAGMS STRAIGHT.

3-1/2" = 89MM
12" = 305MM

10— 12" MAXIMUM
RECOMMENDED

IT IS RECOMMENDED THAT THE FILL IN ANY CELL NEVER BE MORE THAN 12" HIGHER THAN THE FILL IN AN ADJOINING CELL.

11

CONTINUE FILLING THE GABIONS IN 12" LIFTS UNTIL THEY ARE FILLED. FILL FLUSH OR SLIGHTLY ABOVE THE TOP OF THE GABION.

FLUSH



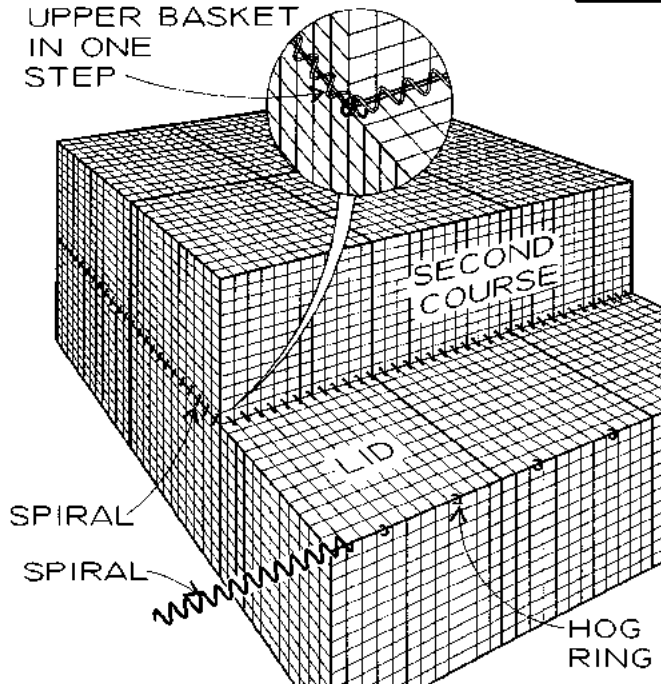
LOWER THE LIDS. USE HOG RINGS TO HOLD THEM IN PLACE BEFORE YOU INSTALL THE SPIRALS.

PLACE THE NEXT COURSE OF GABIONS. USE SPIRALS (OR TIE WIRE) TO PERMANENTLY BIND THE BOTTOM EDGES TO THE FILLED GABIONS.

HOG RINGS ARE NOT PERMANENT CONNECTIONS.

REPEAT STEPS (4) THRU (12) TO THE TOP OF THE STRUCTURE.

ONE SPIRAL MAY BE USED TO CONNECT THE LID AND UPPER BASKET IN ONE STEP

12

12" = 305MM

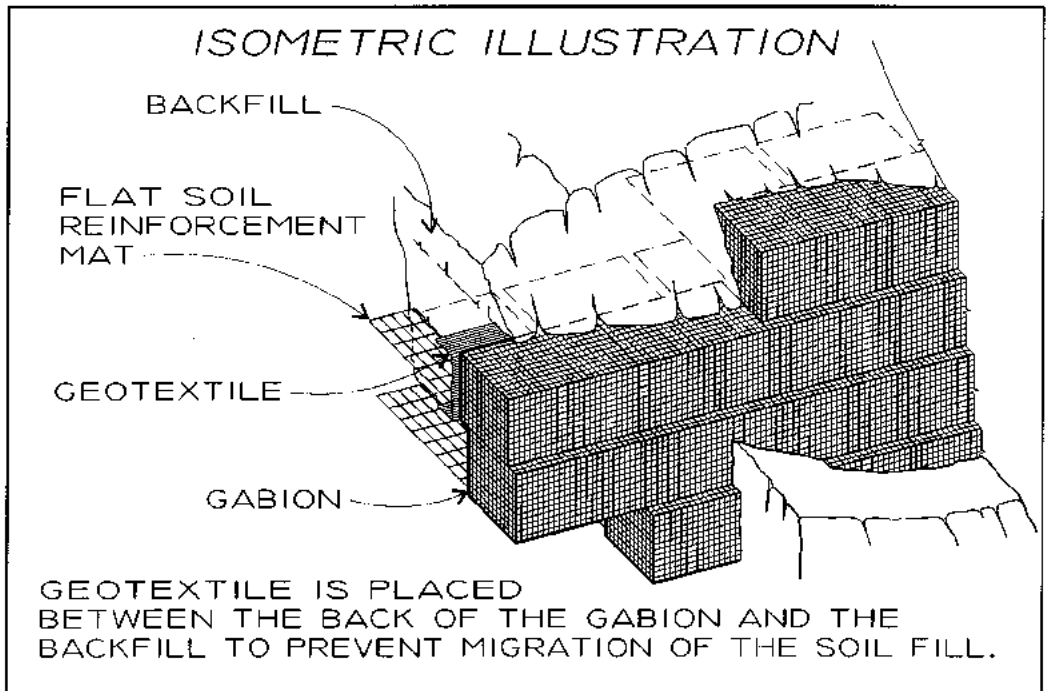
NOTES

GABION-FACED M.S.E. WALL

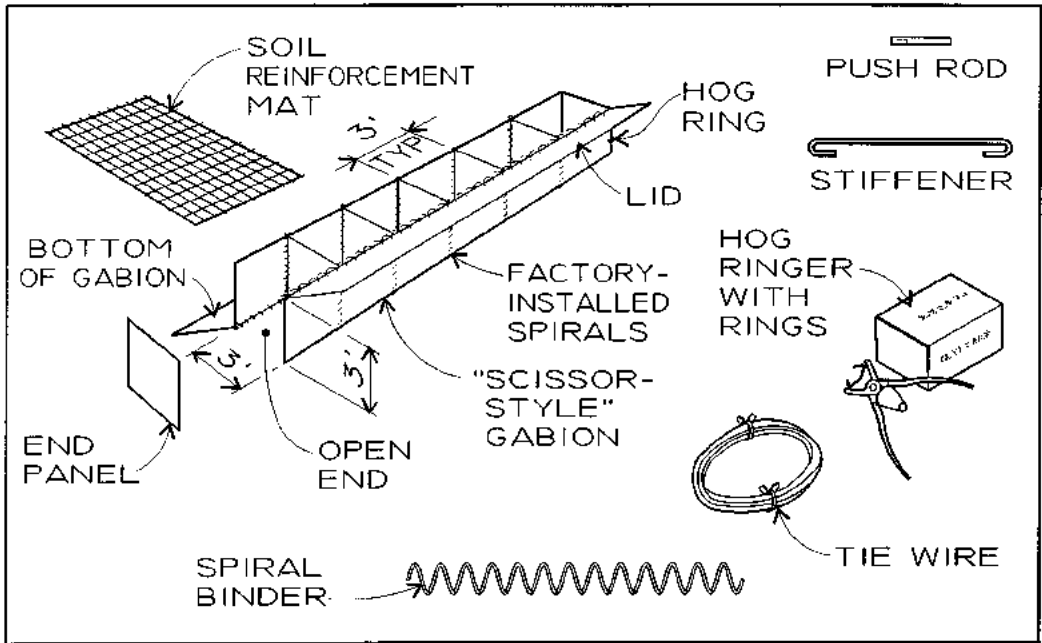
The Hilfiker Gabion Faced M.S.E. Wall combines **ArtWeld Gabions** at the face of the structure, with welded wire soil reinforcement mats spaced vertically at 3-foot intervals.

The "scissor-style" gabions are manufactured in lengths up to 18'. "Scissor-style" refers to the folding pattern of the gabions. They are partially pre-assembled at our factory, with the vertical edges of the diaphragms permanently connected to the vertical faces, and the lid and bottom panels connected to the main body along one long side. They are folded flat for shipment.

The wire gage and length of the welded wire soil reinforcement mats will vary as required for each specific site.

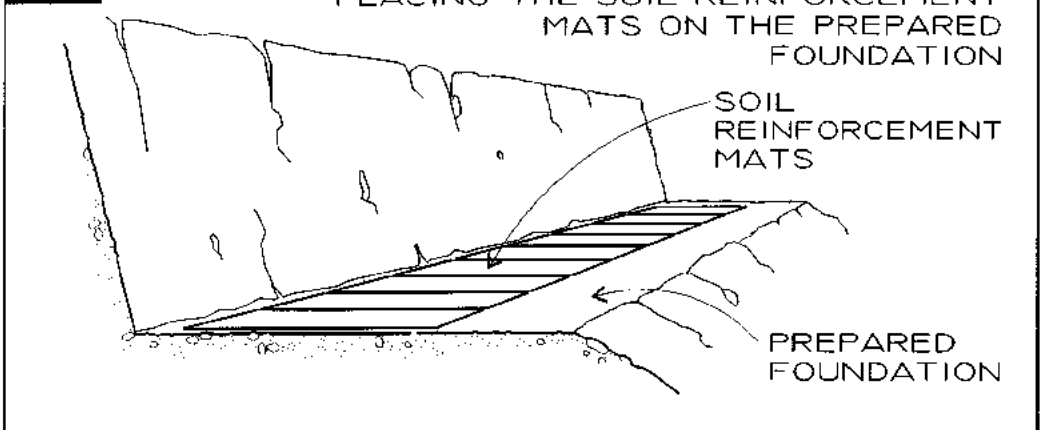


GABION FACED M.S.E. WALL PARTS



13

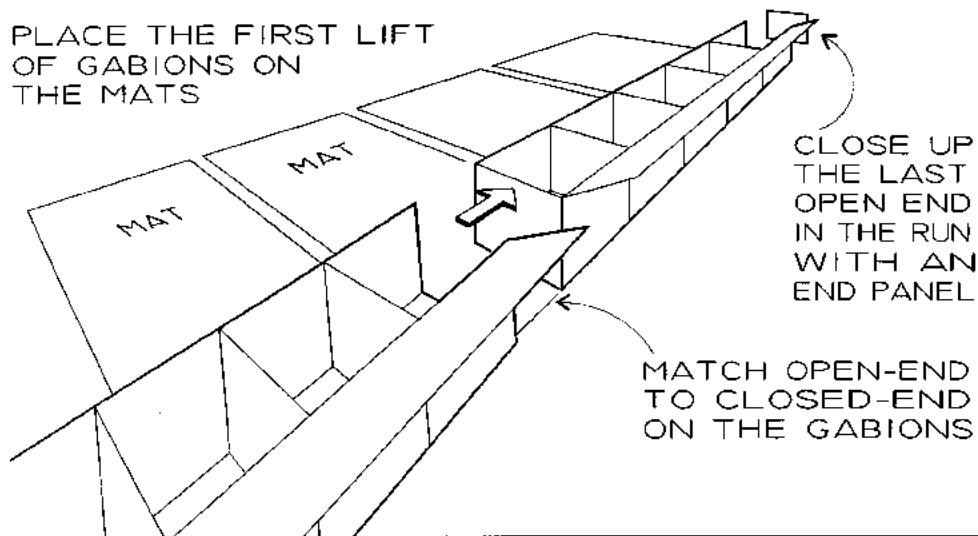
BEGIN THE GABION FACED M.S.E. WALL BY PLACING THE SOIL REINFORCEMENT MATS ON THE PREPARED FOUNDATION



14

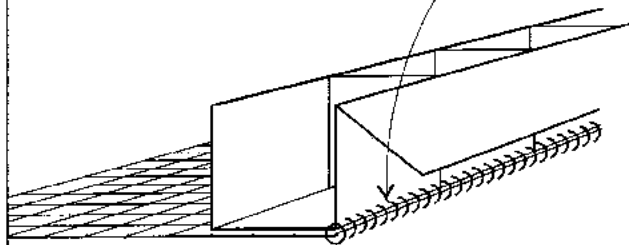
UNFOLD THE GABIONS AND CLOSE THE BOTTOM PANELS. YOU CAN CLIP THEM TEMPORARILY WITH HOG RINGS.

PLACE THE FIRST LIFT OF GABIONS ON THE MATS

**15**

LINE UP THE BOTTOM FACE OF THE GABION WITH THE FIRST TRANSVERSE WIRE ON THE MAT.

SPIRAL THE BOTTOM FACE OF THE GABION TO THE FIRST TRANSVERSE WIRE ON THE MAT

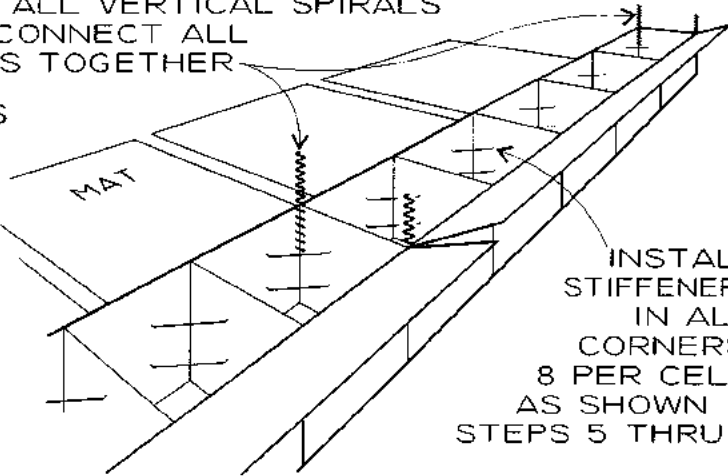
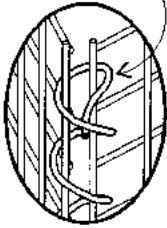


THE SPIRAL WILL PERMANENTLY CONNECT THE BOTTOM OF THE GABION TO THE FRONT, AND CONNECT THE GABION TO THE MAT IN ONE STEP

16

INSTALL VERTICAL SPIRALS
TO CONNECT ALL
ENDS TOGETHER

CRIMP ENDS
OF ALL
SPIRALS
CLOSED



INSTALL
STIFFENERS
IN ALL
CORNERS,
8 PER CELL,
AS SHOWN IN
STEPS 5 THRU 8

BEGIN THE BACKFILL

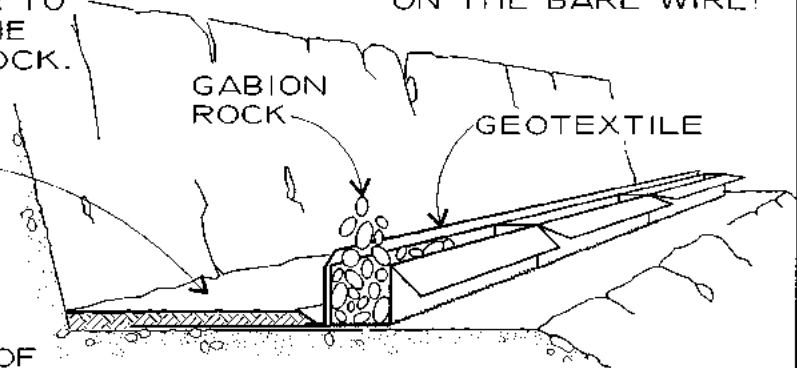
17

INSTALL GEOTEXTILE AGAINST THE
BACK OF THE GABIONS.

PLACE AND COMPACT A LIFT
OF BACKFILL OVER THE
MATS PRIOR TO
PLACING THE
GABION ROCK.
PLACE THE
THE ROCK
AS SHOWN
IN STEPS
9 TO 11.

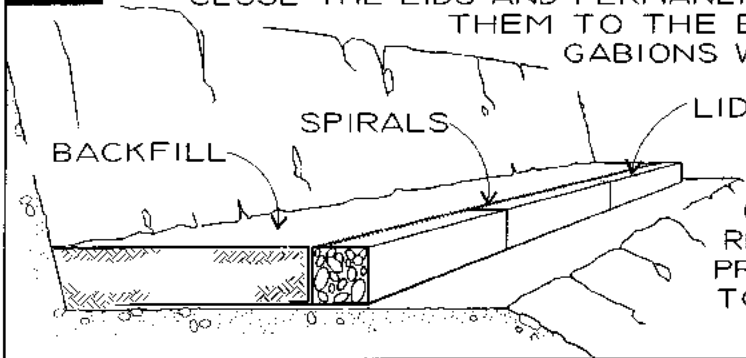
DO NOT OPERATE
HEAVY EQUIPMENT
ON THE BARE WIRE!

NEVER
BACKFILL
AGAINST
THE BACK OF
AN EMPTY BASKET



18

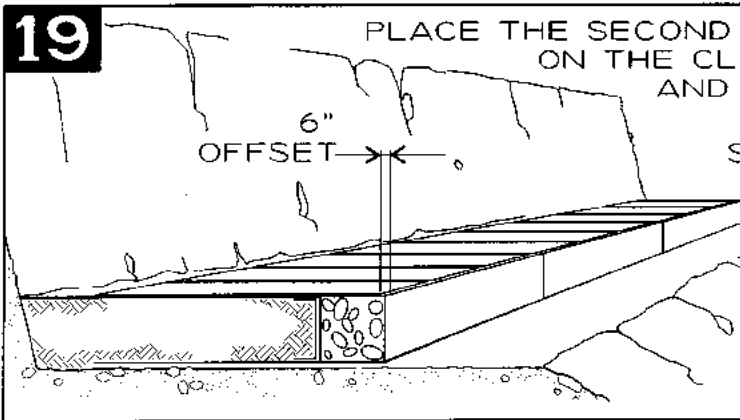
WHEN THE GABIONS ARE FILLED WITH ROCK, CLOSE THE LIDS AND PERMANENTLY CONNECT THEM TO THE BACK OF THE GABIONS WITH SPIRALS.



COMPLETE THE SOIL BACKFILL AND COMPACTION AS REQUIRED IN THE PROJECT PLANS TO THE TOP OF THE BASKETS

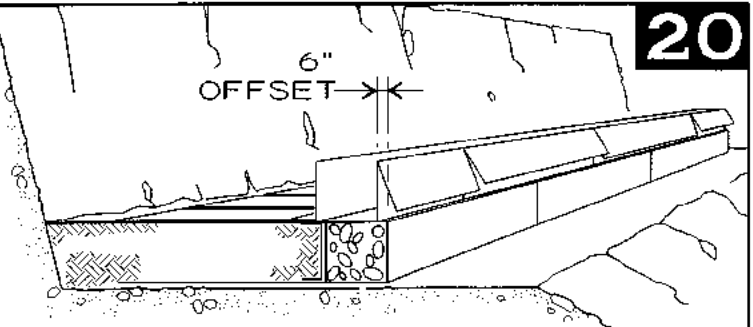
19

PLACE THE SECOND LIFT OF MATS ON THE CLOSED GABIONS AND THE BACKFILL



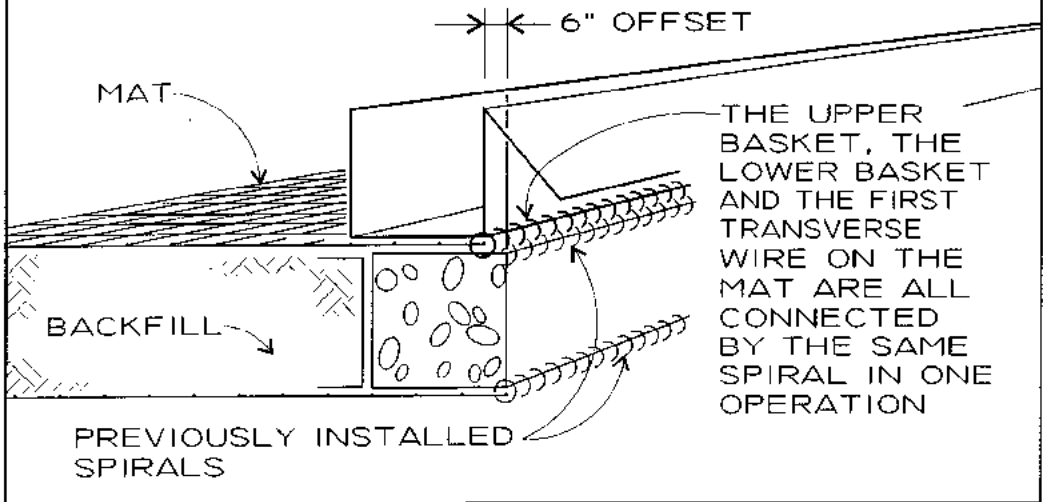
SET THE FIRST TRANSVERSE WIRE ON THE MATS 6" BACK FROM THE FACE OF THE GABIONS. SEE STEP 21.

PLACE THE SECOND ROW OF GABIONS ON THE MATS, WITH THE FRONT FACE OFFSET 6" FROM THE GABIONS BELOW

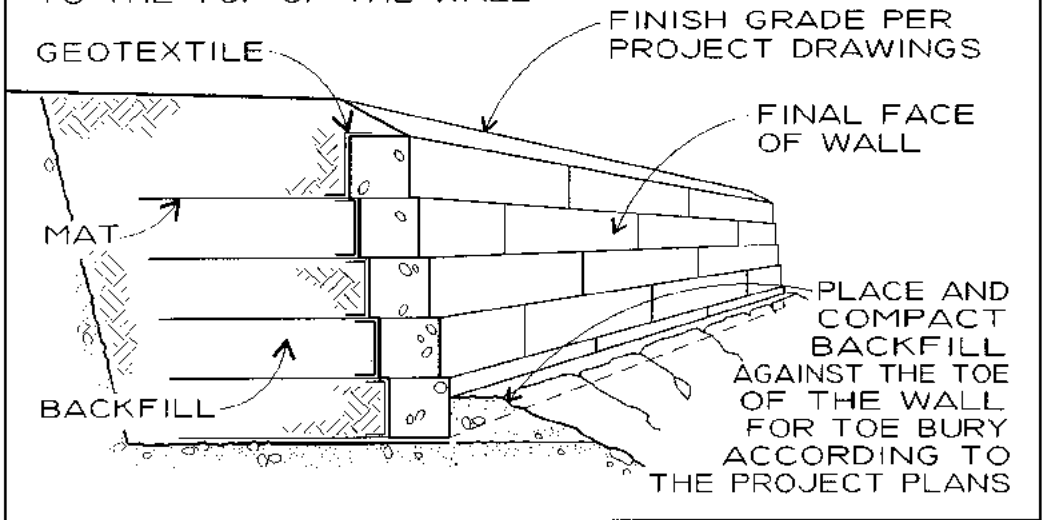
**20**

21

PERMANENTLY CONNECT THE GABIONS AND MATS WITH SPIRALS AS SHOWN.

**22**

CONTINUE STEPS 16 THRU 21 TO THE TOP OF THE WALL



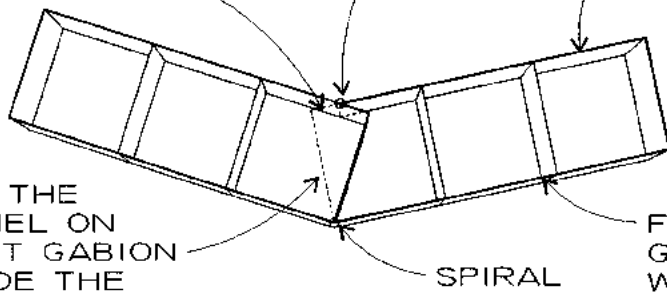
FORMING ANGLES WITH GABIONS

TO FORM A CONCAVE ANGLE (PLAN VIEW LOOKING DOWN ON THE WALL)

TRIM THE BACK OF
THE GABION IF
NECESSARY

SPIRAL
OR TIE
WIRE

BACK OF
GABION
WALL



REMOVE THE
END PANEL ON
THE LEFT GABION
AND SLIDE THE
END OF THE RIGHT
GABION INSIDE. OVERLAP
THE BOTTOM AND LID PANELS

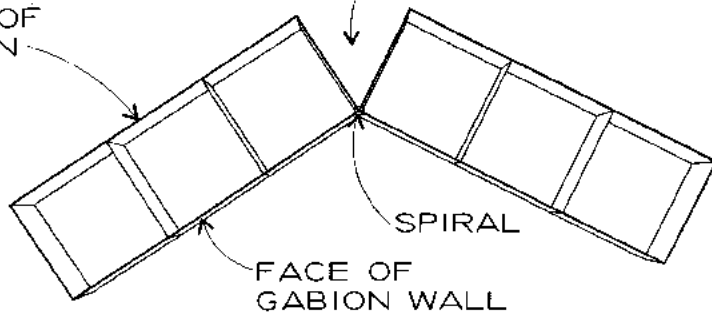
FACE OF
GABION
WALL

SPIRAL

TO FORM A CONVEX ANGLE (PLAN VIEW LOOKING DOWN ON THE WALL)

SPREAD THE GABIONS
APART AS NECESSARY

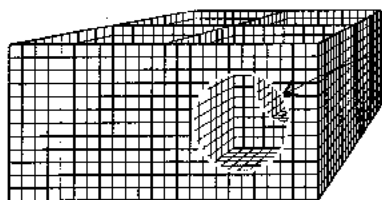
BACK OF
GABION
WALL



FACE OF
GABION
WALL

SPIRAL

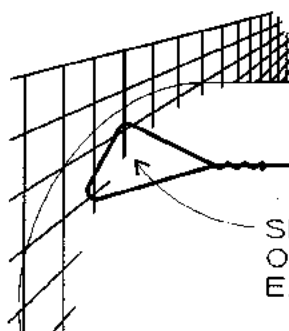
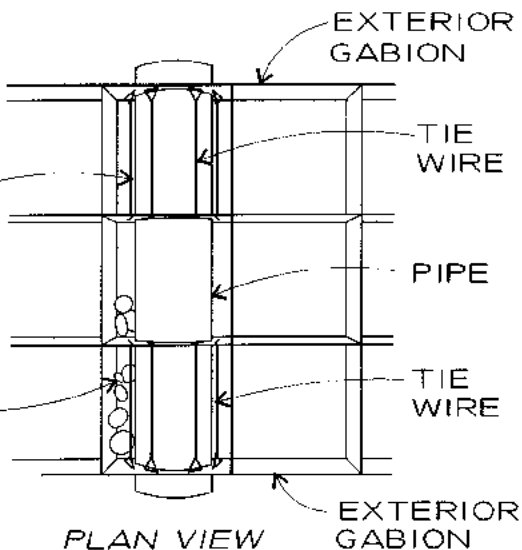
PIPE PENETRATION THRU GABION



CUT A HOLE THRU THE WALLS OF THE GABION, THE SAME SIZE AS THE OUTSIDE DIAMETER OF THE PIPE

PUSH THE PIPE THRU THE HOLES AND INSTALL TIE WIRE ACROSS THE FACES OF THE EXTERIOR GABIONS AS SHOWN, APPROXIMATELY 9" APART

PLACE ROCK UNDER AND AROUND THE PIPE



SPAN TWO WELD INTERSECTIONS OF THE CROSSING WIRES FOR EACH TIE WIRE CONNECTION



GABION WIRE SPECIFICATIONS

USA WIRE GAGE	DIAMETER, MILS	MINIMUM ALLOWABLE AVERAGE GABION WIRE DIAMETER WITH CLASS 3 ZINC-COATING, MILS
9	148	144
11	120	116
13.5	86	82 (STANDARD TIE WIRE)

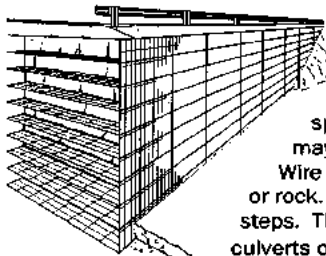
SOIL REINFORCEMENT MAT WIRE SIZE COMPARISON TABLE

"W" SIZE NUMBER	NOMINAL DIAMETER (INCHES)	NOMINAL DIAMETER (MM)
W12.0	.391	9.93
W9.5	.348	8.84
W7.0	.299	7.60
W4.5	.239	6.07
W3.5	.211	5.36

FOR MORE INFORMATION ON WELDED WIRE REINFORCEMENT (WWR) CHECK THE WEBSITE FOR THE WIRE REINFORCEMENT INSTITUTE.

HILFIKER MSE WALL SYSTEMS

OTHER HILFIKER PRODUCTS

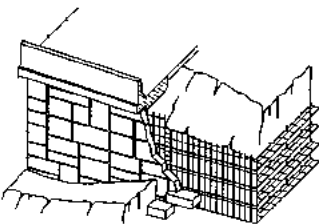


WELDED WIRE WALL

The Hilfiker Welded Wire Retaining Wall is a flexible soil reinforcement system. It is composed of Welded Wire Mesh mats and compacted soil. Mats are supplied in 8' (2.44m) spans, and 24" (610mm) horizontal lifts. The final wall face may be vertical or battered, and may remain exposed Welded Wire (as shown) or may be covered with air-blown mortar, plants or rock. The Welded Wire Wall is adaptable to curves, angles and steps. The mats are easily cut to permit installation of penetrating culverts or pipes, or to fit special site applications.

EUREKA REINFORCED SOIL (E.R.S.)

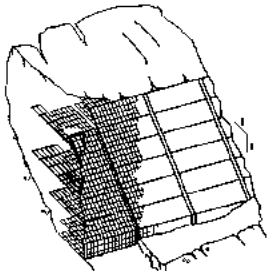
The Hilfiker E.R.S. Retaining Wall begins as a Welded Wire Wall, with the addition of face anchors to tie to a concrete face. After completion and settlement of the Welded Wire Wall, a solid facing is attached. This may be cast-in-place concrete, precast full-height concrete panels, or special rock or gunite as required by the project specifications. The facial treatment of this retaining wall adapts easily to almost any pattern or concept.



HILFIKER STEEPENED SLOPE

The Hilfiker Steepened Slope system is composed of Welded Wire Fabric components. The flat primary soil reinforcement mats are interlocked with bent facing mats, prefabricated to a 1:1 slope. The slope may be flattened, if desired, by stepping back each layer. Behind the facing mats are Welded Wire Fabric backing mats incorporated with erosion mat or sod.

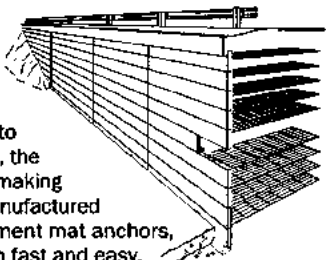
Virtually any type of sod or vegetation that will best suit the environment may be used with this system. Low-growth, maintenance-free vegetation is typically specified.



REINFORCED SOIL EMBANKMENT (SMOOTH FACE)

The R.S.E. Smooth Face Retaining Wall retains most of the advantages of the Hilfiker Welded Wire Wall, while providing the additional durability of precast face panels.

The concrete panels can be cast with a smooth finish, or to match a variety of architectural treatments. In most structures, the simple 12'-6" x 2'-6" (3.81m x 0.76m) standard panel is used, making all the panels interchangeable. Special panel sizes can be manufactured when required. Panels are cast with pre-installed reinforcement mat anchors, and a cantilever footing at the back face, making installation fast and easy.



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