

Mosaic® Wall Construction

Tools

The following tools may be helpful during construction of Mosaic® segmental retaining walls:

VERSA-Lifter®

Block Splitter

Safety Protection

Vibratory Plate Compactor

Diamond-Blade Concrete Saw

Caulking Gun

Backhoe or Skid-Steer Loader

Four-Foot Level

String Line

Hand Tamper

Transit or Site Level

Finishing Trowel

Tape Measure

Four-Pound Sledge Hammer

Broom

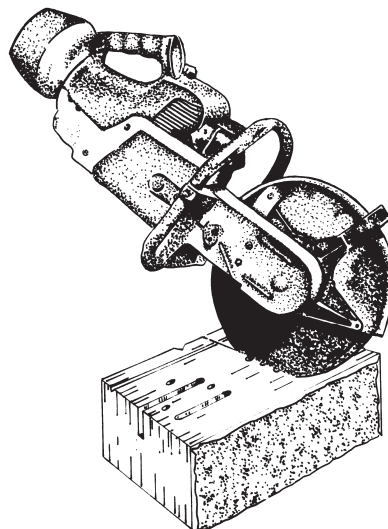
Brick Hammer

Shovel

Three-Inch Masonry Chisel



The VERSA-Lifter helps installers construct VERSA-LOK® Standard retaining walls by making it easier to lift and place units — especially on the base course. Two prongs on the Lifter are inserted into pin holes in each VERSA-LOK Standard unit. Lifting the handle secures the Lifter to the unit and makes for easy, balanced lifting and placement.



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VERSA-LOK Mosaic units are easily modified by splitting for a textured face, or by saw-cutting for a smooth side.

Unit Modification

During wall construction, it may be necessary to split or cut VERSA-LOK® Mosaic® units. Splitting creates an attractive textured face on any visible sides of a Mosaic unit that matches the split-face on the front of the unit. Saw-cutting creates a smooth straight edge on a partial unit, so it can fit tightly next to adjacent units. Remember to always wear proper safety protection when performing splitting or cutting operations.

To split units with a masonry chisel and hammer, mark a path on the unit's top, bottom, and back. Score along the top and bottom paths using the chisel and a heavy hammer. Place the unit on its face and strike along the back path. It is easier to split units on the ground than on a hard surface. The unit should fracture nicely along the paths. If many splits will be required for a project, it may be helpful to rent a mechanical or hydraulic block splitter from your block supplier or rental center.

Saw-cuts are normally made using a gas-powered cut-off saw with a diamond blade. Before you saw-cut a unit, mark a line on each side to be cut. Place the unit face toward you with the top side up, at a comfortable height on a stable work surface. Make a straight cut down and two to three inches into the face. Move saw to top of unit, and cut through top using successively deeper cuts. Flip unit over and finish by cutting completely through the bottom of the unit.

Excavation

Excavate just deeply enough to accommodate the leveling pad (which is normally 6 inches thick) and the required unit embedment below grade. When necessary, also excavate areas where geosynthetic soil reinforcement will be placed. Required unit embedment varies with wall height and site conditions. Generally, if grade in front of the wall is level, one-tenth of the exposed wall height should be buried below grade.



Additional embedment may be required for special conditions including slopes in front of walls, soft foundation soils, and shoreline applications. Compact soil at the bottom of excavation—do not place Mosaic units on loose, soft, wet, or frozen soil—settlement may result. If the wall will set on previously backfilled excavations, such as utility line trenches, be sure the entire depth of existing backfill is well compacted. If necessary, over-excavate soft soils and replace with properly compacted backfill.

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Leveling Pad

Place granular leveling pad material and compact to a smooth, level surface. Leveling pad should be at least six inches thick and 24 inches wide. It should consist of crushed stone. The most commonly used material for leveling pads is what is used locally as road base aggregate. To construct long sections of leveling pad, create forms by leveling and staking rectangular metal tubing along both sides of the planned pad. Place and compact granular material within these leveled forms and screed off excess.

Always begin at the lowest level and work upward in situations where the planned grade along the wall front changes elevation. Use a thin layer of fine sand on top of the leveling pad for final leveling.

See *VERSA-LOK® Technical Bulletin #5* for more tips on leveling pad construction.



Base Course

Make sure that the leveling pad is level and begin placing base course units. For ease of installation, use only VERSA-LOK Standard units for the base course. This will create a uniform “platform” on which to build the Mosaic® panels.



Align base units using their backs or slots, rather than their irregularly textured front faces. String lines may also be helpful when aligning straight walls. Place units side by side on the leveling pad. Fronts of adjacent units should fit tightly and unit bottoms should contact the leveling pad completely. Using a four-foot level, level all units front to back, side to side, and with adjacent units. Take time to ensure a level base course—minor unevenness in the base course will be amplified and difficult to correct after several courses of panels have been installed. After the base course has been positioned, place and compact soil backfill behind units. Also replace and compact over-excavated soil in front of the units. Backfill placed behind and in front of embedded units should consist of soil, not drainage aggregate.

Take time to ensure a level base course—minor unevenness in the base course will be amplified and difficult to correct after several courses of panels have been installed.

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Always install an entire ten-inch-high, four-unit panel before proceeding to the next panel on that course.

Installing First Course of Panels

To start the first course of panels, place two Accent® units next to each other on top of the base course units. Set the units back 3/4 inch. Insert two VERSA-TUFF® Snap-Off Pins through two of the four front holes in the Accent units so they fall into the middle slots of the VERSA-LOK® Standard base units below. Snap-off the top exposed portion of the pins. Finish this ten-inch-high, 24-inch-wide panel by placing a Standard unit and a Cobble® unit on top of the Accent units with a setback of 3/4 inch.



*Mosaic® walls are built one panel at a time!
Always install an entire ten-inch-high, four-unit panel before proceeding to the next panel on that course.*

Insert two VERSA-TUFF Snap-Off Pins through the front holes of each Standard and Cobble unit so they fall into the front slots of the Accent units below. After pinning, pull the units forward to remove any looseness in the pin connections. Check alignment at the back of the units.

Adjacent to this completed panel, start the next panel by placing a Standard unit and a Cobble unit on the base course and two Accent units on top of those, pinning each unit accordingly.

Alternate placing the two Accent units with the Standard/Cobble units on the bottom. Randomly mix the order of Cobble and Standard units within the panels to avoid a repetitive pattern. Continue constructing panels throughout the length of the wall. Do not proceed to the next course of panels until you have completed the entire previous course, including all pinning.

Check levelness at the top of each panel, and panel to panel. Remember to sweep off the tops of installed panels to remove any debris that may interfere with laying additional courses.

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Pinning Mosaic® Panels

Two VERSA-TUFF® Snap-Off Pins are normally used for each unit in a Mosaic panel, making a total of eight VERSA-TUFF Pins per panel. Because of the variable bond and offset placement of panels that occurs in the Mosaic pattern, sometimes only one VERSA-TUFF Pin will fit into a lower unit—resulting in less than eight VERSA-TUFF Pins per panel.

Make sure VERSA-TUFF Pins are fully seated in slots of lower units. If necessary, seat VERSA-TUFF Pins using a mallet and another VERSA-TUFF Pin. For six-inch-high Standard and Cobble® units, VERSA-TUFF Pins are fully seated when they are recessed below the top surface of units. For Accent® units, the top two inches of the pin will initially stick out of the unit. Snap off this exposed section of the VERSA-TUFF Pin by hitting the top of the pin from the side.

Always pin to the front slots in the Accent and Cobble units and to rear slots in the VERSA-LOK® Standard unit. Each Mosaic unit sets back 3/4 inch from the unit below, regardless of its height. Because the completed Mosaic panel is two units high, there is a combined 1.5 inch total setback per ten-inch-high panel, resulting in an approximate 8.5 degree batter (cant) from vertical.

VERSA-LOK's unique hole-to-slot pinning system allows for easy top-down pinning and variation in the bond of the panels.

Each Mosaic panel should be staggered from panels below.

Installing Additional Courses of Panels

When there is no fixed starting point, start the next ten-inch-high course by staggering the panels at least four inches from the vertical joints between the panels below. Patterns in the Mosaic® panels should not line up with the course below it. Vary this bond on subsequent courses of panels to create a random look. Pin units within each panel and to the panels below as described previously. When laying additional courses of panels that start at a corner, wall panel locations will be dictated by the corner panels.

Pull units forward to remove any looseness in the pin connections. Check the alignment at the top of each course of panels and adjust as needed. Stack no more than two courses of panels (20 inches high) before backfilling. If too many panels are placed without backfilling, the panels will be unstable and may push out of alignment during backfilling. If course panels must fit into a limited horizontal space, adjust by placing a partial panel (less than 24 inches wide). Saw cut both top and bottom units on one side of the panel to create a panel with the needed width.

Drainage Aggregate

Drainage aggregate placed behind segmental retaining walls helps eliminate water accumulation and hydrostatic pressure behind walls. Beginning at the level of planned grade in front of the wall, place drainage aggregate between and directly behind units to a minimum thickness of 12 inches. Drainage aggregate should consist of 3/4-inch clear, free-draining, angular gravel that is free of fine dirt and soil.



Do not place drainage aggregate behind units that will be embedded. For walls higher than three feet, a perforated drain pipe should be used to collect water along the base of the drainage aggregate. For some projects, such as shoreline applications, geosynthetic fabric may be required behind the drainage aggregate to prevent soils or sands from migrating into the drainage aggregate and wall face joints.

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Compacted Soil Backfill

Proper compaction of foundation and backfill soil is critical to long-term performance of retaining wall systems. Coarse soils usually require less soil reinforcement and are easier to compact than fine soils.



Place soil backfill beginning directly behind drainage fill in layers no thicker than six inches. Compact soil backfill, making sure that the backfill is neither too wet nor too dry. The amount and type of effort needed for adequate backfill compaction varies with soil type and moisture content. Generally, hand-operated vibratory plate compactors can be used to achieve adequate compaction of granular soils.

To avoid pushing wall units out of alignment, heavy self-propelled compaction equipment should be kept at least three feet behind back of retaining wall units.

Geosynthetic Soil Reinforcement

Geosynthetic soil reinforcement such as VERSA-Grid® is used to reinforce soil backfill when the weight of VERSA-LOK® units alone is not enough to resist soil pressures. Soil reinforcement type, length, and vertical spacing will vary for each project and should be specified by a qualified engineer. For the Mosaic® system, the minimum vertical spacing possible between layers of geogrid is the height of the panels, ten inches. This ten-inch increment for grid spacing should be accounted for in the final engineering design.

Prepare to install soil reinforcement materials by placing Mosaic panels and backfilling up to the height of the first soil reinforcement layer specified on construction drawings. The top of each ten-inch high course of panels creates a flat surface for level geogrid placement. Lay soil reinforcement horizontally on top of compacted backfill and Mosaic panels. Geosynthetics are usually stronger in one direction. It is very important to place them in the correct direction. The strongest direction of the geosynthetic must be perpendicular to the wall face. For correct orientation, follow the geosynthetic manufacturer's directions carefully. After positioning soil reinforcement, place the next course of Mosaic® panels on top of the soil reinforcement.

The strongest direction of the geosynthetic (almost always the roll direction) must be perpendicular to the wall face.

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Keep geosynthetic taut and remove any slack by pulling it away from the wall face.



Insert pins through the bottom panel units, through the geosynthetic, and into the slots of the panel below. Place drainage aggregate against the back of the units and on top of the soil reinforcement. Remove slack by pulling soil reinforcement away from the wall face and anchoring at back ends. Beginning at the drainage aggregate, place and compact soil backfill. Keep soil reinforcement taut and avoid wrinkles. Place a minimum of ten inches of soil backfill before using any tracked equipment on top of soil reinforcement. Placing soil reinforcement behind curves and corners requires special layout and overlapping procedures. Never overlap soil reinforcement layers directly on top of each other—always provide at least three inches of soil fill between overlapping soil reinforcement layers.

See VERSA-LOK® Technical Bulletin #3 for more curve/corner soil reinforcement details.

Caps

Finish Mosaic retaining walls by placing standard VERSA-LOK cap units along the top of the wall. Two cap units are available—Type A and Type B. Alternate A and B caps on straight walls. Use A caps for convex (outside) curves. Use B caps for concave (inside) curves. Front faces of caps may be placed flush, set back, or slightly extended over faces of VERSA-LOK Mosaic units. Caps are secured with two continuous, 1/4-inch beads of VERSA-LOK Concrete Adhesive placed along the top course of wall units. Set and press the caps onto these prepared wall units.

See VERSA-LOK® Technical Bulletin #4 for more about capping.

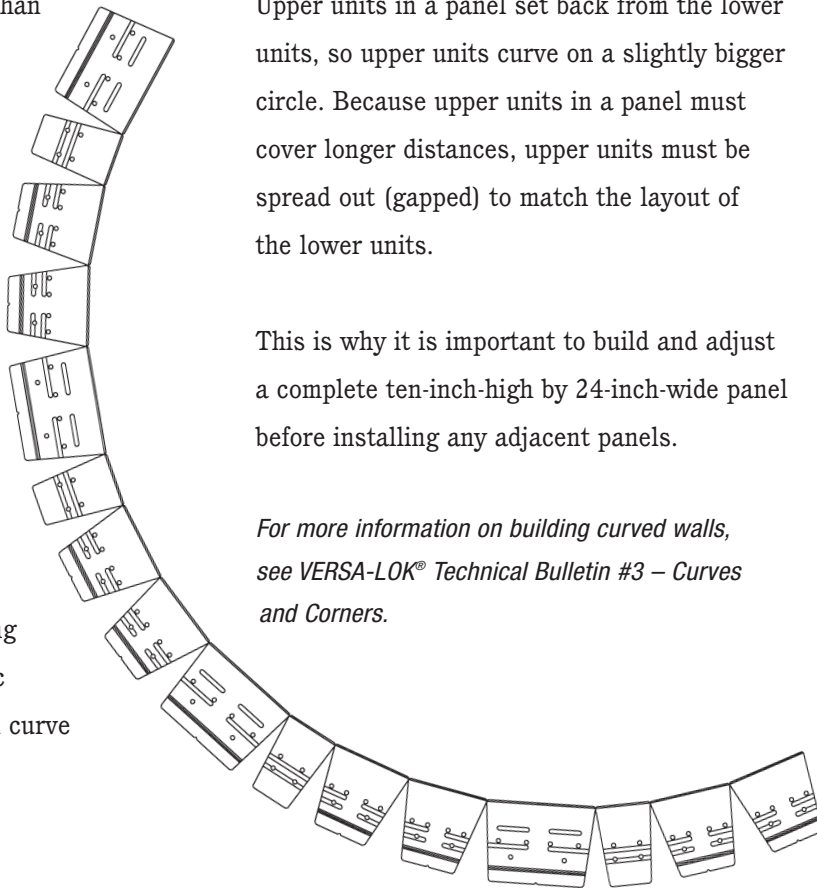


Basic Wall Design Elements

Curves

Curves in a Mosaic® wall are created by fanning apart or bringing together the backs of units. The trapezoidal shape of Mosaic units permits a wide range in radii of convex, concave, and serpentine curves. However, convex (outside) curves in Mosaic walls cannot be built tighter than an eight-foot radius. Also, concave (inside) curves built with less than a six-foot radius look ragged in appearance. An inside corner is recommended in place of a tight inside curve.

When constructing curves, install each ten-inch-high panel completely before proceeding to the adjacent panel. Generally, keep the vertical joints at the front of units tight-fitting. There will, however, be some minor gapping between units in curved Mosaic walls to account for changes in curve radii as courses set back.



Concave (Inside) Curves

Construct concave curves by increasing spaces between the backs of units. For a smooth curve, concave curves should have a minimum six-foot radius at the bottom of the wall.

Some slight gapping is needed between upper units of panels to adjust to changing radii. Upper units in a panel set back from the lower units, so upper units curve on a slightly bigger circle. Because upper units in a panel must cover longer distances, upper units must be spread out (gapped) to match the layout of the lower units.

This is why it is important to build and adjust a complete ten-inch-high by 24-inch-wide panel before installing any adjacent panels.

For more information on building curved walls, see VERSA-LOK® Technical Bulletin #3 – Curves and Corners.

Minor gapping between some units is necessary to account for changes in the curve radius as each course sets back.

Basic Wall Design Elements

To properly install Mosaic curves, build and adjust a complete panel before installing adjacent panels.

Convex (Outside) Curves

Create convex curves by decreasing the space between the backs of the units. The minimum outside radius for a Mosaic® wall is eight feet at the top of the wall.

Each unit sets back 3/4 inch, so panels set back a total of 1.5 inches per each ten-inch-high course. Plan ahead to ensure the radius at the top of the wall is not less than the eight-foot minimum.

Upper units in a panel set back from lower units, so lower units curve on a slightly bigger circle. Because lower units must cover longer distances, lower units must be spread out (gapped) to match the layout of upper units. This is why it is important to build and adjust a complete ten-inch-high by 24-inch-wide panel before installing any adjacent panels.



Corners

Solid Mosaic units are easily modified to create a variety of angled corners. Always build ten-inch-high corner panels first, then work out from the corner. Overlap and interlock corners—do not miter. At the sides (ends) of corner panels, vertically align upper and lower units to create ten-inch-high joints to butt against adjacent regular panels.

Specific examples of 90-degree corners are shown on pages 24-26. Various angled corners such as 45-degree corners can be built by similar methods.

For information on specialty corners, contact the VERSA-LOK® technical staff.



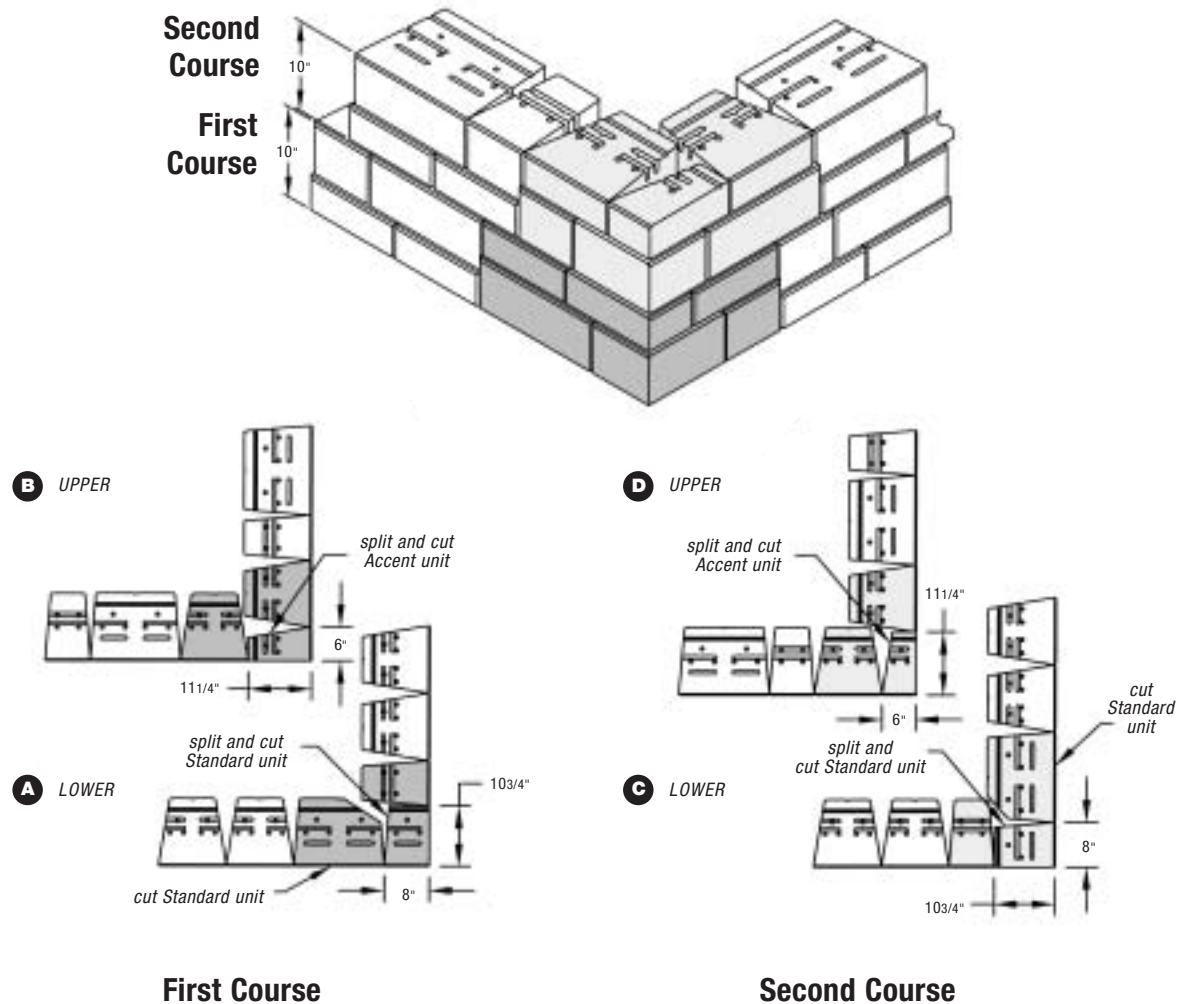
Basic Wall Design Elements

Outside 90° Corner

For the first ten-inch high corner panel, split a Standard unit and an Accent® unit into halves. Next, cut off the backs of two of the split half units as shown (Figure A and B). Also cut or split off the rear corner of a whole Standard unit (Figure A). For the lower portion of the corner panel, place the modified half-Standard unit at the corner. Place the corner-cut Standard unit and a Cobble® unit at its sides (Figure A).

For the upper portion, place the modified half-Accent unit at the corner, with whole Accent units at both sides (Figure B). Complete this ten-inch-high course by building out from the corner panel with Mosaic® panels. On the next course, install another ten-inch-high corner panel that is basically the mirror image of the first course corner panel (Figures C & D). For the remaining courses, repeat these corner panels until reaching desired wall height.

For each course, always build a ten-inch high corner panel first, then work out from this corner panel.



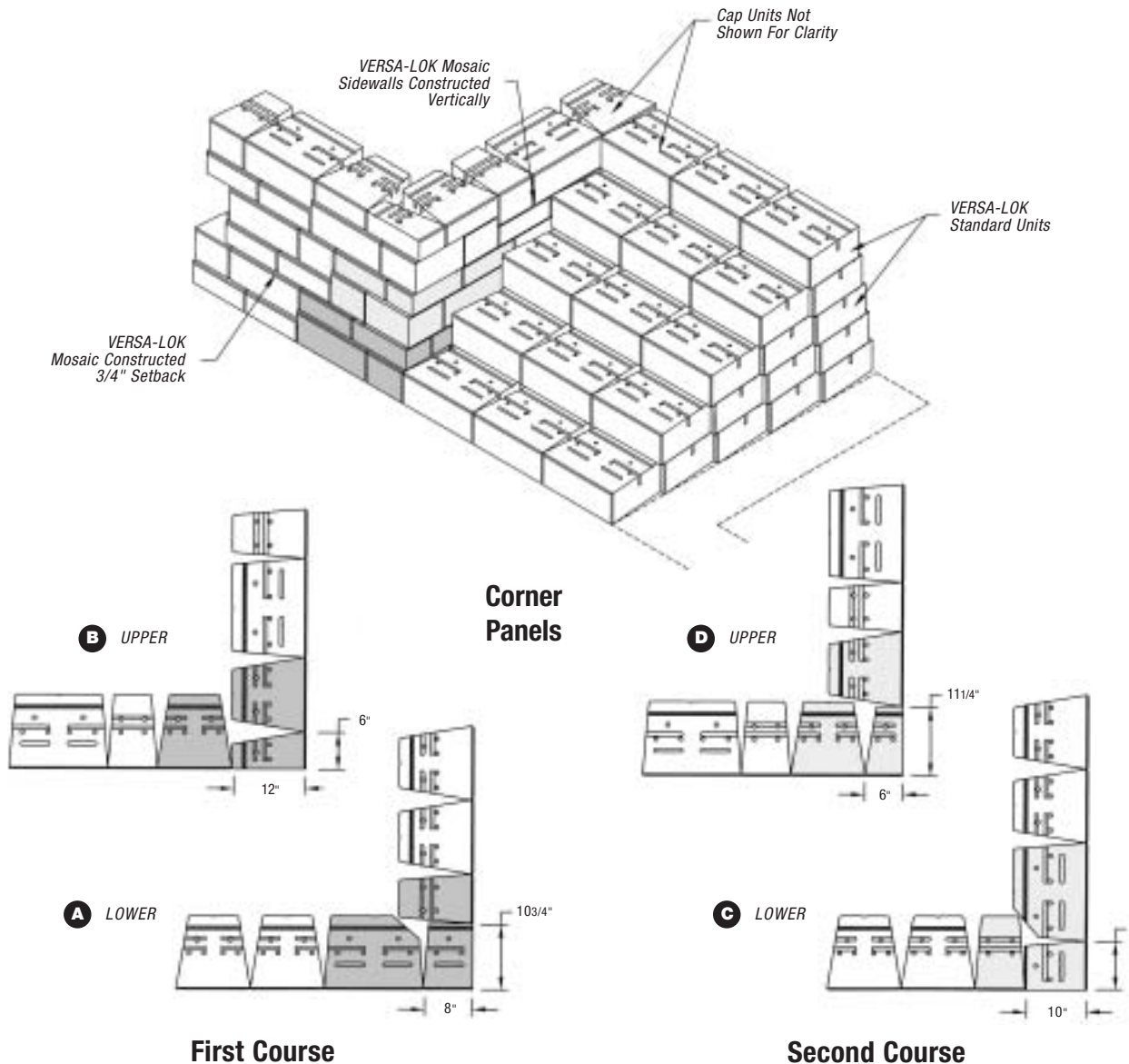
Basic Wall Design Elements

For corners at stairs, the front wall sets back but the side wall is vertical.

Outside 90° Corner at Stairs

When building an outside corner at stairs, the side wall abutting the stairs should be vertical (see page 29). For the first ten-inch-high corner panel, split a Standard and an Accent® unit into halves and cut off the back of the Standard half unit as shown (Figure A). Also cut or split off the rear corner of a whole Standard unit (Figure A). Place the half-Standard unit at

the corner, with a corner-cut Standard unit and a Cobble® unit at its side (Figure A). Above this, place the half-Accent unit at the corner, with whole Accent units at both sides (Figure B). On the next course, install another ten-inch-high corner panel similar to the first course panel (Figures C & D). For the remaining courses, repeat these corner panels until reaching desired wall height.



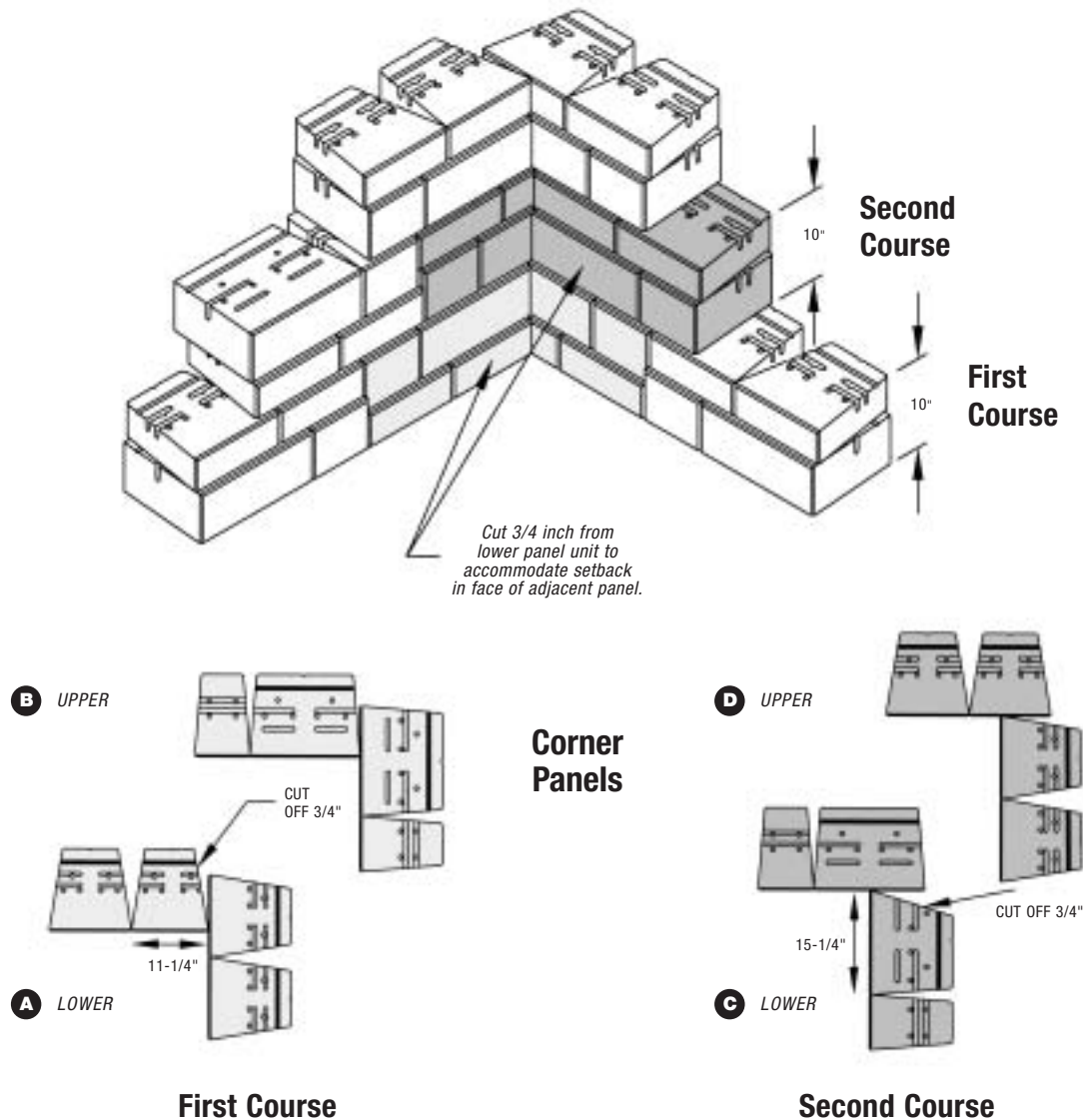
Basic Wall Design Elements

Inside 90° Corners

For the first ten-inch-high course of a 90-degree inside corner, butt the left side panel into the right side panel (Figures A & B). This hides part of the right side panel that runs “wild” past the corner. Upper and lower portions of both panels meeting at the corner should have units of the same height. In the illustrations below, lower units of the first-course corner panels are all four inches high. Modify the left side panel

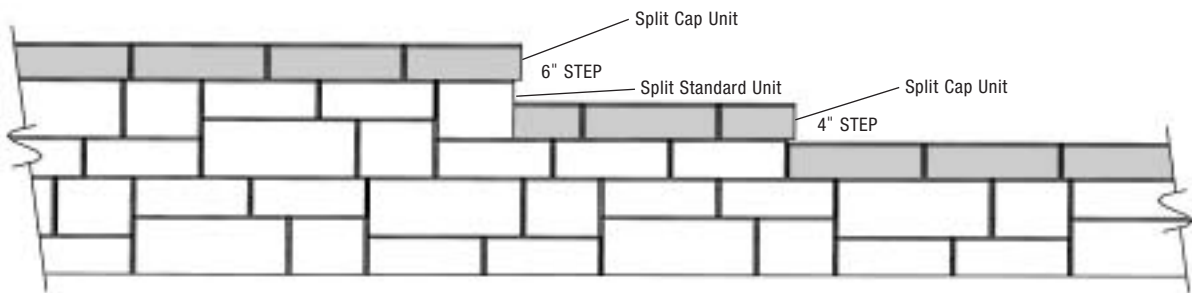
to fit snugly against the setback in the right side panel face by saw cutting 3/4 inch off the lower unit (Figure A). Build regular Mosaic® panels out from the corner panels to complete the first course. On the second course, butt the right side panel into the left side panel and saw cut the lower right side unit (Figures C & D). For remaining courses, repeat these corner panels until reaching desired wall height.

For inside corners, saw-cut units in the abutting panels to fit snugly against the setback within the adjacent panels.



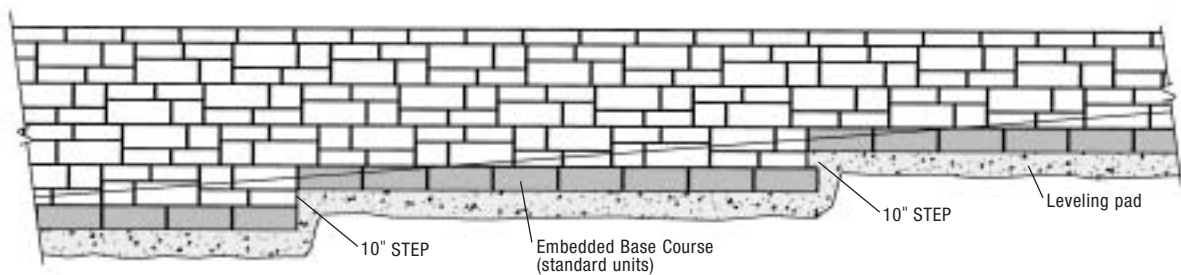
Basic Wall Design Elements

Create attractive step-downs by splitting sides of caps and Standard units.



Stepping Top of Wall

Wall tops should step to match grade changes. If a Mosaic® wall steps down six inches, use a modified Standard unit at the transition. Split a Standard unit in half so the textured wall end will match the wall face. When a step is four inches, splitting the Accent® unit is not necessary. The sides of two cap units should also be split to maintain texture on wall ends.



Stepping Base of Wall

If the planned grade along the front of a Mosaic wall changes elevation, the leveling pad should be stepped in ten-inch increments to match the grade change. Always start wall construction at its lowest level and work upward. Step the leveling pad only often enough to avoid burying extra units while maintaining required minimum unit embedment. With the Mosaic pattern, always build with full ten-inch-high panels after base course installation.

Some of the base course of VERSA-LOK® Standard units can show above grade without changing the random look of the wall face pattern.