

Reference  
Manual for  
**Structural  
Polymer Pool  
Systems**



# Reference Manual for Structural Polymer Pool Systems

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# INTRODUCTION

## LATHAM PLASTICS, INC. REFERENCE MANUAL FOR STRUCTURAL POLYMER POOL SYSTEMS

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**IMPORTANT! PLEASE READ CAREFULLY AND COMPLETELY  
BEFORE BEGINNING CONSTRUCTION.**

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***Swimming pool safety is our primary concern.***

This manual is intended to provide instruction to capable individuals in the recommended methods of safely installing our in-ground pool systems. This manual is not an attempt to mandate specific methods of construction.

While it is not possible to anticipate each improvement in construction codes, materials or techniques, anyone who sells or installs a swimming pool is required to comply with every current national and local regulation governing such activity. The International Building Code (IBC), Building Officials and Code Administrators (BOCA) and the International Code Council (ICC) are among, but not the only agencies that develop pool-related codes. It is of particular importance that sellers/installers acquire construction permits and perform their work in accordance with the building regulations enforced by the municipality in which the swimming pool is to be constructed.

*The National Spa and Pool Institute (NSPI) develops and periodically revises a voluntary standard with the objective of providing recommended minimum guidelines for the design, equipment, installation and use of residential in-ground swimming pools. The standard's development process is verified by the American National Standards Institute (ANSI). ANSI does not develop the standard.*

*Each current American National Standard for Residential In-ground Swimming Pools, though completely voluntary, is often referred to in pool-related cases of litigation. Among the standard's many recommendations is the message to the pool seller/installer as to their responsibility to instruct the pool's owner in the use of all the safety information supplied with it. The builder must also install the enclosed safety signage, NO DIVING labels and safety rope/float system.*

*Therefore, seller/installers of residential swimming pools are strongly encouraged to read and understand the current American National Standard. Copies may be acquired from the NSPI, 2111 Eisenhower Ave., Alexandria, VA 22314. Their e-mail address is [www.nspi.org](http://www.nspi.org).*

There are many factors to be considered when constructing a swimming pool. It must be understood that it is impossible for any manufacturer to anticipate all the conditions that may be faced when projects of this magnitude are undertaken. Accordingly, untrained and/or unsupervised persons should not attempt to perform the tasks outlined in this manual.

**IMPORTANT! PLEASE READ LINER PRECAUTIONS ON PAGE 28  
CAREFULLY AND COMPLETELY BEFORE BEGINNING CONSTRUCTION.**

## CONSIDERATIONS TO BE MADE BEFORE INSTALLATION BEGINS

- Are all contractual agreements validated for the sale and installation of the pool?
- Is the dig specification plan clear and drawn to scale or marked with accurate measurements from fixed objects?
- In order to prevent misunderstandings, has every construction detail been communicated to everyone involved with the sale and installation of the pool?
- Does the plan conform to related building and setback codes?
- Has the permit been acquired and is it visible at the job site?
- Will the access for equipment be adequate?
- Will the pool be located such that monitoring of its users can be continuous? Will it allow immediate access to as well as use of rescue equipment?
- Is the chosen site in a clear area? Is there sufficient sun exposure at the site?
- Is the site free of underground and overhead obstructions such as wires, tanks, pipes, trees and debris that would prohibit excavation or subsequently compromise the swimming pool's structural integrity? Call local building officials for information on services for locating buried utilities and materials.
- Have arrangements been made with a licensed electrician for all electrical connections?
- Are water supply and temporary safety fencing available/scheduled for delivery and installation?
- Have soil condition, grade changes and drainage requirements been evaluated? Has the seller/installer determined that the site and plan require design and approval by a geotechnical and/or structural engineer? Underground water can cause considerable damage to an in-ground swimming pool if it is not avoided or directed away from the site.
- Will the location of the pump/filter and any other motorized equipment be such that it promotes proper function, is accessible and will not cause noise abatement measures to be necessary after construction is complete?
- If soil is to be removed from the site, has its new location been determined and is it approved by the owner of that location?

## MINIMUM TOOL RECOMMENDATIONS

- *Excavation equipment*
- *Socket set, adjustable wrench, open-end wrenches and pipe wrench sets*
- *Plumber's pliers*
- *Allen wrench set*
- *1/2" drill; electric/cordless and bits*
- *Transit, level and framing square*
- *Shovels, rakes and mortar hoe*
- *Trowels; steel and magnesium*
- *Brooms; straight and street*
- *Hole saw set*
- *Jig saw w/plastic cutting blades*
- *Fluorescent spray paint*
- *Tamp; mechanical or manual*
- *Pick, mattock and sledge hammers; 3lb. and 10lb.*
- *Water source with garden hose and nozzle*
- *Tape; 2" masking and fabric-based duct*
- *Screwdrivers; Phillips, slotted and Torx, 2 awls*
- *Commercial vacuum with 6' of hose*
- *Mason's line, C-Clamps or C-vise grips*
- *Eye protection, gloves and water-proof boots*
- *Utility knife w/replacement blades*
- *Measuring tapes; 100' and 50'*
- *Lead cord; minimum 100'*
- *PVC glue, cleaning solvent*
- *(24) 3/8" x 18" steel rods*

## POOL LAYOUT

**TOOLS:** Transit, mason's string, spray marking paint, (2) 100' tape measures, (8-10) 3/8" x 24" rods, dig specification drawing and template (if chosen).

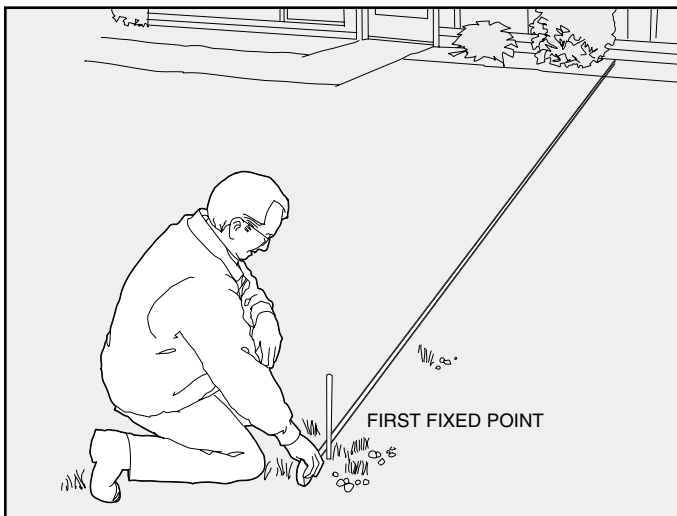
The correct placement of a pool is very important. Its orientation to a house, a view, or other important feature(s) at the site will affect the outcome of the installation.

**TIP!** The seller/installer can reduce time and expense for layouts by purchasing a template that is identical to the plan dimensions of a given pool. Latham Plastics, Inc. manufactures templates that mirror a desired shape. Templates are a good investment; particularly in freeform shapes and/or shapes that are frequently used. Made of mesh cover material or thin vinyl, a template can be transported to a site with ease. At the site, moving it to the exact location desired by the customer requires minimal effort. Staking the center line and/or other important points is made simple, as is painting the ground at the template's perimeter. Contact your supplier to purchase templates.

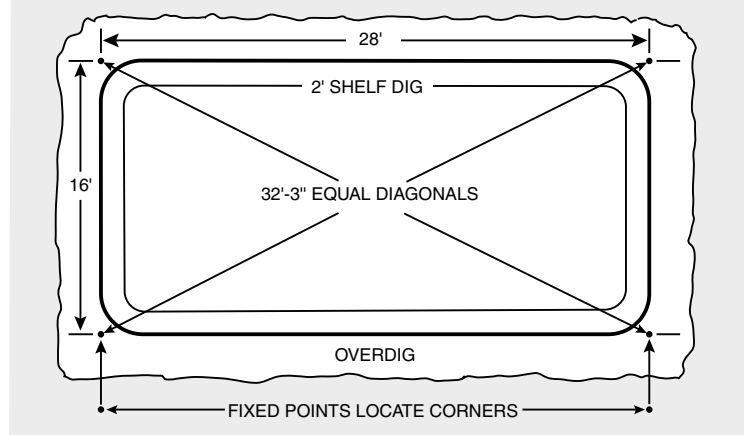
Manual layouts require training and math skills in addition to the same tools needed for layouts using templates. An accurate, legible drawing showing a plan view, side elevation and end elevation is essential. Rectilinear pools are those defined by straight sides such as Rectangles, Grecians, modified Ovals, True Ls, Patricians, etc.

Rectilinear plan drawings (*See Figure A*) should show the overdig perimeter, the pool perimeter and the diagonal measurements between corner stakes. The plan view for a freeform pool must show the center line(s) and all point

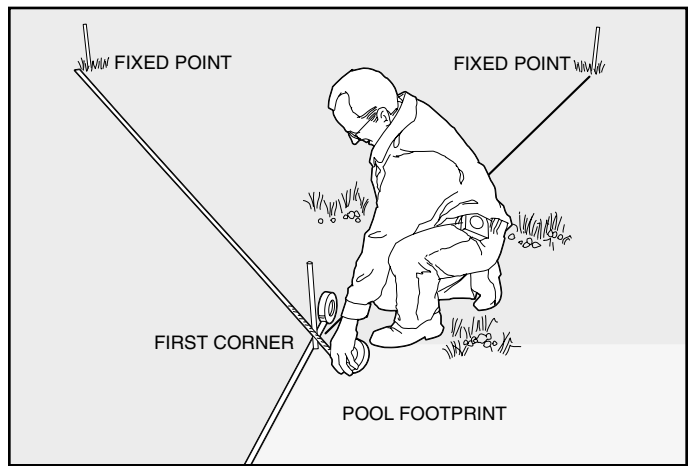
### How to layout a pool



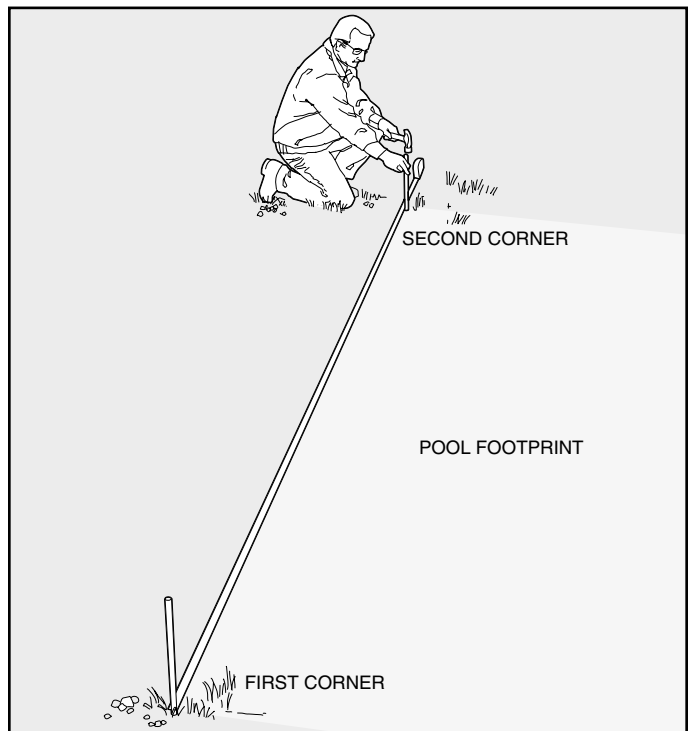
**1.** Choose two fixed points away from the overdig.



**FIGURE A – Rectilinear pool plan drawing**



**2.** Measure from each fixed point to locate the first corner stake.



**3.** Measure the distance to the second corner point and set a stake there. Keep it parallel to reference points. (continued on next page)

# STEP 1 POOL LAYOUT

distances from it. A freeform plan view must also identify all distances from the center line to the axis of each radius as well as perpendicular and parallel planes. The side and end elevations for all pools must indicate depths, grade changes and the distances between them.

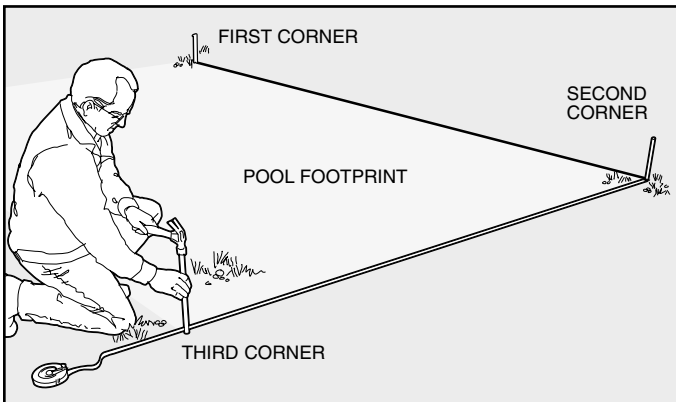
*(See Figures C & D on page 10)*

Once the pool's location has been chosen, its perimeter must be marked on the ground. The area beyond the perimeter is known as the 'overdig' (*see Figure A*) and is used for wall and brace placement. The overdig width may vary but needs only to be sized to accommodate the pool walls, braces and plumbing pipes.

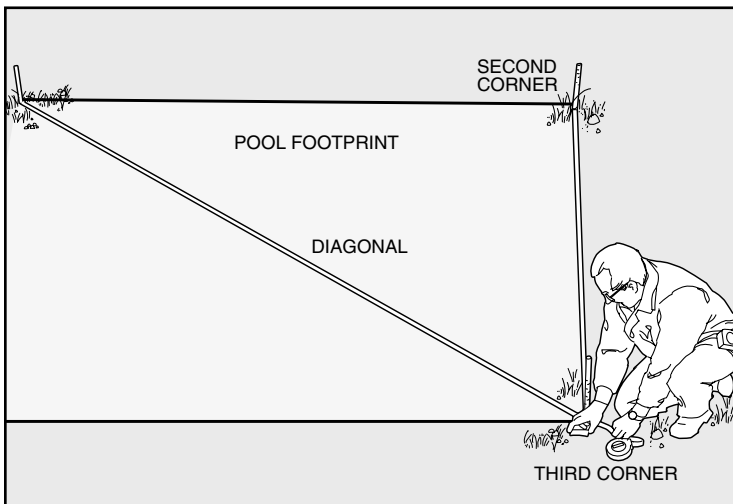
## Rectilinear pool perimeters

Rectilinear pool perimeters can be located within four stakes that are separated by the length and width. Choose a fixed point, away from the overdig (*see Figure A*), from which the first corner stake will be located. Measure the distance from the fixed point to the location of the first corner stake. Mark and identify the first fixed point along

### How to layout a pool (cont.)



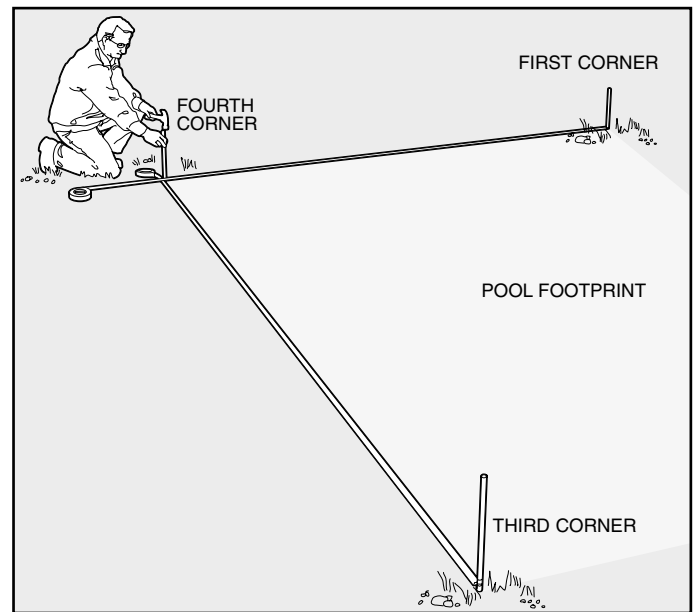
**4.** Measure and set the third corner point square with the first and second.



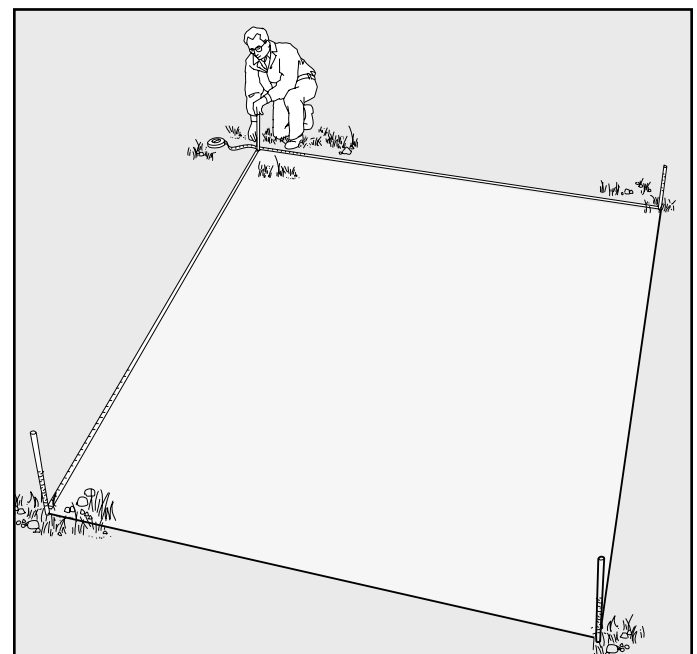
**6.** Square the layout by finding equal diagonals. (See page 7 on keeping the corners square.)

with the distance to the stake on the drawing. Measure the distance from the first corner stake to another fixed point, preferably one that is perpendicular to the first measurement. Record the second point location, along with its measurement from the stake, on the drawing. These notes are important and become more so if stakes are moved or if the excavation must be modified. In most cases, fixed location points are decided upon at the time of the pool sale as is the location for the filter system. The remaining corner stakes can be set by measuring their locations from the first stake and squaring the corners to each other.

*(See Illustrations 1-7)*



**5.** Measure and set the fourth corner point square with the third.



**7.** Measure back to the first corner stake completing the layout.



## HOW TO KEEP THE LAYOUT SQUARE

Care must be taken to keep the layout square. Measure the distance between opposing corners and move the stakes until they are equidistant. At the same time, the length and width dimensions must remain equal to their intended measurements.

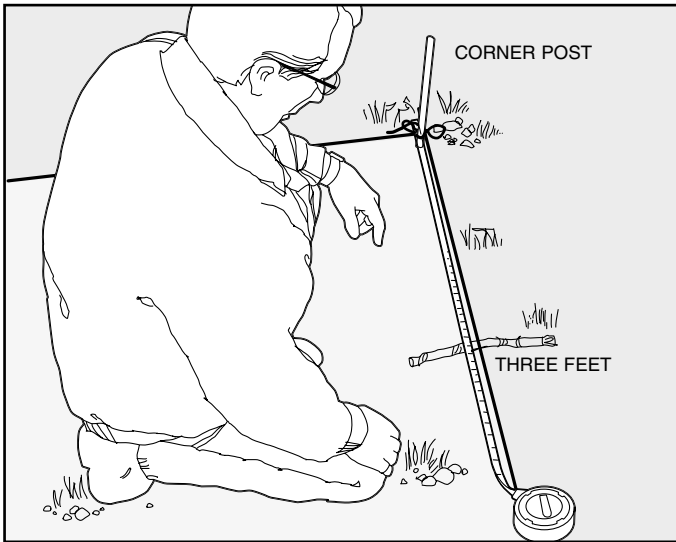
**TIP!** Equal diagonals do not guarantee that a pool is square unless the width, length and diagonal dimensions are equal to their opposing line measurement. Another method of squaring is using the Pythagorean Theorem. Since the hypotenuse of a right triangle can be determined by calculating the square root of the sum of the square of each side, three simple measurements can guarantee the pool's corners are square. Using a corner stake as a starting point, measure one leg of the corner

The seller, the person(s) responsible for the layout, the excavation crew and the pool installers should have access to the same drawings and related information.

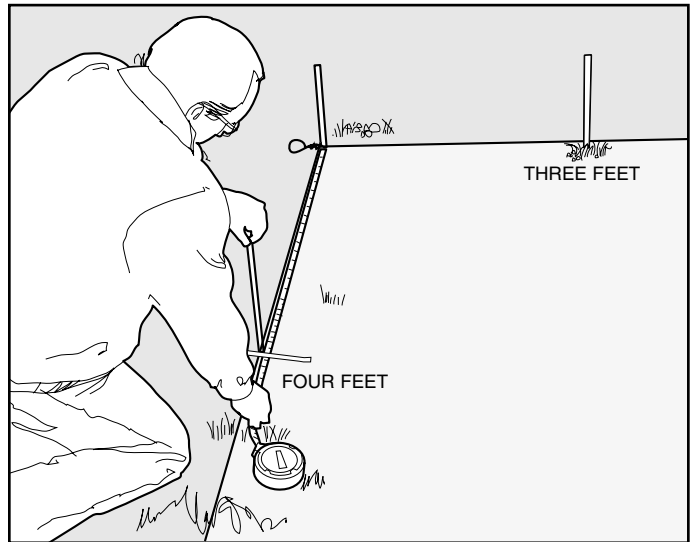
angle and mark it at three feet, then measure the perpendicular leg and mark it at four feet. The diagonal distance between the two points, or hypotenuse, will be five feet if the corner angle is square.

Equal multiples of each length will result in identical multiples of the hypotenuse. Measuring corners in this manner will determine whether a corner is square. Move the lines as necessary. **(See Illustrations 1-4)**

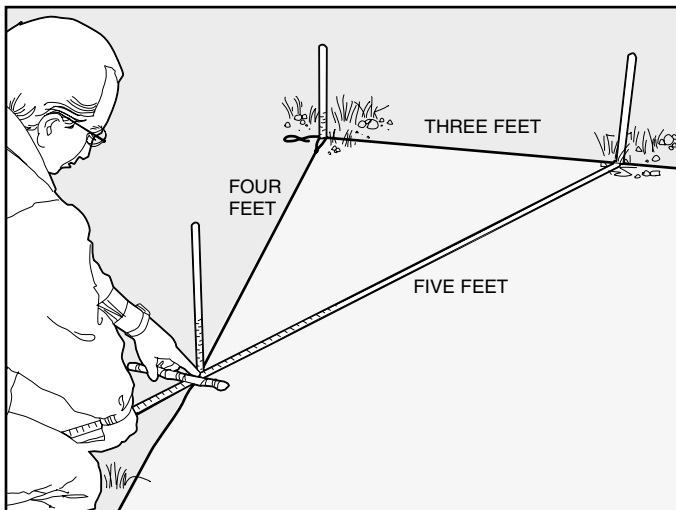
### How to square a corner



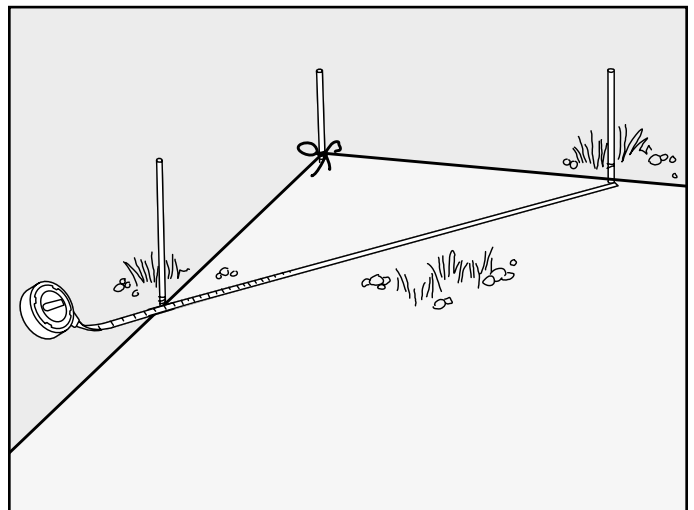
**1.** Starting at corner, mark one side at three feet.



**2.** Mark the perpendicular side at four feet.



**3.** The diagonal distance (the hypotenuse) between the two points will be five feet. The corner is square if it measures five feet.



**4.** Adjust the sides as required to make square. Doubling or tripling the leg measurements will result in increased accuracy.

# STEP 1 POOL LAYOUT

## ROUND POOLS

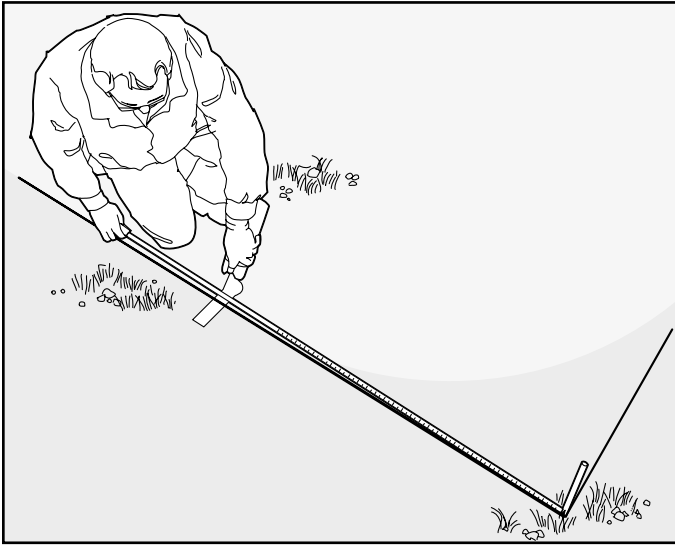
Round pools can be laid out by finding a point at the center of the arc and placing a stake there. Using a measuring tape attached to the stake, hold a can of marking paint at a point equal to the length of the radius on the tape. Paint the complete circle as allowed by the measured length.

## RADIUS CORNERS

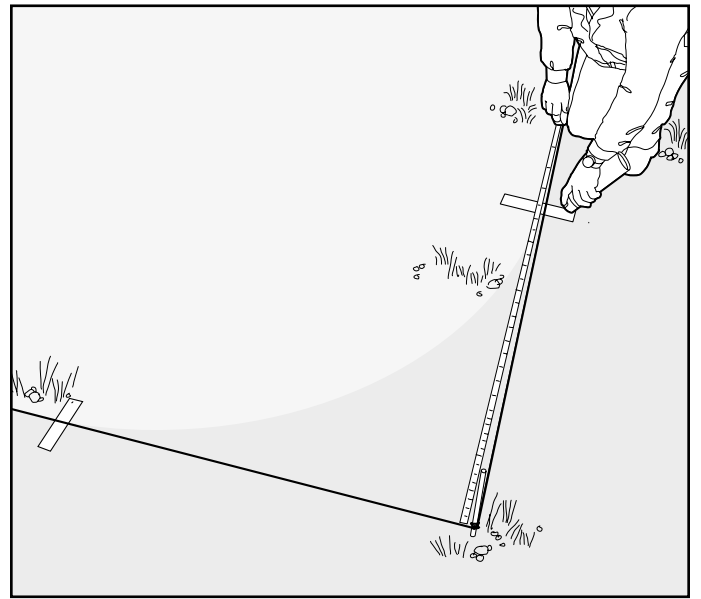
To find the corner radius axis of a rectilinear pool, use string lines or straight edges projecting from perpendicular sides of the pool to a stake placed at their intersection.

First, attach a measuring tape to the stake and measure a distance equal to the intended corner radius from the stake to that point on the tape. Hold a can of marking paint below that point on the tape and spray a mark on both straight side lines. Second, drive a stake at one of the points on the straight side line. Extend the tape to the same length and spray a small arc as shown. Third, repeat the process on the perpendicular side line. The point at which the two arcs intersect is the axis for the corner radius. Fourth, place the stake at that axis and use the same length and spray paint to mark the arc of the corner radius. *(See Illustrations 1-6)*

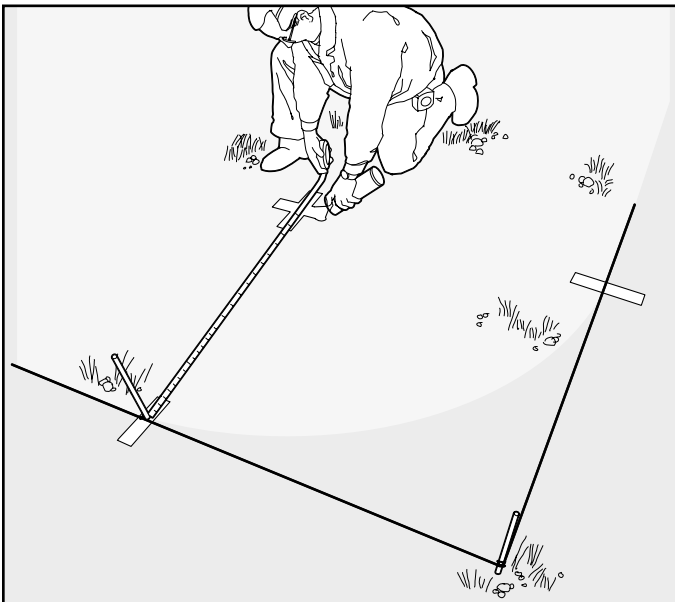
**How to layout a round corner**



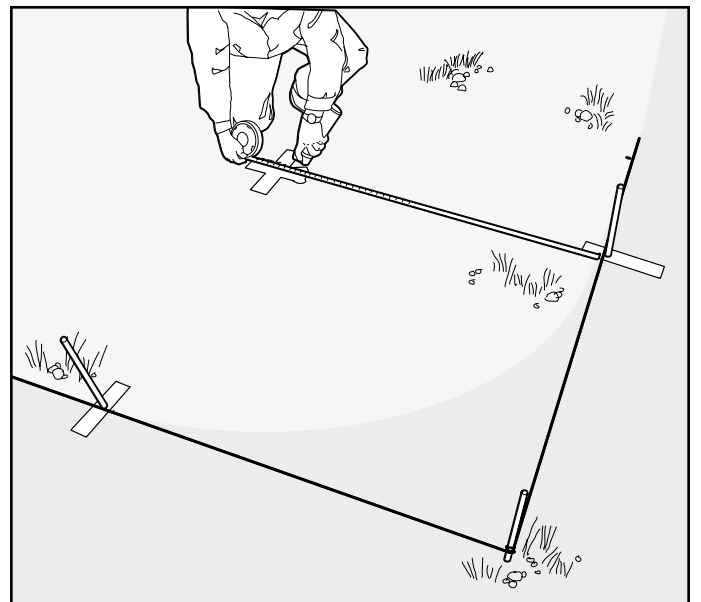
**1.** Measure back from the corner stake the same dimension as the radius of the corner.



**2.** Repeat measurement and mark on second side.



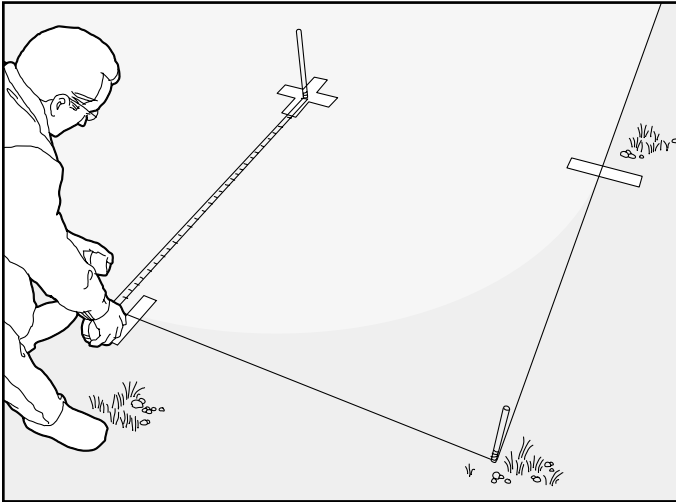
**3.** Place a stake at the marks on each side. Measure the same distance and spray a small arc.



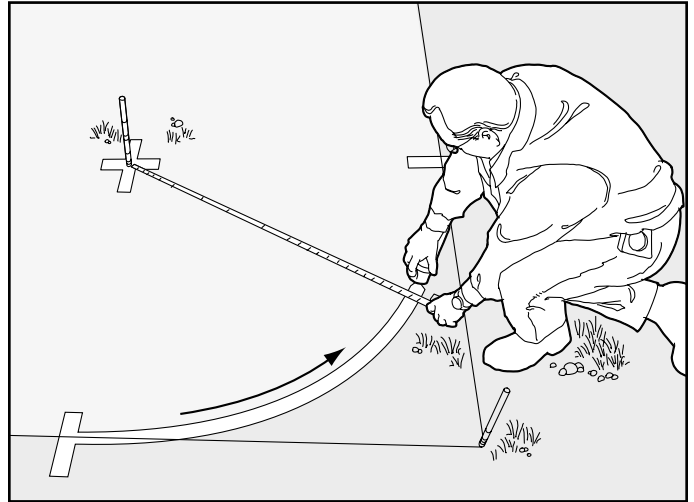
**4.** Measure the same distance and spray a small arc from the second leg.

# STEP 1 POOL LAYOUT

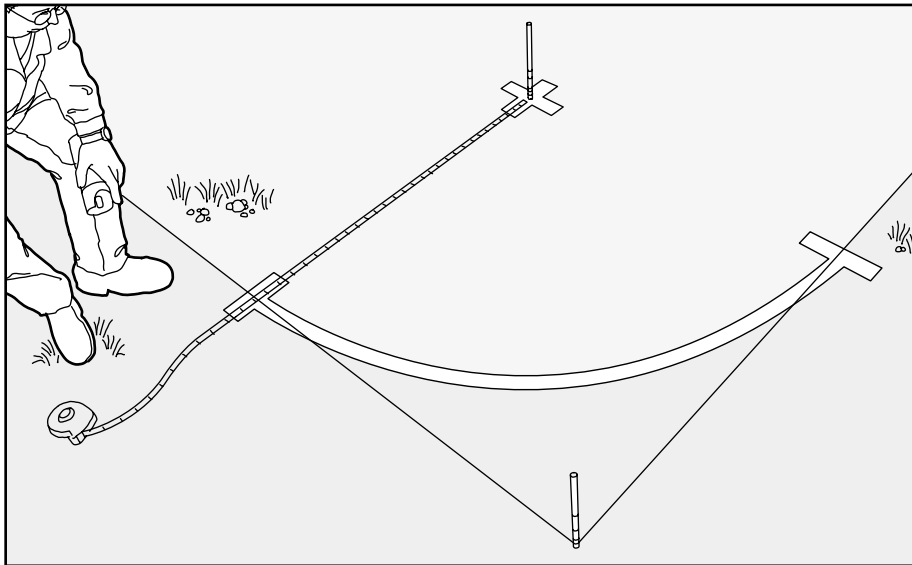
## How to layout a round corner (cont.)



5. Place a stake where arcs intersect. This will be the axis for the corner.



6. Tie a wire to the axis stake (or use a tape) and spray can mark the corner arc.



7. Finished round corner layout. Easy!

## OVAL POOL LAYOUT

True oval ends are marked by finding the center of the pool's width from the squared, straight wall ends and placing a stake there. Attach a tape measure to the stake and measure a distance equal to length of the intended radius from the stake to a point on the string. Use the technique described previously on page 8 to paint the arc of the oval end. (See Figure B)

If necessary, include a separate arc for the overdig to alert the excavator operator to nearby sensitive objects such as shrubs, pipes, wires etc.

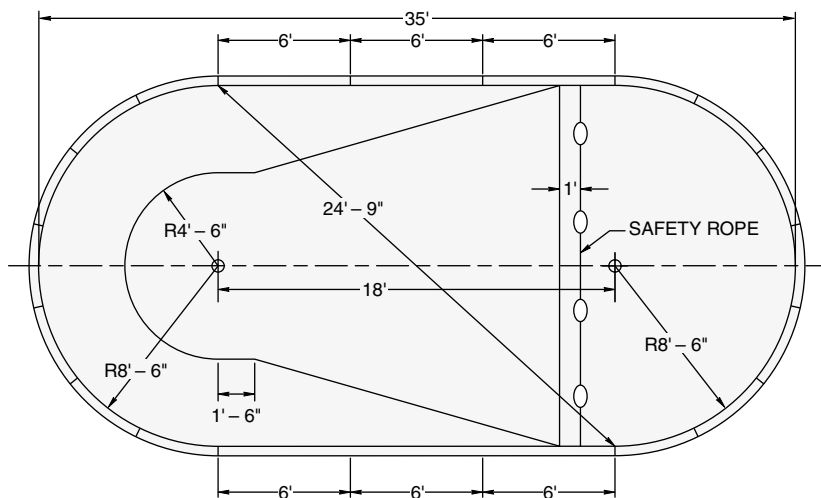


FIGURE B - Oval pool plan drawing

# STEP 1 POOL LAYOUT

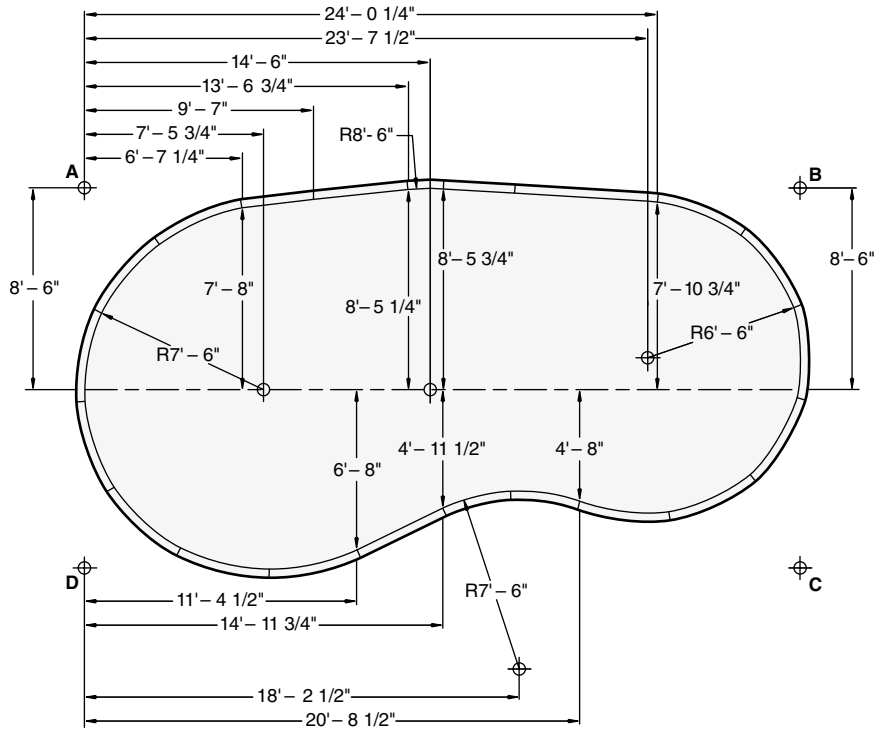


FIGURE C – Freeform pool plan drawing

## FREEFORM POOL LAYOUT

The manual location and layout of a freeform pool can present considerable challenges because it may be difficult to visualize the intended position of the pool. Because any oval or freeform shape fits within a rectangle, it will be easier to visualize the shape and location of the pool if the rectangle is layed out first. The corners of the rectangle will also be the fixed reference points. (See pages 5 & 6)

A center line(s) is very important since most measurements are taken from it. Corner stakes and points that serve as

pivots for interior and reverse radius markings must be considered along with step units and other accessories.

Use the dig specification drawing to identify the key dimensions needed to place the pool correctly. Stake the center line(s) and tie mason's string from one end to the other. Do the same at the corner stakes. Refer to the drawing and mark all other points including straight lines and arcs as indicated. Once that is completed, the perimeter can be marked with paint. **(See Figures C-D)**

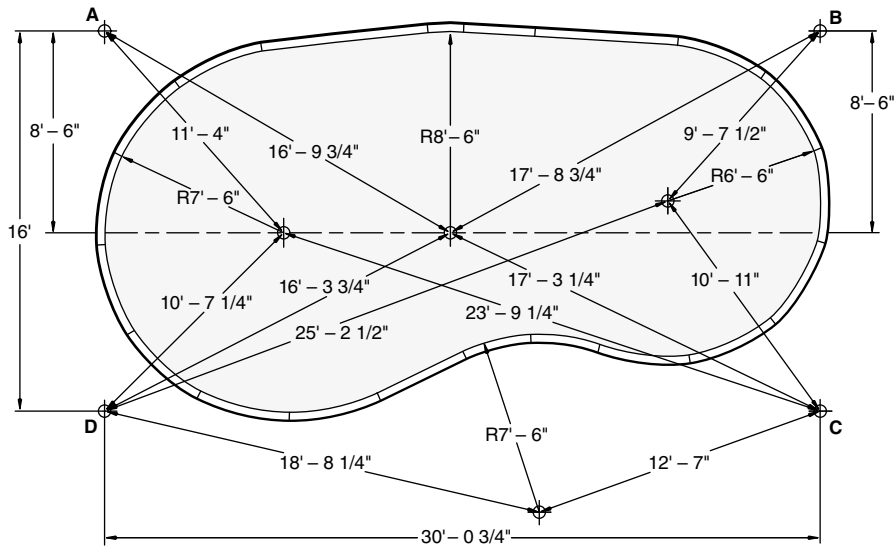


FIGURE D – Freeform pool plan drawing

## SETTING THE POOL'S ELEVATION

A point of reference must be established to determine the elevation of the top of the pool.

Factors such as the site's grade, soil composition and drainage potential are among those things to be considered for this part of the project. Ideally, the top of a pool, including the coping and/or deck, should be 8"-12" above the highest grade. However, if the site consists of expansive soil, it may be necessary to raise the pool to a higher level. Flat or gently sloping sites are usually not difficult to grade. Steep slopes and complex drainage considerations often require professional engineering plans to be drawn for retaining walls, drain systems and backfilling materials. Unqualified persons should not assume responsibility for the design of complicated systems.

A transit and graduated pole may be used to locate the height of the point to which the top of the coping/deck will be referenced. The transit should be placed in a location that allows viewing of the entire pool site yet not in the way of equipment or foot traffic. *(See Figure E)*

## EXCAVATION

Arguably the most critical part of the job, excavation should only be done by an experienced machine operator. In most instances, operators work with at least one assistant who uses a graduated pole, strings and stakes to determine shelf location and elevation as well as lengths, depths and widths of each segment of the pool. An assistant may also adjust the shelf surface to the correct grade as the digging progresses. Competent operators will make optimal use of space, minimize manual soil handling, remove excess soil and arrange the site to allow access for

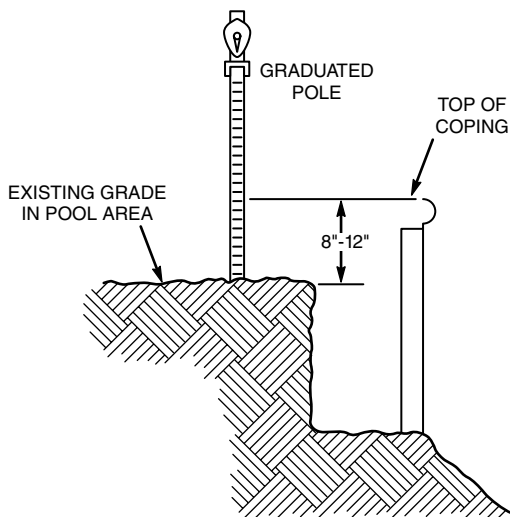


FIGURE E – Pool Elevation Location

efficient construction of the pool. The operator must determine at which part of the pool the excavation will begin. Regardless of the decision, it is best to visualize the process in three stages.

### *Digging to the shelf level*

Digging begins along the marked perimeter and into the overdig to a level equal to the height of the chosen pool panels plus the coping and/or deck. This level is known as the shelf and it must be set such that the deck will be level with the selected reference point. Since the panels rest on it, every effort should be made to keep the shelf intact throughout the digging process. The assistant is responsible for adjusting the shelf height by tamping and/or scraping the surface to guarantee its continuous relationship to the reference point.

If more than one assistant is available, panels and braces can be set and assembled while measurements are taken from the perimeter stakes to establish the exact panel position within the pool. The use of a transit and graduated pole or reference point must be consistent throughout this stage.

### *Digging the shallow end of the pool*

Next, the entire shallow end of the pool is to be dug to the same level as the shelf. Exceptions are noted later in this section. In pools with steps, lounges or similar accessories, the length and width of the overdig must be extended to accommodate each unit and its braces. A trench for plumbing tubes from the pool to the planned filter location can be dug at this time or whenever the operator sees fit. *(See Figure F)*



FIGURE F – The trench for the piping can be dug when the machine operator chooses.

## STEP 2 EXCAVATION

### Digging the hopper

Usually, the last stage of excavation involves digging the hopper. A swimming pool hopper resembles a railroad coal car in that it has sides that slope to a flat bottom.

**(See Figure G)** Hoppers vary in width, length and depth and should be dug according to the dimensions on the dig specification drawing. Keep in mind that the hopper's excavated measurements should be 2-3 inches deeper than the finished grade. The operator's skill and coordination

with the assistant are very important here because inaccurate digging can result in many hours of manual labor. Generally, installers drive stakes at the hopper corners, transition points and pool wall corners and connect string to them at this time. The string is set at the height of the intended finished grade. Remember, if the pool is to be used for diving, the finished dimensions must conform to applicable codes and standards.

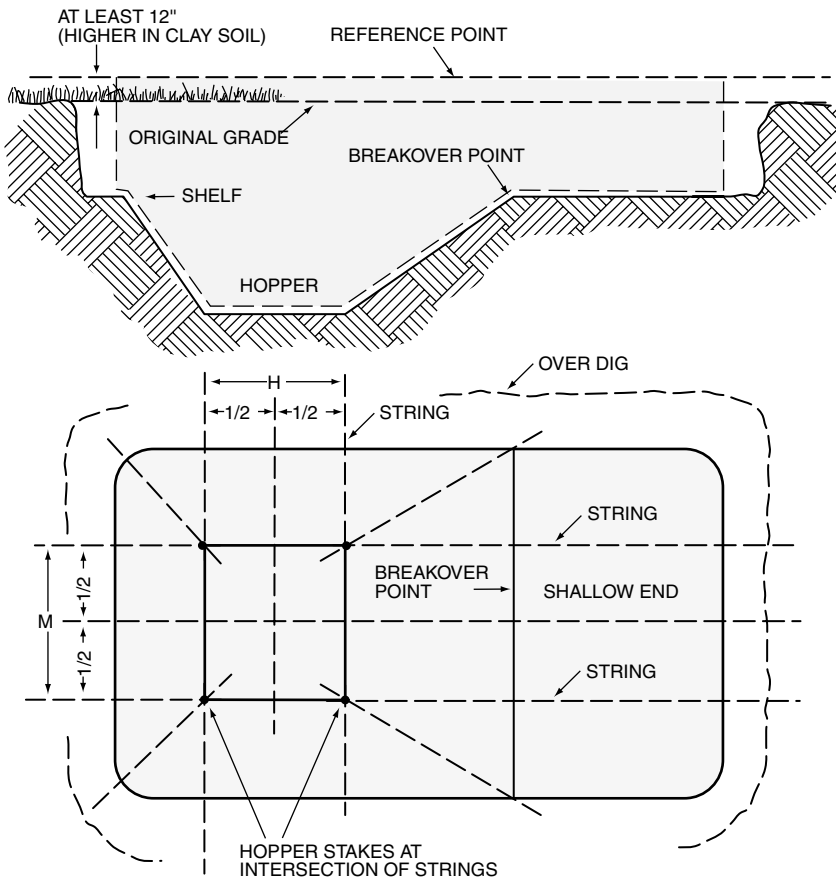


FIGURE G – Hopper plan view

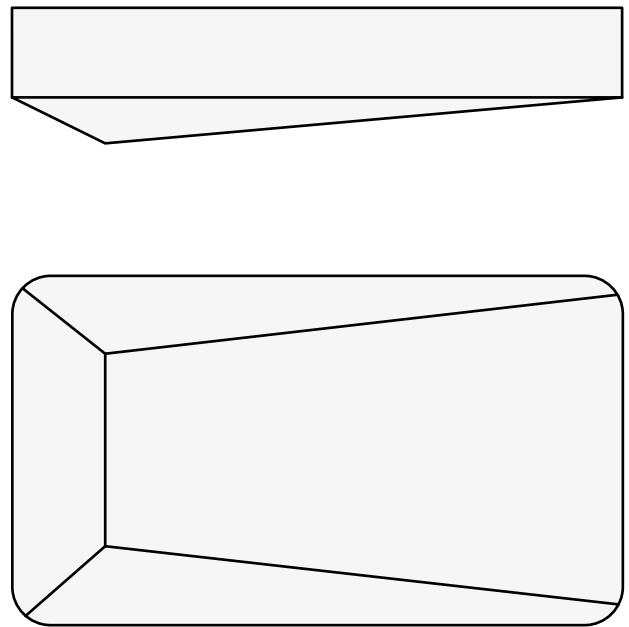


FIGURE H – Wedge bottom side elevation (top) and plan view

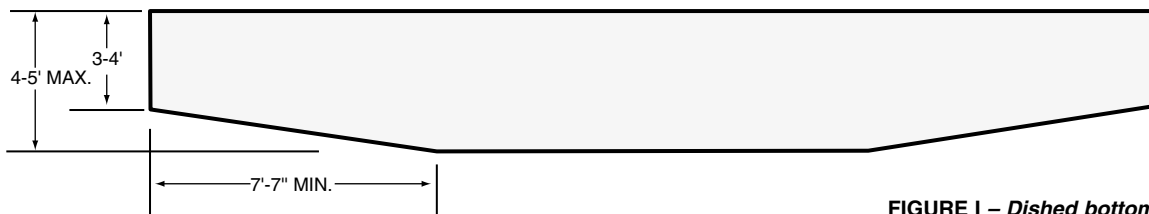


FIGURE I – Dished bottom side elevation

## Alternate bottom shapes

An in-ground, non-diving pool may have a bottom configuration that is flat, “dished” or wedge-shaped. It can also be designed with a hopper that is shallow. “Dished” bottoms are created by excavating a gradual slope down and away from the shelf. Wedged bottoms are gradually tapered from the shallow end wall or from some flat point in the shallow end to sloping, deeper end walls. As with all pool drawings, the grade changes must be specified. Typically, the final depth is lower than the shelf level.

*(See Figures H & I)*

## WATER MANAGEMENT

It is not unusual to encounter ground water during excavation. The best way to deal with water is to avoid it. Sample digging and/or historical records can be helpful when evaluating potential sites for a swimming pool. Consult with a soils engineer for testing.

### Removing Water

Soil consistency and the level at which ground water is known to have been present are among the key factors in deciding how to remove and/or divert water. The elevation of the pool and the surrounding grade are very important too. There are many ways to deal with water problems and some of the recommended methods are presented here.

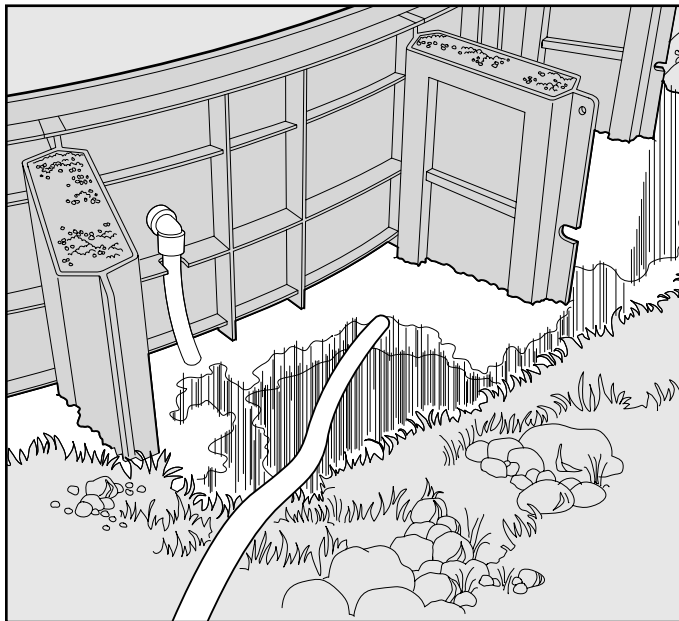


FIGURE J – Removing ground water

### Setting up a pump

When water is discovered in an excavation, a simple pumping system can be very helpful. Connect a foot valve to a length of flexible pipe that is long enough to span the distance between the center of the lowest part of the hole and a point above and away from the dig. In most instances, a one horsepower pump is sufficient, but if the flow of water is heavy, a larger pump(s) may be needed. The foot valve should be imbedded in washed #2 stone. When possible, it is best to set the imbedded foot valve at a point lower than the final position of the main drain(s). The remainder of the pipe can be permanently set into the hopper side walls and under the shelf at some time prior to panel assembly and the concrete collar pour.

*(See Figures J & K)*

Prime and start the pump while directing the water to a storm sewer or lower lying area near the site. Avoid silt accumulation by placing the end of the discharge hose into a large barrel. Silt will settle in the barrel and the water will overflow into the storm sewer or onto the ground. Care should be taken to avoid damage to the adjacent properties and objects when pumping the water. Seek advice from local building officials for allowable discharge methods.

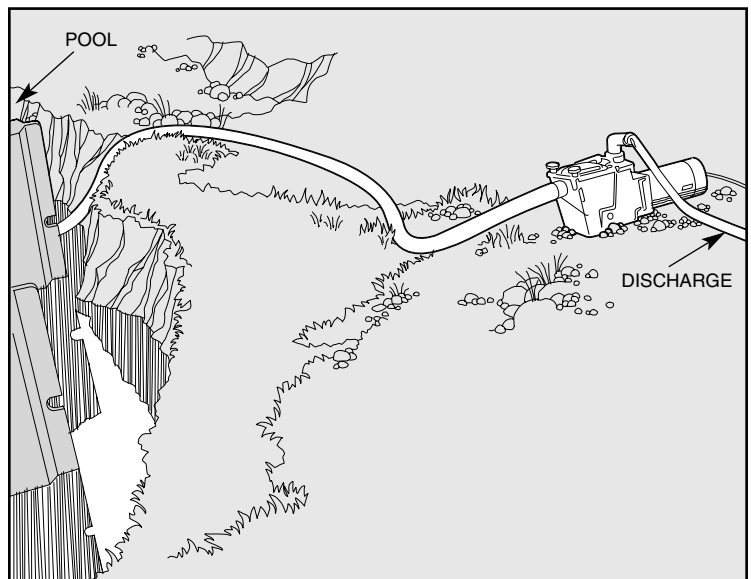


FIGURE K – Simple pump set-up

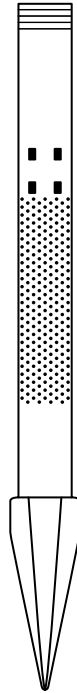
## STEP 2 EXCAVATION

FIGURE L – Well point

Once the project is complete, the system can be connected to a plugged port at the base of a skimmer and used for water control during future liner changes.

### Using a well point

Another, more complex method employed to evacuate water is the use of well points. Sandy soil is most suitable for well points. The device consists of a steel pipe with a hardened tip at one end. A screened segment is positioned between the tip and the solid wall pipe to allow water to be drawn through the pipe. Driven by hand or in association with pressurized water forced through the upper end of the pipe, the well point(s) should be located near the perimeter of the pool and deep enough that the screened sections are below the maximum depth of the pool. Regardless of the number of pipe lengths used to reach the desired depth, the upper most end is to be connected to a pump by flexible pipe. As with the previously described system, priming the pump first, then starting it, will allow optimal operation. In some cases, water volume is such that the point(s) may need to function continually until the pool liner is set and filled. The route and area receiving the pumped water must be evaluated and approved for its capacity before starting this system. (See Figure L)



cause. The foot valve and pump system described earlier may be a sensible first measure in this situation. However, since the remainder of the site is of the same consistency, an evacuation route for inevitably accumulating water should also be created. If there is a lower lying, unrestricted area near the pool location, a trench no less than 1' wide can be dug and pitched at 1/2" per linear foot away from the shelf grade to the designated lower space. The trench bottom should be lined with #2 stone about 2"-3" thick. Once the panel/brace system is positioned and the concrete bond beam is poured, 4"-6" diameter filter-socked, corrugated, perforated drain pipe can be wrapped around the pool on top of the bond beam and a T-fitting used to connect it to a length of the solid pipe at the trench. The pipe in the trench should be long enough to project beyond the slope of the finished grade. The pipe end must be visible upon final grading. (See Figure M)

### Adobe Clay – Backfilling

When the pool is backfilled, only porous material such as sand, gravel, pea or #1-2 stone should be used. When stone is used, wrapping the circumference of the pool with perforated drain pipe may not be necessary since its porosity will allow water to find its way to the section of pipe in the trench. The trench pipe may be surrounded with #2 stone.

**A pool should never be backfilled with expansive soils.**

Above ground, every precaution should be taken to prevent water from roofs, gutters, decks, fields and any other surfaces from being directed toward the pool. In some instances, swales must be created beyond the pitch of the deck at its intersection with an ascending slope. This process will be illustrated in the section of this manual describing backfilling procedures. (See page 29)

## ADOBE CLAY

If expansive soil is discovered during excavation, sub-grade and above ground measures may be necessary to successfully deal with the immediate and future problems that water can

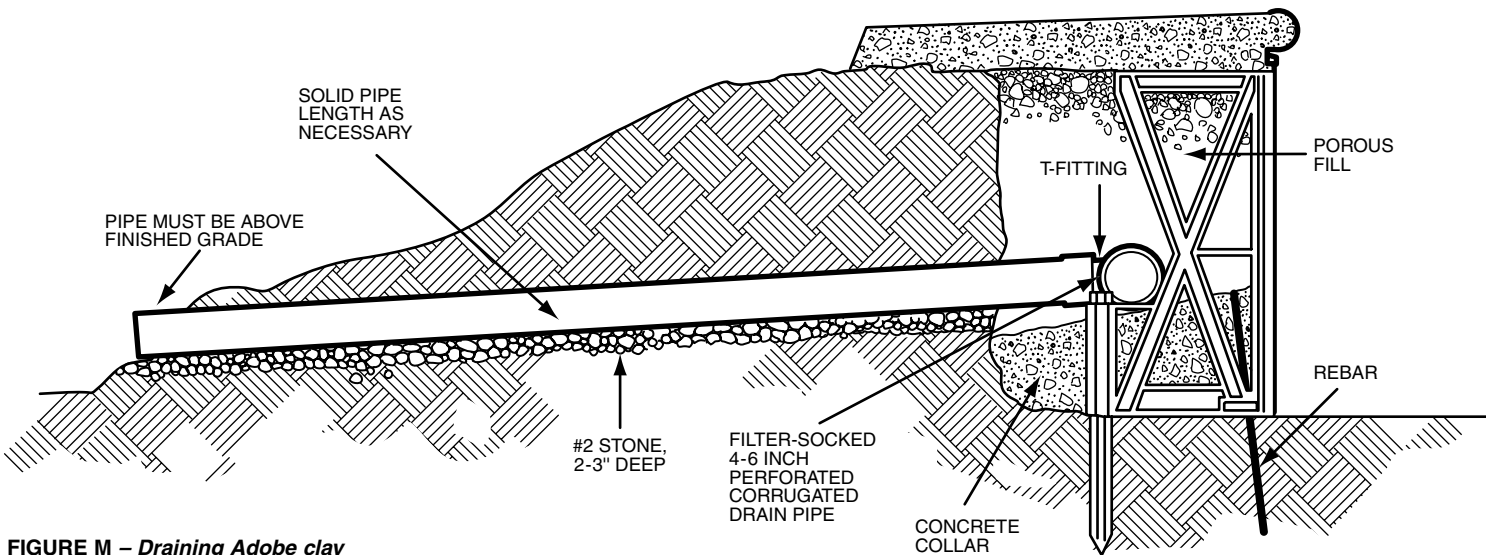
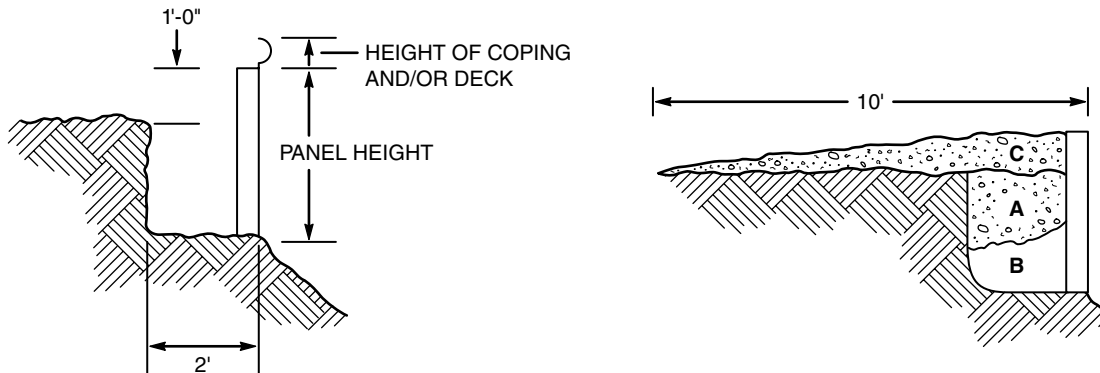


FIGURE M – Draining Adobe clay



# STEP 2 EXCAVATION

## EXCAVATION TABLE *All Pools*



**All Excavation Figures are Average Based on Receptor Tops 1'-0" Above Grade and Bond Beam 1'-0" Thick**

**FIGURE N – Excavation Table**

Pool Size	Pool Excavation	Overdig Excavation	Total Excavation	A Backfill	B Bond Beam	C Backfill	Total Backfill A + C	Mason Sand for Bottom	*1:8 Mix Portland to Vermiculite
12' x 24' Dished to 4'4"	33.2 yd <sup>3</sup>	16.3 yd <sup>3</sup>	49.5 yd <sup>3</sup>	10.4 yd <sup>3</sup>	5.9 yd <sup>3</sup>	20.7 yd <sup>3</sup>	31.1 yd <sup>3</sup>	2 yd <sup>3</sup>	6:12 bags
14' x 26' Dished to 4'4"	44.2	18	62.2	11.5	6.5	22.2	33.7	3	9:18
16' x 32' Hopper	85.2	20.5	105.7	12.8	7.7	25.2	38	5	15:30
18' x 36' Hopper	103.4	22.9	126.3	14.3	8.6	27.4	41.7	6	18:36
20' x 40' Hopper	132.3	25.3	157.6	15.8	9.5	29.6	45.3	7	21:42
14' x 23' Oval Dished to 4'6"	25.1	12.3	37.4	7.7	4.6	17	24.7	2	6:12
14' x 29' Oval Dished to 4'6"	35.9	14.7	50.6	9.1	5.5	19.2	28.3	3	9:18
17' x 27' Dished to 4'8"	47.6	15.8	63.4	9.9	5.9	20.1	30	3	9:18
17' x 35' Oval Hopper	82.2	18.9	101.6	11.8	7.1	22.4	34.2	5	15:30
19' x 37' Oval Hopper	101.3	20.3	121.6	12.5	7.5	23.7	36.2	6	18:36
21' x 41' Oval Hopper	112.6	22.9	135.5	14.3	8.6	27.9	42.2	7	21:42
24' x 40' -L- Hopper	110.5	26.9	137.4	16.8	10.1	27.4	44.2	7	21:42
17' Dia. Round Dished to 4'6"	24.2	11.8	36	11.8	X	12.6	24.4	2	6:12
21' x 33' Ellipse Hopper	84.8	19.5	104.3	12.8	7.3	23.1	35.9	5	15:30

\*Mason Sand and Portland to Vermiculite Figures Approximate

**Note: Bond Beam Not Required on Round Pool in Normal Ground Conditions**

# STEP 3 PANEL & BRACE INSTALLATION

Panels and braces should be placed in their locations as specified on the pool drawing. Be aware that some polymer systems require that braces must also be attached to the center rib of long panels.

## Identify the bottom of each panel

There are two indicators that identify the bottom of each panel. On the ribbed back there are holes in the bottom flange; on the smooth face, a fine scribe line protrudes across the width of the panel, 2" from the bottom. Be certain that all panels are joined right side up. Braces are supplied with stakes attached to them and should be installed with the stake socket nearest the shelf. Stake placement will be addressed later.

## Skimmer panels

On diving pools, a safety rope with floats must be anchored to each side of the pool a minimum of one foot, but no more than two feet, into the shallow end from the breakover. With that in mind, be certain that the skimmer opening is not in line with or near the rope and floats.

## Connecting panels

Begin connecting the panels and braces at a corner or the arc of a radius using the nylon nuts and bolts supplied with the pool kit. Braces are placed inside either panel's flange. Insert and connect wedges if and where indicated on the drawing using appropriately sized fasteners to do so. A nut and bolt must be used in every flange hole and hand tightened. **Do not use wrenches for final tightening.**

There are two important features that make this process easy and accurate. First, the panel side flanges are molded with our mate-lock system. It allows two cylindrical protrusions on one panel to fit into two holes on the adjacent panel. Their locations are such that when joined, the faces, tops and bottoms of the panels are flush.

Secondly, notice the slight elevations in the washer face of each bolt and nut; their purpose is to offer counter-clockwise slip resistance as a wing nut is tightened clockwise onto the bolt or vice versa. (See Figures O & P)

**TIP:** Caulking each panel side flange to prevent water and debris infiltration toward the liner prior to assembly is preferred by some installers. Silicone caulk is recommended. The manufacturer has not done any studies to validate this practice.

If step units or other thermoformed, in-wall accessories are incorporated within the pool's perimeter, use the coated steel nuts, washers and bolts included with the pool kit to fasten each of them to adjacent panels. Detailed accessory installation will be addressed in another section.

Once all of the panels and braces have been joined, adjust their height as necessary using soil or crushed stone and the appropriate hand tools.

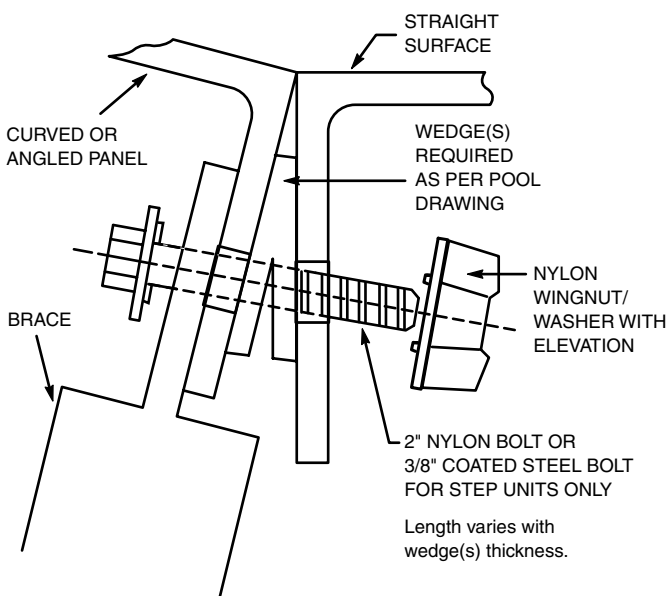


FIGURE O – Plan view of straight step unit bolted to radius spacer panel joint (typical)

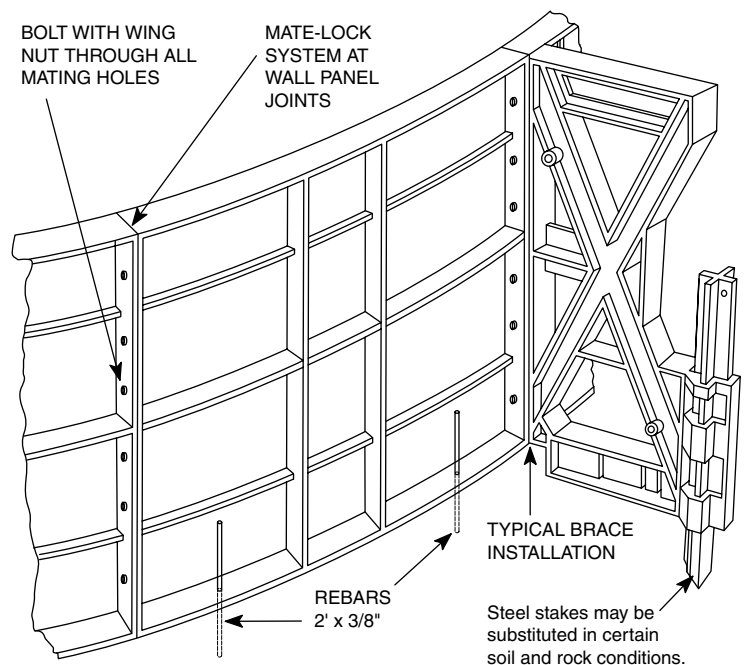


FIGURE P – Typical brace installation

## STEP 3 PANEL & BRACE INSTALLATION

Correctly position all panels and check that the measurements to the bottom of each panel are as specified on the scaled drawing. Drive an 18" x 3/8" diameter steel rod approximately half its length through the holes in each bottom flange and into the shelf. Depending on the rib configuration of the panel, the rod may need to be angled slightly to allow access for a hammer to strike it. The rod helps keep each panel properly positioned. **(See Figures O & P)**

### Setting Stakes

Use one hand to hold the brace stake and, with a hammer in the other, drive it into its socket as it breaks away from the molded tabs connecting it to the brace. A 3lb. sledge hammer is effective for this procedure. (Low air temperature and/or firm soil may require the use of a wooden block or durable cap to be placed over the top of the stake while driving it home). While holding a level on its face, verify that the wall is plumb and drive the stake home. Fix its position by threading a 3/8"-16 x 1" bolt through existing or newly drilled holes in the socket and stake. Lock the bolt in place with a nut. Some braces and/or soil conditions require the use of treated steel stakes. Other fastening hardware, such as a self-tapping screw, is effective with either stake. Make sure the walls remain plumb.

Two people can team up to make quick work of this phase of the job. **(See Figure Q)**

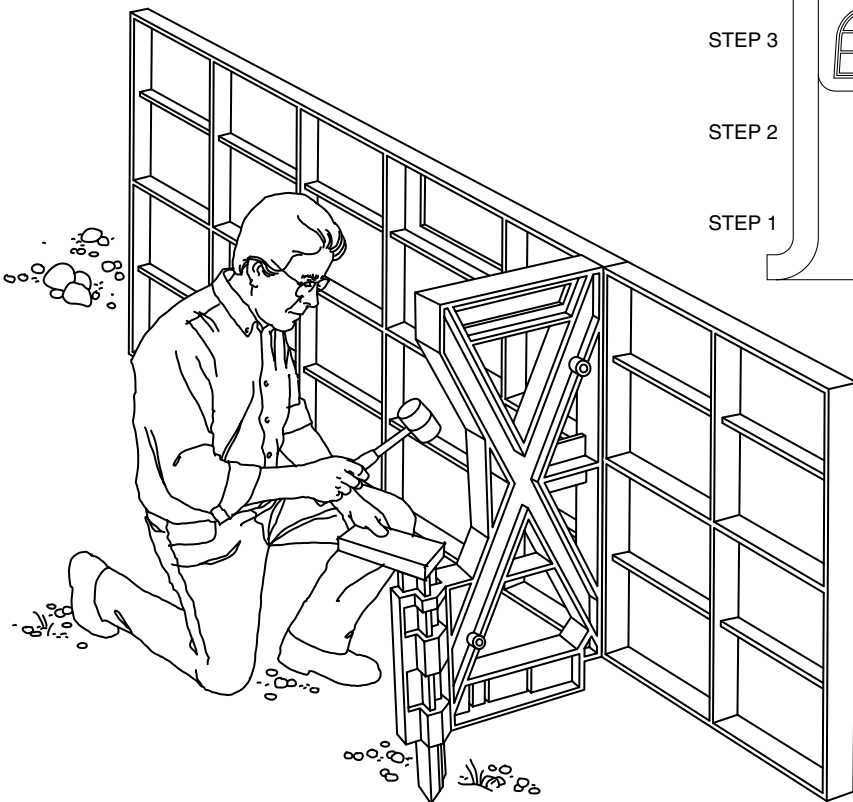


FIGURE Q – Backbrace stake installation

### INSTALLING STEPS, LOUNGES, BENCHES AND WALL LADDERS

The installation of these products can be challenging because some of them are heavy and difficult to handle. Do not throw, drop or abuse these components in any way.

This installation is best done by two or more persons and in conjunction with panel and brace placement.

With the unit resting on its back, remove the attached cover strips, screws, faceplates, Dempsey caps and screw packet with bracing instructions. Put everything in a safe and accessible place. (Be certain the warranty card is given to the pool's owner along with all other product warranties). After placing cardboard or some similar padding near the unit's intended position, carry it there and place it face down on the pad. (Not necessary for wall ladders). Read the bracing instructions found in the screw packet. Some tabs do not need sockets as is also shown in the illustration from bag. **(See Figure R)**

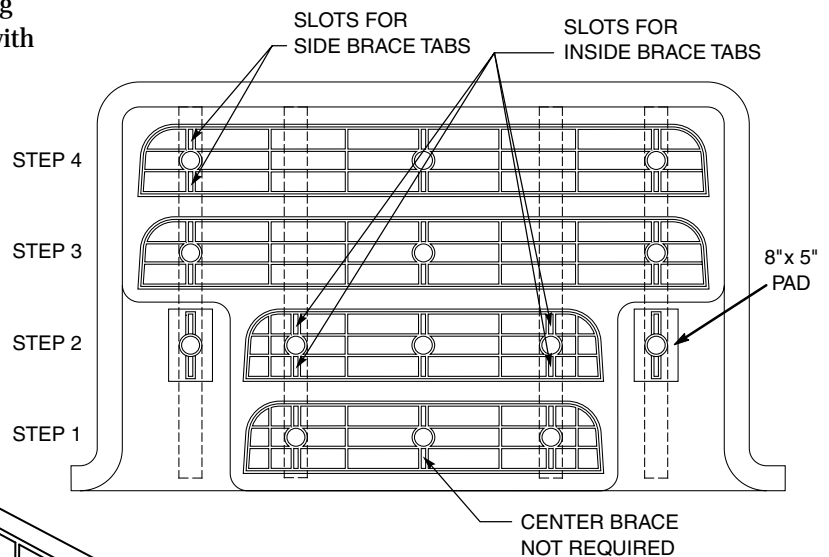


FIGURE R – Step Braces (bottom of steps shown)

Note: Sit 'n' Step braces require pads that are shipped with each unit. Using the instruction sheet, identify the brace level that will support the sitting areas and firmly attach the pads on those brace tabs. Insert each brace tab into the proper socket as shown.

## STEP 3 PANEL & BRACE INSTALLATION

Occasionally, it may be helpful to drive a short, self-tapping screw through one or two socket walls and into the brace tabs to secure the brace(s) while the unit is moved. Be certain each brace rail is completely in contact with all the tread supports before driving the screw at a low angle.

Rotate the unit back onto the braces and carefully maneuver it into position within the panel system. Level and plumb the unit while keeping its face, not the gasket, flush with the adjacent panels. The height of the unit must also coincide with the top of the panels with consideration given to coping or cantilever applications.

Clamp the unit flanges to the adjacent panels using suitable clamps. Be sure the clamps are not positioned over the holes in the panels' side flanges. With a drill and 7/16"

diameter bit, use the panel holes as a template to bore the same number of holes into the step flanges. Drive 2-3 self-tapping screws into the panels and through the step flange to fix their position. The screws should be forward from the back of the panel flange 2-3/4" or more to allow brace placement. Release the clamps and install a panel brace at the flange of each panel that is adjacent to the unit. Insert 3/8"-16 x 2" coated steel bolts with washers (supplied with the kit) through each hole in the braces, panels and step flanges. Thread a washer and nut, hand tight, onto each bolt. Check that the step and panels are level, plumb and flush at their faces. Use a socket wrench to firmly tighten all the nuts and bolts. Check the assembly once again for level and plumb, drive the brace stake home and secure it as described previously. Steel rods can be driven through holes in the base of each step brace to prevent movement of the bottom of the brace. Wall braces may be added to step unit braces in order to provide additional deck support.

**(See Figures S & T)**

### WALL LADDERS

Unlike other face-plated products, wall ladders do not need tread braces. Place the ladder in the desired location and clamp it to the adjacent panels. Be certain the top and face of the unit are flush with the panels' tops and faces. Using the panel holes as templates, drill through the ladder flanges and attach them to the panels as described in the previous section.

Attaching the liner to face-plated products will be presented in the Liner Installation section on pages 23-28.

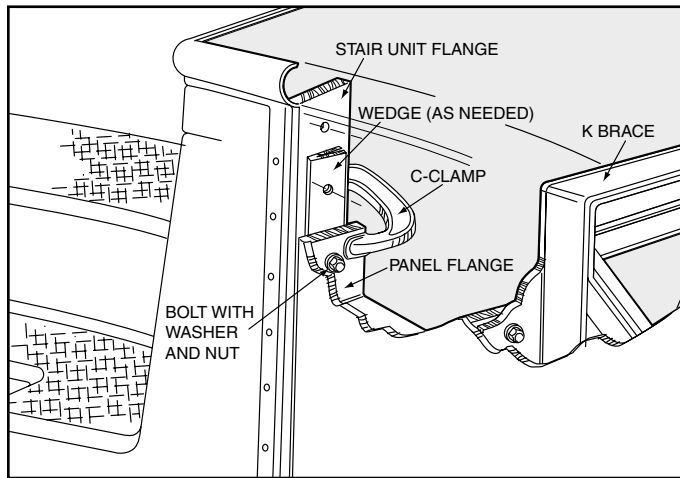


FIGURE S – Step faceplate flange

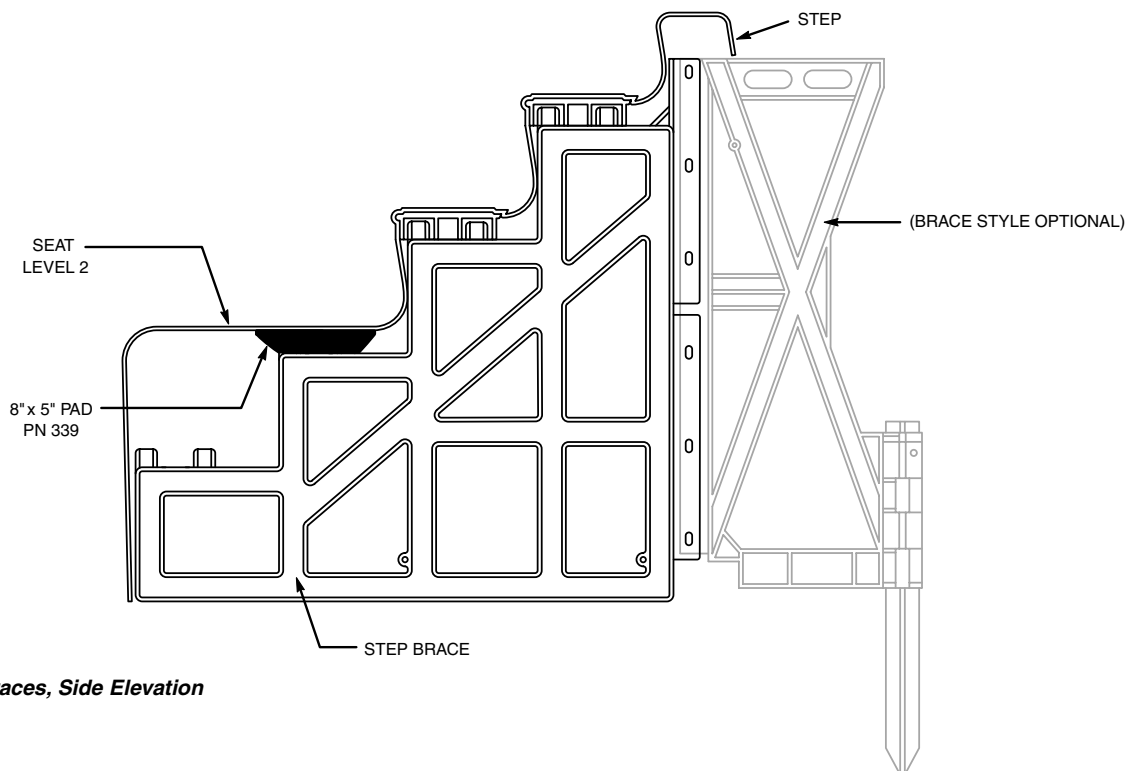


FIGURE T – Step Braces, Side Elevation

## When is the best time to install coping?

The appropriate time for coping installation is one that is decided upon by the installer. Some choose to do it before pouring the concrete collar while others wait until after the pour. One school of thought believes the secured coping stiffens the wall assembly, keeping it properly positioned while helping to resist the lateral load of the concrete. Another view considers the protection of the coping from damage to be most important and promotes precautions to avoid excessive force from concrete directed at or near panel bases. Both require care and repeated checks to ensure the panels are plumb. Regardless of the choice, coping is a structural component of the pool kit that is always visible. For that reason, it is essential that coping layouts be well planned with uniformity being the priority.

## Mirror image

It is recommended that radius, corner and/or angled sections of coping are set onto the respective panels to verify their fit prior to fastening. Throughout the process, every attempt should be made to install each section such that it is a mirror image of the section directly across from it. It is understood that freeform pools can present creative challenges and size uniformity may not be possible.

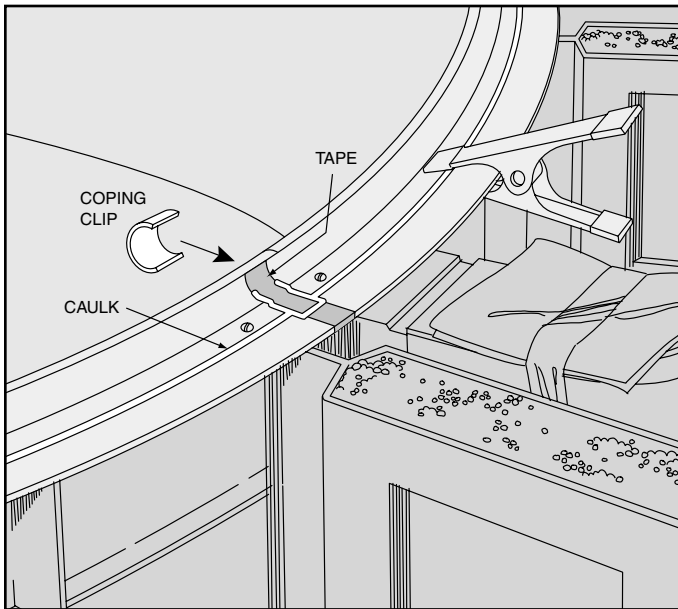


FIGURE U – Coping Installation

Once fitted, each piece should be held to the top panel flange with clamps and fastened with hex-head, self-tapping screws at approximately 12" intervals. (See Figure U&V)

## Sealing

Preferences for preventing water and debris infiltration between coping and panels include caulking and/or taping. In either case, the joint where the coping flange intersects with the top wall flange is one that is to be sealed. Another important area to be sealed is behind coping clips. There is usually a small opening at the base of a clip where it spans the joint of two sections of coping. The opening is a potential route for water and debris to travel behind a liner.

Straight pieces of coping are to be installed last. Cut each section to fit and install it as instructed above. Coping clips can be applied to cover each joint using a dead-blow mallet or similar non-marking tool.

A licensed electrician is responsible for proper grounding of any metallic coping.

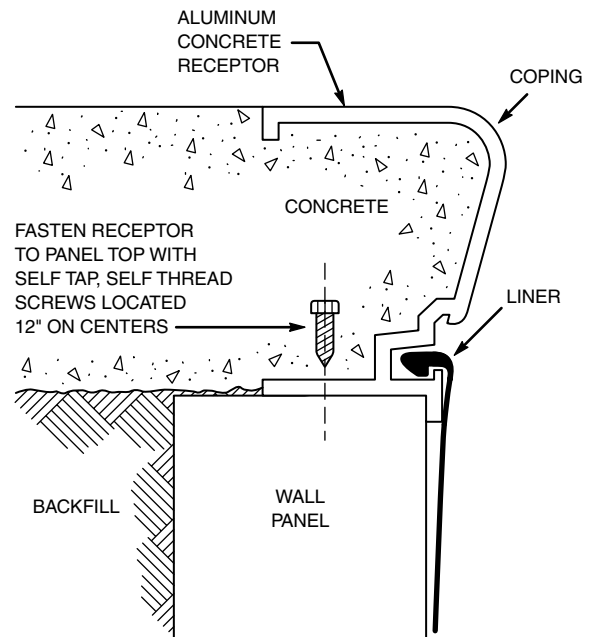


FIGURE V – Coping Installation

## PLUMBING/FITTINGS INSTALLATION

White goods such as skimmer(s), cleaner connections, return fittings and main drain(s) should be installed while following the manufacturer's instructions. The number and location of these fittings is directly related to the size of the pool. Selections for pipe include flexible and rigid PVC that is glued or threaded into PVC fittings to create leak-free water flow to and from the filter.

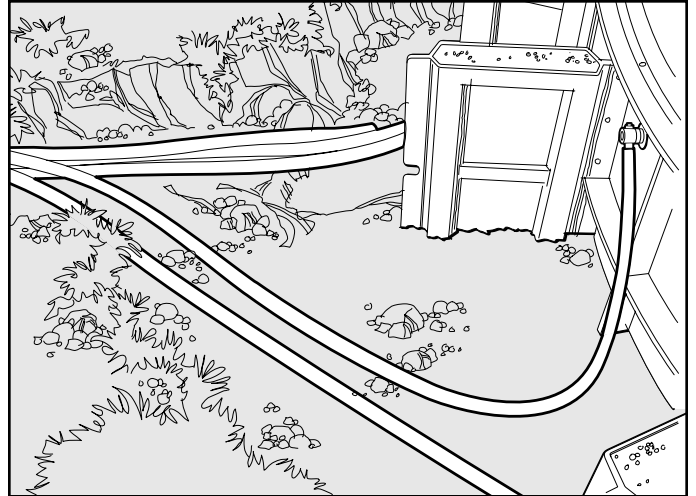
*(See Figure W)*

### Skimmer

Generally, one skimmer is used for every 800 square feet of pool surface area and one return is installed for every 300 feet of surface area. Most pool kits include panels that are designed to house a variety of skimmers, though some require the installer to cut a panel to fit the skimmer to be used. Regardless of the application, the vertical center of the skimmer should be positioned such that it is at the same height as the intended water level.

### Main drains

Main drains promote efficient filtration in hopper pools. The number of main drains used is often dependent on local building code requirements and/or the recommendation from the NSPI standard. The pipe from the main drain(s) to the filter system must be set below grade in the hopper floor and side walls. It should then be directed beneath a panel, exiting through the shelf and on to the filter location.



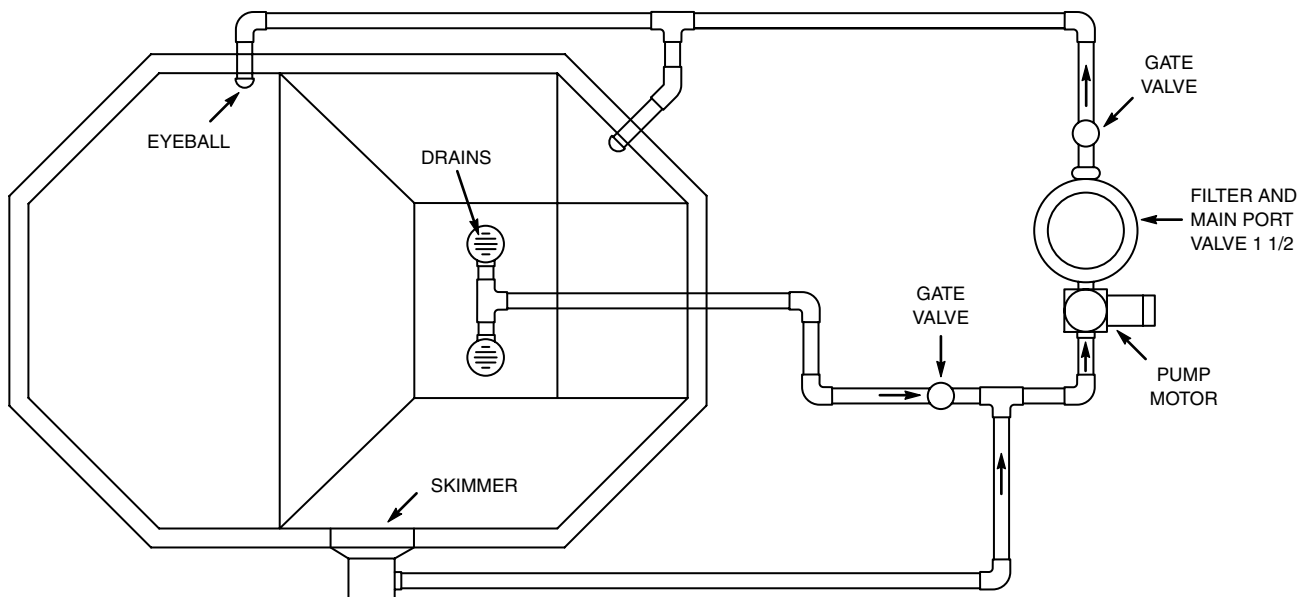
**FIGURE W – Typical plumbing installation**

When they are required, permanent installation of safety rope anchors may be completed at this time. Follow the manufacturer's installation instructions and position the anchors in accordance with the current NSPI standard.

## FILTRATION AND CIRCULATION

Pools require filtration and circulation systems in order to maintain sanitizer levels that are safe for human use. While no specific system recommendations are made, it is very important that they are installed and maintained as directed by their manufacturers. The illustration below provides a view of a typical filtration system installation.

*(See Figure X)*



**FIGURE X – Typical Filtering System**

# CONCRETE COLLAR/BOND BEAM STEP 6

## CONCRETE COLLAR/BOND BEAM INSTALLATION

With all panels, braces, in-wall systems and plumbing properly positioned, leveled and staked, the concrete collar or bond beam may be poured. It is recommended that a wooden support, such as a 2" x 4" be staked in front of face-plated products to prevent the lateral load of the concrete from affecting their shape and/or position.

**(See Figure Y)**

It is very important to maintain panel alignment throughout this process. Do not direct the flow of concrete directly at the panels. Care should be taken to pour the concrete without pooling large volumes in one area. Use a taut string suspended from end to end of a series of straight panels to verify their position.

Adjust as necessary.

Based on structural calculations performed by licensed engineers, the ICBO requires the concrete to reach a thickness of between 8" and 12" over the width of the overdig. Latham Plastics, Inc. supports that requirement but acknowledges that certain soil and rock conditions may justify altering the process. The engineers also recommend that it should slope away from the panel in an effort to minimize water accumulation near the panel.

**(See Figure Z)**

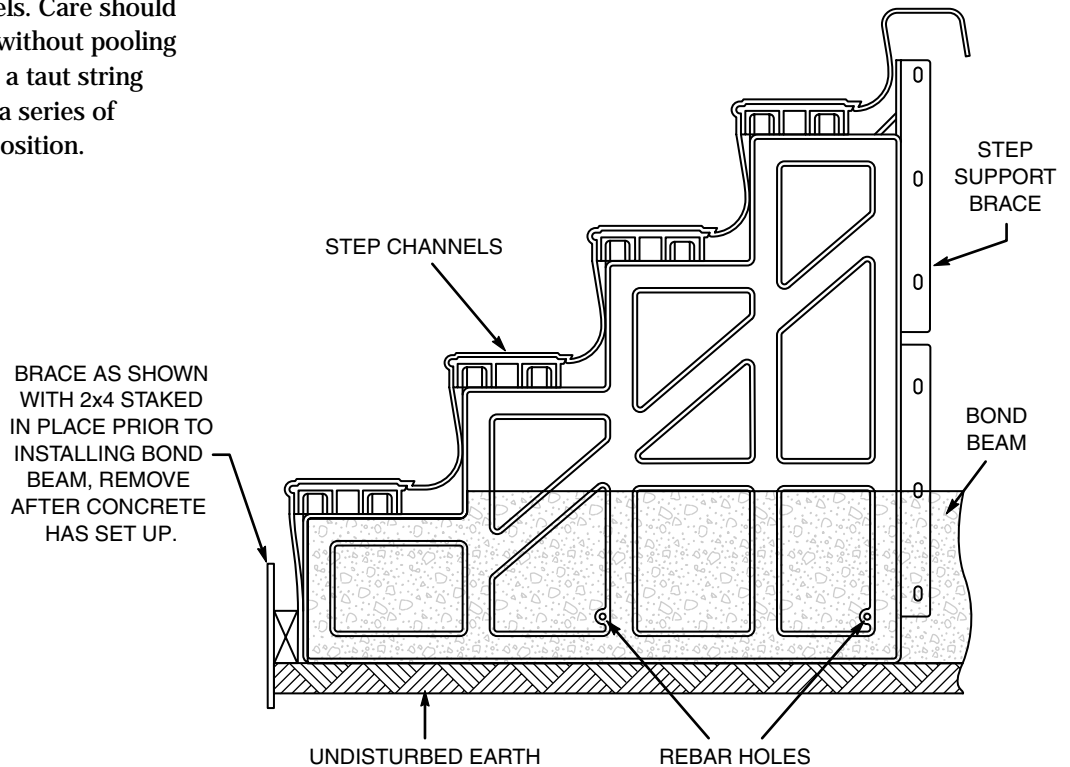
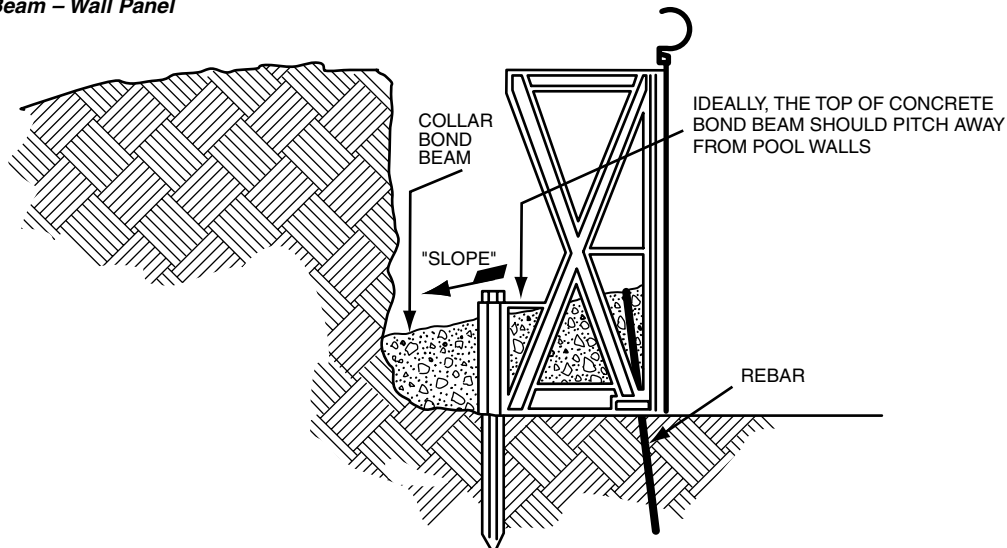


FIGURE Y – Collar Beam – Step Unit

FIGURE Z – Collar Beam – Wall Panel



# STEP 7 FINISHING THE POOL BOTTOM

*Tools necessary at this time are a tape measure, graduated telescoping pole with a plumb bob and a transit.*

The pool bottom must be prepared for finishing and there are several steps in that process. The pool specification drawing is particularly important during this phase of the job.

Begin by removing any rocks, roots or debris from the bottom of the pool. Once the pool bottom is clean, the height of the pool base must be determined and marked by using stakes and string. Locate the hopper corners, the ends of the breakover and the center or ends of the deep end corner panels. Each of these locations is indicated on the dig specification drawing. Drive steel rods into the pool bottom at each point. As was previously mentioned, each panel has a horizontal scribe line molded into it exactly 2" from the bottom. String should be tied to the stakes at the deep end corners and the break over. The height of the string should be level with the panels' scribe lines. The opposite end of the strings should be tied to the respective hopper corner stakes at a height of 2" from the pool bottom. Once those strings are set, additional strings should be run from corner to corner. A line level may be used to reference each corner to the others. Remember, all dimensions must be the same as those on the pool drawing. **(See Figures AA & BB)**

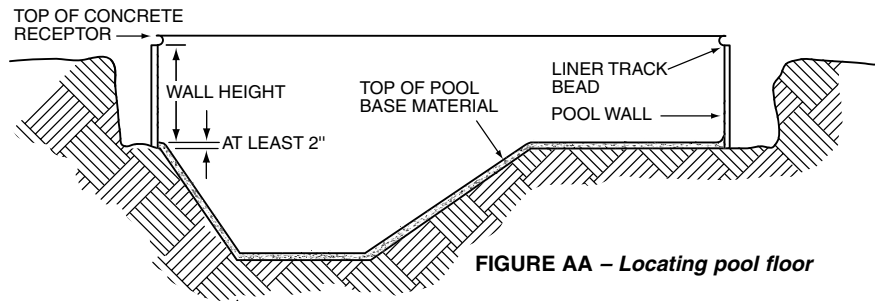
Once the string is set, firmly tamp the side walls, slope and hopper. Several types of pool bases are available and the sequence of the bottom finishing phase can be varied. Some installers choose to use concrete as a pool base. In such cases, hopper side walls may be poured immediately following the collar pour. The size of the pool in relation to the concrete truck's/trucks' capacity and the number of workers present usually determines whether that can be done. What ever the choice, it should be applied at a thickness equal to the level of the string and troweled smooth.

Generally, the sequence of applications is staggered. For instance, the hopper side walls and the shallow end can be done first. After those surfaces are set, a ladder can be lowered into the

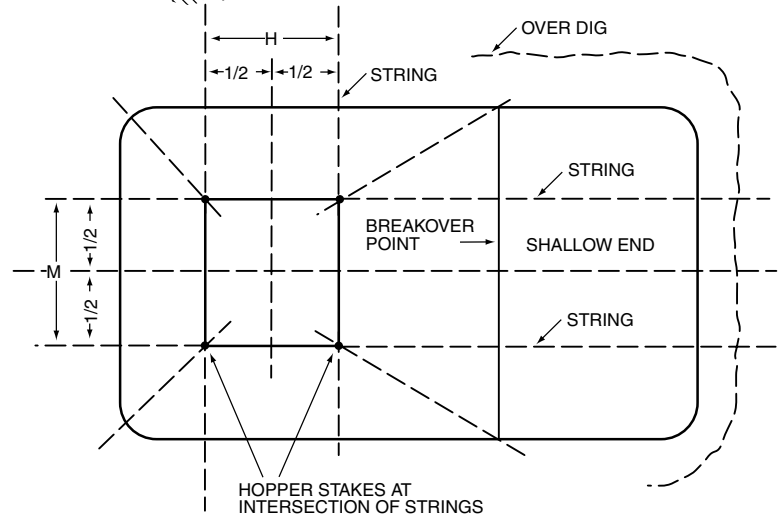
hopper and workmen can descend there and trowel the base material from the break over into the hopper. The last portion of the hopper base is applied with the workman on the base of the ladder supported from the top and resting on the hopper side wall

Once the pool base has set, it should be scraped and/or ground to a smooth, even finish. **(See Figure CC)**

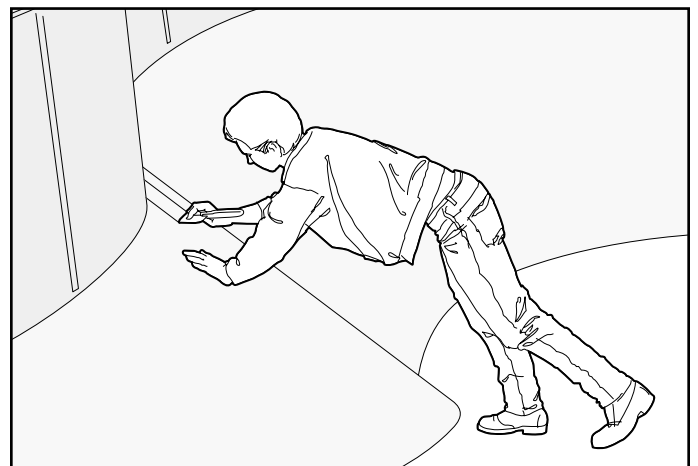
Additional preparation instructions are provided in the Liner Installation Section.



**FIGURE AA – Locating pool floor**



**FIGURE BB – Hopper stakes at intersection of strings**



**FIGURE CC – Once set, the concrete base should be scraped and ground smooth.**



**PRECAUTIONS** Clean the pool walls thoroughly. Rusted and/or rough metal walls may require foam padding to prevent damage to the vinyl liner. Polymer walls rarely require foam padding. Cover all panel joints and the bottom edge of the coping with fabric-based duct tape or painter's grade masking tape. Be sure to check all coping joints for sharp corners. Soften or cover any sharp projections with an appropriate material to prevent tearing of the vinyl liner during installation.

### ***The pool bottom must be prepared***

Take particular care in cleaning and smoothing the pool bottom. Inspect the pool bottom for any debris, protrusions or sharp objects and remove them before installing the vinyl liner. The customer's perception of an installer's workmanship will be largely dependent on how the bottom looks and feels.

Once the interior of the pool is properly prepared, the skimmer and return gaskets may be applied. If the pool has a main drain(s), a base gasket should be seated and fastened to each drain before the vinyl liner is installed.

Vinyl liners should be installed when the ambient temperature is 60° Fahrenheit or greater. Accommodations can be made to install a vinyl liner in cold weather by

enclosing the pool with a temporary, heated structure, though only experienced installers should attempt such a procedure. The vinyl liner should be stored in a heated space for two or more days prior to installation in cold weather.

### ***Make sure the liner is correct first!***

Check the vinyl liner box label and compare the dimensions on the graphic with those of the pool. If they match, detach the banding from the box and remove the lid. A large envelope with all the warnings, warranty and pool care information will be in the box.

**READ THE INSTRUCTIONS TO THE INSTALLER ON THE FACE OF THE ENVELOPE!** If the homeowner is present, ask him/her to look at the liner to be certain it is the pattern/color that was requested. **REVIEW THE ENVELOPE'S INSTRUCTIONS AND CONTENTS WITH THE HOMEOWNER BEFORE LEAVING THE SITE!** If the homeowner is not available, return to the site when he/she is there to review the information.

*It is legally essential that installers present the warnings and care packet to all pool owners and instruct them on the use and importance of its contents.*

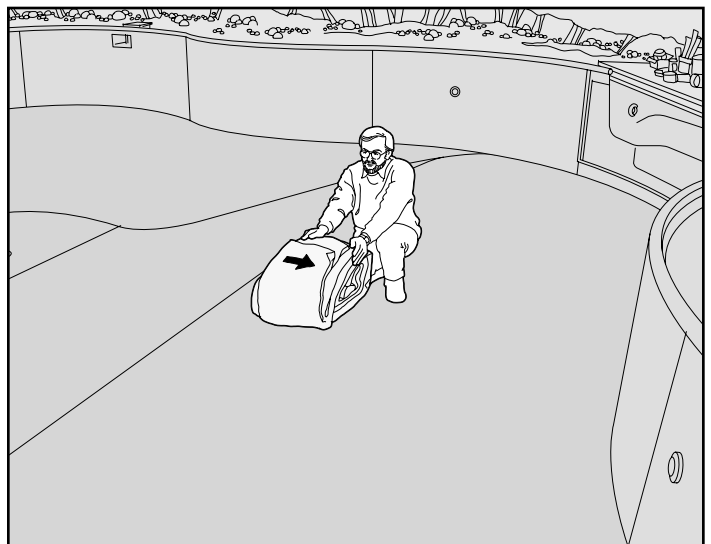
### ***Positioning the liner***

Installing a vinyl liner is easiest to accomplish when done by two or more people. Once it is determined that the vinyl liner is as ordered, notice the red arrow on the top of the folded liner. Carry the box and liner to the center of the transition point of the shallow end, remove the vinyl liner from the box and place it on the floor of the pool with the red arrow facing the shallow end wall.

Unfold it toward the side walls. Grasp the bead and a few inches of the vinyl liner's shallow end wall and pull it toward the pool's shallow end/corners. Since the vinyl liner is fan folded, it will unfold easily. **(See Illustration 1)**

Gently adjust the vinyl liner's position as necessary. Use the factory installed arrows to locate and position corners, the breakover and/or ends of the center line. Do not kick it with abrasive footwear or toes with sharp nails.

### ***How to install the pool liner***



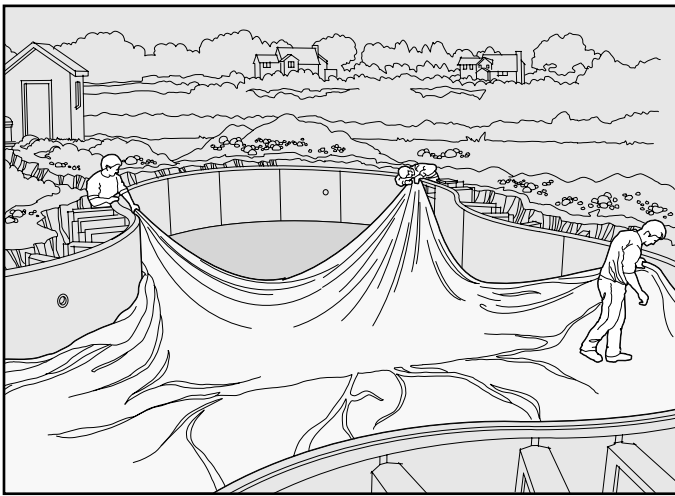
**1.** Position the folded liner at the breakover point with the red arrow pointing toward the shallow end wall.

## STEP 8 LINER INSTALLATION

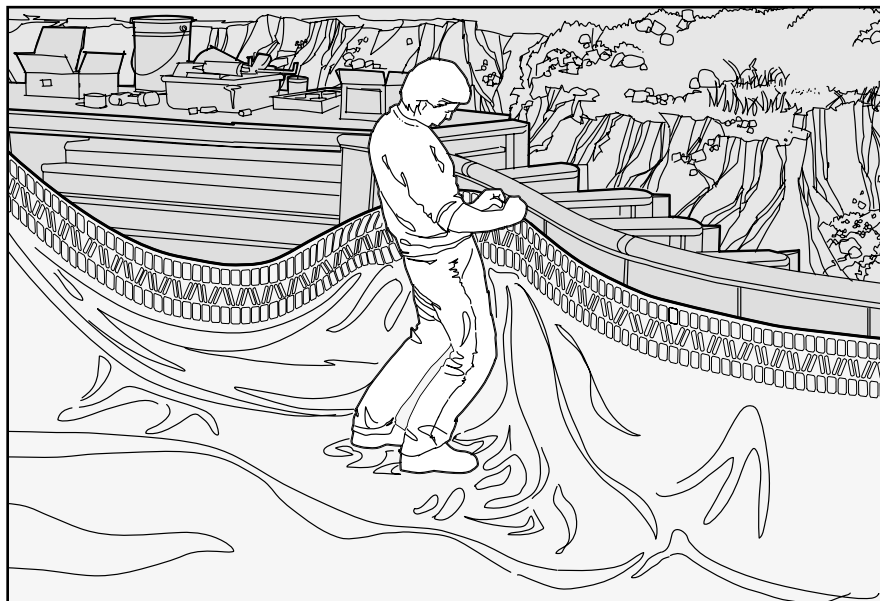
### How to install the pool liner (continued)



**2.** Unfold the liner with the arrows pointing at the shallow end corners. Note plywood and 2x4 with strip to hold liner during install.



**3.** Unfold the rest of the liner toward the deep end of the pool.



**4.** Begin to insert the liner bead into the channel at the corners first and work toward the center.

### VINYL OVER STEP (VOS) INSTALLATIONS

Vinyl liners designed for vinyl over step (VOS) applications require locating and fitting of the step section(s) before any of the shallow end wall bead is put into place. The use of padded weights such as sand bags or water tubes is often necessary to hold VOS liners in position. If necessary, similar types of weights may also be used to hold the vinyl liner in place in other parts of the shallow end.

### VOS OR NON-VOS INSTALLATIONS

With the vinyl liner in proper position, insert the bead into the receiver track at the corners/end and at several points along the shallow end wall and shallow end side walls.

Next, find the corners/end of the opposite end of the vinyl liner. Remember to grasp the bead and several inches of the attached wall material with both hands. Doing so will prevent excessive stress on the bead to wall seam.

Unfold the vinyl liner as it is pulled toward the opposite end of the pool. DO NOT drag it against the coping, ladder sockets or any other potentially damaging surfaces. Properly position the vinyl liner while eliminating as many wrinkles as possible. Once all of the liner's corners/ends are aligned with the pool's corners/ends, insert the bead into the coping at each corner/end. After all the vinyl liner corners/ends are in place, proceed to the middle of the long and short walls and insert the bead into the coping. Continue to do so while working the material toward the corners/ends in both directions. This will prevent poor fitting and undesirable stress at all of the corners/ends.

*(See Illustrations 2-4)*

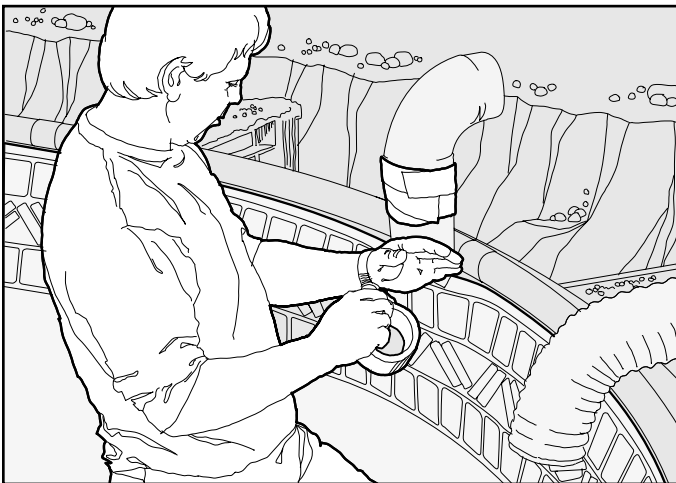
## STEP 8 LINER INSTALLATION

### FINAL POSITIONING OF THE VINYL LINER

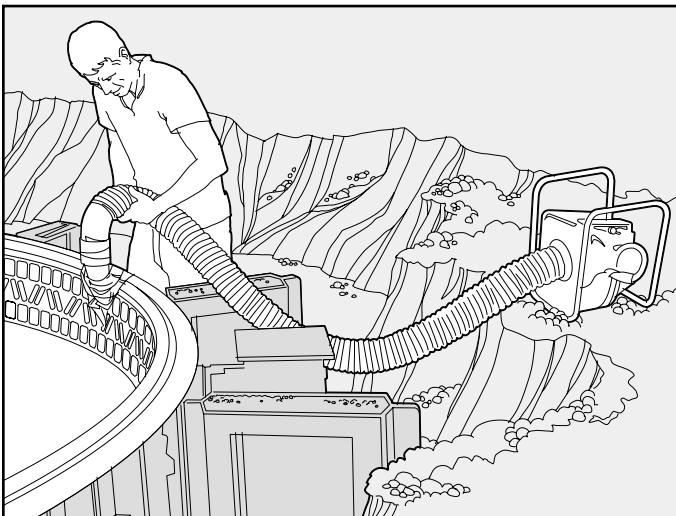
An installer's primary goal at this point is to protect the properly positioned vinyl liner while eliminating all wrinkles. To accomplish this, there are several acceptable techniques for vacuuming a vinyl liner into place. The following are but two of those techniques:

#### *Vacuuming a vinyl liner into place*

■ Remove about 6" of the bead from the receptor on one side wall near the break over. Insert the suction hose of a commercial vacuum between the vinyl liner and the wall to a depth of approximately 20" from the top of the pool. Create a seal around the hose to make the insertion point airtight. Use tape that will not damage the print on the liner and/or avoid putting any tape on the print. Seal all other openings into the pool, such as the skimmer cover, pipe ends and step cover, to prevent air leaks. (*See Illustration 5*)



**5.** To vacuum a liner into place, insert a section of hose or plastic pipe between the liner and the wall. Use tape to create an air-tight seal.



**6.** Turn the vacuum on and work out all wrinkles while adjusting the vinyl liner's position.

■ Insert a vacuum hose into the top of the skimmer and then through the face of it and down about 2' between the pool and vinyl liner. Seal the top of the skimmer and all other openings leading to the pool.

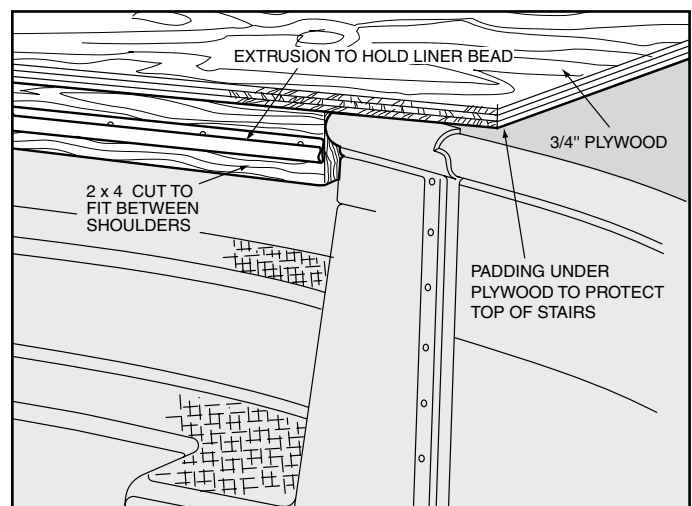
Turn the vacuum on and work out all wrinkles while adjusting the vinyl liner's position to match the pool configuration. Wrinkles can be removed by reaching over the wall and pulling on the vinyl liner sidewall material. Some installers enter the pool and use their stocking covered feet to kick it into place. This practice may result in damage to the vinyl liner causing the installer to become responsible for its replacement. Use caution at all time when handling a vinyl liner. (*See Illustration 6*)

### FITTING LINER TO NON-VOS STAIR/SEAT UNIT INSTALLATIONS

If a non-VOS unit is being used, the vinyl liner may be attached to it using a variety of techniques. Two of the commonly used methods are described below:

#### *Dry Fit*

Once the entire liner bead is inserted into the track, return to the area of the face-plated unit with its faceplates and screws. Place a Dempsey cap over each end of the vertical faceplates. Hold the liner firmly down to the pool floor with one foot (no abrasive footwear) directly beneath one of the vertical faceplate locations. Do this to the point that the liner is stretched but not distorted. While placing the correct size faceplate into position, insert an awl tip into its uppermost hole. Proceed through the liner and on into the corresponding predrilled hole in the unit. Use a second awl to locate the next hole in the same fashion.



**7.** A sheet of plywood with a 2x4 is used to hold liner over unit. A length of receiver track is lined up with the pool wall track and screwed to the 2x4. This is helpful with the dry fit method and is essential with the wet fit method.

## STEP 8 LINER INSTALLATION

Remove the first awl and insert it into the third hole.

**(See Illustration 6)**

Use a clutched drill to drive home a screw into the first hole. Do so without distorting the faceplate. Use the second awl to locate the fourth hole and proceed in the sequence described above. **(See Illustration 8-9)** Upon installation of the first vertical faceplate, install the opposite faceplate in the same manner. Slide the cover strip ends under the Dempsey caps and snap the remaining length into place. **(See Illustration 11)**

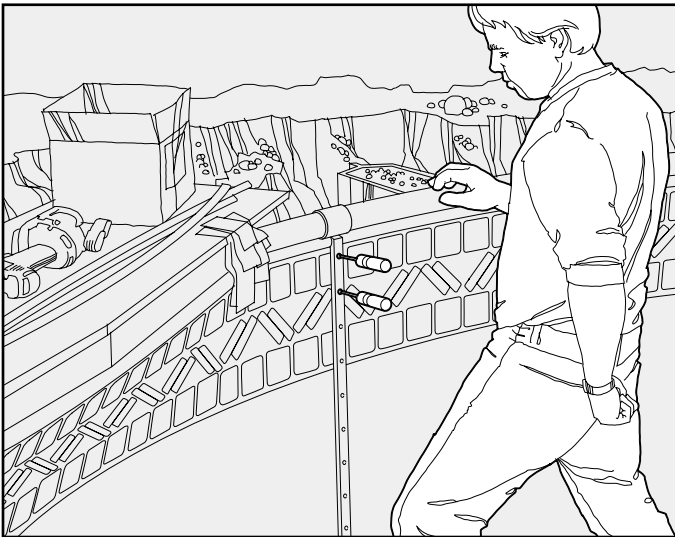
The horizontal faceplate should be installed by fastening one end first, then the opposite end. Find the center hole and insert a screw just deep enough into the unit to prevent the face plate from drooping. Using the awls again, work

from the second screw of one end continuing to the opposite end until all the screws are in place. It is recommended that all screws are tested with a manual driver to be certain that they are seated **(See Illustration 10)**. This must all take place while the liner is being held firmly to the pool floor. Once the faceplate is secure, snap on the cover strip starting at one end and work toward the other.

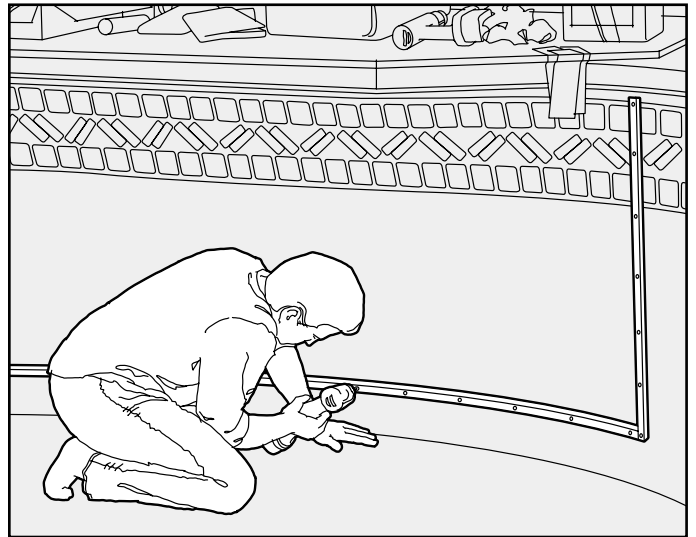
### Wet Fit

This technique requires that a separate, air-tight seal be established above all face-plated units except the 2' wall ladder. A sheet of 3/4" plywood, with a 2" x 4" screwed to the underside of one edge can be used as a cover over these products. The underside of the plywood should be padded with a material that will prevent damage to the

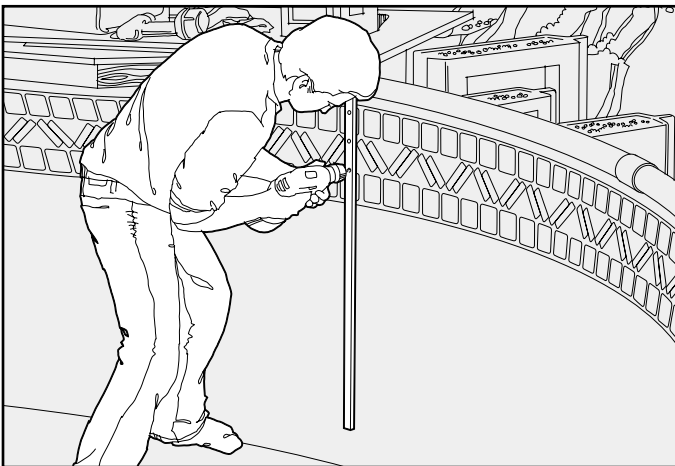
### How to install the pool liner (cont.)



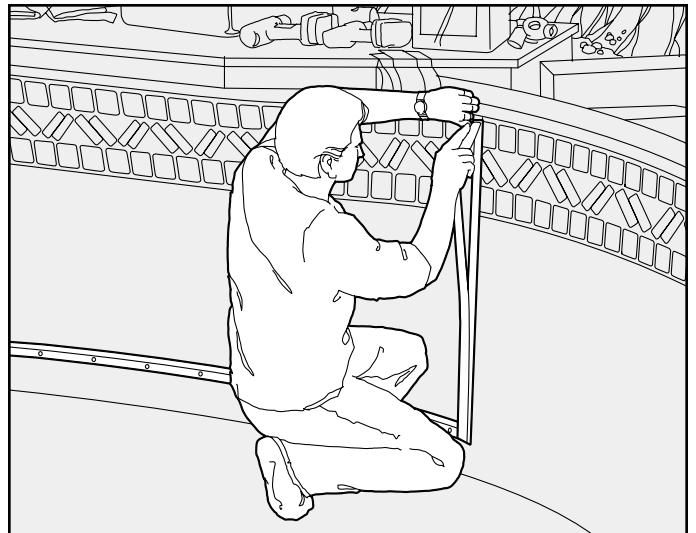
**8.** First, draw the liner tight with your foot, align faceplate and locate the first two screw holes in stair unit flange with the tip of an awl. Note the plywood and 2x4 with channel used to hold liner over unit. Also note the duck tape sealing the liner for vacuum wet fit method.



**10.** Install horizontal faceplate next. Using the above procedure, put one screw in each end first, one in the center and then work towards the center from the ends.



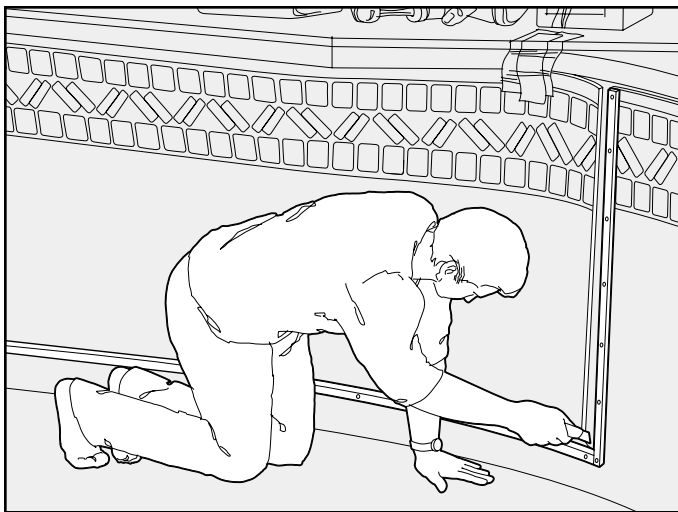
**9.** Move the awl to the third hole, drive a screw in the first hole, locate the next hole and repeat. Do the same with the opposite faceplate.



**11.** Snap cover strips into place.

## STEP 8 LINER INSTALLATION

product and create a temporary seal with the step. The 2" x 4" must be cut to fit the internal width of the unit. With the face of the 2" x 4" flush with the vertical plane of the adjacent walls, a length of receiver track can be fastened to the board at the same height of the track in the coping. **(See Illustration 7)** Insert the liner bead into that receiver track and apply tape over any openings to create an air-tight seal. Proceed with final positioning of the liner as described in the section below. Once the water level is just below the horizontal faceplate location, the faceplates can be installed in the manner and sequence detailed in the DRY FIT section. In each case, use a sharp utility knife to carefully cut the liner immediately inside the faceplates. **(See Illustration 12)** Give the material to the homeowner for potential patching purposes.



**12.** Trim liner just inside the face plate.

It is recommended that novice installers seek advice and training from experienced colleagues to become proficient in these techniques.

### **Install main drain covers**

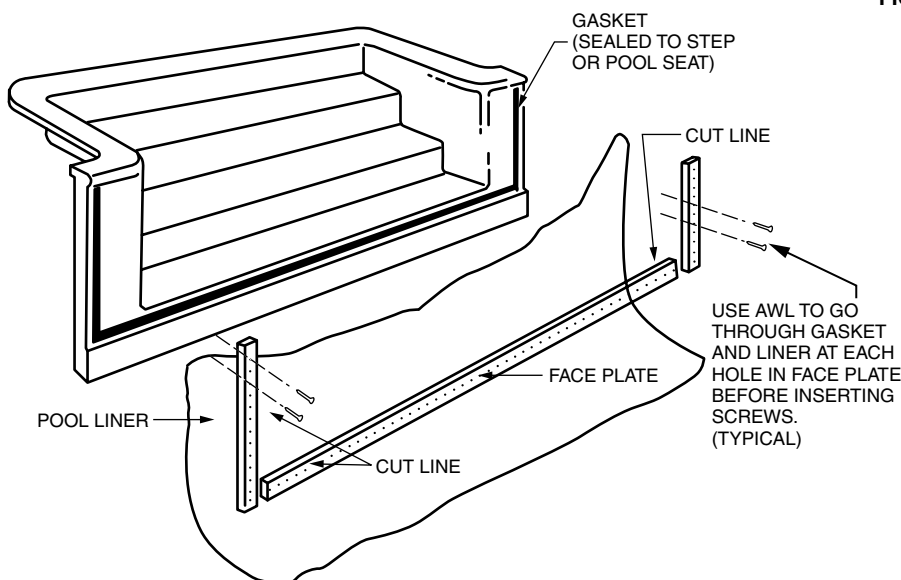
Once the vinyl liner is positioned properly, fits well and all wrinkles have been removed, the main drain(s) cover(s) may be installed. The pool may then be filled with water while leaving the vacuum running. Once the water level is approximately one foot deep in the shallowest part of the pool, the vacuum may be shut off and the hose removed. If the hose was introduced at the receptor track, the tape should be removed and that portion of the vinyl liner bead should be inserted into the receptor track. The pool can then be filled to its operational level. Once that level is reached, the remaining gaskets and faceplates may be installed.

### **Safety rope**

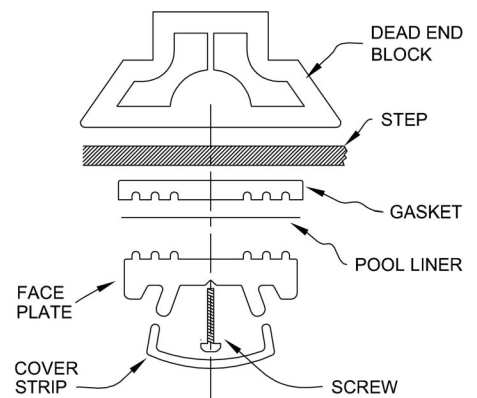
The current NSPI/ANSI Standard requires the installation of a safety rope with floats across the width of the pool parallel to and no less than one foot and no more than two feet from the point of the first slope change in water depths less than four feet six inches.

Proper placement of NO DIVING labels should also occur at this time. See the safety packet enclosed with each Pacific vinyl liner and follow every instruction. Review all the information with the pool owner and leave it in their possession.

It is every installer's responsibility to be familiar with the current NSPI/ANSI standard.



**FIGURE DD – Typical faceplate step unit, gasket and trim**



## STEP 8 LINER INSTALLATION

### **IF THE VINYL LINER DOES NOT FIT:**

In the unlikely event that the vinyl liner does not fit, **DO NOT FILL THE POOL WITH WATER** and **DO NOT CUT THE VINYL LINER OR ATTACH ANY FITTINGS!!**

First, determine that the vacuum is effective. Reassess the vinyl liner's position in the pool. Be sure the liner ends are not reversed; this is a common mistake made by installers of every experience level. Look at the floor of the vinyl liner, in most instances there are fewer seams in the shallow end. If repositioning is necessary, shut off the vacuum and move the vinyl liner accordingly.

Check for unusual features of the pool that may have been omitted from the order form such as a cove in the shallow end or a straight step cut on a corner step or a radius section of the wall.

Compare the corners of the pool with those of the vinyl liner to be sure they are the same arc, shape and/or length.

If the vinyl liner requires modification, make a sketch of the pool on a copy of the pool's design and indicate on it the location and type of alteration needed.

**DO NOT WRITE ON THE VINYL LINER WITH A MARKER OR PEN!**

**DO NOT APPLY DUCT TAPE TO ANY OF ITS PRINTED SURFACES!**

Contact the distributor from whom the vinyl liner was purchased. It is the distributor's responsibility to contact a Latham Plastics, Inc. Customer Service representative to arrange the rework or replacement of the vinyl liner. Keep it clean and dry. Dirt and moisture affect the integrity of vinyl, which in turn limits its potential for reuse. The product must be returned clean and dry in its original carton.

***Vinyl liners returned in poor condition cannot be reworked.*** (See technical attachments.)

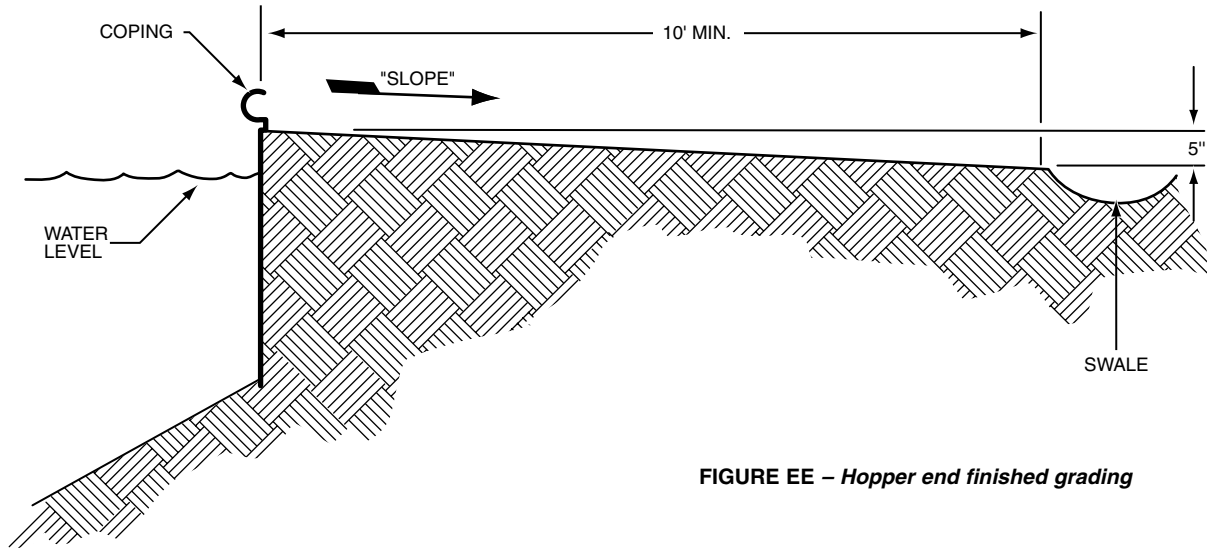


FIGURE EE – Hopper end finished grading

## BACKFILLING

DO NOT USE EXPANSIVE SOIL TO BACKFILL SWIMMING POOLS. Materials such as sand, bank run gravel and pea or #1-2 stone are ideal for backfilling. Before beginning this phase of the job, be certain all work related to WATER MANAGEMENT has been completed. Polymer wall systems should not be exposed to direct sun light for more than two weeks. Ultraviolet rays can cause crazing of the panel skin.

The recommended method for backfilling a swimming pool is to elevate the level of the material being used at the same rate as the water level inside the pool. Deviations from this recommendation should always include measures that guarantee the structural integrity of the pool wall system.

Use equipment such as a skid-steer to carefully place the material into the overdig. Compact it in layers to avoid settling after a deck is installed. Upon reaching the top of the wall system, leave the brace tops exposed to allow concrete (if that is what is chosen) from the deck to encompass the upper brace rail.

## FINAL GRADING

Surface water drainage is an important part of every swimming pool installation. Allowing or promoting water flow toward the pool can cause a vinyl liner to “float”. In addition, freezing water can cause structural damage to the wall system. Final grading should include a minimum pitch of 1/2" per foot away from the pool's edge. If a concrete deck is installed, the pitch may be reduced to 1/4" per foot.

The manufacturers of any of the pool's components cannot assume responsibility for damage to a pool caused by improper grading and/or ineffective drainage systems. **(See Figure EE)**

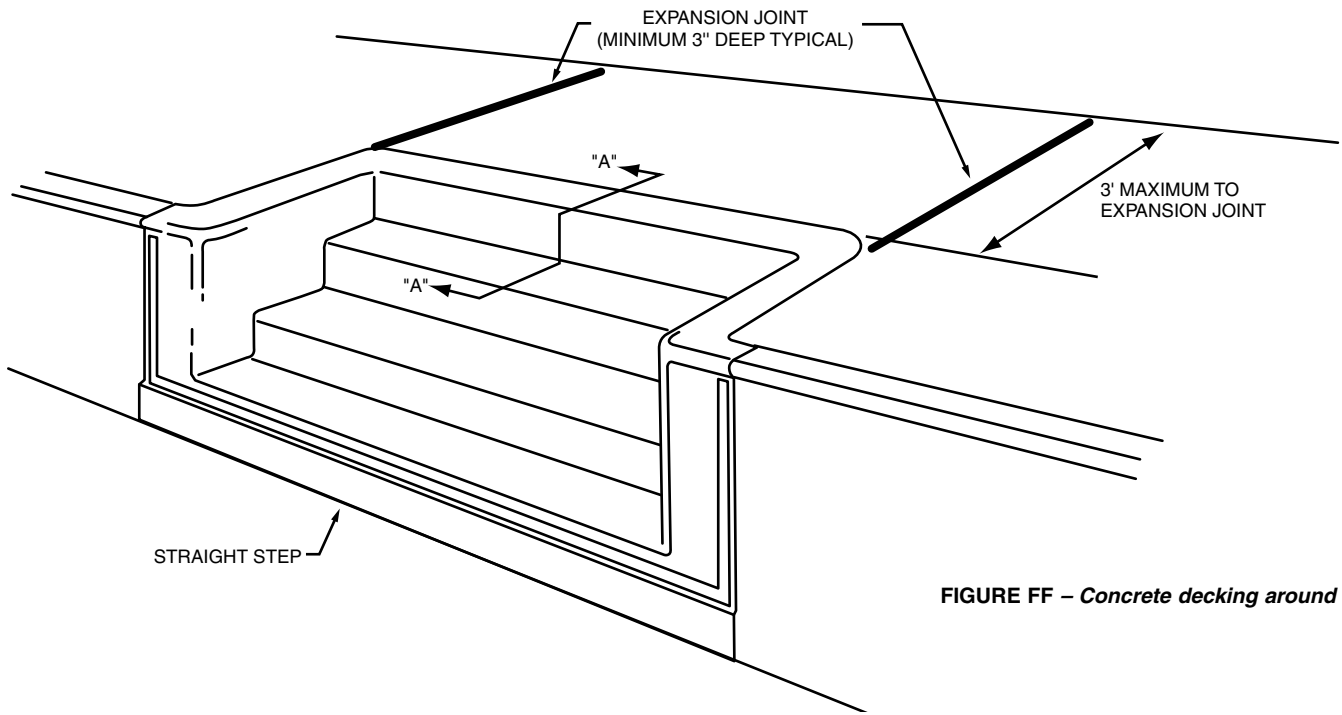


FIGURE FF – Concrete decking around steps

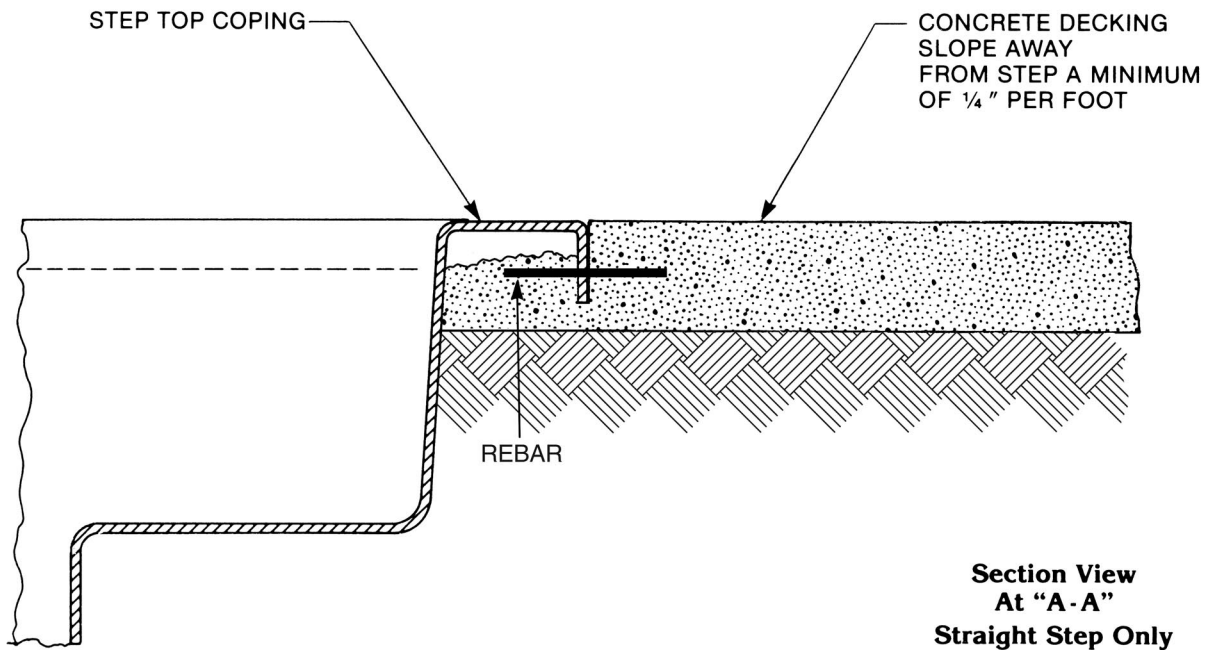


FIGURE GG – Concrete Decking



## DECKS AND SUB-DECKS

Decks can be made from a wide variety of materials. Generally, concrete, brick, stone or wood are used. Careful evaluation must be made of the ground conditions onto which a deck will be placed. A deck is the most visible final touch and installers should be well trained in the proper installation of these materials.

Installing concrete decking around the perimeter of step units or similar accessories should include the use of reinforcement rod inserted into holes drilled in the shoulder of the unit. It is essential that the concrete be forced up and under the shoulder for additional support. Always install the appropriate hand rail to aid in the safe use of step units. **(See Figures FF & GG)**

The manufacturer cannot assume any responsibility for decking installations or their damage to the pool structure.

### Wood, Brick or Stone Decks

Installation of wood, brick or stone decking requires a sub-deck to be poured on which the upper deck will rest. The purpose of the sub-deck is to prevent surface water from disrupting the backfill while increasing the potential for liner floating and structural damage to the upper deck and pool. The illustration below shows a typical sub-deck installation with a non-concrete deck above it. Notice the minimum 3' width and 1/4" per foot slope of the sub-deck away from the pool. **(See Figure HH)**

## LIGHTING SYSTEMS

Advances in the design and installation of swimming pool lighting have been numerous in recent years. From wet niche lights to fiber optics, there are types of lighting systems available to satisfy virtually every pool owner's desires. Installers must get the required training and practical experience from each lighting system manufacturer before attempting to install lighting fixtures.

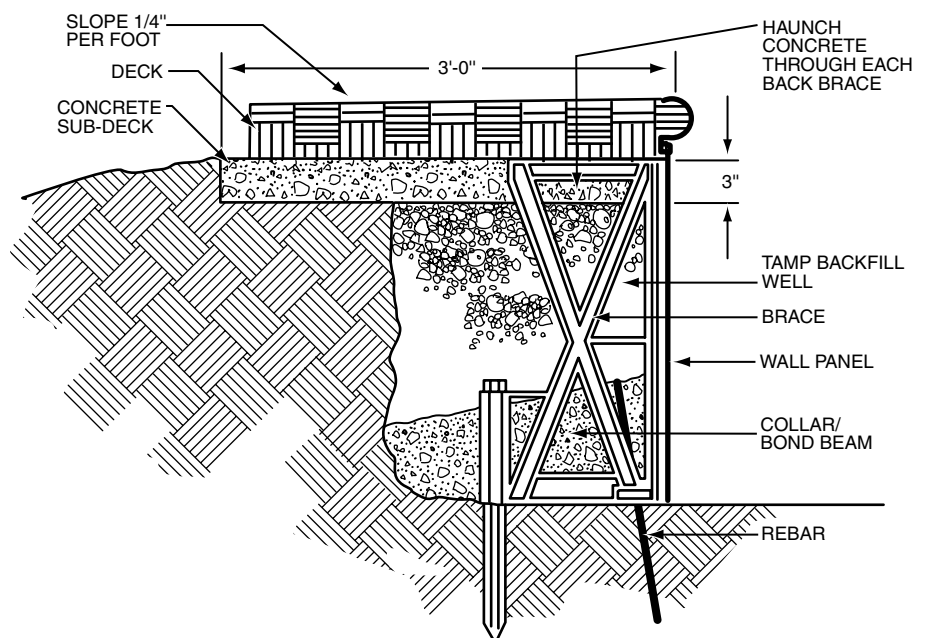
## ACCESSORIES

Ladders, slides and diving boards are accessories not manufactured by Latham Plastics, Inc. When used with a pool, these products should be installed with strict adherence to their manufacturer's instructions and the current NSPI standard.

## CLEAN UP

Building an impressive pool will be minimized if the job site is left in disarray. Always make arrangements for soil, debris, equipment and leftover parts to be removed in a timely fashion. When the last person leaves the job, the site should be clean and properly graded; in turn, the customer will be eager to give referrals and testimonials.

FIGURE HH – Subdeck Placement









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