

Latham Steel Pools

Installation Guide

LATHAM



[ICC-ES/ESR-2782](#)

Latham Steel Pools

Introduction:

This guide is the recommended installation procedure for the Latham Steel Pool System.

This edition is detailed and suitable for both professional pool builders and "do it yourself" home owners.

Please ensure that all building codes, swimming pool regulations and regional requirements are adhered to and only approved products and building materials are used.

Our Pool System is the only steel pool system ICC Certified ensuring engineering excellence. For more information visit:

http://www.icc-es.org/reports/pdf_files/ICC-ES/ESR-2782.pdf

Safety first, always.



Introduction

The proper installation of a swimming pool is probably the most critical factor in providing customer satisfaction and assuring continued product acceptance. The design of this manual provides the installer with innovative skills, and the best known procedures for successful installations. These easy to follow instructions also help you avoid painful and expensive experiences such as; improper grade, pool off level, loose plumbing fittings, settling concrete, and leaking water.

This manual represents years of experience, research, and actual on the job know-how. It is the most current information regarding procedures for the proper, efficient and profitable installation of swimming pools to make your job easier.

The material in this manual is intended as a guide only. The manufacturer makes no representation, warranties, or guarantees of any kind, expressed or implied, regarding this information. The manufacturer is not liable for any personal injuries or property damage resulting from, or during, installations done based on this information.

If there are any discrepancies between this information and state or local building codes, or if state or local codes are more comprehensive or specific about construction, design, or safety, those regulations must take precedence.

Before proceeding read Appendix A, National Spa and Pool Institute Standards and recommendations for the installation of in-ground swimming pools.

**PLEASE READ THIS INSTALLATION
GUIDE THOROUGHLY.**

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**preliminary
considerations**

Preliminary Considerations

Building Codes/Permits

Advance knowledge concerning Local and State Swimming Pool Codes can avert many a disaster upon completion of the project. Fines and work stoppage orders can ruin your day. Most ordinances vary considerably from one community to another and nothing should be assumed or implied. It is recommended that the builder present this manual to the local building departments so they understand your intentions. Also secure a copy of their Local Swimming Pool Code. Be sure that you understand all code requirements directly and indirectly associated with your swimming pool. Take special note of sewer, drainage, fencing, lot line, power lines, fire, and electrical requirements. Obtain the required permits before starting your Steel installation.

Utilities Required

- o Water, for construction and filling of pool
- o Electrical, for temporary supply during construction and a permanent supply for pump and pool lighting
- o Sewer, or adequate drainage
- o Fuel, for heater - Natural Gas, Propane, or Fuel Oil

Selecting the Pool Site

Obstructions must be considered before selecting a final pool site. These could include: underground wires, gas lines, septic tanks; dry-well systems, plumbing, trees, and overhead power lines. Underground obstructions should be located before excavation begins. If various obstructions are unavoidable a compromise must be reached, keep in mind labor and material costs of moving or replacing obstructions. Choose an avenue of least resistance for the sake of practicality and economy.

Sun & Shade can be an important factor when determining the pool site. Excessive shaded areas from trees and other buildings could result in uncomfortable swimming conditions during marginal weather months. In addition it could considerably increase heating costs. Proper pool orientation will take advantage of sunny days for comfortable swimming condition, decrease heating costs, and in some states meet requirements set forth by the public health department referring to diving board placement.

Existing Landscape Removal. The subject of tree removal is dependent on individual preference. The decision should be made on the amount of landscape to be sacrificed for a low maintenance pool. Still, it should be noted that a certain amount of removal may be tolerated without disturbing the natural atmosphere of the backyard. This can be done by careful use of planters, shrubs, and flowers. Of course, remove any trees and shrubs located directly inside the pool layout.

When it becomes necessary to remove trees, the entire root system should be excavated. This prevents any possibility of settling of pool walls, vermiculite pool bottom, or the surrounding concrete deck. An effective method of preventing continued root growth is to apply copper sulphate to the root system.

Ease of Excavation. Try to locate the pool to provide the best access and most ideal working conditions. Placing the pool a few feet one way or the other, may permit improved excavation conditions, easier dirt removal and concrete placement. These judgements will become more obvious with experience.

Convenient Access to changing facilities and house exits also requires some thought. As you select your pool site, make a rough layout where you think the pool should be located. Then consider decking and walk way by staking out their approximate positions.

The Location of the Pool in Relation to Other Buildings should be both an aesthetic and practical consideration. Some alternatives to be considered are whether the pool should be laid out parallel, perpendicular, or at a 45 degree angle to an existing house or building, building line, hedge row, fence or another dominant object.

Advanced Knowledge of Unknown Subsoil Conditions can be helpful in determining the placement of the pool. It is advisable under certain circumstances to probe the subgrade by boring a series of test holes. The results would suggest the best position and grade of the pool. Problems such as a rocky substrate, high water table, clay, should be located before construction. They can be simply eliminated by moving the pool, thus keeping the construction process as smooth and economical as possible.

Check the Selected Location for Grade or Elevation of the Pool. The pool floor must rest on undisturbed soil. Keep the top surface of the pool at least three to four (3-4) inches above highest grade in the area. This will avoid any surface drainage back into the pool. Other terms used to describe the top of the pool coping are pool grade, final elevation or "top surface." This elevation sets up the transit as a reference point for all elevations.

The Equipment Location. Both pool owner and pool builder should collaborate when deciding where the pump and filter should be located. The following points should be included in your considerations:

1. Locate filter on a concrete slab. Be sure to make the slab large enough for all equipment, usually 3' X 4' or 3' X 7' with a heater. Also consider at this time whether an enclosure will be built over the equipment and plan the slab size accordingly.
2. Keep the filter within 50' of the pool to maintain optimum pump performance.

3. Never locate the filter and pump more than six inches (6") above or six inches (6") below pool grade. Otherwise pump priming or overflow problems may result.
4. Never locate the filter and pump in a basement. The possibility does exist that a malfunction in plumbing could flood the basement.
5. Consider where the backwash water will drain. Is there adequate drainage? Check for local codes requiring special methods to dispose backwash water.
6. Location of the filter is also important from an aesthetic point of view. When making the rough layout of the pool, visualize placement of the filter and plan for future landscaping or enclosures. Out of sight of the immediate pool area is preferred.

Excavation Contractor

One of the most important phases contributing to a smooth installation is the excavation. If the excavation is incorrect, each subsequent step becomes more costly and more difficult. For instance, if the bottom grade of the pool is too shallow and rough, you must resort to hand trimming. Keep in mind a machine can do in minutes what it takes hand labor hours to accomplish. A skilled excavation contractor should be chosen for this critical part of the installation process.

When selecting an excavation contractor be sure to confirm their experience from friends, building contractors, or local officials. The job can be finished most efficiently if the contractor has a rubber-tired back-hoe with a bucket capacity of at least one-half cubic yard, (Case 580, Massey-Harris 2200 with 212 back-hoe, John Deere or International). In addition, a dump truck to remove excess dirt will speed the job along. The back-hoe should have adequate swing to enable loading of earth directly into a dump truck thus eliminating unnecessary handling of dirt. Extendable type hoes are more versatile. A contractor with previous swimming pool experience also will make the job much easier.

The excavator should be sure to study the pool drawings in detail before starting the job. Also, set the exact requirements of the job and tolerances for the various sections of the excavation. Determine the exact excavation route for access to the excavation site and where excess dirt is to be disposed. You may wish to incorporate performance requirements and pool construction plans into a contract so there will be no misunderstandings later.

Receipt and Inspection of Goods

Examine the equipment and the Steel Swimming Pool Kit on receipt, and check the number and marking of cartons against the packing slip. Before starting the installation, review your equipment requirements to be sure they are correct for the particular pool installation. Do not attempt to assemble the pool with damaged materials.

Tools and Materials List

The following tools, equipment, and materials are needed for the swimming pool installation.

Basic Tool List

Transit Level	9/16" wrenches (2)
Shot Stick	½" wrench (1)
Carpenter's hammer	¾" electric drill with assorted bits
4 lb. sledge hammer	100' extension cords (2)
Pick axes (2)	Pocket knife or Stanley type utility knife
Concrete shovels (2)	Pair vice grips (2)
Wheel barrows (2)	Long handled square shovels (2)
50' Tape	4" D-21' aluminum irrigation pipe
5/16" Hex Drive Head Bit	4' carpenter's level
# 1 Phillips screw driver	# 2 Phillips screw driver
Hack saw	300 ft. roll of mason's string
Large slot screw driver	Cloth rags/sponges for cleaning purposes
Commercial vacuum cleaners (2) - 2HP wet/dry vacs	
5' vacuum hoses for commercial vacuum cleaners	
18" pipe wrenches (2) OR 460 Channel lock type pliers	

Mixing/Vermiculite Tools

Several 5 gallon buckets	5 cu. ft. or 9 cu. ft. paddle type mixer
50 ft. of garden hose	30 or 55 gallon drum for mixing water
16" magnesium floats (2)	Several 16" round edge pool trowels
30" magnesium darby (2)	
(Note: Some tools may duplicate those needed for concrete)	

Concrete Tools

Joint scoring tools (2)	Fine hair concrete broom
30" Magnesium darby (2)	Stainless steel finish trowels (2)
42" Bull float and Handles	Wood or magnesium floats 16" (2)
Stainless Steel Edgers (2)	

Materials List

Contact cement
100' of 1-½" poly pipe 100 lb. test (4)
Rolls Teflon tape or (2) tubes Permatex liquid Teflon
Assortment of 1-½" plastic, elbows, tees, male adapters, couplings.
Assortment of #24 stainless steel pipe clamps for 1-½" poly pipe
<i>Note: 1 ½" SCH 40 rigid pipe or flexible PVC spa pipe can be substituted with corresponding PVC rigid fittings and 1 qt. cans of PVC/CPVC glue and cleaner.</i>

Materials List continued.

(2) Rolls of 2" duct tape for taping panel joints and to cover coping while deck is poured
Vermiculite pool base and portland cement - (contact local supplier for quantity)
100' of #8 solid copper grounding wire and clamps - check with local codes
2 X 4's and/or 1/4" masonite for forming concrete deck
1" X 4" X 18" wood forming stakes (one for every three feet of deck perimeter)
3/8" reinforcing rod 2 times perimeter of pool wall
Additional 40' 3/8" re-bar cut to 2' lengths
2 lbs. Duplex (double head) 8d nails and 2 lbs. Duplex 16d nails
XYLENE or XYLOL thinner (removes duct tape adhesive residue)
Ready-Mix concrete for concrete deck (Formula: Area of deck in sq. ft. divided by 75 = yards of concrete needed)

Note About Tool List:

If you do not own the above tools, many can be easily rented at the local rental shop. For the do-it-yourself installation it may not be necessary to have 2 or 3 of any particular tool. For the pool dealer or builder the additional tools will speed installation.

**BE SURE YOU HAVE ALL THE TOOLS
BEFORE STARTING EXCAVATION!**

Starting Construction

Construction Sequence

Two Workers Building Pool

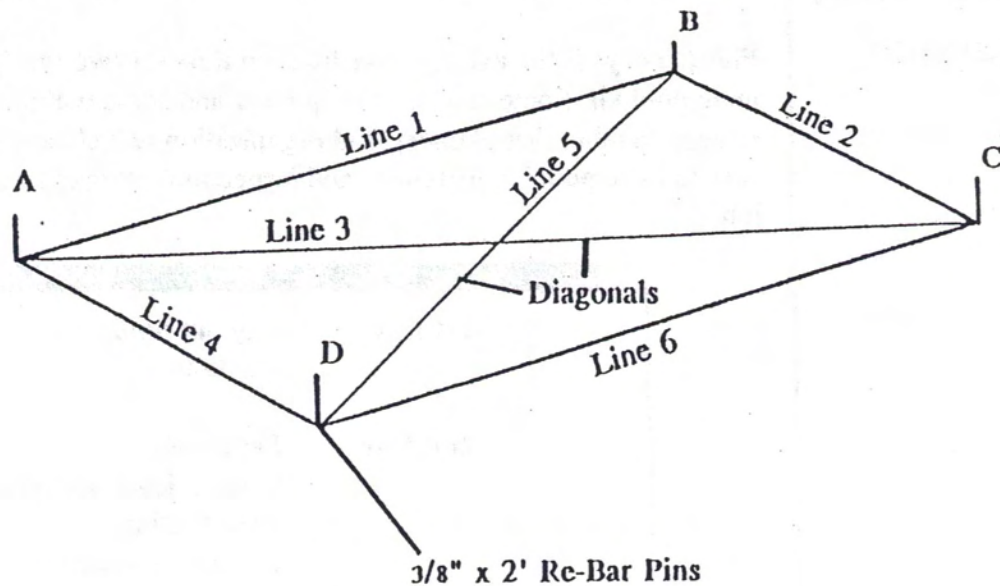
5 Days/80 Hours

Five (5) days is the average construction time for two workers building the swimming pool kit. Some can be done quicker and some will take longer. It is important to keep in mind that planning and organization will always speed the process. Be sure to have permits, materials, and inspections all taken care of before starting a job.

1st Day	Lay out pool Dig hole
2nd Day	Set panels Square, level, and plumb panels Pour footings Bottom preparation Plumbing
3rd Day	Trowel bottom Install liner Fill pool with water
4th Day	Pressure test plumbing Back fill pool Form for deck Set accessories Grounding pool
5th Day	Pour deck Clean up Safety warning labels

Layout of Pool Area

To provide working space when the pool walls are set in place, all outer dimensions of the excavation are made 24" larger than the actual pool size. For example, excavation for a 16' X 32' pool is 20' X 36'. These enlarged dimensions are the "Excavation Dimensions." The "Overdig" is the extra 24" excavation. The excavation is outlined by four re-rods, one at each corner. Re-rods should be 3/8" X 2' (also known as "pins"). Drive the first layout re-rod firmly into the ground in the excavation corner that has the highest elevation. From this re-rod as a working point, lay out the rest of the excavation as shown in the following diagram and chart.

**EXAMPLE**

POOL SIZE	LINE 1	LINE 2	LINE 3	LINE 4	LINE 5	LINE 6
16 X 32	36' - 0"	20' - 0"	41' - 2½"	20' - 0"	41' - 2½"	36' - 0"

NOTE: Measurements vary within each pool size. Refer to the Swimming Pool Drawings for the pool you are building.

STEP 1.

From re-rod "A," at the highest ground elevation, lay off the distance of one side of the pool to re-rod "B." Care should be taken when setting the direction of the re-rods. As previously outlined, their placement is important as it relates to the house, fence line, or other visual barriers. Refer to the Preliminary Considerations Section on page 10.

STEP 2.

With re-rod "B" as the center point and line 2 as a radius, scratch an arc on the ground at approximate right angles to line 1.

STEP 3.

With re-rod "A" as the center and diagonal line 3 as radius, scratch an arc on the ground to intersect the arc from re-rod "B." The intersection of these two arcs will determine corner point "C." Drive a re-rod firmly into the ground at this point.

STEP 4.

With "A" as center and line 4 as radius, scratch an arc on the ground at right angles to line 1.

STEP 5.

With "B" as center and line 5 as radius, scratch an arc on the ground to intersect the side arc drawn from "A." The intersection of these two arcs determines corner point "D." Drive a re-rod firmly into the ground to mark this point. Now

check line 6 length (D to C). It should equal line 1 length (A to B).

Now the excavation layout is squared. Next choose the elevation for the top surface of the pool (top of coping). Normally the surface will correlate with a surrounding walk, patio deck, or highest ground elevation of the pool site. The top surface of the pool must be three to four inches (3" - 4") above the highest ground elevation or rain and snow drainage problems will result.

To decide the depth of the initial excavation, locate the highest ground elevation on the pool site. If this point is not in the way of excavation and dirt removal, mark it conspicuously for future reference during the pool construction. If it is in the way of excavation, transpose this elevation to a deck, sidewalk, mortar joint on a block basement wall, or driving a stake in an out of the way place. Add four inches (4") to this elevation and this will now be the elevation for the top surface of the finished pool. The depth of the footing excavation will then be 44" (the Steel wall of 42", plus the coping height of two inches (2")) below this reference point. Remember, the reference point plus four inches (4") is the top of the finished pool including the coping. This is now known as the finished elevation.

IMPORTANT! ALWAYS CHECK THE EXCAVATION DEPTH FROM REFERENCE POINT.

The 44" depth, measured from the top of the coping, will be maintained in shallow end and on the 24" wide working ledge or overdig around pool wall perimeter. The first operation is to dig the 24" wide working ledge to a uniform depth of 44" below the reference point selected as the top surface of the pool. Work from deep to shallow end. Dig the ledge (overdig) across the deep end width of the pool and down one side. Setting the depth of the excavation requires a standard calibrated survey shot stick and transit level. A 2 X 2 or other similar stick approximately 10' long can be substituted for a standard shot stick.

Set up the transit in an area that gives clear view of the pool sight and won't have to be moved during construction. After setting and leveling the transit in an out of the way place, mark the shot stick. This is done by placing shot stick at the selected finished elevation and marking it at the level indicated by the transit. With a pencil, mark the stick at the point where the transit cross hairs intersect with the shot stick. This will indicate the finished elevation. Mark off an additional 44" above the level mark on the shot stick and place it in the hole as the excavator digs. This mark now determines the excavation depth for the shallow end and everdig ledge. When the 44" mark is in the level sight of the transit you know that this part of the hole is at proper depth. If the pencil mark is above the cross hairs, the excavation is not deep enough and the pool will be higher than the predetermined elevation. A mark below the cross hairs indicates the excavation is too deep and the pool wall will be below the predetermined elevation. Accuracy at this stage will require less shimming and adjustment of pool walls later. Refer to pictorial views for excavation procedure. If possible, locate backhoe so that the excavation will proceed from deep to shallow end.

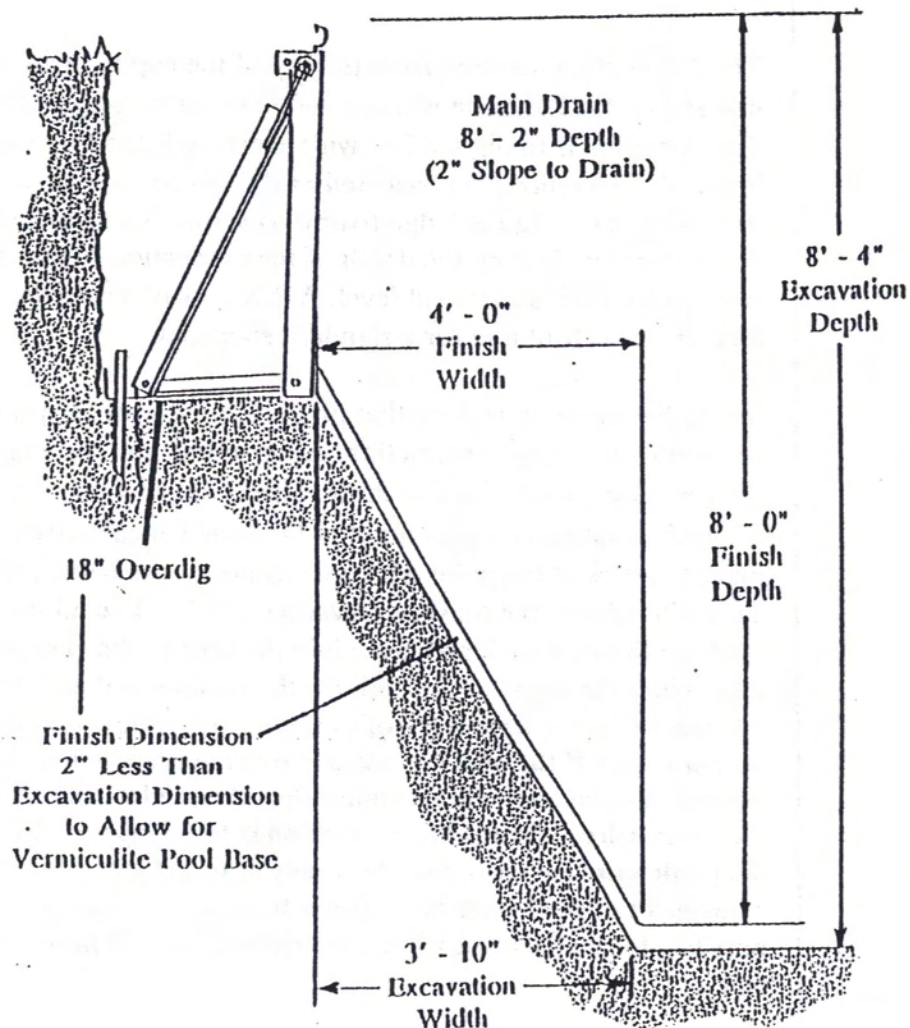
Starting Excavation

After the first part of the excavation is done, the next step is to layout the exact pool size on the floor of the 44" excavation. Remember to leave the 24" overdig as a working ledge. This layout should be accurate because it will decide the exact position of the pool.

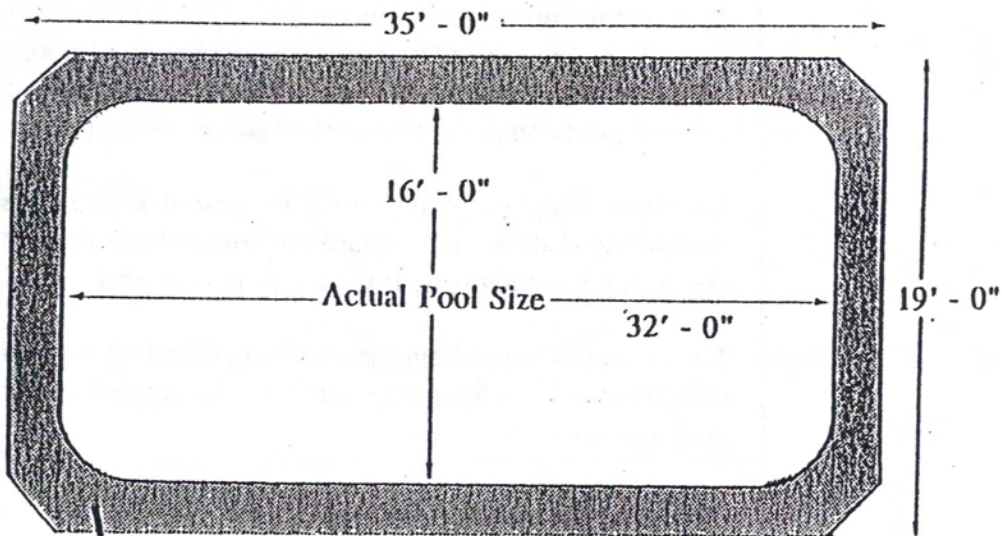
After the final position of the pool is decided, on one side and one end of the 44" overdig excavation, the top edge of the hopper slopes (deep end) should be marked with string. Using the strings as a guide, cut the earth with a shovel along the strings. Simultaneously, the termination of the deep end slope should be marked along the strings with re-rod pins. Refer to Diagrams on the following page.

IMPORTANT: Be careful not to dig into the area outside the string to avoid an undercut of the 24" working ledge. Doing so will remove supporting ledge for panels.

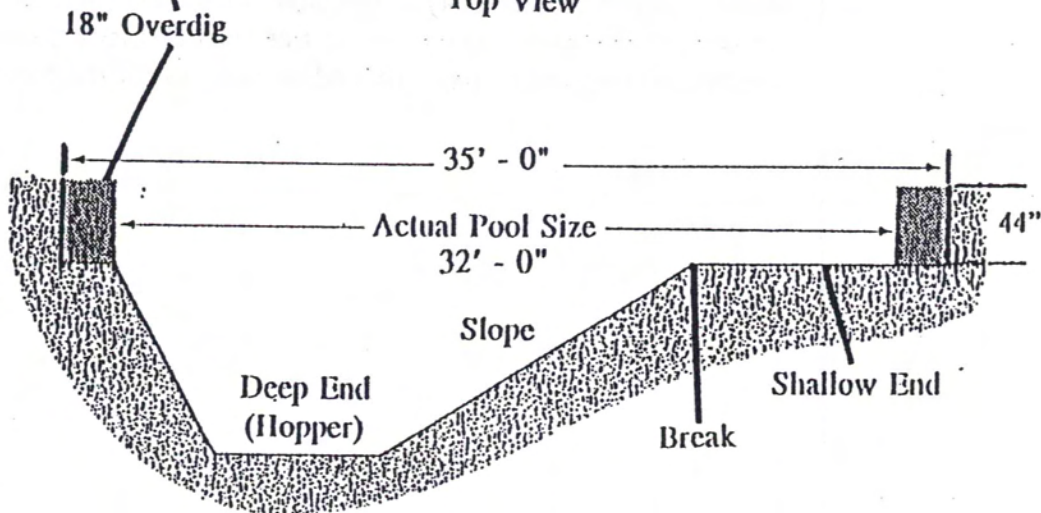
While digging the hopper, the excavator can sight across to the opposite side of the pool and trim the hopper walls to the proper slope as the final depth of the



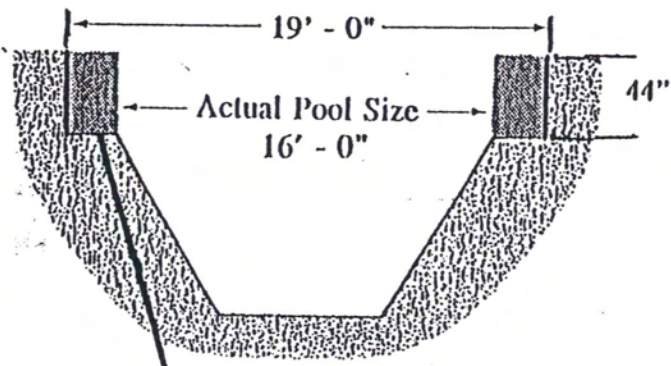
16 x 32 Rectangle
Dimensions



Top View



Side View



18" Overdig

Deep End View

hole is reached. The excavated depth of the hopper is four inches (4") deeper than the finish dimensions. This allows for two inches (2") of vermiculite pool base on the bottom and a two inch (2") slope to the main drain. Refer to the Steel Swimming Pool Drawings for installation of your particular pool size. This total excavated depth is 8' - 2" measured from the top of the coping. (The original grade mark for the finished height of the pool.)

Check the hopper to make sure it is squared as you proceed from the hopper toward the shallow end. Square the hopper by laying out the sides and then measuring the diagonals. If the diagonals are equal, the layout is square.

The excavator should dig the plumbing trench at a depth of at least 18". It should reach from the pool overdig to the equipment pad. This will save digging by hand later.

Ordering Concrete Footing

The concrete footing should be ordered at least one day in advance to avoid scheduling problems the day of the pour. This is also recommended for ordering the concrete decking on Day Five of this manual. Instructions for ordering the concrete footing are on page 30, and on page 53 for the concrete decking.

Day two

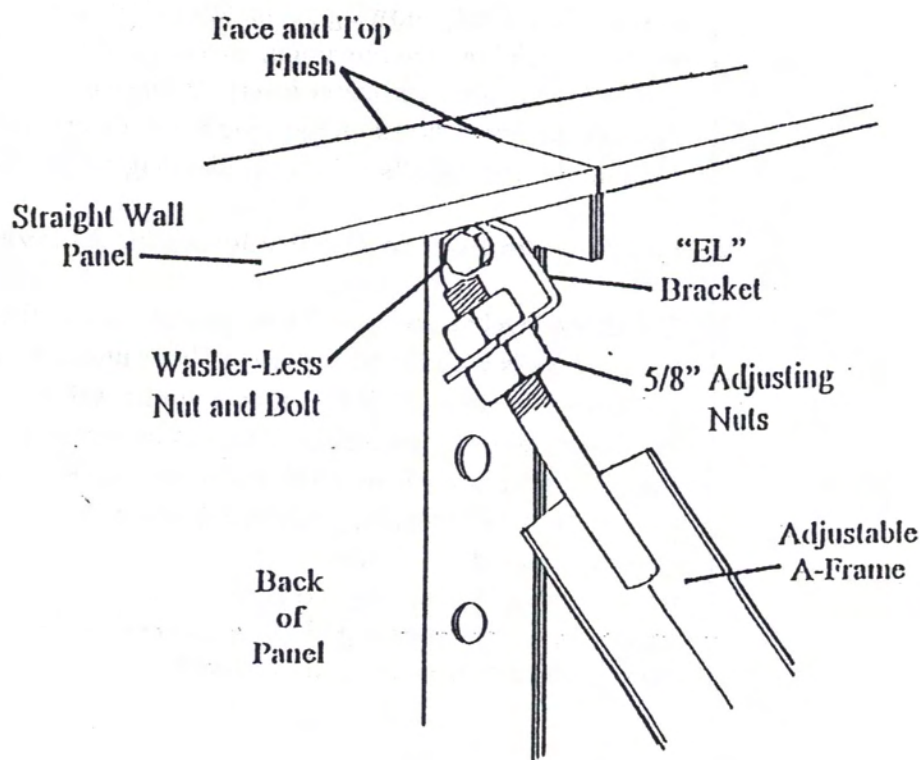
The Skimmer and Inlet Placement

Placement for the skimmer and inlet fittings should now be determined. The desired

Steel Wall Panel Assembly

position of the water re-circulation inlet fittings (returns), and skimmer should be marked on the swimming pool construction plan. It is best to place the skimmer near the center of one of the long sides and down wind of the generally prevailing breezes. In this way the wind will help direct surface dirt and debris to the skimmer for removal from the pool. In addition, thoughtful consideration should be given to the circulation pattern of the water when placing inlets. Strive to eliminate as much as possible all dead spots in corners. Water temperatures in a heated pool will be kept uniform, chemistry will be constant, and maintenance will be kept to a minimum.

Set the Steel Swimming Pool walls on the overdig supporting ledge, leaning them back against the side of the excavation in the proper order as shown on the Steel Swimming Pools Drawings. Be sure to place the Skimmer and Inlets in the proper locations. Beginning at any corner, assemble the two corner panels using the nuts and bolts provided, 7 per panel joint. When two straight wall sections are joined, use the adjustable A-braces attached at the top and bottom holes of the panel flanges. When tightening the panels joints, make sure that the top and face of the two panels are flush to each other and not offset. Tighten the top and bottom bolts first while checking for proper alignment. When the panels are flush, tighten the remaining nuts and bolts. Proceed with the next panel joint, alternating in each direction from the first corner, using the corner to help stabilize the entire wall assembly.



Walk Out Steps

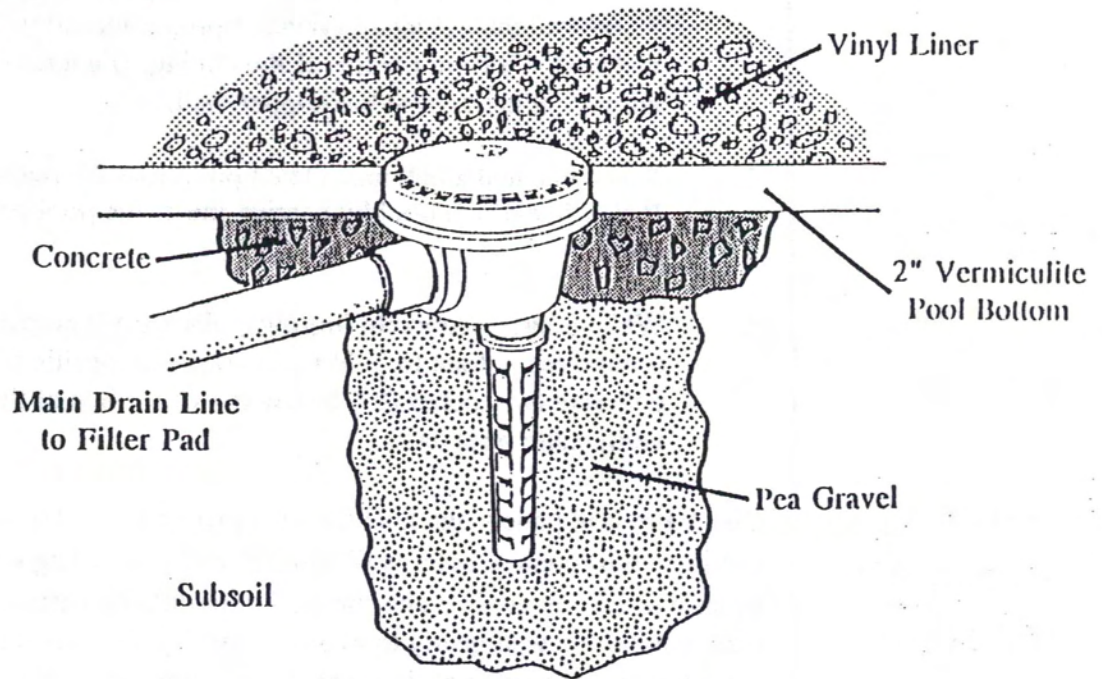
When using a step section, individual manufacturer instructions should be followed for installation procedures. The Steel Kit, when ordered for a step section, contains two (2) panels (one left hand and one right hand) each ground flush and pre-drilled to accept a step section. To keep the lower edge of the step straight when pouring the concrete footing, place a 2 X 4 or 2 X 6 across the lower front length of the step section, (inside the pool), securing it with forming stakes.

Squaring the Pool Walls

After all pool walls are assembled, position the complete assembly absolutely square and parallel. Do this by measuring length, width and diagonals as found in Steel Swimming Pool Construction Prints. First, fit the pool to the deep end walls excavation as close as possible. An easy way to achieve squaring is by setting an alignment string along the bottom length of the pool wall, and straightening a long wall first. Recheck the widths of the pool at the corners. Then measure the diagonals of the pool walls corner to corner. When the dimensions are equal, the pool is squared. Straighten the remaining walls. When the wall assemblies are straight, square and parallel, drive $\frac{3}{8}$ " X 2' re-bar pieces into holes located in the bottom flange of the pool wall panels along the entire pool perimeter. Pin the corners first. Leave 6" of re-rod extending above bottom flange. Also drive galvanized triangular stakes through stake pocket holes in each Poly Strut, allowing six inches (6") of stake to extend above stake pocket. Straighten the remaining walls as staking and pinning progresses. Now all around the pool perimeter insert 20' lengths of $\frac{3}{8}$ " steel reinforcing rod through the lower holes on the Poly Strut. Overlap the ends of the re-rod 10 - 12" and tie wire together. Refer to the diagram on the following page.

Leveling the Pool to the Predetermined Elevations

Check the level at each panel joint and at each of the step's four corners. Level the pool walls with the transit using shims under the pool walls as necessary. ($\frac{1}{4}$ " masonite cut in 4" X 6" squares works well for shims) This procedure is very important and enough time should be devoted to the leveling procedure to assure an absolutely level pool. Following the leveling procedure, plumb the pool walls using adjusting rods and deadman anchors or A-X bracing system. (See Appendix F) If deadman anchors or braces are not used, plumb the panels while pouring the footing. To achieve a straight sight line and plumb walls, stretch an alignment string along the top of the pool walls from corner to corner, on each straight section of wall.

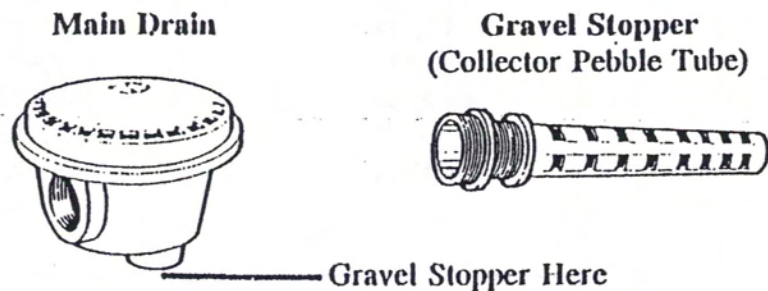


Main Drain Installation

Installation of Main Drain

Before pouring the footings, the main drain must be installed. Proceed in the following manner:

1. Assemble the main drain by installing the hydrostatic relief valve inside the drain and gravel stopper in the bottom opening; and a male insert adapter in the side opening. Cover the opening of the main drain with parallel strips of duct tape. Trim the excess off at the outer edge of the sealing surface. This will keep the screw holes free of dirt until the liner is installed. Face plate and anti-vortex cover will be installed after the vinyl liner is in place.



2. Dig a three foot (3') diameter hole two foot (2') deep in the center of the pool bottom (hopper) and fill with gravel 1 to 1½" in size. Position assembled main drain in gravel at proper elevation of eight feet two inches (8'2") from the top of the coping. Dig a trench from the drain across hopper and up the hopper wall.
3. Run a one and a half inch (1½") pipe from the main drain in the trench. It should exit the pool by passing under the pool panel to the equipment pad.
4. While pouring concrete footings, place small amount of concrete around main drain to hold main drain into position. Be sure to keep concrete two inches (2") below top of surface of the drain to allow for vermiculite pool base.

Pouring of Concrete Footing

Check the wall panels one final time for proper level. To avoid the concrete footing from running under wall sections and protruding into pool excavation, be sure to fill any voids under the wall with dirt. Be careful to place the concrete behind the wall gently to avoid disturbing the straight wall or level. A little extra patience and care at this stage is recommended. Also, smoothing out footing with a trowel or shovel will provide a more suitable bedding for the plumbing to set upon.

Pour a four and a half (4½) to five (5) bag concrete footing mixture around the entire pool panel perimeter, at a depth of six inches (6") to eight inches (8") and at least 16" wide. Footings deeper than this are unnecessary and may result in bowed or crooked walls.

AMOUNT OF CONCRETE NEEDED	
POOL SIZE	YARDS OF CONCRETE
12 X 24	2½ YARDS
14 X 28	3 YARDS
16 X 32	4 YARDS
18 X 36	4½ YARDS
20 X 40	5 YARDS
24 X 44	5½ YARDS

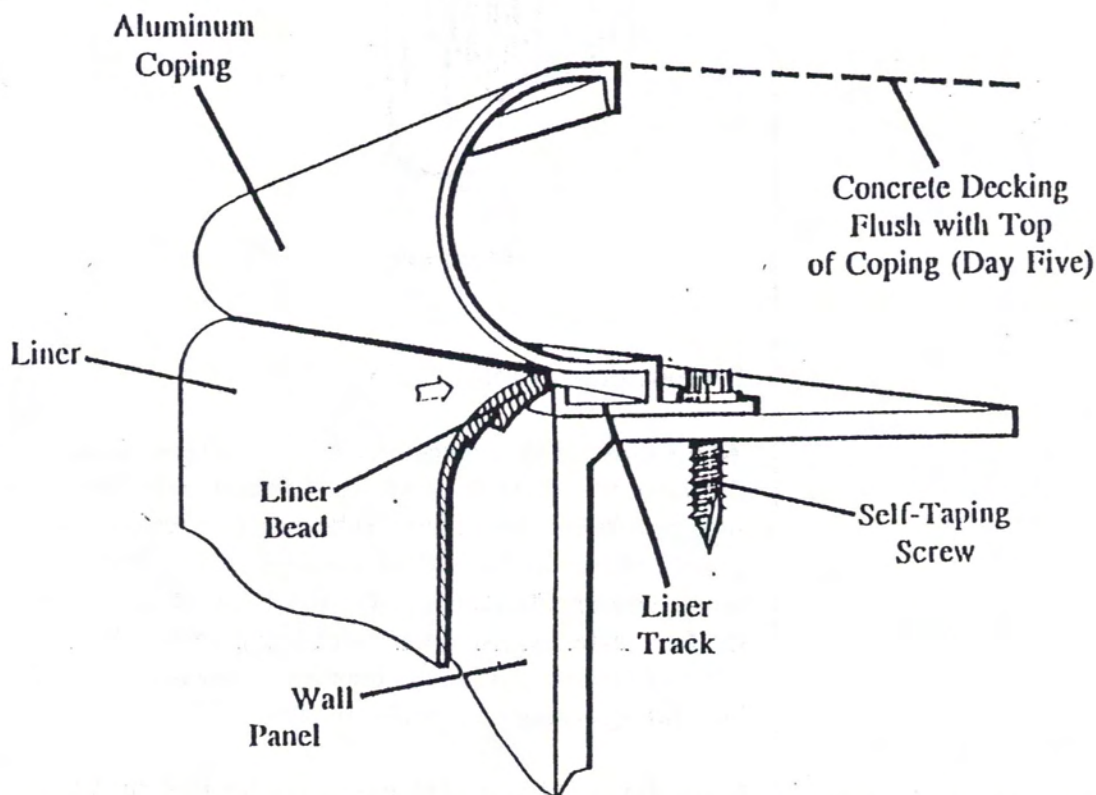
Footing Formula

Total perimeter in feet divided by 25 equals approximate yardage needed for footing. Round up to the nearest $\frac{1}{4}$ yard. Order an extra $\frac{1}{4}$ yard for step sections.

Note: order extra concrete to pour pad for filter, pump and heater at this time. (Square footage of filter pad divided by 80 equals extra yardage needed for filter pad.)

Installation of Coping

Install all corner sections first with the self drilling, self tapping screws provided. Corner sections next to a step may have to be cut and hand trimmed to fit snug next to the step. An adjustable clutch screw shooter or drill with a $\frac{5}{16}$ " hex head bit works best for driving these screws. After the corners are secured, screw the long lengths of coping with drive screws in the same manner. Make sure the liner receptacle on the lower edge of the coping is flush with the top inside edge of the pool walls. Screws should be driven at one foot (1') intervals. When cutting the straight pieces of coping and fit them into place, avoid coping joints that correspond to the pool wall joints. Included with the coping corners are two inch (2") wide coping clips use these clips to cover coping joints. These clips must be placed before concrete deck is poured.



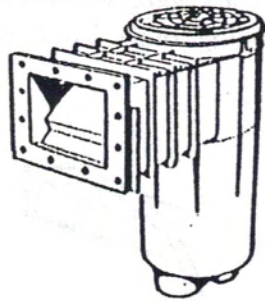
The coping provided with the pool has a dual purpose of: Acting as a receptacle (liner track) for retaining the liner bead; and serving as an attractive edging against which concrete is poured.

Pool Bottom Preparation

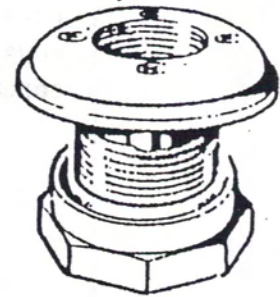
Installation of Skimmer

After selecting the location for the skimmer, mark on the front of the pool wall the hole pattern and skimmer opening required. Use the skimmer face plate as a template for this purpose. Take care in selecting the skimmer position to avoid structural ribs on the back side of the pool wall. Install the skimmer on the pool wall as shown and as explained in the following steps:

1. Place gasket on skimmer face, making sure holes in gasket align with holes in skimmer face. (A very light application of adhesive cement will assist in holding gasket in place.)
2. Align skimmer face and gasket with drilled panel holes and fasten to wall at top center and bottom center with the two pan head (slot head) securing screws.
3. Glue second gasket to front face of panel.
4. Insert four (4) face plate screws, without face plate, at each corner of the skimmer opening. This will make it much easier to locate screw holes after installing the liner.
5. The skimmer is ready to receive the liner.



Skimmer



Inlet Fitting

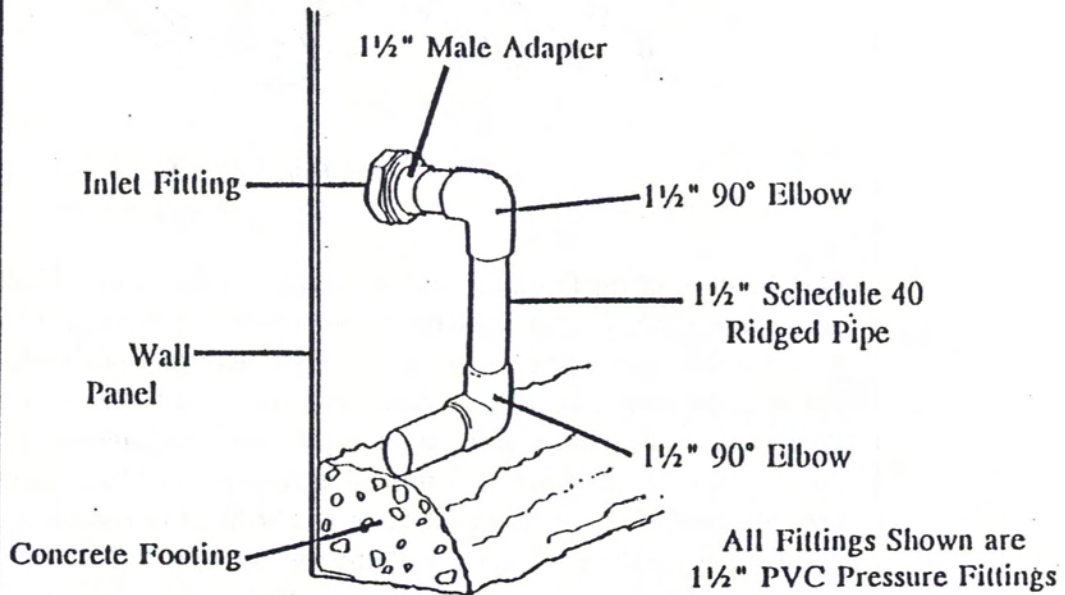
Preparation of Inlet Fitting

At the two predetermined locations cut a three inch (3") hole in the pool wall 22" from the top of the pool wall to receive the inlet fittings. Use a jig saw or hole saw to cut these holes. Take care in selecting the inlet position to avoid structural ribs on the back of the pool wall. Install the inlet fitting as shown in manufacturers illustrations. Remove the eyeball, the four face plate screws, and the face plate, exposing the liner sealing gasket. Insert two face plate screws, without face plate, to aid in locating screw holes after liner installation. The inlet fitting is ready to receive the liner.

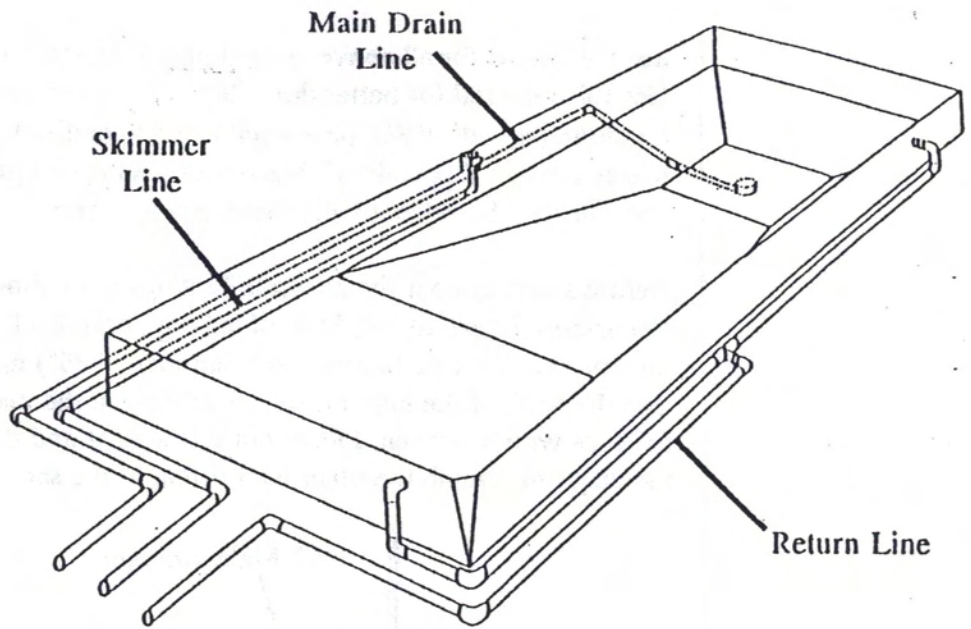
Many different types of plumbing can be used such as: PVC schedule 40 and PVC pressure slip fittings; 100 lb. test poly pipe and poly fittings with stainless steel clamps; or even flexible PVC pipe. (Flexible PVC or Spa Flex pipe is usually available from a swimming pool supply house.) It is recommended to

use PVC rigid for all above ground plumbing (face plumbing) at the equipment pad. Use this material for better durability and a more professional appearance. For tips on plumbing with PVC, please refer to Appendix B. When plumbing with poly pipe, please refer to Appendix C. Never use a damaged piece of poly pipe kinked while it was unrolled because it will most likely leak later.

Before starting, coat the concrete footings with about two inches (2") of clean sand to cushion the plumbing. Start plumbing at the back of the inlet fitting. Apply teflon tape or permatrix #2 to one and a half inch (1 ½") male adapter threads and insert it into the back of the inlet fitting. Hand tighten the male adapter, then tighten another full turn with a wrench. Plumb out of the inlet and down to the footing as shown in the diagram. Plumb the other inlet fitting in the same manner.



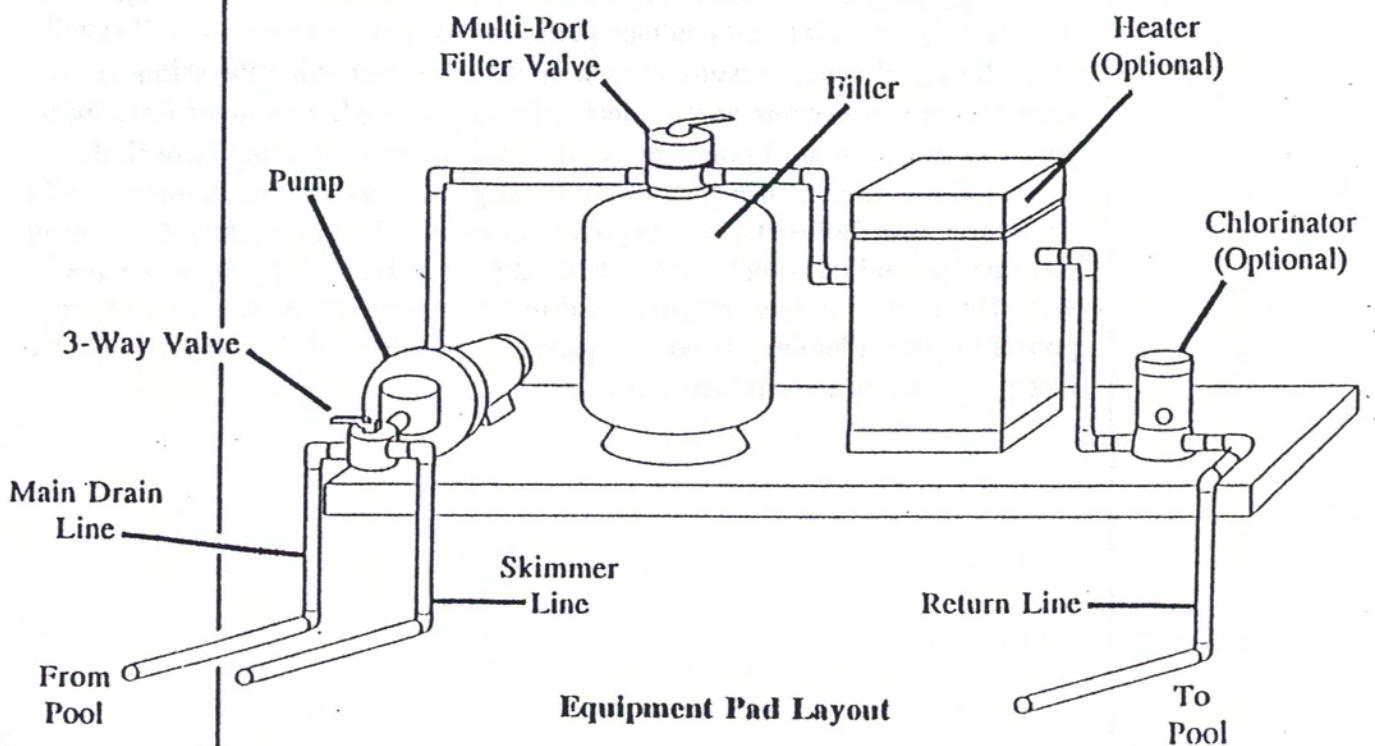
At the approximate midpoint between the two inlet fittings, put a one and a half inch (1 ½") tee fitting and continue plumbing to the equipment pad. This will allow for equal water pressure at each inlet fitting. Plumbing the skimmer follows the same procedure as the inlets, with only a single line to the equipment pad. Cut off the stub of plumbing for the main drain protruding through the footing about three inches (3") off the footing. Plumb the main drain line to the equipment pad. Before filling the pool with water, all the plumbing to the equipment pad should be completed to a level at least as high as the top of the pool wall. Not following this procedure will result in an overflow when filling the pool if the face plumbing is not completed. If possible it is best to complete the face plumbing on the equipment pad.



Pool Plumbing Layout

Equipment Pad

For plumbing of the filtration equipment please refer to individual manufacturers requirements. Also refer to the illustration on the next page for general layout and sequence of the equipment. Pressure testing of the plumbing lines before backfilling is highly recommended. This simple additional precaution can save many, many hour of painstaking repair work and additional costs later. Pressure testing procedure is described in Appendix D. Once the equipment has been plumbed, the electrical contractor can be hired to complete the electrical connections for the pool pump, and underwater light. All electrical connections must be done by a certified electrician in compliance with local and national electric codes.

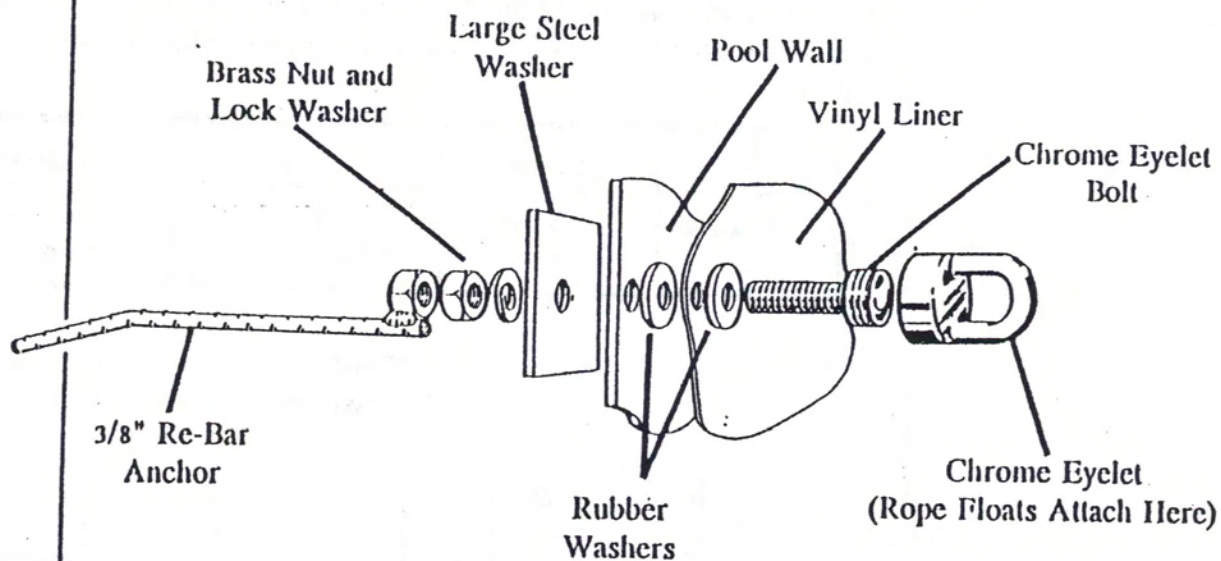


Equipment Pad Layout

Installation of Underwater Light Niche

Underwater lighting fixtures and fixture housings must be installed under the provisions of Article 680 of the current National Electric Code handbook. Twelve volt fixtures must be installed with an approved transformer. When installed with proper niche, and according to Article 680 as above, both 12 volt and 110 volt fixtures require additional safeguards. These safeguards include either differential circuit protectors or ground detectors. Local code must be consulted concerning electrical connections. For underwater light installation instructions please refer to individual manufacturers instructions.

Before installing the liner, glue the gasket onto light niche and insert four (4) face plate screws into niche, (without face plate.) These will help locate screw holes after installation of liner. The light niche is ready to receive the liner.



Installation of Rope Anchors

To ensure maximum safety for the non-swimmer, National Swimming Pool Institute residential and commercial code requires the installation of a safety rope designating the change of pool bottom from shallow to deep end. (Also known as the "break")

Locate and drill $\frac{1}{2}$ " (inch) diameter holes, 12" (inches) back of the break and into the shallow end, three inches (3") from top of pool wall. Be sure to use the large metal washers on outside of pool wall to secure the rope anchors. Use lock washer, securing nut and re-bar with attached nut to complete assembly. Remove the rope eyelets from inside of pool. Rope anchors are ready to receive the liner.

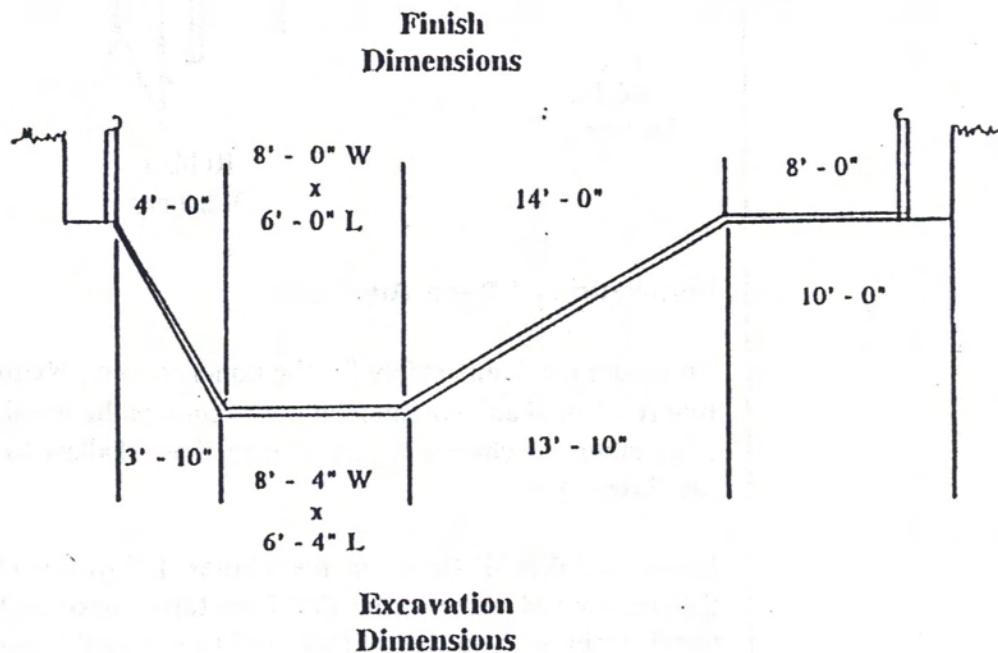
Resetting Dimensions

Once the footings have been poured, check the depth in various sections of the pool bottom and hopper in relation to the top of the wall, including the coping. If the

excavator has worked carefully, the pool floor should be close to the exact depth. Then, only a small amount of hand trimming will be necessary. As mentioned before, the depths may be up to, but not greater than, two inches (2") deeper than required but may not be less than the dimensions shown. Extra depth will help with the liner fit, especially when temperatures are above 85° F. The final sizing of the pool bottom determines the smooth future appearance of the liner in the finished pool.

The hopper dimensions must be reset for finish grade dimensions. These dimensions will allow for one and a half (1½) to two (2) inches of vermiculite pool base and provide an accurate guide for trowellers finishing the pool bottom. Using the 16 X 32 rectangle as an example, take the finish dimensions from the Swimming Pool Drawings as a guide. Note that each of the hopper dimensions varies by two inches (2") from the excavation dimensions, to allow for vermiculite. (Except for the shallow end dimension.) Dimension should now be as follows:

	Shallow end	Slope	Hopper Walls
Excavation	8' - 0"	13' - 10" 3' - 10"	8' - 4"W X 6' - 4"L
Finish	8' - 0"	14' - 0" 4' - 0"	8' - 0"W X 6' - 0"L



Layout of Finished Dimensions

Start the layout at the shallow end working to the deep end, using 16 X 32 rectangle as the example. Refer to your specific pool construction plans for measurements and finished grade.

- A. Set two (2) pins, one against each wall, eight feet (8') from shallow end wall. Set a string on these pins across the width of the pool at a height of two inches (2") from the bottom of the wall panel. This should be the same height as the vermiculite line of the Steel panel. This marks the end (termination) of the shallow end floor and the beginning of the slope. This point is also termed "the break."
- B. Measure an additional 14' from the break and set two more pins against the wall and run a string between those two, this time at the bottom of the wall panel. Now measure four feet (4') away from each wall, along the string and toward the center, and drop a two foot (2') re-bar pin. (A plumb bob may be used for better accuracy.) Drive the two foot (2') re-bar pin down with a hammer. This is now the end of the slope, (slope termination), and defines the width of the hopper side walls and the beginning of the deep end floor. Measure from the string down to the re-bar pin and mark it at 61" (inches). This now defines the depth of the pool at eight feet six inches (8'6") from the top of the coping. This determines the finish depth of the deep end (hopper). (Again, this can be made up to two inches (2") deeper, but never less than 8'6"). The main drain should be set an additional two inches (2") lower.
- C. Next, measure four feet (4') from the deep end wall toward the shallow end and set another re-bar pin on each wall. Repeat the procedures for the end of the slope pins in step eight and setting the depth. Now run a string from the break pins down to slope termination pins and around the perimeter of the deep end floor. Set these strings at the finished depth marks. These are now finish grade strings.

Checking the Final Grade

There should be a minimum of two inches (2") between the finish grade strings, and the excavation. Walls, floor and slope should be flat and smooth as possible to avoid excessive vermiculite use. Hand-trim areas that are too high. Fill and pack low areas and voids with clean sand. Trim out any protruding tree roots or rocks. String across the slope diagonally from deep end corner pins up to the two inch (2") vermiculite line on the bottom of the pool wall panels. This will give you a more accurate view of the excavation. An additional string run down the center of the shallow end, over the break and down the slope to the beginning of the deep end floor will help trowellers in the finishing process particularly for larger pools. Be sure to check strings during finishing of the pool bottom to see that they are tight, and not sagging. You are now ready to start trowelling the pool bottom.

Divider

Day Three

Installing Pool Bottom

Mixing Procedure for Vermiculite Pool Base

1. A five (5) cubic foot or nine (9) cubic foot-paddle type (mortar) mixer is recommended.
2. All the water goes into mixer first. (Check with supplier for recommended amounts.) Use the 55 gallon drum as reservoir and 5 gallon pails to pour into mixer.
3. Next add recommended amount of Portland Type 1 cement.
4. Add one (1) complete bag of vermiculite pool base. With larger mixers it is possible to mix two (2) bags at a time. Still, consistency may be difficult to maintain.
5. Do not over mix. Run mixer 40 to 60 seconds to avoid clumping of mixture.
6. Dump into a wheel barrow for transport to the pool. These are general mixing instructions. Consult your material supplier for individual manufacturer mixing procedures and quantities. See Appendix E for additional mixing and trowelling tips.

Bottom Finishing Procedure

Bottom finishing can be done by progressing either from shallow to deep end or deep to shallow end. If you choose to finish from shallow to deep end, the work crew must be able to exit and enter the pool without disturbing the finished areas. For this purpose, a wooden extension ladder with a 16' X 36' board nailed to the bottom should be set on deep end floor. This will enable the work crew to climb out of the pool without disturbing the finished bottom. Mix can be conveyed from the mixer to the pool bottom by five (5) gallon buckets. An easier and more efficient method is to transfer mixture from the mixer to a wheelbarrow. Then use a 2 X 10 ramp to pour mixture over the pool wall directly into the pool bottom. The crew can then use a flat shovel for final placement.

Trowelling the Bottom

When trowelling the vermiculite pool base, a minimum of thickness of 1 ½ inches must be maintained throughout. Spread the vermiculite out with a flat shovel into roughly 2' X 6' sections. Use a 30" magnesium darby to spread and flatten the vermiculite. The darby does most of the work in finishing. Get the vermiculite as flat as possible by working the darby in several different directions. Use the 16" pool trowel to "slick" the vermiculite and close the surface and finish as smooth and flat as possible. This section is now finished, and another can be started.

At the base of the hopper walls, create a two foot (2') fillet or radius. This is done by placing vermiculite at the wall base and shaping the fillet to its proper radius with a glass jar or other circular object. This fillet will give a smoother finish to the liner at the base of the wall than would a sharp base angle. Done at this point it also will take stress off the liner. A skilled troweller can usually form the two inch (2") fillet with only a trowel and mag. It is important to avoid

sharp edges or pockets in the pool bottom, thus avoiding areas for dirt to collect after pool is filled.

As deep end slopes are completed and hopper bottom is trowelled, strings and pins should be removed from the bottom vermiculite trowelled smooth. Be careful to trowel out any "nerds" or crumbs as work progresses. These will show through the liner if they are not taken out. If the bottom is trowelled from deep to shallow it will be extremely difficult to keep crumbs out of finished bottom. Debris cannot be swept out until bottom is cured, most vermiculite mixes are not ready to walk on for at least 48 hours, delaying liner installation.

Trowelling shallow to deep, keep working crumbs and debris to a final corner of the hopper. Trowel deep end walls first, the floor around drain and work your way onto the ladder board. Before exiting the pool pull the tape off the main drain keeping the screw holes clean. Insert two (2) face plate screws $\frac{1}{2}$ way down into the drain, opposite of each other. Leave the pool carefully to avoid crumbs and carefully lift out eh ladder and board with two (2) crew members.

Installation of the Liner

The first step for installation of the liner is to wipe down the pool walls with a rag to remove any dirt or vermiculite that may be stuck to the walls. Next, tape the pool wall joints with duct tape to create an air seal and prevent air from leaking through wall joints while the liner is vacuumed into place. Tape should extend from the bottom edge of coping down to the top edge of the vermiculite bottom material. It is also recommended to tape the back side edge of the coping on the top of the pool panel to improve air seal for fitting liner.

METHOD #1

After the vermiculite bottom has been completed, the liner should be rolled out on to the ground, preferably on grass, to remove the packaging wrinkles. If it is an extreme hot or sunny day do not leave the liner out too long, it will become soft in the heat and stretch too easily. When the liner is ready to install, roll it up on a four inch (4") diameter aluminum irrigation pipe at least three feet (3') longer than the width of the pool. Tape the liner to pole at the deep end and roll from deep to shallow. Fold in the sides so the width of the liner when rolled up is less than the width of the pool. Be careful when rolling out the liner not to pick up any leaves, stones, twigs or dirt on liner bottom. Stand 2 X 4's on edge just behind the coping to avoid liner pole bending coping. Be sure to tape the pole where it contacts the coping if the 2 X 4's are not used.

Set the rolled up liner and pipe on top of the pool wall at the shallow end so it will unroll from shallow to deep. Begin installation of the liner aligning center of liner with center of pool. Unroll the liner and place the liner bead in liner track under the coping, across the end and down the sides to the break. Check at this point for proper liner alignment. This can be done by comparing the

position of the corner seams to the corners of the pool wall. Readjust liner in shallow end if necessary to center and make each corner match. Proceed down each side toward the deep end. Be very careful not to stretch liner perimeter while installing. If more perimeter is needed at final stages of installation, stretch the liner along the sides of the pool. Unroll liner off liner pole as needed while installing. Check the deep end corners for alignment. If all the corners are properly aligned you are ready to vacuum the liner into place.

METHOD #2

Using this method will require extra installation time. After vermiculite installation and if it is firm enough to walk on, (usually by the next day), place liner in shallow end, rolled up as it comes from the carton. Be sure to sweep out any debris that may be in the pool bottom. Position liner at the shallow end wall and unroll down center of pool into deep end. Begin installation of liner at the shallow end of the pool aligning as it is in Method #1.

VACUUMING LINER INTO PLACE

If a step section is to be used, install the step face plate before vacuuming the liner. Be sure liner is correctly aligned in the pool before proceeding. After complete liner installation, prepare to vacuum the liner into place with two (2) commercial type vacuums or heavy-duty shop vacs. Tape a vacuum hose between liner and wall panel at the break and another hose on the opposite side at the break. If preferred, one hose may be run through the skimmer opening. Be sure to seal all air leaks with duct tape. Places that need to be sealed to prevent air leaks are:

1. Panel joints, (taped before liner is dropped);
2. Return fitting inlets;
3. Skimmer plumbing inlets;
4. Around vacuum hoses on top of skimmer;
5. Light conduit connection or deck box if installed;
6. Ends of any plumbing that might already be installed.

At this point two (2) or three (3) of the crew should position themselves behind the shallow end wall in the 24" overdig area, while another crew member prepares to turn on the vacuums. The crew behind the shallow end wall can reach into the pool and grasp the liner near the seam at the bottom of the wall. They should then pull the liner upward toward the top of the wall and hold it in place. Turn on the vacuums and hold the liner in the pulled position. This will draw the liner up into the shallow end until the deep end is fitted by the suction of the vacuums. This procedure will minimize excessive stretching of the liner into the deep end. As the vacuum pressure increases behind the liner, it will become increasingly difficult to hold the liner in the pulled position. When there is sufficient vacuum to hold the liner from sliding back into the deep end, release the liner slowly. Fit the liner into the shallow end corners.

Examine the liner from all directions. See if the liner is seated correctly in the

bottom of the pool or if it needs repositioning. Make adjustments where necessary (if possible while the vacuums remain running) by pulling the liner into place. Before filling the pool, all folds or wrinkles must be pulled out flat. It may be necessary to turn off vacuums and reposition the liner as needed. **Any wrinkles after this stage will remain permanently.**

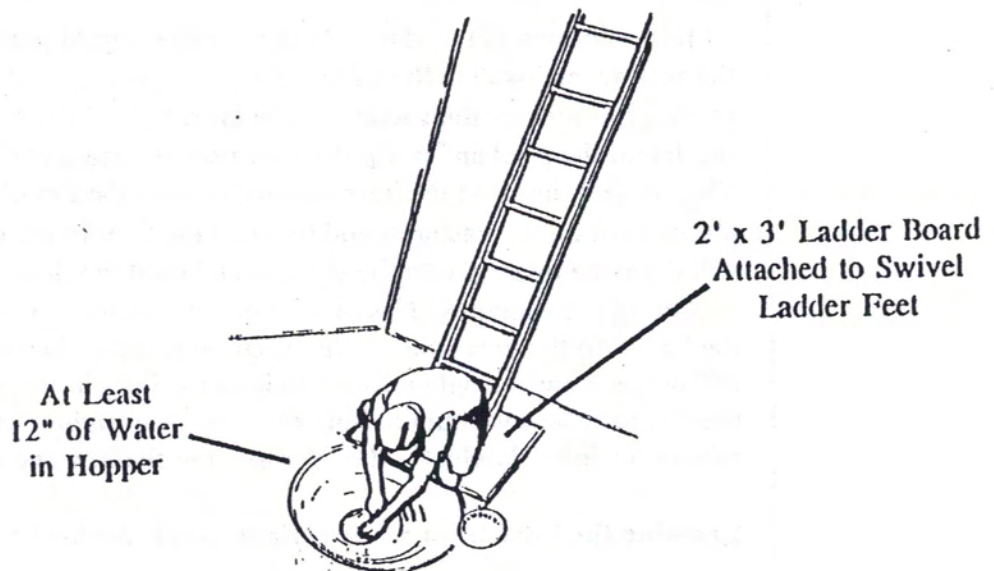
After properly positioning the liner, start filling the pool with water while the vacuums are still running. If using garden hoses to fill the pool, fill the hopper with a few inches of water and place the end of the hoses on the bottom of the hopper. (Examine hose ends to be sure no sharp edges will damage the liner. Tape hose ends if necessary to protect the liner.) After six (6) to eight (8) inches of water has filled the deep end, turn off water source and install main drain gasket and face plate while underwater.

Installation of Main Drain Face Plate

If bottom material is still soft at this stage a ladder and board as described in "Final Bottom Finishing" on page 37, should be used to avoid footprints in the bottom. **Be extremely careful of sharp edges on the board that might puncture liner! Proceed as follows:**

1. Very carefully puncture the liner where the heads of the two (2) previously installed screws protrude. Back screws out through vinyl liner and quickly position gasket and face plate.
2. Reinstall the two sets of screws and partially tighten each.
3. Install remaining screws through face plate and gasket, puncturing vinyl as screw enters pilot hole in main drain body. Tighten screws evenly and securely in a cross pattern sequence.

CAUTION: Don't over tighten, screws will break.



**Installing Main Drain
Face Plate**

4. After completely installing face plate, trim vinyl from inside main drain face plate with sharp blade and install main drain grate.

Continue to fill pool with water. It may be necessary to remove some wrinkles during the filling operation. Wrinkles must be removed before they are covered with more than two inches of water. If wrinkles remain, pump the water out. Remove the wrinkles and refill the pool. Avoid this costly and time consuming error by removing wrinkles before they are covered with water.

When about six inches (6") maximum of water is in the shallow end, turn off vacuums and remove hoses from behind the liner. *Note: Vacuums must remain running until the water is into the shallow end or wrinkles will develop.*

Remove hoses before they are covered with water and become impossible to remove. Once vacuums are removed, continue filling the pool.

Filling the Pool with a Fire Hydrant or Tanker Truck

If the pool is to be filled from a high pressure source of water, such as a fire hydrant or tanker truck, fill the hopper with two feet (2') of water from a garden hose before the high pressure source is turned on. Direct the water from this source into the partially filled hopper. This procedure should be followed because water from a high pressure source, if allowed to hit the hopper sides or bottom directly, can make an impression in the freshly poured vermiculite under the liner and disturb an otherwise smooth pool bottom. Always flush the water source for a few minutes away from the pool area before filling the pool. This removes any accumulated sediment that may be in the water hydrant lines.

Installation of Light Niche Face Plate

As the water reaches to approximately two inches (2") of bottom of the light opening proceed as follows to install light niche face plate.

1. Remove the previously installed face plate screws by piercing the liner at the screw head and reversing the screws out of holes.
2. Align face plate being sure it is right side up. Refer to manufacturers instructions. Insert screws through face plate into the liner holes, and partially tighten.
3. Insert remaining screws, piercing the liner and tightening each in a cross pattern sequence. Check all screws for tightness one final time.
4. Cut liner along inside edges of face plate.
5. Make sure copper or PVC conduit is installed to a point at least 12" above the pool coping before continuing to fill the pool or an overflow will result.

Consult the current National Electrical Code Handbook for specific requirements on installation and placement of the junction box.

Step Section Face Plates

For installation of step section face plates please refer to individual manufacturers instructions. It is recommended that step sections be sealed with tape behind the liner during vacuuming and filling. When the water level has reached six inches (6") below the first step, the face plate should be installed before continuing to fill the pool.

Installation of Inlet Fitting Face Plates

When water is approximately two inches (2") below inlets, proceed as follow to install the inlet fitting face plates.

1. Remove previously installed face plate screws.
2. Position face plate and re-install the screws. Partially tighten each.
3. Insert remaining two screws and tighten all screws in a cross pattern sequence.
4. Cut liner inside face plate.

Installation of Skimmer Face Plate

Allow water to reach within one to two inches (1"-2") of bottom of skimmer opening. Proceed as follows to install the skimmer face plate.

1. Remove previously installed face plate screws.
2. Position face plate and re-install the screws at each corner.
3. Insert remaining screws and tighten in a cross pattern sequence.
4. Cut liner inside face plate.

IMPORTANT: Do not fill pool any further until the backfilling is completed. Extra water will over stress the pool walls.

Final Assembly of Safety Rope Eyes

After installation of liner, pierce liner. Place gasket washer on rope eye, and assemble rope eye and concrete anchor as shown in diagram. Refer to diagram on page 31.

**Day
Four**

Pressure Testing Plumbing

Testing the Plumbing for Leaks

First construct a pressure test device as illustrated in Appendix A. Apply teflon tape to the test device and insert it into the top of skimmer. Hand tighten only. Place the pump valve on full skim and the multi-port filter valve on full filter. Hook up a garden hose to the test device and turn the water on allowing the plumbing to fill with water.

When water comes through the inlets, shut off the water and plug the inlets with 1 1/2" PVC threaded plugs. Turn on the water until the pressure gauge reads 25-30 psi. Shut off valve on the test device and watch the pressure gauge. If the lines have a leak, the gauge will show a drop in pressure, usually very quickly. Visually inspect all pipes and fittings for drips or leaks of any kind. Repair and replace plumbing where necessary. Release the pressure in the system by turning the pump valve to 1/2 drain, 1/2 skim. The plumbing is ready to backfill.

Backfilling the Overdig

When backfilling the overdig it is useful to have a string set up along the coping of the long sides of the pool to help maintain straight walls. It is possible for the pool walls to get pushed inward during the backfill procedure. Pool walls that get pushed inward must be dug out by hand all the way down to the footing. This allows the water pressure to push it back out. The water level in the pool should be at least one half the way up the vertical walls to help offset the pressure of the backfill. Do not fill the pool any higher than one to two inches (1" - 2") below the bottom of the skimmer or risk over stressing the Steel pool walls.

When using earthmoving equipment such as a caterpillar, backhoe, front end loader or bobcat, machinery must be kept a minimum of three feet (3') away from the pool walls at all times. This means extra hand work but the extra effort will more than offset the risk of caving in a pool wall.

During the backfill process, be careful to remove any large rocks, cinders, large roots or other debris. Clean sand, river run, pea gravel, or small grade limestone are all excellent backfill materials. The plumbing should be supported or arranged in the trench to avoid excessive stress on the plumbing pipes. Backfill the overdig up to the top of the pool wall panel, not to the top of the coping. This allows for some settling and the thickness of the concrete decking. Once the pool is completely backfilled, fill the pool with water to the middle of the skimmer opening.

Excessive water soaking around the pool to help "settle" the backfill should be avoided because of the possibility of water seeping under the footing and in turn floating the liner. This can also wash fine grit in behind the liner. The best method for compacting the backfill is to rent a high frequency power soil compactor (plate style compactor) available at most rental shops. This tool can be operated somewhat close to the pool walls and is by far the fastest, most effective way of reducing future settling problems.

Final grading and contouring of the backfill should take in consideration the area and drainage of the pool deck and the drainage of the surrounding yard with the purpose of channeling the rain or snow runoff away from the pool.

Preparing to Pour the Deck

Forming the Deck Area

The deck is ready to be formed using 4" X 8' strips of 1/4" masonite for curved decks or regular 2 X 4's for straight decks. Be sure to check remembering to keep the same distance around perimeter of pool for a neat job. Form deck three to four feet (3'-4') wide all around the pool and six to eight feet (6'-8') around diving board and step areas. Screed backfill inside the forms to maintain constant depth of 3 1/2 to 4 inches minimum, while maintaining elevation of the form. Staking need only hold the form in place, about every three feet (3'). Backfill dirt against the form for additional rigidity. The top of the form should be one inch (1") below the top of the coping for a four foot (4') wide deck thus giving a fall of 1/4" per foot. Be sure to mount safety rope anchors and coping clips before pouring the deck. Make sure the back side of rope anchors are exposed to allow concrete to hold re-bar. Be sure to expose the tops of the poly struts to allow the concrete to bond to them.

Diving Board Installation

For specific requirements of jig placements, consult manufacturers instructions.

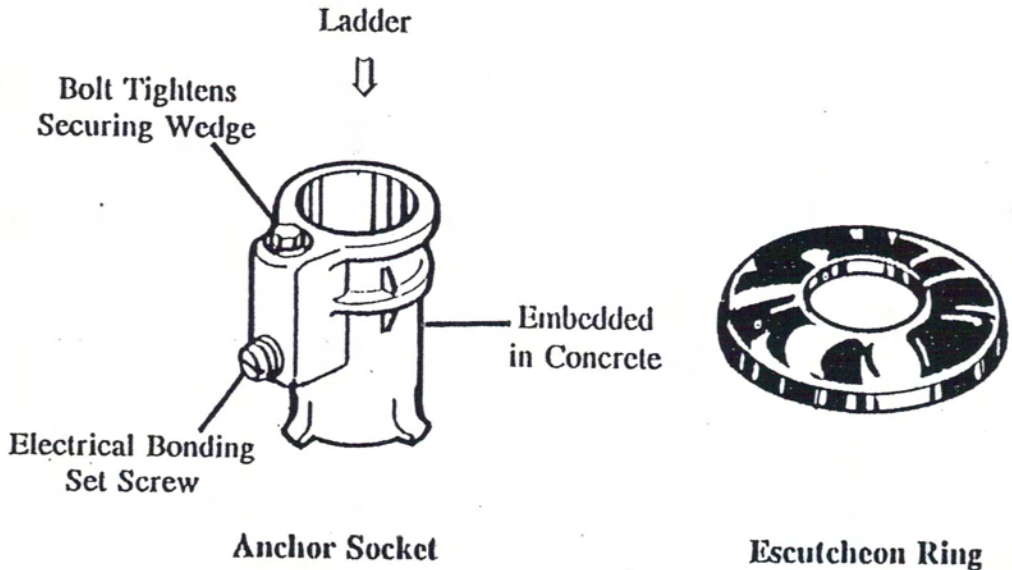
Be sure that the diving board jigs are in line with the center line of the pool, level and plumb. If concrete jigs are not properly set, the board installation will appear crooked and not function properly. Do not mount or use the diving board for at least five (5) days after concrete is poured.

Ladder Placement

Place the ladder over the pool wall in the middle of the deep end slope for easy access by divers and swimmers in the deep end of the pool. If there is no step section, a second ladder must be placed in the shallow end. Swimming pools with a walk out step are required to have at least one handrail at either side or in the middle of the step. Two handrails may be used at either side. A shallow end ladder is not necessary with a walk out step.

Assemble the ladder according to manufacturers instructions. Be sure to seat the rubber bumper pieces securely to the bottom of the rails to protect the liner from puncture. Put the chrome escutcheon rings on each ladder rail. Insert rail ends into the anchor sockets and tighten the securing wedges, making sure rails are fully inserted and bottomed inside of the anchor sockets. Prepare step hand

rails in the same manner for the escutcheons and anchor sockets. Electrical bonding set screws are located on the back of the anchor sockets. When the deck is poured and screeding is finished, place the ladder assembly in the concrete. The ladder should be placed level, plumb and parallel with the pool wall, and the anchor sockets should be completely encased in concrete and flush with the surface. Do not use the ladder for at least five (5) days after the concrete is poured. Clean off any concrete splatters within 24 hours. (Spraying WD-40 on rails before pouring will make cleaning much easier.) Slide the escutcheons over the anchor sockets so they lay flat onto the concrete after it has been poured, and cured.



Electrical Bonding

Any metallic hardware or accessories around the pool site must be grounded (bonded) to a common ground. For specific requirements on electrical bonding of swimming pools, the builder must consult the current **National Electric Code Handbook** or local electrical inspectors office.

NOTE: Wiring, splicing and grounding of the junction box and pool equipment should be done **only** by a licensed electrician. *Electrical bonding must be completed and have an inspectors approval before pouring the deck.*

Day

Five

Pouring the Concrete Deck

A Final Check List Before Pouring Deck

- Recheck all forms for $\frac{1}{4}$ " per foot fall
- All pool walls are straight
- Backfill has been skreeded for constant $3\frac{1}{2}$ to 4 inch depth
- Coping clips are in place
- Back side of rope anchors (re-bar) are exposed to bond with concrete deck
- Diving board jig or standards are centered
- Coping is taped with duct tape to protect from wet concrete
- Electrical bonding is complete and inspected
- Plumbing has been pressure tested
- Re-bar is in place at top of Poly Struts
- PVC or redwood expansion material on hand (optional)
- Skimmer extension collar is in place

The following instructions assume the reader is familiar with basic concrete finishing techniques. If you do not have any previous experience with concrete flatwork it may be advisable to subcontract this part of the installation. Because the concrete deck is the finishing touch to the general appearance and quality of the pool installation, this may be best handled by a professional crew.

Planning the Pour

Order concrete a day or two in advance from a local ready-mix company. Figure the amount by measuring the total square footage of the deck area. Divide the total by 75, the result equals the yards of concrete needed (total square footage divided by 75 = yards). The figure 75 is used for pools to allow for extra volume in coping, under wall and around panel bracing. Order a $5\frac{1}{2}$ to 6 bag mixture for the deck using limestone only and a four (4) to six (6) inch slump.

Do not pour the deck on a day when rain is forecast. (Covering concrete work during a rain is possible, but in the case of a swimming pool deck, it is made considerably more difficult with the ladder, step handrails, and diving board standards and limited access.) Have all the concrete tools on sight before starting. It is also advisable to have two (2) concrete wheel barrows on hand as well. Most pools don't have enough access for a concrete delivery truck to reach the entire perimeter of the pool and hand wheeling will become necessary. Before concrete arrives, mask off the top edge of the coping to protect it from the concrete finishing process. Be careful not to let the tape lap over coping edge because the concrete will chip when the tape is pulled off.

Final Placement and Finishing

Place concrete into forms and strike off the surface with a skreed board. Be extremely careful to keep concrete from falling into the pool water. Concrete in the pool throws the pool chemistry off balance, makes cleanup much more difficult and can even clog and ruin the plumbing, filter and vinyl liner. Skreeding should leave

concrete flush with the top surface of the coping. Also screed concrete flush with the top edge of the skimmer opening. Proceed with the usual steps for concrete finishing. Add redwood or PVC expansion materials and score the crack joints at four to six feet (4'-6') intervals around the perimeter. The final finish must be made with a concrete broom to produce a non-skid surface. Chlorinated pool water on slick trowelled concrete creates an extremely slippery and dangerous surface.

Decorative Decks

Many different types of finishing can produce beautiful and decorative deck designs. Exposed aggregate, epoxy stone, Flo-Crete™, Sun-Deck™, cool deck, or colored concrete can be used. Crack joints can be applied in a random pattern to create a natural flagstone effect.

Fencing Around Pool

All swimming pools are required to be fenced in to limit pool access. Check with local code requirements for swimming pool fencing. Also refer to NSPI suggestions in Appendix E.

Installation of Safety Rope

Slide floats on to rope and attach with rope clamp on one rope eye. Measure length of rope with snap swivel hook attached at other end of safety line, clamp and cut off excess.

Required Safety Warning Labels

One (1) or two (2) large area signs pertaining to diving or non-diving instructions as well as general pool safety rules are included. These should be posted in a conspicuous location inside the swimming pool area. Four (4) warning labels are included in the Steel pool package that state **NO DIVING-NO JUMPING**. These labels must be affixed to the pool coping. To be affixed properly, they should be centered with one on each end and one on each side of the pool. It is the responsibility of the installer and/or the pool owner to affix these labels. Please note on your warranty registration form there is a space that must be checked stating these labels have been affixed to the pool.

Summary of Important Tips

1. All fittings and clamps must be absolutely watertight. Leaks can mean expensive repairs later. Pressure testing is essential. See Appendix.
2. Pool should be placed at least three to four inches (3"-4") above existing grade. If pool must be placed any lower, make sure that water drainage from surrounding high ground won't collect around the pool. If you have no other choice, place drain tile around bottom of pool next to the footing to drain water away.
3. Pool must be absolutely level. Check and recheck with transit before pouring concrete footing around base of pool walls.
4. Diving board jigs should be properly positioned with center line of pool, level and plumb.
5. Never backfill with shale, rocks, or cinders. River run, pea gravel, or sand makes the best backfill.
6. Never turn on the underwater light unless there is water in the pool. Pool lights are water cooled.
7. Refer to and study Maintenance Manual for operating and maintenance instructions. It is very important to keep the pool water in chemical balance to ensure a sparkling and inviting pool. Start balancing the water chemistry as soon as the pool is filled.

Appendix

Appendix A

NATIONAL SPA AND POOL INSTITUTE STANDARDS AND RECOMMENDATIONS FOR THE INSTALLATION OF IN-GROUND SWIMMING POOLS

1. Deck to be finished with a non-slip finish and sloped $\frac{1}{4}$ " per foot away from pool.
2. Steps, if installed, must be provided with a handrail as instructed on individual construction plans.
3. Pool must have barriers on four sides. All entries in barrier must be provided with doors or gates that are equipped with self-closing, self-latching mechanisms that are located above the height of a toddler and are provided with hardware that enables permanent locking. If the house is part of the barrier, all doorways opening from the house to the pool area must be provided with similar mechanisms. All window openings from the house to the pool should be provided with childproof locks or window screens. The height, nature, and description of the barrier should be determined by consulting local codes. In the absence of local swimming pool barrier codes, the barrier should be of a construction that affords no external handhold or footholds and of a material which is impenetrable by toddlers. This barrier should be at least four feet (4') in height and completely surround the swimming pool. Consultation with an expert in the area of swimming pool barrier design is recommended.
4. Installation of any electrical device by anyone other than a licensed electrician is prohibited.
5. Pools should be provided with a minimum of two points of exit in the form of ladders or steps, one in the deep portion of the pool and one in the shallow portion of the pool. If a step is used as a point of exit, it should be located in the shallow end of the pool.
6. One skimmer must be provided for pools up to 799 square feet. Two skimmers must be provided for pools 800 to 1600 square feet.
7. The following area safety signs should be installed in a prominent location:
 - A. NO DIVING EXCEPT FROM DIVING BOARD
 - B. DANGER, RISK OF DROWNING
 - C. BASIC LIFE SUPPORT
 - D. POOL RULES
 - E. SAFE DIVING
8. The following safety equipment should be available:
 - A. First aid kit
 - B. Reach pole with hook - not less than 12 feet long
 - C. A $\frac{1}{4}$ " diameter throwing rope as long as 1- $\frac{1}{2}$ times the maximum width of the pool or 50 feet, whichever is less, to which has been attached a ring buoy with an outside diameter of approximately 15 inches or some other similar flotation device.
9. Main drains shall be of the anti-vortex type to prevent entrapment.
10. Circulating equipment shall be adequate to turn over complete gallonage in a maximum of 12 hours.

11. A hydrostatic relief valve in the main drain should be installed to relieve water pressure which could develop between subsoils and vermiculite or concrete pool bottoms.

Additional Recommendations

1. Spring-assisted diving boards prohibited.
2. Swimming pools with a surface area of 400 square feet or less should be provided with at least one 250 watt, 120 volt light fixture. Swimming pools with a surface area of 401:1042 square feet should be provided with at least two 250 watt, 120 volt light fixtures. Each fixture should be installed in locations as designated on construction plans per national and local electrical codes.
3. Area lighting should be provided according to local codes or design practices set forth by an illumination engineer.
4. Pools must be built in accordance with local, state and national codes. Pools must be constructed on undisturbed soil and the top of the pool must be at least three inches (3") above the highest nearby grade.
6. Surrounding elevations should be contoured to prevent surface water from running toward pool.
7. Circulation equipment should be located within 50' of pool.
8. Pump should be located not higher than six inches (6") above deck elevation.
9. Backwash waste should be disposed of per local codes.
10. Main drain and skimmers should be plumbed as shown on construction plans.
11. If the concrete decking is wider than four feet (4'), the pool wall and associated deck structure should be protected from thermal expansion and contraction by the installation of expansion joints three feet (3') from the pool wall around the entire perimeter of pool. If the deep end deck is to be more than eight feet (8') wide, the expansion joint at the deep end of the pool should be set six feet (6') from the pool wall to allow for the diving board jig.
12. All expansion joints and points where concrete adjoins pool walls should be sealed to prevent the entrance of water into the joint.
13. **EACH POOL IS SUPPLIED WITH IMPORTANT SAFETY AND INSTRUCTIONAL MATERIALS WHICH MUST BE DELIVERED TO THE POOL OWNER BY THE BUILDER OF THE POOL.**

Appendix B

POOLMAN'S GUIDE TO PROPER PIPING CONNECTIONS

The following information is an excerpt from Hayward Pool Products, Inc. Tech Bulletin.

Making up Plastic Joints

The following procedures, along with the use of recommended joining materials especially formulated for plastic fittings will insure strong leak-proof systems.

Threaded Joints

- 1) **Plastic to Plastic:** Before applying any sealant you should — Check if fittings fit tight or loose (plastic tolerances allow for some degree of looseness without being out of specification). Remember, a dry male fitting should thread up hand tight about 2/3 of the way into any female thread connection.

Recommended plastic to plastic thread sealants are:

Permatex No-More-Leaks (White)

Teflon Tape - Use extra care if used underground on suction joints or on spas and systems subject to heated water.

Preparing the Threads	
<p>If you use:</p> <p>Permatex No. 2 (Or Permatex No-More-Leaks)</p>	<p>If you use:</p> <p>Teflon Tape</p>
<p><i>Normal fit:</i> Apply liberal coat to thread only.</p>	<p><i>Normal fit:</i> Wrap 3-3½ full turns in clock wise direction.</p>
<p><i>Loose fit:</i> Apply one coat to male threads then apply 2 wraps of Teflon followed by a second coat of Permatex No. 2 over the Teflon tape.</p>	<p><i>Loose fit:</i> Add another 1 or 2 full wraps. Remember - Excessive wraps of Teflon tape will increase the male thread dimension and could cause cracking of female ports if fitting is overtightened.</p>

Screw the fittings together as far as possible hand tight. Then, tighten one more full turn using a strap wrench or pump pliers. This is all that is needed for a tight joint. Remember, this tool is on the end of your two foot (2') arm which allows you to exert great torque even with a "strong" hand.

2) PLASTIC TO METAL:

The same sealants are recommended, however, if you use Teflon tape be sure to clean or deburr any rough metal or plastic threads to prevent

ripping or tearing of the tape during the thread make-up. (Also look for flash edges on male threads - they can cut through tape causing leaks).

Follow the same steps as a plastic to plastic joint with these exceptions:

- (a) Use a male adapter or male metal fitting into a female plastic thread whenever possible.
- (b) Never use a male plastic threaded end into a female metal thread if heated water of any degree is involved. The different expansion rates cause leaks.

Remember, the nature of any plastic fitting will allow you to sock it home to the bottom of any female threaded fitting if you use heavy plumbers pipe wrenches or feel overly strong and aggressive.

Overtightening is never wise and is unnecessary if the proper sealant is used. It could cause fitting breakage and will make later disassembly difficult. Finally, common plumbers oil based pipe dope compounds should not be used with plastic pipe, valves or fittings. It has been proven that cracking or breakage of valves and fittings has been caused by the effects of many of these pipe dopes. These failures may occur in a short period or over a prolonged period of time.

NOTE: Heated water will accelerate this possibility.

SOLVENT WELDING OF RIGID PVC PIPE AND FITTINGS

A properly prepared joint will become chemically welded, not cemented as in the commonly used term. Practical experience has proven that a solvent welded joint is the strongest part of any piping system. However, it can also be the weakest, if improper preparation and materials are used. With this in mind, please follow these "down to earth" instructions step by step without cutting any corners. We are aware of the many variations published through the years of how to make a joint; the following is recommended for piping systems normally encountered in the swimming pool industry.

TO JOIN

HERE ARE A FEW OF THE AVAILABLE SOLVENT CEMENTS*:

- PVC to ABS (Cycolac)** - Weld On No. 794 (Green-Medium Bodied fast setting)
- PVC to PVC**
 - Weld On No. 705 (Clear-Medium Bodied fast setting)
 - Weld On No. 711 (Gray-Medium Bodied fast setting)
 - Weld On Wet-R-Dry (Blue-Medium Bodied fast setting)
 - Pool-Tite (Light Blue-Medium Bodied fast setting. Also called Blue-Glue; dries clear)

***NOTE:** There are many other brands that work equally as well. Note of caution: Avoid using the so-called all-purpose cement or spray can types. There are no "all-purpose" cements on the market today that have recognized approvals. They can cause leaks.

NOTE: Polynesian Pools Ltd. recommends the use of clear medium bodied cements and clear solvents. Do not use anything less than medium or heavy bodied cement.

Materials Needed

- 1) Solvent cement: Clear type such as Weld On No. 705 is okay if pipe and fittings fit snugly. Gray or blue types such as Weld On No. 711 or Pool-Tite usually work best as they will fit gaps if pipe and fittings are on the loose side.
- 2) Primers such as Weld On P-70 or Prime-Tite. these purple primers are now recommended by most of the fitting and pipe manufacturers.
- 3) Sand cloth, No. 60 or 80 grit - plumbers sand cloth is usually not coarse enough to break through the pipe surface. It will also load up very fast with plastic particles.
- 4) Chamfering tool or file - such as manufactured by Reed Manufacturing, or a deburring tool manufactured by Ridgid Tool. (Optional)
- 5) Common hacksaw, miter box and saw, or plastic pipe cutter.
- 6) Natural bristle brush - 1" for 1½" pipe; 1½" for 2" pipe, etc.
- 7) Clean white rags.

PROCEED AS FOLLOWS: Remember, 73° F is the ideal temperature for making any PVC joint. A higher temperature will cause quick set up and fast curing. A lower or "wetter" temperature will cause slower set up and longer curing. A windy day will dry both the cleaner and cement very quickly, requiring you to do work quickly, once cleaner and cement are applied.

- 1) Cut pipe ends square. (Clean off burrs.)
- 2) Remove raised bead or burrs (which result from cutting) if you use a plastic pipe cutter.
- 3) Sand O.D. of pipe at least ½" longer than socket depth (as you would copper tubing). The solvent cement will penetrate more deeply into this rough surface.
- 4) Clean pipe end and fitting socket with clean rag or with recommended cleaner.
- 5) Check dry fit of pipe into socket - 2/3 of the depth is normal (it should not bottom when dry.)
- 6) Prime O.D. of pipe and I.D. of fittings with brush or dauber until they soften (become tacky). Be careful not to allow primer to "puddle" in the fitting socket.
- 7) Quickly, while surfaces are tacky, brush on a heavy, even coating of cement to the fitting socket and a full, even coating to the pipe end. Keep brush or applicator in cement can between applications to prevent drying out.

- 8) Quickly, within 5-10 seconds, insert pipe giving it a slight twist as it bottoms.
- 9) Hold joint for 5-10 seconds to prevent pipe from pushing out of socket. Especially true if pipe and fittings are loose fit.

If you have properly followed the above steps, you will be able to handle almost at once. However, do not put any stress or twisting force on the joint for at least 25-30 minutes. A solvent welded joint will leak if disturbed at this critical set up point.

Do not pressurize joint for at least two hours if pressure is under 10 psi; six hours if pressure is 10-20 psi. Remember, full 100% joint strength takes a full 48 hours. Always be sure to read and follow the specific instructions given for the product you have chosen to use. NOTE: We strongly recommend that you let joints cure for a full 24 hours minimum if lines are to be buried.

SOLVENT CEMENT - DO'S & DON'TS

DO NOT

Use a heavy plumbers metal pipe cutter. It will raise a heavy bead which must be removed. (This bead will prevent pipe from sliding into fitting socket.) Also tends to push cement into fitting as you insert the pipe.

Use cement that has become any thicker than pancake batter. Discard it if it flows like honey or if it has been allowed to freeze.

Try to dilute or cut it with cleaner or any other chemical. It must be used as it comes from the can. Cement has a shelf life, which is usually stamped on the bottom of the can. Storing fresh cement upside down is a good idea. This will keep the can air tight.

Leave a prepared joint without again priming. Pipe and fittings can pick up moisture or dry (during coffee breaks, etc.) which will cut down on the quality of the joint. Once a fitting and pipe is primed, you should immediately apply cement.

Attempt to join pipe and fittings that have been exposed to the hot sun - the hot surfaces will dry the primer and cement almost at once preventing them from fitting together properly. Cool both surfaces down with wet rags or water. Be sure to dry and prime before applying cement. Also keep dirty hands off surfaces to be joined. Seat, oils, etc. will prevent cement from proper bonding.

DO

Use fresh dips of primer for each joint.

Cover the solvent cement can, between joints, to keep it from air drying and thickening.

SOLVENT WELDING OF FLEXIBLE PVC PIPE (SPA FLEX) TO PVC OR ABS FITTINGS	
EZ Weld Grey 1600 No. 405 EZ Weld Industrial Grade EZ Weld Pool Pro Combo IPS Weld on No. 795	Permalite Plastics Permalite Plastics PIP Permalite Plastics No. 385

TO JOIN

Here are a few of the available solvent cements: Anzen 185
There are many other types available. Use the type recommended by your flexible pipe supplier.

MATERIALS NEEDED

- 1) Solvent cement (use only the type recommended by the pipe manufacturer).
- 2) Primer. Because of the many types of flexible pipe and cements used today, we cannot offer specific instructions. Follow manufacturer's instructions carefully.
- 3) Hacksaw - Only sensible way to cut flex pipe.
- 4) Natural bristle brushes or daubers as supplied in some cement cans.
- 5) Clean white rags.

PROCEED AS FOLLOWS

Remember, 73° F is the ideal temperature for making joints. A higher temperature will cause quick set up and fast curing. A lower or "wetter" temperature will cause slower set up and longer curing. A windy day will dry both the cleaner and cement very quickly, requiring you to work quickly, once cleaner and cement are applied.

- 1) Cut pipe as square as possible.
- 2) Clean of saw cut burrs from O.D. and I.D.
- 3) Wipe pipe and fitting/socket as clean as possible. Keep dirty hands off surfaces to be joined.
- 4) Check dry fit of pipe into socket.
- 5) Hold flex pipe for 60 seconds after joining the fittings.

NOTE: There may be variations in the O.D. of flex pipe resulting in loose or tight joints. We mention this point so that you can compensate for a loose or tight fit by being extra careful not to disturb until joint has set.

PVC PIPE TO PVC FITTINGS

Pipe	Apply primer to O.D. of pipe with brush or dauber. Brush on until surface becomes softened.
Fittings	Apply as above until sockets become softened. Do not allow any "puddles" to remain in socket.

PVC PIPE TO A.B.S. FITTINGS (CYCOLAC)

Pipe . Apply to pipe as per above instructions.

Fittings/Valves

- 1) Apply purple primer sparingly. (Reason - purple primer is very aggressive toward A.B.S. and will penetrate too deeply if applied in excess. This will cause joint to cure more slowly than normal.)
- 2) Quickly apply solvent cement while surfaces are still soft. Brush or daub on a thin even coat to fitting socket and a full even coating to pipe O.D.
- 3) Insert pipe into socket twisting $\frac{1}{4}$ turn if possible: Hold joint firm for 10-15 seconds or until pipe no longer wants to push out. This is a common occurrence with flex pipe.
- 4) Last, but most important, is proper curing before testing. Allow 8-10 hours minimum if test pressure is 10-15 psi; 10-24 hours minimum if test pressure is 20-40 psi.

Remember, full cure is 48 hours.

FINAL NOTE

An important tip for you to follow - Regardless of the type of piping you are installing, about two days before actual installation of system:

- 1) Make up several joints as per instructions above.
- 2) Let joints cure 24-48 hours and then cut apart on angle. (Like cutting a London Broil.)
- 3) Try to pry apart.
- 4) If joints separate easily, you may have either not followed instructions properly or used improper materials.
- 5) We strongly suggest you do not install until you have reviewed procedures and can prove to yourself that joints are of full strength.

If the joint is difficult or impossible to separate, you can feel confident that materials and procedures are correct and you can confidently proceed with the actual installation.

Appendix C GUIDE TO PLUMBING WITH POLYETHYLENE PIPE

C

Excerpt from Spears Manufacturing Catalog

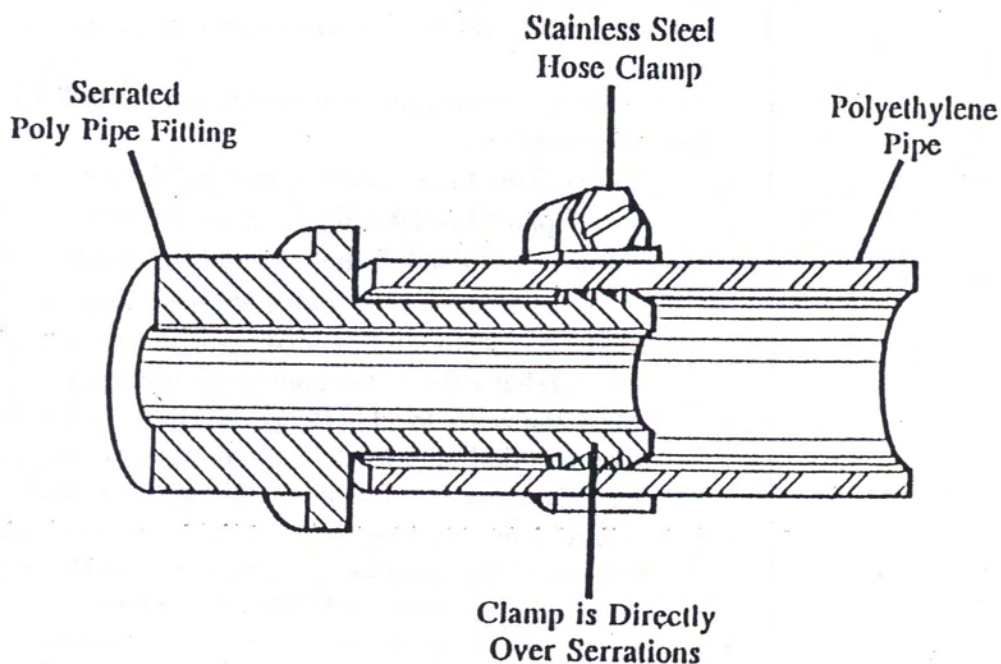
Recommendations for installers and users

Threaded Connections Spears Manufacturing Company recommends the use of quality grade thread sealant. Choice of either Teflon tape, paste, or other pipe joint compound is at the discretion of the installer. The manufacturer's literature for these products should be reviewed for proper selection and application procedures. **WARNING:** Some pipe joint compounds or Teflon pastes contain substances that could cause stress cracking to plastic.

1 to 2 turns beyond **FINGER TIGHT** is generally all that is required to make a sound plastic threaded connection. Unnecessary **OVERTIGHTENING** will cause **DAMAGE TO BOTH PIPE AND FITTING**. (INSERT DIAGRAM) Placing the clamp over the serrations of the fittings assures a tight joint and eliminates the possibility of seepage. When double clamping, set screws on clamps 90° apart.

INSTALLATION INFORMATION

Pipe is cut to length with handsaw or knife. When installing flexible lines cold water should be run through line prior to backfilling to permit pipe contract. Care should be taken to prevent large and sharp-edged rocks or other debris from being in position to crush pipe.



The insert coupling is used to join lengths of flexible pipe. Stainless steel clamps are first slipped over ends of pipe, fitting is inserted and steel clamps are tightened securely over barbs on fittings. **DO NOT** use oil or any detergent on any fittings. In systems utilizing insert fittings, the same procedure is followed as for the insert coupling. Use plain water or soapy water as lubricant on fitting. For attachment to previously installed metallic systems or threaded fixtures, the insert adapter is utilized. Apply thread sealant to the threaded end of the adapter and tighten into female connection. Steel clamp is then slipped over pipe end and pipe slipped over serrated end of insert adapter. Steel clamp is then positioned over serrations on insert adapter and securely tightened with a screwdriver.

ALL FLEXIBLE PIPE IN SIZES 1-½" AND LARGER SHOULD BE DOUBLE CLAMPED IN ALL INSTALLATIONS.

Appendix D

PROCEDURE FOR FINDING LOSS OF WATER IN SWIMMING POOL

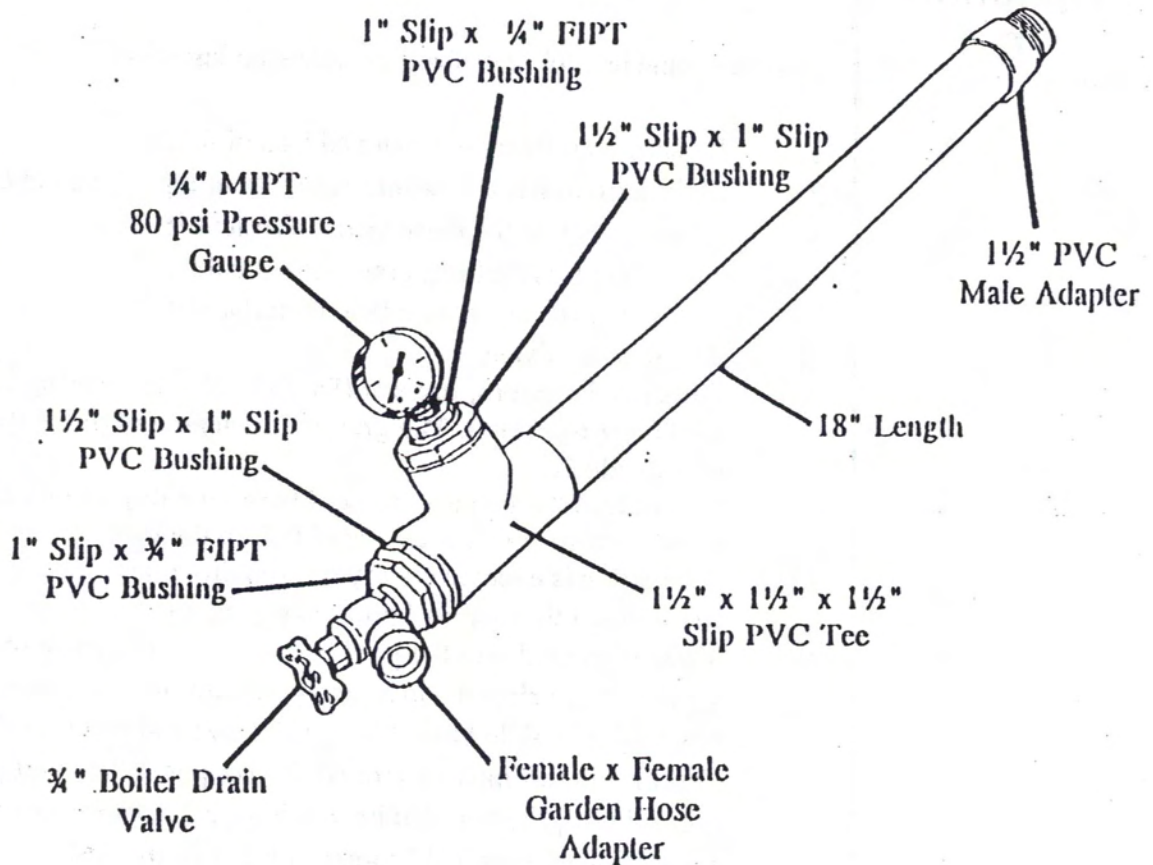
First determine if there is an abnormal loss of water. In hot summer weather, particularly if there is wind and heavy use of the pool, a pool can easily lose a half (½) to three quarters (¾) inch of water a day. However, under any conditions a loss of a fourth (¼) of an inch a day is not considered excessive. The best time to mark and test for water loss is overnight.

Once leaking conditions are determined, use the following procedures to locate a swimming pool leak:

1. Turn off the filter system. Leave it off during testing.
2. Install plugs in inlet fittings, skimmers, main drain, pool sweep fittings, light conduit (behind light fixture) and any other openings in the pool. Be sure these plugs are positive seals. Inlets and skimmers are best sealed with threaded PVC plugs and teflon tape. Be sure the hydro relief valve in the main drain is seated and sealed.
3. Mark the water level in the pool. Track the changes in water level over a period of at least 24 hours to determine the amount of water loss. Do not allow swimmers during this period.
4. If level does not drop, it can probably be assumed that the water loss is through the plumbing system, or one of the other plugged openings. The water loss is not in the liner or one of the face plates.
5. If water level continues to drop it can be assumed that the pool liner or face plate and/or screws are leaking. Most likely the liner or one of the face plates is causing the leak.

If the level does not drop in the pool proceed as follows:

- A. Construct a pressure testing tool as shown in the diagram and adapt to swimming pool circulating lines.
- B. Pressure test each line separately.
- C. Apply pressure to lines with the threaded PVC plugs still in place, by opening valve on pressure testing tool. Do not apply more than 25 psi to lines.
- D. Turn valve off on pressure testing tool when 25 psi is reached and watch pressure gauge. If the line is leaking, gauge will indicate a drop in pressure, usually very quickly. If the line is not leaking the gauge will hold pressure for several minutes.
- E. If needed, repair or replace defective lines.



Pressure Test Device

If level continues to drop in the pool, proceed as follows:

- A. Fill a 2 cc disposable syringe with food coloring dye.
- B. Using the syringe, inject the dye close to a suspected area being careful not to agitate the water. Observe the movement of the dye. If a leak is present, the dye will be drawn into the hole where water is escaping. This indicates the presence of a leak.

Test the following areas for leaks:

1. All liner seams
2. Inlet fittings, Skimmer, Main Drain Light, Pool Sweep Gaskets
3. Hydrostatic static relief valve in main drain

C. Patch holes in liner with a vinyl liner repair kit.

It may be necessary to use SCUBA equipment to properly test all of liner area.

Appendix**E****ADDITIONAL MIXING TIPS FOR VERMICULITE**

Here are some helpful hints from experienced installers:

1. Be sure your mixer is clean and free of debris.
2. Make sure to use the proper amounts of ingredients in each batch.
3. Check your mix for these visual characteristics:
 - (a) Has uniform gray cement color;
 - (b) No dry or unmixed material visible;
4. Avoid over mixing.
5. For sloped sections, use a stiffer mix (do this by using less water and/or shorter mix time). The greater the degree of pitch, the stiffer your mix should be.
6. Do not install a vermiculite pool base on a day when a chance of rain is forecast, or if rain is expected before the liner can be installed.
7. If substrate is excessively dry or contains a large percentage of sand, wet it down thoroughly before applying the mix.
8. If mix conveyed into the pool bottom turns out to be too wet for application to sloped surfaces, trowel up only to the point where the mix begins to slide back. Move sideways and apply to the next area. Continue in this manner around the hopper. When you return to the original area, the vermiculite will have set sufficiently to enable application of a second "course" on top of the first.
9. On extremely hot, dry days, more water may be needed to achieve proper consistency in your mix.
10. In areas where winter temperatures drop rapidly and often to sub-zero readings, some installers place the mix on a chicken wire mesh for added protection against future cracking. Be sure the wire doesn't have sharp edges protruding through because these will puncture the liner.
11. If you run into an extremely rough or rocky hole, it may help to apply the mix very roughly to fill gouges and cover stones. When mix has set up slightly, surface can be moistened and trowelled to a smooth, final finish.
12. Vermiculite pool base is not recommended for use in sidewalks around pools.

Glossary

Glossary

BACKWASH	Process by which the dirt collected out of the pool water by the filtration system is flushed (cleaned) out of the filter and discharged. Under normal operation it is usually less than 50 gallons of water.
BREAK COPING	Line at which the shallow section of the pool ends and the slope to the deep end begins. Half round aluminum trim pieces complete with liner track on the bottom. Pieces are screwed to the top of the pool wall, flush with the inside edge using self tapping screws. Coping provides a smooth and aesthetic edging around the pool to pour concrete decking as well as a positive securing method for the top perimeter of the liner.
FIVE BAG MIX	A ready-mix concrete term used to determine the amount of actual cement used in the concrete mixture. Also correlates to the strength of the concrete itself. The more bags, the stronger the concrete. Four and a half to five bag (4½ to 5) is recommended for footings, five and a half to six (5½ to 6) bag for the decking.
HOPPER	Deep end of the pool, including the slope, starting at the break or termination of the shallow end of the pool.
HYDROSTATIC RELIEF VALVE	A valve used in the main drain that functions to relieve unequal water pressure between pool water and ground water table.
INLET/INLET FITTING	A PVC plastic fitting designed to be attached to the pool wall panel, providing a sealing surface for the liner. Clean filtered water inlets to the pool from the equipment pad through the inlet fitting.
LINER BEAD	Outer edge or perimeter of the vinyl liner that is of greater thickness, intended to mate with the liner track at the base of the coping to "lock" the top perimeter of the liner in place.
LINER TRACK	A "C" channel located at the base of the coping facing the inside of the pool, at the top of the pool panels. The liner bead mates with this "C" channel "hooking" or "locking" the liner in place.
PINS	2' X 3/8 inch steel reinforcing steel rod cut to 2' lengths used for pool layout and securing the wall panels at their base before the footing is poured.
POLY-STRUT	Structural foam X-brace included with the swimming pool kit. Attached to the pool wall panels at each panel joint (excluding the corner joints).
POOL BASE	See Vermiculite.
POOL OFF LEVEL	One end or one section of the pool wall higher or lower than the rest of the walls. With water in the finished pool this condition will become visually obvious and unsightly as water always seeks its own level.
RETURN/ RETURN FITTING	See Inlet/Inlet fitting definition.
RE-ROD	Steel reinforcing rod used primarily for strengthening poured concrete. Also used in two foot lengths for swimming pool layout and securing base of pool wall panels. Recommended diameter is 3/8 inch.

Steel Swimming Pool Construction Guide

SELF-TAPING SCREWS	Screws supplied with the coping kit for the purpose of fastening the coping to the top of the pool wall panel. It is not necessary to pre-drill holes for the screws. Place at one foot intervals along the back flange of the coping.
SHOT STICK	A pre-ruled or calibrated survey instrument, sometimes known as a "grace" rod, available at most rental shops and survey supply companies. Used with a transit level to establish a common grade or level for the finished swimming pool.
SKIMMER	A swimming pool accessory attached to the pool wall panel by which the filtration system can, automatically "skim" debris from the surface of the pool water. Water is then drawn to the pump and through the filtration system returning to the pool via the inlet fittings.
SLOPE	The downward sloping section of the pool bottom starting at the break (termination of the shallow end), and ending at the beginning of the deep end floor. Provides a safe transition from shallow to deep water.
SLUMP - FOUR INCH, SIX INCH CONCRETE	A ready-mix concrete term used to determine the stiffness of the concrete mixture. Scaled from one to twelve, one being extremely dry and stiff, twelve being extremely wet and loose. Four inch (4") slump for the footings, six inch (6") slump is recommended for pouring the decking.
TRANSIT or TRANSIT LEVEL	A survey instrument used with a shot stick for establishing a common grade or level for the finished swimming pool. Available at most rental shops and survey supply companies.
VERMICULITE POOL BASE	An inorganic, chemically inert, expanded aggregate material that is mixed with Type-I or portland cement to form a smooth, stable pool bottom. Provides a lightweight, porous, semi soft and non-abrasive surface for the vinyl liner. Also known as concrete pool base aggregate or CPBA.
VERMICULITE LINE	A raised line molded into the bottom length of the Steel pool wall panels. The pool bottom material (vermiculite) should be trowelled up flush with this line.