



Yep, we use biceps, triceps, a strong back, and a little help from shovels and wheelbarrows to build 90 percent of our ponds.



pond excavation



So, there was this 20' x 30' pond that we were building for a customer in a nearby suburb. We'd worked most of the morning and everything was going according to plan. We were beginning to rock things in and were having our usual amount of fun when I needed something out in the truck. So I decided to take the most direct route, directly through the excavated pond (no water yet). I proceeded to jump over a couple of good size boulders and onto the top shelf... where we'd just dug several new plant pockets.

A Trip to the Emergency Room

Can you see this one coming? Well, I didn't. Looking back on it, I should have known better, but as I landed on that shelf, my right foot hit the side of the plant pocket and my ankle twisted harder than I'd ever dreamed it could.

In fact, I thought I might have broken it. One of the guys took me to the emergency room for an x-ray which showed (to my relief) that nothing was broken. It was severely sprained, and it cost me a good eight weeks of prime-time work. I mean, I still went out to the job sites and I gave a little advice, but physically speaking, I was of no value at all to the construction crew.

So a couple of thoughts here...when you're building a pond, there's nothing wrong with walking around it if you need to get something out of your truck. If you insist on going the most direct route, avoid jumping into newly dug plant pockets, 'cause it's a painful and costly experience... believe me!

Ed Beaulieu

Vice President of Field Research



When we have areas like this to work with, we pray for rain to make it nice and muddy.

Off to the Right Start

It may seem really basic, but it's extremely important to know how to properly excavate a pond. We all know that a contractor can dig a hole, but do you really know the benefits of doing it right? Our step-by-step process will undoubtedly save you time, money, materials, and headaches.

To get off to the right start and avoid surprises later on, there are a couple of things to do before the digging starts.

1. Assess the property where the pond will be located and take note of all the existing structures and utilities.
2. Using a site or laser level, determine the high and low areas where the pond will most likely be positioned. (see sidebar to right)

esp Usando un PLS2E Palm Laser Transit

Using a PLS2E Palm Laser Transit

There are several different types of site levels sold today. It seems like a lot of contractors are starting to purchase the laser level brands for the simple fact that it only takes one person to calculate levels around the job site instead of two, saving the contractor an enormous amount of time and labor. In this section we will illustrate how to use the PLS2E Palm Laser Transit.

There are four basic components of the laser site level or a linear transit: (A) The Palm Laser® or site level, (B) Laser Detector, (C) Tripod, and (D) measuring rod. Laser transits or site levels are a staple in the pond construction industry. The basic principle is to establish a level plane from which to take accurate measurements.

esp Hay cuatro componentes básicos del nivel del sitio del láser o de un tránsito lineal: (a) The Palm Laser® o nivel del sitio, (b) Detector del láser, (c) Trípode, y (d) caña que mide. Los transitos del láser o los niveles del sitio son muy importantes en la industria de construcción de estanques. El principio básico es establecer un plano del nivel para tomar medidas exactas.

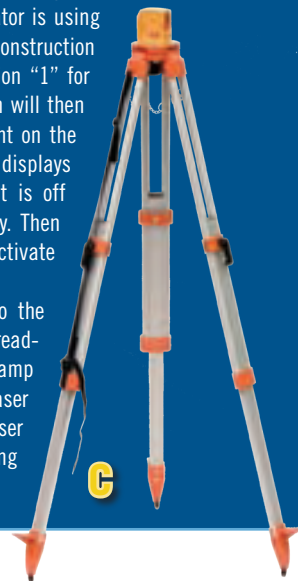
Here's How It Works:

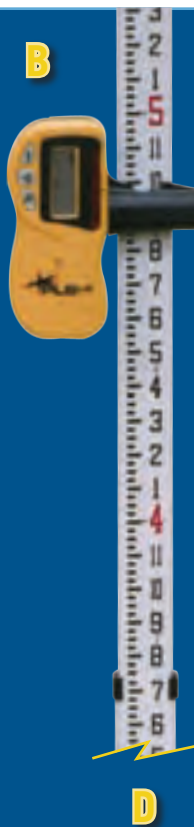
Set up the tripod in an area where it can stay for the entire day, but close enough to provide accurate measurements. Even though the Palm Laser® has a working range of +/- 100 feet, it usually is a good idea to have it close to the pond so the operator can use the middle range numbers on the measuring rod. For example, if your tripod is set up 50 feet away from the pond, this area may be 3' higher than your pond elevation. If this is the case, the operator will be reading a higher measurement on the measuring rod and then when the excavation is complete, the operator will have the rod in the bottom of the pond which will add another 2 feet on top of that. The result is that the operator may run out of room on the 9' 10" measuring rod when sliding the laser detector on the rod.



1. Even though the Palm Laser® is self-leveling, the top of tripod should be somewhat level and securely stationed in the ground.
2. The Palm Laser® is then attached to the tripod with the large center screw located on the tripod.
3. Once the Palm Laser® is secure, press "ON" to scroll through the different construction laser options. There will be four options available, but if the operator is using this unit only for pond construction purposes, then select option "1" for the horizontal beam which will then display a green L.E.D. light on the back of the unit. If the unit displays a red light, then the unit is off tilt or not leveled correctly. Then press the "Pulse ON" to activate the unit for outdoor use.

4. Connect the rod clamp to the measuring rod by simply threading the set screw on the clamp to the back side of the laser detector. Now attach the laser detector to the measuring





rod by closing or opening the clamp screw. (E) Once attached to the measuring rod, the operator will notice reference indicators on the clamp that are points aligned with the detector that will read the beam from the Palm Laser®, giving the operator a measurement on the rod.

5. To use the laser detector, press the “ON/OFF” once to turn it on. The unit will beep and the display will show to confirm that the unit is ready for use. Press the “ON/OFF” button again to shut the unit down. It also will shut down automatically if the unit is not used for 30 minutes.
6. Now the operator places the measuring rod in several different locations around the pond’s perimeter. At each location the laser detector will beep and illustrate what direction the unit has to slide on the rod by showing up and down arrows. Once the display on the laser detector shows a steady horizontal line, secure the clamp tightly to the rod and record the number that is in-between the reference indicators on the front side of the rod. Each number on the rod is read feet first, then inches.
7. This will give you an idea of the surrounding topography. The important thing to remember is once the level is set up, it does not move, the measuring rod does. As the rod goes down into a hole or depression, the measurement increases. As the rod goes up to a high spot or hill, the measurement decreases. These numbers are relevant in establishing a water level. You may ask why we’re fussing about an inch, but when it comes to where the water level is supposed to be, an inch is a lot. On an acre pond, an inch is equal to 28,000 gallons, so . . . make sure you get it right.

esp **NAquí es Cómo Trabaja:** *Instale el trípode en un área donde puede permanecer todo el día, pero debe de permanecer cercano para proporcionar medidas exactas. Aun cuando la palma Laser® tiene un alcance de +/- 100 pies, es*

generalmente una buena idea de tenerla cerca de el estanque para que el operador pueda utilizar los números medios de la caña que mide. Por ejemplo, si su trípode esta localizado a más de 50 pies de distancia del estanque, es posible que tenga una diferencia de 3' más alto que la elevación del estanque. Si éste es el caso, el operador leerá una medida más alta en la caña y entonces cuando la excavación este completa, tendrá 2 pies más de profundidad. El resultado es que se le puede terminar el espacio cuando este poniendo el láser en la caña.

1. Aunque la palma Laser® automáticamente se nivela, la parte de arriba del trípode debe de estar al nivel y colocado con seguridad en la tierra.
2. Entonces la palma Laser® se une con el tornillo grande de centro situado en el trípode.
3. Cuando tenga la palma Laser® bien asegurada, presione “ON” para investigar todas las opciones que ofrece. Habrá cuatro opciones disponibles, pero si el operador está utilizando la palma solamente para los propósitos de construcción de estanques, entonces seleccione la opción “1” para que exhiba una pantalla L.E.D de tras de la unidad. Si la unidad exhibe una luz roja, entonces está de inclinación o no esta nivelada correctamente. Entonces presione el “Pulse ON” para activar la unidad para el uso al aire libre.
4. Conecte la abrazadera de la barra con la caña simplemente roscando el tornillo de presión en la abrazadera con el lado trasero del detector del láser. Ahora una el detector del láser a la caña cerrando o abriendo el tornillo de la abrazadera. (e) En cuanto este unido a la caña, el operador notará los indicadores de referencia en la abrazadera que son puntos alineados con el detector que leerá la viga de la palma Laser®, dando al operador una medida en la barra.



TIP from TEAM AQUASCAPE

The Palm Laser® has a self-leveling pendulum mechanism inside, so if there is a nearby table or deck railing that is just about waist high from the pond level then simply rest the Palm Laser® on it. Making sure that it won't get knocked around and/or moved on accident. This will eliminate having to use the tripod near the pond site.

5. Para utilizar el detector del láser, presione el botón “ON/OFF” una vez para que se active. La unidad sonara y la pantalla demostrará que esta lista para usarse. Presione el botón “ON/OFF” otra vez para apagarlo. También se apagara automáticamente si la unidad no se usa por 30 minutos.
6. Ahora el operador coloca la caña en varias localizaciones alrededor del perímetro del estanque. En cada localización el detector del láser sonara e ilustrará en qué dirección tiene que resbalar la unidad en la caña hacia arriba o abajo demostrando con flechas la hacia donde debe de mover la unidad. En cuanto la pantalla en el detector del láser demuestre una línea horizontal constante, asegure la abrazadera firmemente a la caña y registre el número que está entre los indicadores de la referencia sobre el lado frontal de la unidad. Cada número en la caña se lee los pies primero, entonces las pulgadas.
7. Esto le dará una idea de la topografía circundante. Es muy importante recordar que en cuanto se instale el nivel, él no se mueve, la caña es la que se mueve. Si la caña baja, la medida aumenta. También si la caña sube, la medida baja. Estos números son relevantes en establecer un nivel del agua. Usted puede preguntarse porqué nos estamos quejando alrededor de una pulgada, pero deben entender que una pulgada cuenta mucho. Por ejemplo en un estanque de un acre, una pulgada es igual a 28,000 galones! Eso sí es una diferencia grande.

CONSTRUCTION GUIDELINES

Ledges

Purpose of Ledges:

Safety

If someone were to accidentally or purposefully walk into one of our ponds, it would be like walking down a gradual staircase, not a steep and slippery, dangerous drop-off.

Strength and Stability

Terracing is much more stable and less likely to collapse than a steep, tall wall.

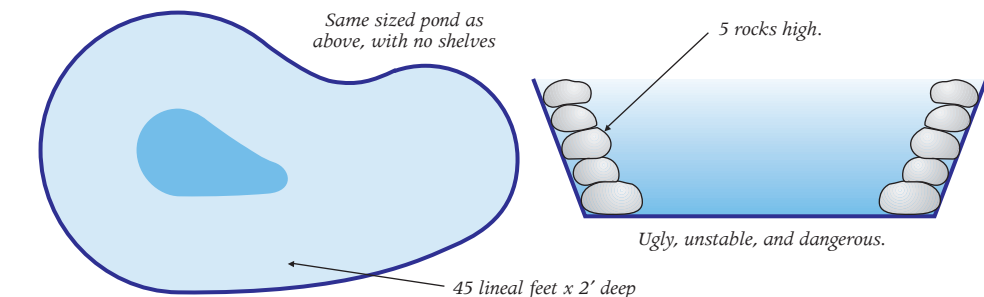
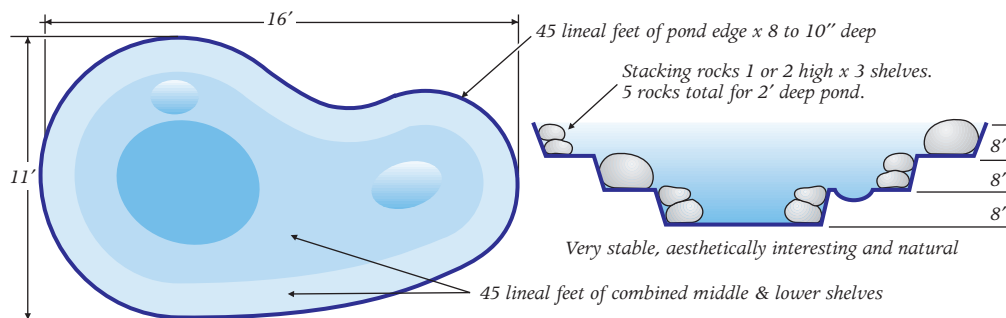
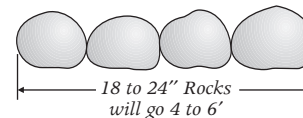
Aesthetics

Our ponds are very clear, and you will see the bottom contours, adding interest to the pond's interior.

Aquatic plants

The different ledge depths are perfect for planting the many different species that are available.

- Marginals will grow in 1 to 12" of water.
- Water lilies prefer 12 to 36" of water.
- Oxygenators prefer 12 to 36" of water.



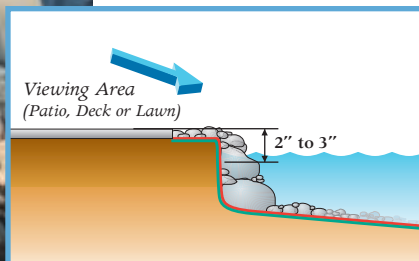
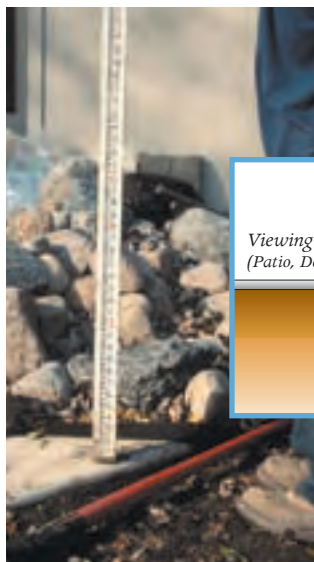
Stone Usage

Using our formulas, a 11' x 16' pond is 176 ft.² divided by 65 = 2.7 tons of rock. We always round up, so the new number is 3 tons of boulders. This is an average and if we want some character stones we would add another half ton, bringing it to 3½ tons.

The top ledge of an 11' x 16' pond has the greatest perimeter. It's approximately 45' long. Using a mix of stones we would need 1½ to 2 tons.

The middle and lower shelf combined are approximately 45' long. We would need another 1½ to 2 tons. Our estimated amount of stone was 3½ tons and it should be fairly accurate. If the pond were excavated without shelves, not only would we need an extra 1½ to 2 tons of stone to cover the steep walls, it would also take several more hours to excavate.

The Site Assessment



Go around the pond perimeter to determine the high and low areas in relation to the main viewing area. Most of our ponds are located next to a

patio, so the patio would be the starting point (A). We like the water to come right up to the viewing area, so we typically set the water level 2 to 3" below the level of the patio. Once the water level is established, we make the entire pond perimeter a minimum of 2" above the water level (B).

At the back edge of the pond, where the waterfall is located, the level would be much higher, depending on the final waterfall height. All measurements taken from this point forward will be in direct relationship to the water level!

esp Analicen el perímetro para determinar los lugares altos y bajos con relación al área principal de vista. Casi todos nuestros estanques están localizados al lado de un patio, así es que el patio sería el lugar principal de donde empezar. Nos gusta que el agua llegue al área principal de vista, así es que típicamente establecemos el nivel del agua entre 2 a 3 pulgadas bajo el nivel del patio. Una vez que el nivel del agua está establecida, hacemos todo el perímetro del estanque un mínimo de 2 pulgadas sobre el nivel del agua.

En el borde de atrás del estanque, donde la cascada está localizada, el nivel sería más alto, dependiendo de la altura final de la cascada. Todas las medidas que Ud. toma desde este punto en adelante serán relacionadas directamente al nivel del agua.



CONSTRUCTION GUIDELINES



Una forma fácil para medir es el filo de la pála que mide como 10 pulgadas.

An easy gauge while digging is the shovel blade. It's about 10".



The First Ledge

Now you're ready to dig the first ledge (A). It's typically 6 to 10" deep and should be dug around the perimeter of the entire pond (B). Remember, this ledge will be covered in gravel, so a ledge that is 6" deep will become a ledge that's 4" deep after the gravel is installed (C).

Ledges can vary according to their usage, but they do not have to be perfect. Remember, our goal is to copy nature, and natural ponds don't have perfectly level or symmetrical ledges graduating towards the bottom of the pond. When the first ledge is completed, mark out the next area to be excavated (D).

esp El Primer Borde

Ahora ya está listo para excavar el primer borde (A). Típicamente debería de ser entre 6 a 10 pulgadas de profundo y debería de ser excavado alrededor del perímetro del estanque entero (B). Recuerda, este borde va a ser cubierto en grava, así es que un borde de 6 pulgadas se va a convertir en un borde de 4 pulgadas después de que uno instale la grava (C).

Bordes puede variar de acuerdo a como sean usados, pero no tienen que ser perfectos. Recuerda, nuestra meta es en copiar la naturaleza, y estanques naturales no tienen bordes perfectamente leves o simétricos que van bajando hacia el fondo del estanque. Cuando el primer borde es completado, marque el siguiente lugar que va ser excavado (D).

Berm Building

During the excavation phase, the filters and piping are laid as well. The BIOFALLS® filter is always set first, and the flexible piping follows. This is important for peak efficiencies of the crew.

The excavated soil is used to create the berm around the BIOFALLS® filter and its size should be equivalent to the size of the pond. In other words, if the pond is 11' x 16', and 2' deep, the berm should be 11' x 16' and 2' high. If the BIOFALLS® filter is set higher, more soil will be needed to disguise the waterfall and may seem out of place. If it's set lower, the berm will need to be more spread out in order to use the soil. Each site is evaluated by the salesperson as to how high or low the waterfall should be.

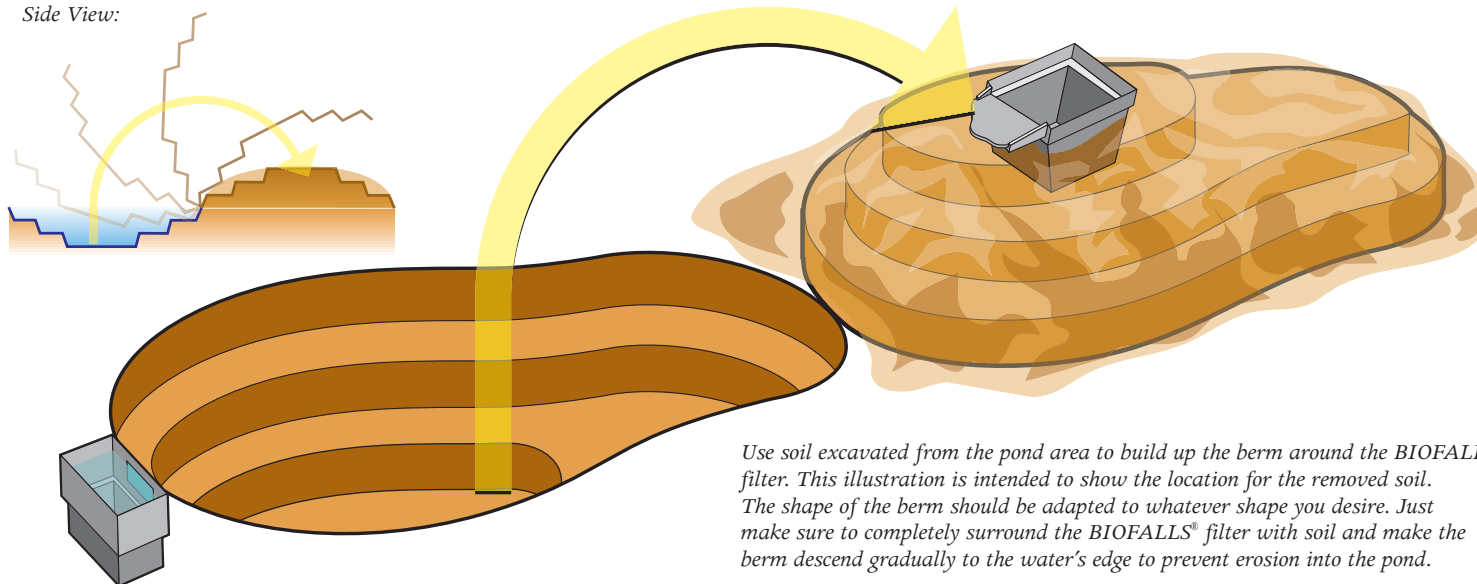
Soil usage is often an overlooked part of the construction process. **Our crews rarely remove soil from a project** and if the quality of the soil is poor, organic topsoil is brought in to be used for future plantings. The larger and broader the berm, the easier it will be to naturally incorporate plantings to help a water feature reach it's full potential.

esp Construyendo BERMES (Berms es la tierra alrededor de la BIOFALLS®)

Durante la excavación, los filtros y las pipas también son tendidas. El BIOFALLS® siempre es tendido primero, y después la tubería flexible sigue. Esto es importante para la mejor eficiencia del equipo de construcción. La tierra excavada es usada para crear el BERM alrededor del BIOFALLS® y su tamaño debería de ser equivalente al tamaño del estanque. En otras palabras, si el estanque mide 11 pies por 16 pies, y dos pies de profundo, el BERM debería de medir 11 pies por 16 pies y dos pies de alto. Si el BIOFALLS® es puesto más alto, la tierra será necesitada para esconder la cascada y se verá extraño. Si es puesto más bajo, el BERM va tener que ser más extendida para utilizar toda la tierra. Cada locación es evaluada por el ventor para ver que tan alto o bajo la cascada debería de estar.

El uso de la tierra casi siempre es olvidado durante el proceso de la construcción. Nuestros equipos muy raramente remueven tierra de un proyecto, y si la calidad de la tierra es muy pobre, tierra orgánica es traída para usar en proyectos en el futuro. Entre más grande y amplio el BERM, más fácil va a ser incorporar plantas naturalmente para ayudar un rasgo de agua llegar a su potencial.

Side View:



Use soil excavated from the pond area to build up the berm around the BIOFALLS® filter. This illustration is intended to show the location for the removed soil. The shape of the berm should be adapted to whatever shape you desire. Just make sure to completely surround the BIOFALLS® filter with soil and make the berm descend gradually to the water's edge to prevent erosion into the pond.



Challenges of Poor Soil Conditions

Because we've built ponds all across the United States, we know that there are many soil types that can cause all sorts of pond construction challenges. Our home base is located in the western suburbs of Chicago, and we typically deal with a small amount of topsoil with the remainder being a mix of clay and gravel.

Clay Soil

For us, spring and fall are the best times for excavation because the clay is softer, while mid-summer requires a pick-ax to chisel through the hardened clay. We know that the soil in certain parts of Chicagoland is notoriously bad and the selling price of the job should reflect the extra time needed to complete the excavation in difficult soil.

Rocky Soil

In addition to longer digging time, rocky soil has other challenges. One of them is a hard sub-surface to deal with after the digging is complete. In this instance, we lay down several layers of underlayment to act as additional cushion under the liner. In severe cases, place a layer of the fabric on top of the liner where larger boulders will be set.

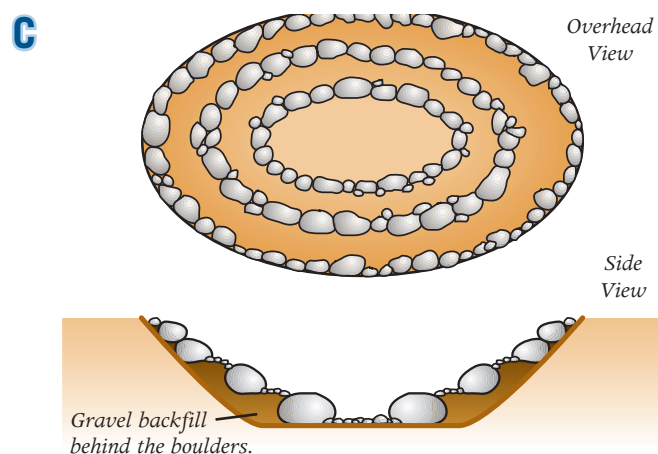
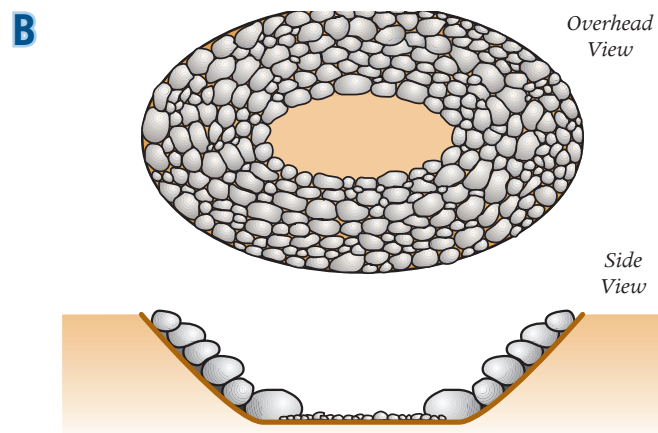
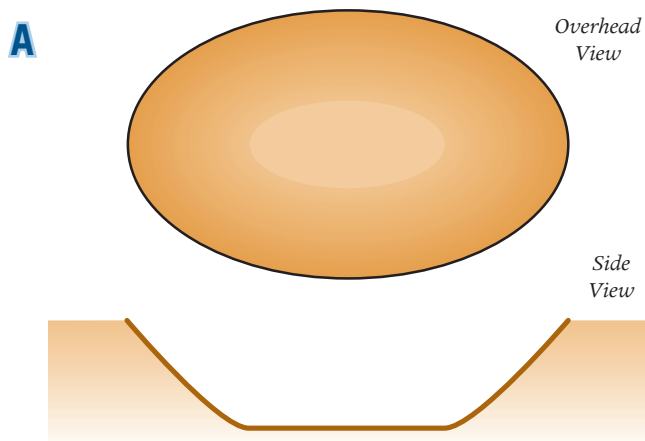
Bedrock

Bedrock is tougher because it takes much longer to dig than in any other soil conditions. Depending on where the rock layer is found, the pond may need to be built totally above grade, or half and half. The deeper you can dig, the better the pond will look. It's tough to make a pond look natural when it's sitting 18" above the surrounding soil, but it's up to the sales people and clients to decide the best course of action. In certain parts of the country jack-hammers are a necessary piece of equipment. It's the only way to cut through the hard layers. We know it's a slow process, but extreme conditions call for creative solutions.

Sandy Soil

In sandy, loose soils the digging is a piece of cake, but it's almost impossible to cut a ledge into it. The easiest way to handle this problem is to dig the pond with a flat bottom, with the side gently sloping into the middle (A). Once the pond is dug, you have two options:

- Place boulders on the sloping sides, and put gravel on the bottom (B).
- Place boulders on the bottom and backfill behind the rocks creating gravel and boulder terraces. Planting areas and irregular ledges can be created with this method (C).



TIP from TEAM AQUASCAPE

Tools for backyard ponds are readily available, and most contractors probably already have them. They include:

- Sturdy shovel: Rough excavation.
- Flat shovel: Finishing and shaping.
- Pick-axe: Tough soil.
- Pry bar: Removing larger stones.
- Wheelbarrow: Moving materials.
- Site level: Accuracy of project.

The only specialized item is the site level. If you're new in the business, and don't want to purchase one, they can be rented for about \$30 a day. They cost about \$250 to \$300 for a basic set-up, and they're well worth the investment.

Laser levels do the same job as a standard site level, except they only require one person to operate

and they're very accurate, even at several hundred feet. This makes them a necessity on larger projects. Laser levels have come down in price recently, and you should expect to pay between \$800 and \$1200, depending on features. Being in the pond business, we also opted for the one that's waterproof.

Fish Caves

If your client is looking for an interesting addition to their pond, as well as a unique hiding spot for fish, consider installing a cave or underwater tunnel. It's easy to do during the excavation phase.



- *Simply cut the shelf out where the cave will be located.*

- *Place a large piece of drain tile into the excavation to check for the fit.*



- *Remove the pipe and install the liner.*

- *Place the pipe back into the excavated area and install the rocks as usual.*



As you can see, after the installation is completed, it will blend into the rest of the pond bottom, providing your fish with a custom home. For those of you who have visited Aqua Terra, Greg has a twenty-foot long, four-foot wide cave that you can actually swim through!



Large Projects

On larger projects of 600 square feet or more, we bring large equipment in to help with the excavation, large boulder placement, and material handling. Once the decision is made to bring in a piece of machinery, we take full advantage of it. Typically, these projects run over \$10,000.

Skid-steers and backhoes are the two most common pieces of equipment, but cranes and loaders can be used as well. A skid-steer can be effective in excavating the top shelves of the pond, but the bottom and final shaping should still be done with hand tools. A good backhoe operator can maneuver around enough to do quite a bit of digging, but some handwork is still necessary to clean things up.

We do not own any heavy machinery because we can't justify the cost, so we subcontract all of our machine work. The cost of the subcontractor is calculated into the sell price of the project where he'll be used. For more information on large scale projects and using machinery, see *chapter 16*.

As you can see, there is a little more to excavation than meets the eye, but it's still not too difficult. In fact, it's pretty basic, and actually, just a lot of common sense. If you start your project out on the right foot and avoid creating extra work for yourself, everything else will fall into place and you'll undoubtedly save time and money in the process.

