

Waterfall & Pond

Construction Manual



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Waterfall & Pond Construction Manual



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INTRODUCTION

Whether you are interested in the business of designing and constructing waterfalls and ponds for a living, or just interested in building a water feature for your own enjoyment, this book is for you.

Waterfalls and ponds have been my life. As a child of ten I remember riding around the Michigan country-



side with my mother, picking up special rocks from farmers' fence rows. To the farmer these beautiful colored rocks were for their farming equipment, but to my mother they were jewels for adorning the waterfalls she created on our six-acre estate. I can still recall the excitement each time a new treasure was discovered. "Wow," she would exclaim, "Check this one out! Have you

ever seen such a beautiful rock?"

I have to admit, my appreciation for rocks and their



unique beauty was not the same back then. I knew I would have to carry that rock she thought was so beautiful back to the car. Later, while constructing the waterfall, she would often ask me, "Remember where we found this one?" Every collected rock found a special place in her creations.

Over the years I had constructed several water features, both indoors and out. But it wasn't until 1982 that waterfall



construction became a permanent way of life. This was when I built a 15-foot tall wa-

terfall in the restaurant of the Landmark Hotel in San Diego.

I received so many requests from the many patrons at the restaurant who wanted one of their own, that I had to give up building homes and restaurants and devote full time to building water features. The truth of the matter is, building waterfalls and ponds is more exciting and profitable.

Twenty years later, I am still constructing waterfalls and ponds and have over 1,800 projects to my name. What is amazing is that I have never designed or built two projects the same. There is no job too big or too small. I recently completed a waterfall on Mount Soledad in La Jolla, California that is 135 feet tall



A small portion of the 135 foot tall waterfall with a stone quartzite stairway climbing along side.

and takes up the complete back yards of three adjacent homes.



Designing and building custom homes and restaurants prepared me in ways for what I do now. As a contractor I had to learn every aspect of construction: design, engineering, layout, woodworking, electrical, plumbing, concrete and more. While what I accomplished was indeed rewarding from the standpoint of working with my hands and creating many beautiful things, there was still something

important missing. I had never built that brought my clients so much joy, pleasure, peace and relaxation as when I created a natural water feature. It was only when I started constructing waterfalls and koi ponds that clients would call me months or years later to thank me again and share how much it meant to them. No one ever did that when I was building homes or remodeling. The only calls I

would get months later were to complain about something. The same is true with any form of earning a living that your heart is not in. I became burnt out and bored after only seven years in construction. It was just a job by then. Now, on the other hand, my work is my hobby and a source of joy and fulfillment. I am creating something that many of my clients have said brings them more joy and pleasure than anything they have ever spent money on. What more could I ask for?

The purpose of this book is to share with others what I have learned over years of trial and error (much error). Of the many books I have read to



learn more about water feature construction, few authors had much to say about construction techniques that they learned or discovered from their own experience. Not to mention that, collectively, thousands of pages were filled with pictures of

water features that the average homeowner could not relate to



or envision in their own yards. These photographs of waterfalls are usually surrounded by vegetation with 20 to 30 years of growth and natural aging;

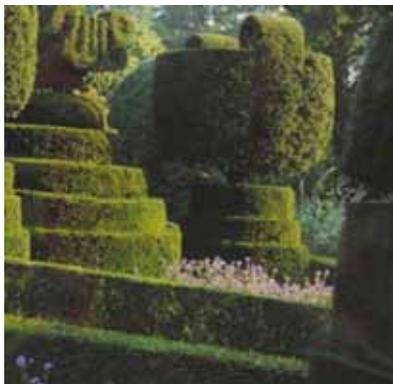


Hardly your average front yard.

elegant formal fountains gracing the courtyards of palatial estates; castles with labyrinths of trimmed hedges and im-



maculate and carefully mani-



cured gardens of exotic plants and topiary.

This book contains enough information for professional contractors to start building water features and earn a six digit income, and still have time for a few vacations each year. It will also allow homeowners with limited funds to build their own waterfall and pond while savings thousands of dollars. A person with basic construction skills can easily perform most of the work themselves. If they have no prior experience, they will learn how to be their own contractor, by hiring subcontractors, and still save hundreds of dollars while maintaining full control over the outcome of the project.

This book will teach contractors how to reduce their

overhead and increase their net profit from the national average of 5 to 7% to well over 50% while doing something fun and rewarding. You will learn to create something that will supply continual joy, pleasure and relaxation to your customers. You will soon discover that you will receive many compliments, much



praise and appreciation for what you add to their life and property. The water feature will become a focal point and their main source of entertainment at



home. There is rarely a day that goes by that they won't visit the pond to see how everything is pro-

gressing. Or sit lazily by its edge, relaxing and enjoying the



healthy benefits of the waterfall. It's like having the Discovery Channel in your back yard!

Watching the amazing antics of the fish when they spawn, tracking the metamorphosis of a tadpole into a frog, the fighting of two crayfish, sometimes even to the death or loss of a claw for the right to mate with the female waiting on the sidelines. The awesome escape



of a dragonfly from its cocoon prison; dis-



Mating dragonflies and an infant dragonfly shortly after hatching.

covering one morning that you have a new addition to your aquatic family. The delight in



naming all your favorite friends; even the sadness from the loss of one of them to a predator.

You will be pleased to discover that the caliber of people who desire to have ponds and waterfalls built for them is much higher than the average clientele of contractors. This is usually noted up front by the fact that they love animals. Ninety percent of my clients



have loving dogs or cats. The majority of them become friends of mine and regularly greet me with a hug when I stop to visit or check on their pond. About one in five reward me with a cash bonus or lovely gift upon completion of the project.

One client was so moved by what I had created that she took a day off work and spent it shopping “for just the right gift that would express how she felt.” She began by handing me a letter with ten hundred dollar bills inside. The letter expressed her deep feelings of gratitude and appreciation; how all her life she had dreamed of someday having a waterfall and



pond in her yard, but never dreamed it would be so beautiful. She then went back into

the house and brought out a wrapped gift and explained, with tears running down her



cheeks, that the letter or money did not properly express her true feelings of appreciation, but that she found something that would. It was an original signed and numbered painting by Thomas Kinkade called “Bridge of Faith” -- a picture of a stone bridge spanning a sparkling creek, meandering through a forest with the sunlight filtering through the trees and glinting off the water's surface.

This sums up why I love what I do! When my wife and I got married, the majority of our friends and guests were my waterfall customers. It is true that you

should “do what you love and the money will follow.”

Years ago I met someone who had a large and elaborate system of salt water aquarium tanks with thousands of dollars



worth of exotic fish and sea life. I was so enthralled by their beauty, charm and all the different species being together, I decided I wanted the same thing. Fortunately, I listened to the owner of this collection and heeded his advice to learn all I could about his hobby of salt water aquariums.

I purchased the most expensive book I could find on the subject, complete with hundreds of beautiful color photos. After looking at all the pictures first, I started to read the book. By the end of chapter 2 I turned loose of my salt water fish dreams.

No, you don't just fill up an aquarium tank, throw in some salt and fish, and live happily ever after! There's a delicate chemistry to maintain with the water, bacteria, and other life

forms that have to be established first. Then there's the introduction of fish, with that continual maintenance.



Why is it that the most beautiful aquatic creatures require more investment and maintenance than do their less exotic, fresh water cousins?

I ended up purchasing a small tank with some fancy goldfish who later all died because I didn't read up on the effects of chlorine on fish (a whole other story). I have received hundreds of phone calls over the past twenty years from disgruntled amateur pond

builders asking, “What do I do next?” or, How deep do I have to dig this? I followed all the directions that came with the pond kit, but it still leaks! My pond looks like pea soup -- what should I do? I piled up rock on the edge of the pond for a waterfall, but the water is leaking out the back.” They all reminded me of myself, with my enthusiasm for having my own salt water fish aquarium! These folks thought it would be easy to build their own pond. Just dig a hole, fill it with water and throw in the fish. Isn't that what happens in Nature?



CHAPTER 2

CONCEPTS & DECISIONS

If you are considering a water feature as an investment in your property, may I add several words of caution. Down the road these may save you the heartache, sorrow and aggravation of dirty, murky, green or smelly water, sick or dead fish, leaky pond or waterfall, or high maintenance and energy costs. You could get twenty opinions on how to build your water feature, and all twenty would be different.

Here are some of my own opinions for you to think about and, I hope, benefit from. **1.** Take your time. **2.** Plan it out. **3.** Research the subject thoroughly. **4.** Seek out an expert in the field. A few years of experience are important. **5.** Make sure they are licensed and bonded. **6.** Accept only concrete and steel rebar construction. Never use a liner. Proponents of liners will claim there is a 40 or 50 year warranty on the liner. Not true! It's only true if you leave the liner in the box. It would work only in a perfect world – where



there were no gophers, squirrels, chipmunks, rats, tree roots, sharp rocks, pebbles or other such objects. Once you have a hole, it is impossible to find. Even a pin-hole will allow 5



Typical Installation

are difficult to maintain. Debris collects in them, requiring frequent cleaning. Submersibles can leak oil that may kill the pond inhabitants or, worse,



short out and create a shock hazard. **8.** Use a biological filter to help eliminate nitrates and nitrites from the water. (I recommend a pressurized back-flushable filter, not a gravity flow.) **9.** Install a

skimmer for removal of surface leaves and debris. **10.** Use two anti-vortex drains on the bottom of the pond for suction line to prevent whirlpools and fish or turtles from being sucked against the drain. **11.** Make sure your pond is a minimum of three feet deep to regulate water temperature in



the summer months and to discourage herons and raccoons from dining out. **12.** Build caves and ledges for turtles and fish to hide in. **13.** Install an ultraviolet light to kill bacteria that cause smells and pathogens that kill fish and algae spores that create green water. **14.** Do not use me-



chanical auto-fill valves; only use an electronic one like the AquaFill System. It does not stick or malfunction which could result in pond overflow



and dead fish from chlorine poisoning. **15.** Use plenty of water plants in the falls and pond. They provide extra oxygen and food for the fish and

act as natural filters, utilizing the nitrate nitrogen in the water. **16.** Use a high-efficiency, out-of-pond pump that conserves energy and by operating it 24 hours a day, the biofilter will receive a continuous flow of oxygenated water, which the anaerobic bacteria require to live. The bacteria will die in as little as two or three hours without the constant flow of oxygenated water and nutrients.

The bacteria are essential in breaking down hydrocarbons, nitrates and nitrites in the water. **17.** Make sure you have proper drainage around the pond and waterfall so runoff from the rain storms does not enter the pond and contaminate it with silt, fertilizer, pesticides, etc. Acid rain can also affect the pH of a pond. **18.** Learn basic pond maintenance. (An ounce of prevention is worth a pond cure.)

Okay, now to the practicalities. Before installing a water feature you need to ask yourself several important questions first: What is your budget? How much can you spend on the entire project? You could spend \$3,000 on a water feature and find out you

still need an additional \$1,000-1,500 for plants and amenities, such as a deck, gazebo, walkways, fish or landscape lighting in the pond, waterfall and lawn. Other possible extras are a biological filter, auto-fill for pond, skimmer, back-flushable bio-filter, and more.

How big is a water feature? If you are building your own, then structurally size is not that big an issue! I would charge the same price for a 3-foot high waterfall as I would for a 5-foot; the same for a 3 by 5-foot pond as a 4 by 6. There is only a \$200 difference in cost between the 1,000 and 2,000 square feet of concrete shell surface. Your main concern about size should be space, not cost. How much of your yard can you sacrifice? Even if the space between your house and the property line fence is limited, a water feature can be incorporated.

Small ponds 1½ to 3 feet deep can facilitate a sump pump located within the pond. Even though a sump pump is inexpensive, it consumes much more energy than an above-ground pump. A pond any deeper than 3 feet requires an exterior pump for better acces-

sibility and maintenance, and at a higher cost. But they pay for themselves in a short period of time with the energy savings. Also, larger ponds require greater filtration, more cleaning and maintenance.

The size of the falls will determine the size of the pump needed. The higher the falls, the bigger the pump needed to supply the water and the greater the cost for electricity. Height creates head pressure which requires more energy and is the major factor in operating cost.

How much entertaining will you do? Will you need a deck? If so, how big?

You might consider placing a pond next to an existing deck. Many people do just the opposite, they build a pond and then construct a deck beside it. In this case, you can take advantage of an existing deck and construct an open stairway (stair bridge) to span the pond. This affords unique access to the opposite side.

Will you have adequate room for table and chairs? Do you want a spa? Or a fire pit or barbecue? Enough lawn for games? Where do you spend most of your outdoor leisure



This was an existing deck that was built over a sloping bank which allowed us to create the illusion that the house was built atop the waterfall that cascades from under it. The stairway acts as a bridge from the deck to the back yard spanning the pond which runs along the entire length of the house at three terraced levels with the waterfall wrapping around the back side.



time? That is the area for your waterfall! The waterfall will bring you the most enjoyment,



Above: This client only had five feet between this window and the property line fence, with nothing but the fence for a view. With a little imagination and a few rocks and plants, they are now enjoying a natural tropical scene with a waterfall and small pond with fish.

Below: A view of the outside area from the corner of the house showing a natural flagstone path leading to the pond and waterfall.

Notice how the falls wrap around from the surface of the fence to the house on the other side of the fireplace and picture window. Also the same flagstone used to create the path was also utilized to construct a coping band around the front of the pond to allow access to the window for cleaning and a place to stand to enjoy the pond and its inhabitants.

therefore it should be located closest to the area where you plan to spend most of your time out of doors.

Do you want to see or hear the waterfall from indoors?



Consider adding an exterior patio or French doors to your house to access your water feature area.

Do you wish to have fish and other aquatic creatures? Long term, a properly maintained nitrogen cycle costs less than maintaining a pond that use chlorine and other chemicals. Fish, plants and proper bacteria are needed for healthy pond and nitrogen cycle. Once properly established, a healthy fish pond is virtually maintenance free.

Are you willing to remove or replace certain trees or bushes to enhance the waterfall and pond? Some trees have very aggressive root systems that can literally move concrete as they grow, causing cracking

and upheaval. Certain trees can contribute a great deal of debris to the water feature that fouls the water and may cause premature failure of the filter system.

What type of rock do you want? A commonly used rock is cobble stone. But because of the round shapes, water rolls



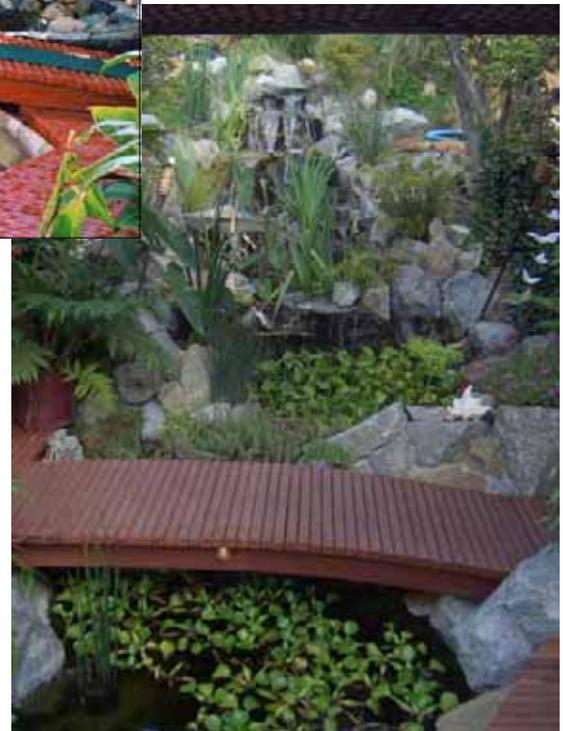
over the surfaces and creates a minimum of sound or visual effect. In contrast, irregular, angular, sharp-edged granite or similar rock creates turbulent conditions similar to white water as it flows over the edges.

The greater the “white water” the more sound is produced. Also, a side benefit is the aeration of water which benefits fish and discourages the production of algae. However,

do not attempt to match the color of rock with the decor of the house, brick and other features of your home. Stay natural – contrast is good!

What about electrical supply for the pump and equipment? In 23 years I have never seen the electrical costs for supplying power to the equipment site exceed \$2,200, and the average is less than \$500.

What about water for an automatic water filling sys-



Top: My personal waterfall constructed of cobblestone. Bottom: After remodel and replacing cobble with angular granite rock.

tem? Water is very accessible in any household and getting it

to the water feature site is a minor expense.

CHAPTER 3 THE IMPORTANCE OF DESIGN

“STYLIN”

Deciding right away what style and what size water feature you want will give you a better sense of your ability to create it yourself, or whether you need professional assis-

tance. For example, it is one thing to mix up one yard of concrete in a wheelbarrow for a 3 by 6 ft. pond, and another when it's eight yards for a 10 by 20 ft. pond. Ten yards of concrete can be delivered by truck and pumped into place in the space of one hour.

Building a large water feature can involve a great deal of work and time. Do all your

planning well in advance of construction and define as precisely as possible the atmosphere you want to obtain. Is your vision one of a small, ornamental Japanese koi pond, or do you want to create a natural waterfall and pond with water plants, fish and amphibians? List all of your preferences before starting your project.

SITE FOR SORE EYES

Several considerations must be made in choosing the site





for the water feature. If you desire plant and animal life, then sunlight is essential for the pond's nitrogen cycle. Trees may limit the amount of sun and can be a problem with leaves falling into the pond. Safety should always be a factor if there are small children; you may need to consider appropriate fencing or other solutions discussed in a later chapter.

If your pond is constructed on the edge of a canyon, hill or

A pondless waterfall affords safety to small children. When the children are grown the pond can then be filled to the top of the seat wall.





Above: The fence was temporarily removed during construction to create an exit stream that appears to be running over the edge of the hill on its way to the lake below. However, the stream actually ends just over the crest of the hill, spilling into a screen covered well which collects the water. A submersible pump directs the collected water back to the pond.



bank, you can incorporate an exit stream or creek.

The water exiting the pond appears to be flowing down the hill. In reality, it travels a short distance over the edge and is then collected in a cistern. This cistern houses a pump for returning the water to the pond, where it returns again by way of the stream. This stream water is a separate system from the waterfall and pond, but appears to be a real overflow rather than recirculated water.

SIZE

Try using your available space to its best advantage and design the largest pond possible for that space, since the bigger the pond, the more stable its biological equilibrium.

A common complaint I receive from clients months after completing their project is, “I wish I had made it bigger.”



Lilies are a good way to shade the pond.

When designing bog plants and deciding on water plants, make sure of the plant’s specific requirements such as space, depth, and so forth. Certain water lilies, for example, need a great deal of room (up to 23 ft. per plant) if they are to flourish. Pond care requirements are, to a great extent, directly proportionate to the number of fish and water



String algae, also called blanket algae.

plants occupying the body of water. One of the best deter-



Hyacinths are also a great shade plant.

rents to algae is shading the pond from the direct rays of the sun. This can be done by spanning a portion of the pond with a pergola or similar structure. The most common and economical method is to cover 40% to 50% of the pond’s surface with lilies and/or hyacinths.

DEPTH

The depth of the pond has a profound influence on the biological condition and health of the occupants of the pond and a depth of 3 feet or more will prevent the damaging effects of abrupt temperature fluctuation. The water will remain cooler in summer, providing better oxygenation for fish, and will protect them in the winter when the surface freezes. An ideal pond for koi



fish is one with varying depths, ledges and caves.

While we're talking about predators, let me tell you my



personal experience. I have lost fish to raccoons, herons, owls and egrets.

shallows. Herons and raccoons love shallows because it gives them a staging area to wait for dinner. Both raccoons and predatory birds have more patience than we do. I've seen a heron stand perfectly still for more than 20 minutes waiting

there are no shallows and the sides are steep and over three feet deep, the fish are relatively safe unless they come to the surface. We design all our ponds with a large number of caves around the perimeter of the pond for the fish and turtles to hide in.



If you want success with the returning company of turtles, simply create a "turtle island" in the center of the pond. The turtles like to feel safe when they come

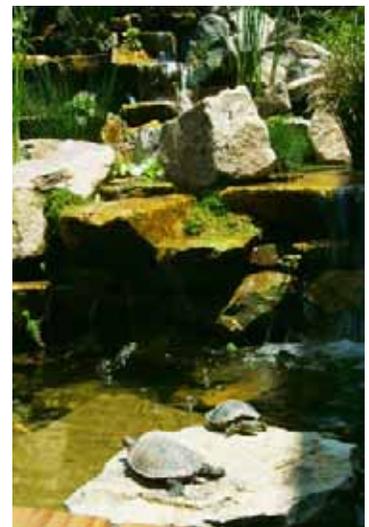


out of the water to sun bathe. Turtles need to dry off to prevent fungus growth on their shells.

If they have an island, they can dive quickly into the safety of the water in



for the fish to come out of hiding. To put it simply, herons are a whole lot smarter than fish! Herons will even regurgitate part of their previous meal to attract the fish to the surface.



Because of a poorly designed pond. Ponds should be built with straight sides, a minimum of three feet deep, and no

The good news is that herons and raccoons don't like to swim after their dinner. So if

any direction at the first sign of danger. Another reason to construct caves is to provide a safe haven for the turtles, fish and crayfish to hibernate in the



winter months.

To break up the straight lines around the perimeter of the pond, we construct bog planters which contain soil that remains soggy, providing a perfect home for marginal water plants such as grasses, papyrus, reeds, cat tail, horsetail, pickerel, water parsley, water pea, and so forth. Sandy beaches can also be created, but instead of sloping steadily into the pond until it reaches the bottom, the beach should drop off abruptly after achieving a depth of only six inches, and the beach effect is created.

SHAPE

Giving a pond a shape that looks natural is not at all

difficult using professional construction. Ponds constructed with plastic liners usually come in two styles, round and oval. They are adorned with a necklace of rock around the perimeter to hide the edge of the liner laying outside the pond. We like to break up the straight lines around the pond's perimeter by giving it a serpentine



shape and constructing bog planters. These planters contain soil that will stay soggy in order to provide the perfect home for marginal water plants such as grasses, papyrus, reeds, cat tail, horsetail, pickerel, water parsley, water pea, and more.

The shape of a pond is an important factor in areas where it will freeze in the winter. The sides should be slightly sloped in order to absorb the hydraulic thrust of ice

that can crack or fracture a concrete pond shell.

SHELVES

Shelves are needed around the perimeter of the pond to allow for the growth of shallow water plants and to provide for a means of escape for small children and animals that may fall in. Sandy beaches can be created, but instead of sloping steadily into the pond until reaching bottom, the beach should drop off abruptly after achieving a depth of only six inches. This gives the illusion of a beach descending slowly into the pond, but

it doesn't go far enough to allow predatory birds or raccoons to wade in for a meal. This short beach allows only minnows, guppies, or small fish to venture into the shallows, and keeps the large fish safe from predatory waders. A lip of concrete is created along the edge of the beach underwater to prevent the sand from eroding and sliding into the pond.

SOUNDS



Beaches add charm, character and interest to any pond. However, a beach, if not constructed properly can provide a ramp for predators to wade in and dine out. These beaches may appear to descend gradually into the pond as most natural beach would. If a crane or egret were to wade in, they would quickly be surprised.

These beaches only extend a foot into the pond and only three or four inches before dropping off vertically, straight down to the floor, three to four feet. The concrete pad for the beach sand has a raised lip along the edge to provide a retainer to prevent the sand from eroding and sliding into the pond.



Sounds mean different things to different people. One person may love the frequencies of a solo violinist. However, to another it may rival on a black board. Yet, if you place that irritating instrument



in a symphony orchestra, it becomes a sound producing calm and relaxation.

And so it is with water



sounds. A stone statue of a small boy issuing a single stream of water, or a Greek maiden pouring water from an urn, even a lion or aquatic

animal spewing a never-ending mouthful of water (what's that all about?) can create a single of tone that is obnoxious to some people and that sends others dashing to relieve themselves.

My belief is that the reason this type of sound is not relaxing to most of us is that it is not a common sound found in nature. If, however, the sound



of a single stream is added to hundreds or thousands of other frequencies, tones and durations, as will be found in most waterfalls, it becomes enjoyable for virtually everyone. During all my years of building waterfalls I have never found a neighbor to complain. In fact, the comment I usually hear is, "I get the benefit of

enjoying the sound of my neighbor's waterfall without having to build my own!"

BUDGET

Budget is always a factor. Because a water feature modifies and drastically changes the garden, its creation can be a complex undertaking. There are many choices available, and therefore cost can vary considerably, as can the time necessary to complete the project.

Everyone is familiar with the cliché, "You get what you pay for." Since after buying your house there is relatively little you could spend your money on that would give you more long-term enjoyment, relaxation and stress release than a natural water feature, you should consider it a worthwhile investment in your mental health and future well-being. Therefore, once you have determined how much you are able to spend, it would be inadvisable to try to save costs by reducing the overall size of your pond and waterfall.

USING SPACE EFFECTIVELY

With the average price of a home in California selling for over \$400 per square foot, it would make sense to utilize as much usable space as possible, including the property sur-



rounding the home. Since California is hilly, many homes



back up to a slope or bank between the houses. This is all wasted land that, with minimal



effort and cost, could be terraced with a deck.

Consider putting a water feature as a focal point for the front entryway to your house. Create a pond or stream which requires a visitor to cross a bridge to get to the door. You can turn a mundane front yard into a scene from *Better Homes and Gardens*.

HEALTH BENEFITS, TOO

It was not known until recently that the majority of pleasure, relaxation and stress relief was not derived from the actual sight or sound of a beautiful, natural waterfall. This was discovered by an experiment involving seven people with impaired sight and hearing (five were blind and deaf from birth, two had their eyes covered and ears disabled by special ear-phones). In addition, they all had their noses plugged. They were then taken to seven different locations in an 8-hour period in San Diego, California: downtown, Balboa Park, the Pacific Ocean (and remember, none of them could see the beautiful waves or hear them crash against the shore or smell the fresh, salty air), a nearby desert, a lake with connecting river, a suburban housing community, and, finally, a large grouping of man-made waterfalls.

These people, who couldn't see, hear or smell, were then asked to list the seven locations in the order that would best

describe where they felt the most relaxed or comfortable. The seven locations were unanimously listed in the following order: ocean, waterfalls, lake/river, park, suburb, desert and downtown. Why was this so? Because of the negative ions! Moving water (waves, falls and rain) generates the largest quantity of negative ions, followed by trees and plants through photosynthesis. Living creatures respond positively to negatively charged

oxygen. The ocean could not be seen, smelled or heard; however, it was chosen as the place that brought the best feelings of well-being because of the negative ions it generated.

An additional experiment was conducted with this same group of people who were taken into seven different rooms, all the same size, temperature and humidity. Negative ion generators were used to simulate the conditions in all

seven of the previously visited locations. Again, all seven participants picked the identical preferences based on the amounts of negative ions present. That is why the moving water in a natural waterfall produces such a calming atmosphere and acts as a stress-reliever.

So, for the sake of your well-being, do not skimp on the size of your waterfall!



CHAPTER 4

“...OVER TROUBLED WATERS”

A bridge does not always have to be a functional structure that gets us from point A to point B with dry



feet. A bridge can have a personality of its own or lend to the personality of your water



feature and its surroundings. There are as many different faces to bridges as there are bodies of water to cross.

Bridges take you to special places – that’s why they were built. Consequently they have the magnetic attraction similar



to a mermaid summoning the adventurer to the other side. These structures not only accomplish that, but in doing so, bridges afford an opportunity to view this otherwise unexplored spot from a whole new angle. It’s similar to experiencing the ocean from the crest of a dune rather than the beach. You might say, it’s the closest we’ll get to walking on water in this lifetime!

A bridge can be as simple as a series of stepping stones, or as awesome as the Golden Gate. Construction materials, styles and expanses create thousands

of possibilities. When designing your water garden, be sure you do so with a bridge in mind. Plan it in a way that

makes one necessary. This can be done in several different ways. Try land-locking a corner section of your yard using a pond or stream.



PLANNING

When planning a bridge, keep in mind that if in the process of spanning the body of water the bridge exceeds

30" above grade, a railing is required by Code.



Railings not only provide safety; they offer charm to a

stones or an arched bridge? Configure your garden so you can incorporate both! [see page 26.] Even a simple bridge can transform and enhance your water feature. However, make an effort to ensure it will blend with the overall design and complement the other features of your water garden. It is best to plan your water garden around a bridge so that you know in ad-

By not planning ahead you may have to compromise the size or shape of your bridge.

APPLICATION

Why do you have a bridge? Where does it originate and where does it lead? A bridge should be functional and practical. It can be functional by getting you to the other side with dry feet. However, if there is nothing on the other side, then why have it? Bridges normally serve a purpose, such as getting around an obstacle. I suppose you could have a



bridge and add great design possibilities. One drawback, however, is that in certain situations railings can block the view of a waterfall or some other point of interest. A railing can also create a spot for pause and reflection, a place to enjoy the moment.

Having a hard time choosing between stepping

vance exactly where it will be located. Then you can make preparations for it, such as a footing or platform on both sides of the stream or pond.



bridge that leads to nowhere or to a dead end, wall or fence. But at least let's put a bench or chair at the other side as a reason to cross.

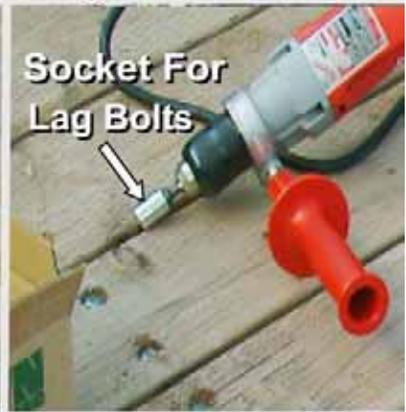
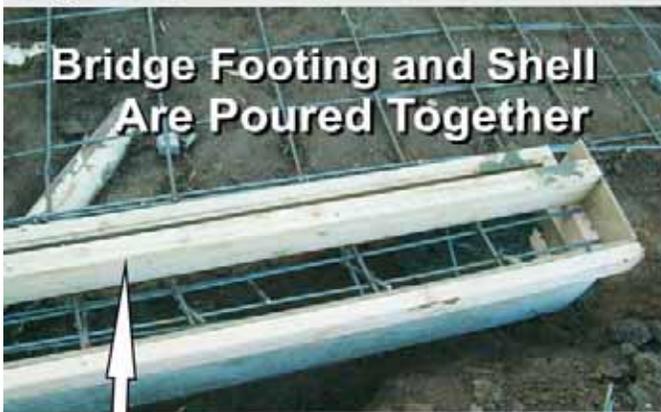


Stepping stones serve as a bridge across the upper pond and an arched wooden bridge spans the lower deeper pond. Stepping stones add charm to any shallow pond.





Wooden bridges should not rest in the dirt on either side, but rather supported by a concrete footing or notched apron as shown below. This footing apron was engineered with rebar reinforcement since this bridge supports golf cart traffic.





SIZE

The height and width of the bridge should be in proportion to the span or length. However, many ornamental bridges are as tall as they are long, making it not only awkward but downright impossible to cross. (Not that you would always need to.) A proportional bridge is not too large or

resemble a lawn ornament or other novelty.

LOW PROFILE

Bigger or taller is not necessarily better. Bridges not only serve their purpose but also allow for closer inspection of aquatic life around it. The width of the bridge should be in proportion to its length, wide enough to cross safely but not so wide that it overpowers the water it is spanning.



Entrance to our store in San Diego.

If your goal is to create a natural, subdued atmosphere in your water garden, I would suggest leaving it natural looking. This means keep ornamentation to a minimum and don't paint it black, jade or fire engine red. However, if you wish the bridge to be the focal point of your garden, especially ones with oriental flavors, then by all means, a jade ornamental arched bridge with railing is in order. Arched bridges create a semi-formal atmosphere and add charm and elegance to nature's beauty.



tall so as to distract from its purpose, and it should complement esthetically its surroundings. It should not

CHAPTER 5

VIRTUAL WATER FEATURES

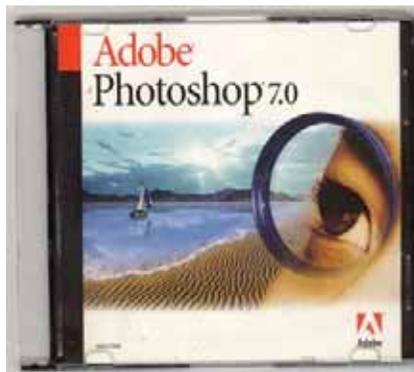
DIGITAL DESIGN

One of the most frustrating aspects of designing water features is trying to convey my ideas to my customers. I have no problem coming up with award-winning designs or implementing them. My challenge is getting my client to see what I see. Drawing and painting are not my forte; it is next to impossible for me to draw a rock, not to mention water. The hardest part for me is drawing perspective. So my most famous phrase became “Just trust me.” Unfortunately, these are the most common three words spoken by used car salesmen! Thank goodness that most of my clients were referrals from other satisfied customers who already knew what I was capable of creating.

When I discovered a computer program called “Photo Shop” I realized that I could use it to create virtual photos of

water features. I learned how to cut an item from one picture and paste it into another. Actually, that was nothing new for me since I did that in kindergarten. It’s called cut and paste. Only now I use a mouse instead of rounded scissors.

I started out scanning dozens of photographs into Photo Shop which converted them into a digital image capable of being manipulated in hundreds or thousands of ways. The Photo Shop program has a large learning curve, especially for someone who is unfamiliar with graphic design techniques, so I started searching for a solution.



Product Description

Amazon.com Review

Mixed-media professionals such as photographers, Web designers, and graphic designers will not be disappointed in Adobe's latest incarnation of Photoshop. In this release, Adobe aims hard at addressing the issues of file man-

agement, easy photo retouching, and smarter output for the Web. While Adobe manages to successfully address these issues, it also remains true to its photo editing roots. New and improved features and tools such as a painting option and an enhanced brush palette allow Photoshop to build on its reputation as the leading tool for image manipulators. New-school designers of wireless applications will smile when they discover that Photoshop 7.0 offers support for WBMP-formatted graphics.

Photoshop 7.0's new file management system comes in the form of a Windows Explorer-like file browser that allows users to easily sort and locate their images within various projects. Users can now organize projects by name, date, resolution, and a number of additional parameters.

The enhanced brush palette allows users to create custom brushes and save them as presets that can be accessed from the Tools options bar. Users can easily vary different aspects of the brush by changing the hue, opacity, or flow of the brushes for pastels, oils, and charcoal. Photoshop 7.0 also introduces a new Healing Brush and Patch Tool. With these tools, users can easily "heal" their images by removing scratches, blemishes, and other imperfections while preserving shading, lighting, and texture attributes.

Adobe has taken great strides in revamping Photoshop 7.0 to be more Web-ready than ever before. With the help of its companion software Image Ready, users can now easily create rollovers and complex navigation bars by using

the new Rollovers palette. Additional Web-ready features include enhanced Web export functions that allow designers to preview images designed for PDAs and mobile phones in the WBMP format. Users can easily create a slide show of their images and post online using the new Web Gallery. People concerned about posting their images online can secure their images with the new password protection feature before sharing them.

Adobe has finally introduced a long overdue spell checker with wicked multilingual spell-checking capabilities. A new search and replace feature allows users to search and replace across different layers in the same document.

While Photoshop 7.0 introduces an impressive array of features that allow photographers, Web designers, and graphic designers to work more effectively with Web and wireless devices, it also remains the leading tool for anyone serious about digital imaging. No other software package provides users with the ability to create such high-quality images.

--Rich Ting

DIGITIZING

Microsoft has developed a user-friendly software for working with photographs. They can be scanned into the program or digital photos from a digital camera can be downloaded into the program. Then each picture can be en-

hanced through a variety of processes such as brightness, contrast, blur, tint, etc., all with a simple click of the mouse. Once the photo is finished, I can then cut out objects from the picture, such as rocks, groups of rocks, plants, or portions of the waterfall and pond.

Using this process with pictures from hundreds of my projects, I was able to build a substantial library of objects for pasting into the “before” photo of a client’s yard. Now I can take a digital picture of someone’s yard and download it into Microsoft’s “Digital Image Pro” program. Next, by dragging various items from my library, I can construct a waterfall and pond of any shape, size or configuration onto that picture.

So thanks to the arrival of the digital age, I can construct on paper a virtual image or idea that was in my head. As a result, my clients can see exactly what their feature will look like when finished.

MICROSOFT DIGITAL IMAGE PRO SUITE 10



PRESS SUMMARY

New One-Click Auto Fixes, Advanced Editing Features and Intelligent Panoramic Stitching Create Professional-Quality Photos

REDMOND, Wash. -- Aug. 10, 2004 -- On a high-resolution digital camera or a camera phone, great photos are just a click away with Microsoft Corp.'s latest digital photography offering.



Today, Microsoft announces the availability of its new line of digital imaging software, including Digital Image Suite 10, the comprehensive yet easy-to-use photo solution for organizing, editing, sharing and safekeeping digital photos. Digital Image Suite 10 combines the power of two digital imaging software applications -- Microsoft Digital Image Library 10 for organization and Microsoft Digital Image Pro 10 for editing -- to offer an end-to-end solution with powerful panoramic stitching in two dimensions, intuitive color-correction tools, even more

one-click fixes, and added options for organization and sharing.

Fixing With One Click

It doesn't get any easier than one-click correction, and Microsoft Digital Image Suite 10 includes three new Auto Fixes to solve common photography problems. The new Exposure Auto Fix automatically adjusts the brightness and contrast of an image, and the new Color Auto Fix analyzes and automatically corrects the color and light in the image by changing the source lighting, saturation and color balance. By using these two new Auto Fixes along with the existing Contrast and Levels Auto Fixes, users can quickly improve their photos to achieve the best results.

Camera phones make digital imaging even more accessible, and Digital Image Suite's third new Auto Fix significantly improves pictures taken on a camera phone. Cellular phones with imaging devices already outsell digital cameras worldwide, and this year InfoTrends Research Group Inc. estimates camera phones will account for about 60 percent of the nearly 300 million digital-image-capture devices in use worldwide. While camera phones are fun and increasingly popular accessories, the quality of the images produced is often substandard. This year, Digital Image Suite 10's new Camera Phone Auto Fix is a one-click fix that specifically addresses color casting and noise issues -- the problems that frequently plague camera-phone images.

"Today's camera phones have inherent limitations, so the

ability to quickly and easily enhance these images with one click is invaluable," said Jill Aldort, consultant at InfoTrends. "Microsoft is providing a simple way for consumers to improve their spontaneous shots."

Advanced Editing Features Made Easy

Microsoft is committed to providing features that are powerful and easy to use, yet that also help consumers grow and learn with their software. That's why Digital Image Suite 10 includes two completely new toolsets for color and lighting correction. All the tools needed to correct issues with color and lighting have been consolidated into two central locations for more efficient editing: the Color and Saturation toolset and the Exposure and Lighting toolset.

Users can easily adjust everything from the color temperature to the source lighting and saturation levels of their pictures. In addition, both toolsets provide the powerful new Levels and Curves tool to alter the luminosity, color and saturation properties of an image -- features professional-level photographers will appreciate. The ability to adjust the saturation curve is only available in Microsoft digital imaging software.

Digital Image Suite 10 also includes superior panoramic stitching that not only stitches images horizontally but supports vertical stitching. Images can be merged above and below each other as well as side by side to create one all-inclusive image. The unique algorithm developed by Microsoft Research is powerful enough to handle multiple im-

age files from the highest-resolution cameras.

"As customers purchase increasingly advanced cameras, they need imaging software that can keep up with their hardware," said Jeanna Peterson, group product manager in the Home Retail Division at Microsoft. "The panoramic stitching available in Digital Image Suite 10 provides the cutting-edge technology customers demand while maintaining the ease of use they expect from Microsoft digital imaging products."

TRICKS I'VE LEARNED

Many graphic or photo software programs will let you manipulate an object.

For example, each individual object that is dragged to the work space is surrounded by a "bounding" box with nodes on the sides and corners of the box. By clicking on a corner node and holding down the mouse, you can drag the corner to make the object larger or smaller. By clicking on the side node you can make the object in the box fatter or taller. With this feature alone you can totally disguise any object, be it a rock or plant, by changing its dimensions. Just by dragging a rock to the work space, copying and pasting it several times, you can change the shape of each copy of the

original object. Not only can you make the rock wider, taller, flatter, larger, or smaller, you can also warp the shape, change the color, shade it, or tint it.

So with only a handful of rocks on the work space, you could create a veritable rock quarry! By dragging the nodes in a section of pond water, you can make the water fit any size pond by stretching or narrowing it. Any overlapping areas outside the designed parameters can be trimmed to fit into a precise space by temporarily rendering the water area semi-transparent so the area of rocks and plants can be seen.

Then, using the erase tool, the overlapping areas of water can be removed so as to fit in the proper space. As you can see in the accompanying photos, it did not require a lot of items to create this water feature. Several objects were duplicated or stretched to disguise their similarities. Need a couple more weirs in your waterfalls? Just click and drag or paste – it's that simple.

Right after seeing the virtual photograph of his backyard, a homeowner exclaimed, "Let's do it." Not how much

will it cost, just "Let's do it." Another client joked, "Wow, this is so beautiful, I think instead of you building the waterfall, I'll just have this enlarged and pasted on our living room window!"

Not only do I charge \$350 per virtual photo, I recently increased my construction prices by 30 percent. And since implementing digital designs in my bids, my closing ratio on signed contracts has soared from 60% to 80%. Eight out of ten proposals/contracts come back signed with a deposit check enclosed. Let's face it: people like to see what they are getting for their hard earned money. Fortunately, all of our projects end up looking even better than the virtual photo design.

SOME TECHNICALITIES

If you are considering adding digital designing to your business, make sure you invest in a good digital camera – at least 3 megabytes (Mb). The one I use is the Fuji Pro S2 SLR. It is 12.1 Mb or over 12 million pixels per inch (4,256 x 2,848). Also, your computer needs to be able to

handle the software with the proper amount of Ram, and the appropriate size processor and hard drive. If you are using a Windows system, the minimum that you should have is Windows 98, ME, 2000 or XP. To work with most digital imaging software programs, your computer should have a 500 mHz or higher processor, 128 Mb of Ram or higher. I have 851 mHz and 640 Mb of Ram. Your hard drive space should be at least 250 Mb (mine is 120 Gb, however I work with video also), super VGA monitor (800 x 600), 16 bit color or better. For you Mac users, life is simple: a Power Mac G4 with iPhoto is all you need.

I have been experiencing major crashes on my Windows XP system working with video, so I recently ordered the new Power Mac G5 with dual 2GHz, 512K L2 cache/processor, 512 Mb DDR400 128 bit SDRam (expandable to 8Gb SDRam), 160 Gb serial ATA super drive, three PCI-X slots, 64 Mb DDR video memory, 56K internal modem, software Mac OSX10.2 Jaguar. I've just shared with you the minimum vehicle needed to get

you where you're going – or the equivalent of a “Geo,” versus the version I'm purchasing. If you want the best and like getting there faster with more fun on the way, buy the Lamborghini, like I did.

MAKING THE SALE

If you are a contractor or pond builder, constructing water features for a living, you must ask yourself, “Do I want to increase my income by 15 to 20 percent? If the answer is yes, then you need to start providing your clients with digitally designed virtual photos of their yard. When I meet with my client for the first time to survey their yard, I ask several important questions:

1. Where do you spend most of your time when you are inside the house? Ninety percent of the time the answer is, the living room.
2. Where do you spend most of your time when you are outside? That answer is usually the patio.

By establishing these facts up front, you can explain that the water feature's location needs to be nearby the place

where they spend the majority of their time. For example, outside the living room window or slider and near the patio. If their waterfall and pond are located in the back corner of their property, the only time they will enjoy it is if they make an effort to go out to where it is. Once these issues are settled you now know where to take the picture.

The next step is to explain that I take a digital picture of the area and create a virtual photo of the proposed water feature. In the event the client decides to proceed with the project, I deduct the \$350 charge from their contract. If the cost is approached in this way, you will rarely receive a “no” when your prospective client is deciding what to do. In addition, I mention to the client that if they decide to get other bids, they will have the photo which will allow them to compare apples to apples when getting the other bids.

Digitally designed virtual photos are to builders of water features what preview trailers are to the motion picture industry. While visiting the Macintosh dealer in San Diego, I was asked to observe the

quality of the Power Mac's processor. The Apple representative played a trailer from the movie "Winged Migration." This clip was designed to play on the average Windows screen in a 3" x 3" window. He played it on the Power Mac's 23" screen at "full screen" size. The result of this single visual presentation was my verbal response: "I'll take it," not "How much?"

Please note that my sales success rate of more than 80 percent is not solely the result of using virtual photos. My company, WaterFalls Naturally, has been designing and constructing water features for over twenty years, with over 1,800 projects to its credit. However, it is obvious that this innovation can greatly enhance the success of any business, no matter how young.

There are several examples of virtual photos that are displayed on our websites, www.waterfallsnaturally.com or watergardensdesigned.com.

Recently I did a "cut and paste" job of an object that one of my clients recognized in a digital virtual photo displayed on our website. This client called me and couldn't

figure out what her cat was doing on someone else's waterfall staring down at the koi fish in their pond! She was completely dumbfounded, but like I said before, you can cut

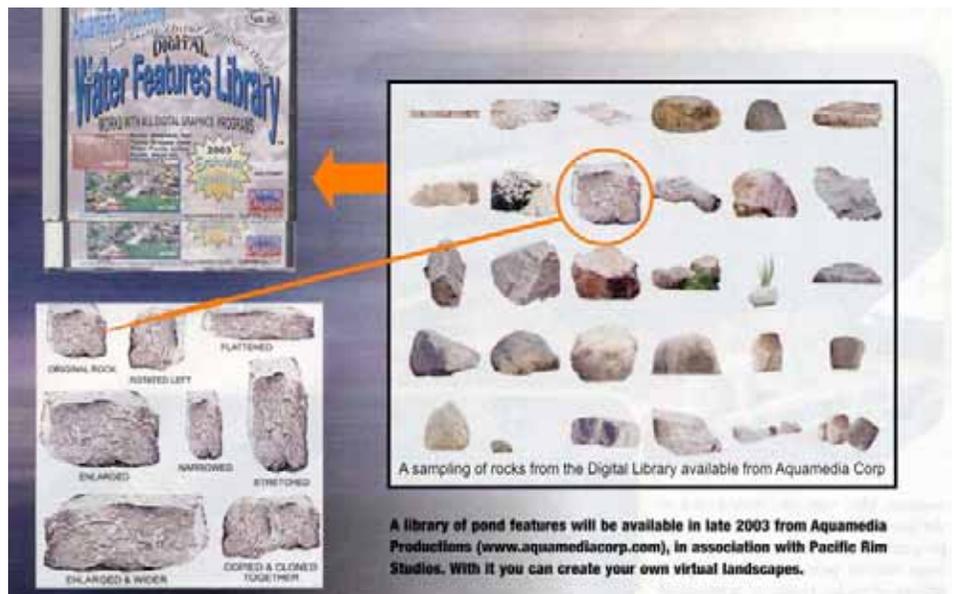


and paste anything, anywhere in the digital world.

WHEN CAN I START?

Aquamedia Productions, in association with Pacific Rim Studios, has compiled a digital graphics library of water feature-related objects which can be utilized to create an unlimited number of designs. This digital graphics library just became available on CD or DVD. All photo objects in this library are royalty free so you can create your own beautiful designs.

Water features are becoming a common addition to current landscape designs. And the projected future trends are even more promising. The digital age is upon us and we have the perfect product to utilize this technology. So get ready to give your computer a tune-up and let's get started!





CHAPTER 6

CRITTER-PROOF PONDS AND WATERFALLS

A waterfall and pond can provide more long term joy, pleasure, stress relief and relaxation than anything you have ever spent money on. However, owning a water feature can produce its share of frustration and unpleasant moments.

Most of my clients, before deciding to become pond owners, never had fish as pets. In fact, many expressed a reluctance to acquire fish because of the additional feeding and care required. The majority of my more than 1800 customers over the past 23 years ended up getting fish for their pond. Then after that came turtles, crayfish, tadpoles, and even snails. What's more, they couldn't help but give them all cute names. One especially cute one comes to mind, named after me! I wonder, is that a compliment?

PREDATORS

Imagine this: One day I received a call from a favorite customer who managed to pull herself together long enough to explain through her broken sobs that Charlie has been eaten! My first guess was, the cat, until she continued with, "All that was left of him was the tail and some scales!" Bingo, she wasn't talking about a fish!

As distraught as she was, I thought she had lost a dear family member. Actually, she did -- Charlie. What could I possibly say to consoler her; Sorry, Charlie?

I felt responsible for Charlie's death. After all, I'm the one who talked her into getting koi fish in the first place. I was aware of the dangers asso-

ciated with building a pond with a shallow end. It afforded a means by which predatory birds such as herons can wade in and wait. And I mean wait!

My pond is predator-proof, so I have had herons drop in, strut their stuff back and forth along the pond's edge, right outside my office window. They spot the fish, but the pond is too deep to wade in and the water surface is too low for them to stand on the edge and bend over and successfully snag their supper.

The same goes for a raccoon. With steep sides all around a pond which ranges in depth from three to five feet, nothing can wade in without actually swimming, including me. The pond is completely surrounded by walkways decks and bridges that all are at least twelve inches above the surface of the pond. At twelve inches, cranes cannot bend



ciated with building a pond with a shallow end. It af-

over far enough to grab a surface fish. Raccoons can swim, but not at the same time that they catch fish. If I build a pond with a shallow end, I design caves around the entire perimeter. That way, if a fish is surprised at the shallow end, it can instantly take cover at a moment's notice.

An electric fence wire (high voltage DC current, which is safe for pets and humans) can



be strung from 3½” insulated holders anchored in the cement between the rocks. This allows turtles to pass under but it shocks the living daylights out of a raccoon. Does it harm the raccoon? No. Does it hurt him? Yeah, baby, just hard enough and long enough to make sure it will remember the experience and your pond. He will, in a nanosecond, remove your pond from his nightly restaurant tour.

You might ask, what about the “rainbird scarecrow” ad-

vertised in all the pond magazines? This ad uses a motion detector that activates a rainbird sprinkler head mounted



inside the beak of the brightly painted head of an attached macaw parrot. Ooooh, scary! I just wish I had thought of it (and didn't have a conscience) and was raking in the big bucks for something cheap to manufacture, though it doesn't work.

After hearing the different stories from several clients, I have come to the conclusion that the raccoons and herons look at the scarecrow as an added benefit to dining at their house. They can get a shower while they eat sushi!

Well, what about the actual scarecrow such as those used by farmers to scare the crows away from the crops? The scarecrow idea, in the guise of

a heron, was thought up by the same expert who thought of the owl replica to scare pigeons off the roofs and banned perches. You've seen these, I'm sure, on top of the roofs of gas stations or drive-thru restaurants, whitewashed with pigeon



guano! You know the ones I'm talking about – the whitewashed owl with a pigeon perched

on its head. I'm not even going to mention the crocodile or alligator replicas, or better yet, the crocodile head you blow up like a swimming pool water toy and turn loose on your pond.

Well, I changed my mind and I'm going to talk about it. Now, let me get this straight. A plastic replica of an animal that lives in Africa or Florida is



going to scare a bird that has never seen one, either real or plastic? I know what you're

thinking – herons are smarter than pigeons!

Another trick that works 80% of the time, is a statue of a crane or heron. It is assumed



that because these birds are territorial that if they see a plastic replica of themselves, that they will assume their plastic relative has first dibs

on this watering hole and will graciously move on. Good luck with the other 10%! It only takes one with a big appetite.

CHILD SAFETY

One of the major reasons that people do not invest in waterfalls or ponds is because they impose a potential hazard to small children. Fifteen years ago, Water Falls Naturally developed a method to create a child-safe waterfall and pond.

We construct a waterfall that spills into a pond as usual. However, if it is a shallow pond, we fill it with large rocks, stacking them up until they break the surface of the water.

With plenty of spaces between

the rocks, there is adequate room for small fish and guppies or mosquito fish which will live off small water bugs and mosquito larva. This way, it is impossible for a child to drown in this pond, yet there is room for hyacinths and lilies and fish.

When the children are old enough, the rocks can be removed and the pond is transformed into a regular one which you can stock with larger fish.

The deeper ponds we build have a grate which is supported by small ledges a few inches below the surface. Rocks sit on the galvanized, rust-proof grate; and hyacinths, lilies and rocks camouflage the grating, and fish and turtles can still come to the surface. This construction technique was introduced by us in 1984 and allows waterfalls and ponds to be built in a front yard despite stringent building codes that restrict pond depths. Now it is possible to enjoy all the benefits of a waterfall and pond without worrying about these potential hazards.



Collection basin containing the anti-vortex drain and AquaFill electronic auto level float control system.



CHAPTER 7

LINERS

Why is there so much talk about pond liners? Which ones are UV protected, or stronger, or last longer? I am by no means an expert on liner technology, nor have I ever



used them in my 23 years of designing and building waterfalls. If you're a "liner guy" disciple, you're probably thinking, "Oh no, here he goes."

To tell the truth, I have been minding my own business for over two decades, just watching, reading and listening to all the "experts." I've listened to how "liners are simple to install," and "liners are inexpensive compared to concrete and steel," and liners are quick to install." Or "liners

last for 50 years," "liners bring higher profits to pond construction," and "liners don't contaminate the water with alkali as does concrete construction." Yes, I've almost sold myself on listening to the "experts" facts on paper. Well, not quite,



due to a few facts of my own.

So, a liner is guaranteed for 40 to 50 years? I would have to agree with that, as long as you left it in its box the whole time. Too bad a liner manufacturer's warranty doesn't include damage from gophers, ground squirrels, chipmunks,

rats, mice, or tree, plant and weed roots. Or from stretching and punctures due to heavy rocks and other sharp objects.



Startling fact: a hole only the size of a pin hole can lose one drip per second, or 5 gallons in just 24 hours. That's a pin hole, not a hole made by a pair of buck teeth on a burrowing mammal.



Imagine along with me for a minute. You have spent \$8,000 of your hard-earned money for a pond and waterfall. This water feature is impressive. They dug a big hole, piled up some dirt at one end, draped a large rubber liner

over the whole thing, and placed giant boulders all around the pond and on the dirt mound. Smaller rocks fill in between the boulder and additional rocks cover the liner in the pond.

Now, it's two years later and you've just come home from a two-week vacation to find the pond half empty (or half full, if you're a positive person). There must be a leak! How did this happen? Where is it?

No problem, you think, I remember the salesman's pitch: "If you should ever get a leak, just clean off the area around the hole, dry it off, and using the directions enclosed in the kit, apply this patching material."

But there's only one problem: where is the leak? or leaks? How do I find it? And if I do find it, and I'm successful in patching it up, what's to keep it from leaking again?

Okay, I'm going to snap my fingers and you'll wake up. "Snap!"

Surprise! That was only a mental exercise with a happy ending. It wasn't real! Or was it? Yes, it was. The short story you just heard was true. One

out of every eight projects we do involves replacing the leaky liner of an angry pond owner.

Why am I finally speaking up now, after 21 years and over 1,800 waterfalls and ponds? Because I'm angry, too! Not at the "liner guy" who sells the liners, but at his disciples around the country who are bragging how much money they make in just two or three days. I'm not upset at the fact that they make in two days what it takes me six to seven days to make in constructing my ponds of rebar and 5000 psi concrete. My ire stems from having to charge \$8,000 to replace a \$6,000 liner pond that lasted only two years. (A liner with padding didn't stop a tree root which traveled 25 feet to do its work.) For only an additional 16% in cost, that client could still be enjoying his original pond, stress-free, for his lifetime and that of his children and grandchildren.

The main features touted by liner promoters are simplicity, low cost, quick installation, and extremely high profits. In an article published in his catalog/magazine of liners and accessories, the "liner messiah" has obviously taught his disci-

ples well, as you can read in this excerpt:

"If you hire us to install your pond, you get a choice of buying it with or without a stream. We offer no other choices! The pond we build covers an area of 11 by 16 feet, has a maximum depth of 2 feet, and a beautiful waterfall. We'll build your pond in one day. The basic pond costs \$5,100 and if you want to connect the falls with a stream, you're looking at an extra \$1,000. That's it. End of story. No Mas."

That's what Ernie Selles, president of Patio Ponds and disciple of the "liner guy," said. Another quote from Ernie in the same catalog is "I get out of bed every morning and look forward to going to work in a way that I never had before." I noticed he didn't mention how he slept.

Let's do the math on Ernie's installation. The pond, stream, and waterfall cost \$6,100. The actual retail cost of the kit is just \$1,000. \$5,100 profit for only one day of labor. Notice: unlike our package, they offer no lights, no auto-fill, and the pond is only two feet deep. Yet a three foot minimum is recommended for koi fish.

A two foot pond affords no protection from predators such

as raccoons and herons, and the shallow depth is affected easily by rapid temperature changes, causing undue stress on the pond's inhabitants.

We would build the same pond with a depth ranging from 3 to 3 ½ feet, with no shallows for dining predators. It is constructed of rebar 10 inches on center with a shell of 5000 psi concrete (sidewalks and driveways are 2500 to 3000 psi).

This 7 sack, 60% pea with fiber mix is so dense that it's waterproof. However, we still coat it with Thoroseal. The Thoroseal prevents any leach-



ing of alkali from the concrete.

The pond is equipped with two anti-vortex bottom suction drains, a skimmer to remove surface debris, and an out-of-pond pump that produces 5000 gallons per hour at only 3 amps, compared to the pond



guy's pumps which are only 4200 gallons per hour at 7.6 amps – over twice the cost of energy! In addition, you have to pull his heavy cast iron monster pump out of the water to clean out debris that is stuck in the bottom strainer holes.



We would also include a state of the art Aqua Ultraviolet filter and UV light – the

best money can buy. The liner guy's filter needs to be disassembled in order to clean it. The Ultima II filter requires the simple turn of a handle to back-flush the debris. This system has been operational in my water features for six years with no problems.

We include an ultraviolet light in our system that kills the bacteria create smells, kills pathogens that cause disease and algae spores that turn the water green. This light has a wiper arm that cleans the internal lens without the need to open the light.

We also offer an automatic electronic water filler, the "AquaFill" by Aquamedia Corp.



that keeps the water level of the pond constant. Competi-

tors' fillers are mechanical just like the float in a toilet tank.



Mechanical fillers can corrode and stick, causing overflows and even poisoning the fish with excess chlorinated water. However, the AquaFill does not stick or corrode, it is elec-



tronic and hermetically sealed.

Not only are all our ponds a minimum of three feet deep, we build caves for the turtles

and fish to hide in. With liner construction, rocks cannot be cemented to the liner and consequently many are loose, creating a hazard if someone were to step on them. Kids will be kids and I promise they will eventually be running up and down the falls.

We have no loose rock because they are all cemented in place with *Aquamedia Mortar Mix*, which is not only four times stronger than regular mortar, it is very dense. As a result, alkali will not leach out into the water and create a pH problem. Regular mortar mix is porous and water passes through the joints of the rock, carrying with it cement residue. This in turn creates stain trails high in pH, easily poisoning the fish.

So, as an educated customer, would you pay \$6,100 for a rubber liner, or spend the same or slightly more to get a shell made of concrete and steel that not only would never leak, but would last for decades? What are we looking for as contractors? Exorbitant profits or peace of mind with long-term, happy clients?

It is far more pleasant for me to get a call eight years

down the road from a contented client than to get a complaint about a leaky pond. What does the "liner guy" disciple say to those complaints -- "Sorry, we only have a one year warranty"?

Or do they go back and remove all the rocks, pull out the liner, clean it, repair the leaks, and replace all the rocks and equipment at no cost? And what if the rocks were originally set in place with a crane and you no longer had access to the back yard?

You say liners are professionally installed. Then why is the very same liner kit sold to homeowners and do-it-yourselfers? The reason is, it doesn't take an experienced professional to install one. All you need is a garden hose and a shovel!

Look before you weep, and happy pondering.

WANT TO HEAR A HORROR STORY?

Sometimes I get calls from people who have purchased a new home with an old pond that has a big problem. The number one complaint is that it won't hold

water; second is the water is green; third is that it is ugly – an eyesore! Eighty percent of all these calls pertain to a liner pond and waterfall. Last year we replaced over \$40,000 worth of defective liner ponds.

One customer in Escondido, California had spent \$6,000 to have a koi pond and waterfall built by a large and well respected local pond supply company. They complained of needing to add water daily since the pond was constructed over a year ago. The installer's response was that the loss was due to evaporation. After installing an electronic auto-fill system they discovered the auto-fill was turning on every 15 minutes to replenish the loss.

In addition to the annoying water loss, they could not enjoy their fish for half the year because of murky green, foul-smelling water. They reported the installer was out there dozens of times dumping various concoctions in the pond with a promise of startling results. The results were startling all right – our client sued the pond store and contracted with us.

A FEW PROBLEMS

The first thing I discovered was that the volume of the pond was eight thousand gallons and the waterfall pump was only 1,800 gallons per hour. It was taking five hours to run the total pond volume through the filter. Secondly, the filter was rated for a 2,000 gallon pond, not 8,000. (Filters are usually overrated by their manufacturers as it is.) Third, the ultraviolet light was also rated for a 2,000 gallon pond, making it only one-quarter effective (according to its ratings) at controlling suspended algae growth. Fourth, because the pump was only 1,800 gallons per hour, it was not strong enough to properly backwash the filter, which requires twice that flow to be back-flushed properly. Consequently, the filter was overloaded with rotting waste material that was contributing to additional pollution of the pond.

The fifth defect in design was caused by the pond's large surface area, which was surrounded by several deciduous trees that were dropping their leaves into the pond. Needless to say, there was no skimmer installed. So all this debris ended up rotting on the bot-

tom of the pond, contributing to the nitrate and ammonia overload.

The sixth was that the suction drain on the bottom was at the same end of the pond as the waterfall. Consequently, the water was only circulating between the water returning to the pond and the water leaving it (from waterfall to drain). Half the pond was not circulating properly and was stagnating because the nitrifying bacteria were not receiving adequate oxygen to do their job of breaking down the nitrites.

NOW LET'S DO IT RIGHT

We were asked to assess the condition of the pond and determine the cost to correct the problems found. We turned off the waterfall to test the evaporation theory and discovered (with the falls turned off) that the pond was losing 25 to 30 gallons per day, or 750 gallons per month!

Installing a larger pump filter and UV was not going to solve all their problems. I suggested that since a reputable pond builder and store owner was involved, he should get a

second opinion. He was confident that, with our reputation of 22 years and 1,800 ponds under our belt, we knew what we were doing.

After finding a temporary home for the fish, we drained the pond and quickly made two discoveries. As the water was being pumped out of the pond, there was a small waterfall developing from the water that poured back through a hole in the liner created from a tree root. Also, water was leaking back through a loose seal around the bottom drain as fast as we could pump it out. (This continued for some time, revealing there were hundreds of gallons of water being stored in the sandy soil surrounding the perimeter of the pond due to the ongoing leaks.)

We offered to repair the faulty drain and patch the punctured liner and refill it, but the owner insisted we do it right, using rebar plus 5000 PSI concrete and skimmer. Unfortunately, not a single item in the entire system could be reused in the new construction. Even the PVC had to be scrapped since it was undersized for the pump.

In the final analysis, because this project was not thought out or designed properly, the initial \$6,000 spent was entirely wasted. Replacing everything and installing it correctly cost the customer \$10,000. The new pond was constructed of 3/8" and 1/2" rebar, 10" on center with 4 1/2" of 5000 PSI concrete and fiber mix added.

The ugly fiberglass waterfall was removed and replaced with a natural looking waterfall constructed of real granite rock. A skimmer was installed on the opposite side of the pond from the waterfall. The bottom suction drains (two anti-vortex drains in series to prevent turtles or fish from getting sucked against the drain) were placed on the opposite side of the pond from the waterfall to maximize circulation.

Next, a Venturi Valve was installed to add additional oxygen and create a circular current in the pond. This delivers oxygenated water to all areas. A 3000-gallon Ultima II bio-filter was installed with two 40-watt Aqua Ultraviolet lights. The high efficiency filter pump, which runs 24 hours a

day, is made by Little Giant Company and is rated at 3,800 gallons per hour. It costs the same to operate as the one it replaced, which delivered only 1800 gph.

We installed a second pump of the same rating to allow for twice the flow volume off the waterfall on demand. It is also operated by a timer that comes on twice a day for one hour. This keeps sediment stirred up in the falls and pond to aid the filter in removing it. The skimmer now removes 90 percent of all debris falling into the pond before it can become waterlogged and sink to the bottom.

The electronic autofill we installed in the previous pond at the owner's request was the only item that was reused in the new system. It is designed to add water to the pond automatically as needed due to normal water loss through evaporation and wicking around bog planters into adjacent soil.

This story has been repeated dozens of times over the past few years. Fortunately, most of them were on a much smaller scale. Most of our business is word of mouth, so I

imagine there are many people who, not knowing whom to call, simply gave up and turned their water feature into a rock garden.

TO THE PROFESSIONAL CONTRACTOR

If you are tired of narrow profit margins, stiff competition, increasing code restrictions, stricter regulations, and difficult, unappreciative clients, you are about to discover an exciting niche in the construction/landscape industry. You will be able to use this niche as a means of creating a lucrative income while enjoying your work as a professional builder.

For many years I designed and built custom homes, several restaurants, commercial buildings, a high-rise and many remodel projects, only to discover that there is much competition in the building trades.

It's hard to name your own price when several others are bidding on the same project. Plus, there is only so much you can charge for material, and a limited amount you can charge per hour.

For each designated task, however, there is no competition in professional pond and waterfall construction.

In addition, no one is familiar with what is involved – either regarding materials or labor. Consequently, you can usually name your own price.

Unlike the average construction project, where hundreds of companies are capable of performing the same tasks, professional waterfall and pond building is an art form which only a handful of people can accomplish. How can an artist take a \$40 canvas, use \$20 worth of paint, \$200 in brushes, apply the paint to the canvas and get thousands of dollars for a few hours of effort?

That is precisely what I have been doing for over twenty years, using real estate as my canvas and rocks as my paint. Yes, it did take several years to perfect the techniques, the engineering challenges, and improve the quality of rock work to achieve a natural look, but I had no one to learn from or emulate other than Mother Nature.

You will not have to repeat the same mistakes I made; you

can benefit from my years of trial and error, thereby being able to start commanding higher prices for your work much sooner. I will teach you how to earn more money for the hours invested than you can in any other area of home improvement.

The majority of my clients have stated, when the project was completed, that it turned out to be much more than they ever expected. Why would they say this?

Because they had nothing else to compare my work to. Except for liner ponds with their little necklace of rock surrounding the perimeter, trying to cover the liner, and the stack of loose rock posing as a waterfall. But then you are already aware of this fact if you spent any time on the web or reading pond magazines.

HOW THE LINER INDUSTRY WORKS

The liner gurus such as the “Liner Guy” with his own magazine and catalogue recruits unsuspecting followers with a “Build a Liner Pond Day” and shows how easy it is to get something for nothing. Here's what these guys do:

- Lay out the pond with a garden hose
- Remove the sod and dig the hole
- Drop in our guaranteed liner
- Fill with water
- Drop in our pump
- Run our pipe
- Throw a piece of our liner on the pile of discarded dirt
- Stick in our filter
- Cover pile of dirt with loose rock
- Turn on our pump
- Throw in your fish
- Collect your money and split.

Does this sound a bit harsh on the liner industry? Well, here's "the rest of the story." I'm going to add a few more items that the liner guys omitted:

- Ground squirrels
- Gophers
- Rats
- Mice
- Chipmunks
- Sharp rocks
- Heavy rocks
- Falling rocks
- Sharp objects
- Tree roots
- Plant & weed roots

- Leaky drain seal
- Leaky skimmer seal

Did the liner guy offer you a guaranty against any of these

Here is what you would have had to do if any of them happened in your newly-built liner pond (and I know the Liner Guy didn't give you this list):

- Take out the fish
- Turn off the pump
- Take out the loose rock
- Pump out the pond
- Take out the pump
- Take out the liner
- Spread out the liner on

the lawn

- Clean off the dirt and algae

- Inspect every square inch of the liner for holes. (Sure, there are shortcuts, but if you assume you've fixed the problem after patching a hole, put everything back and then discover there was more than one hole, you might be a tad irritated. Remember this rule of thumb: one pinhole and you can lose five gallons of water every 24 hours!)

- Patch the hole or holes
- Repeat the whole process

over again, only in reverse. Hey, sound familiar? It should, with the exception of laying out the garden hose and

digging a hole, you have just built another water feature!

If it had been done the professional way to begin with, all this time to tear it apart and put it back together could have been used to design and build another permanent project professionally with steel and concrete.

Can you imagine if this scenario was referring to a project involving large boulders that were set in place with heavy equipment such as an end loader or crane?

Not to mention lawn sprinklers, flower gardens, trees and shrubs that were growing there, and sidewalks and hardscapes installed! If you were frustrated enough, I guess you could do what I actually saw someone do – move!

HOW SOME LINER DEALERS OPERATE

There are some pond liner dealers who expanded their business by adding pond accessories such as pumps, skimmers, filters, etc. They then started teaching people how to dig holes, throw in a liner, a pump, a filter, some water and fish, and make thousands of dollars. It caught on – why

wouldn't it? We know there is no such thing as getting something for nothing, at least of minimal quality. How about getting something for next to nothing? Hey, that might work!

Okay, let's get this straight.

One day's work using \$500 in materials and I get to collect five grand? Wow, that sounds great! Now teach ten friends to do the same thing, okay? Well, sure, why not? Then, get all ten to buy their materials from you! What a racket! I mean, what a deal!

It almost sounds like the Amway multi-level concept. Well, no, not exactly. The difference is that Amway guarantees what they sell and they have integrity. Can these dealers guarantee no leaks for five years? Even four years, or one?

Of course not. Can you guarantee a ground squirrel or gopher won't gnaw through the liner? (Maybe, if you cut him in on the profit.) Or that tree roots won't punch through the side? A rock's constant pressure from its weight slowly pressing, stretching through the liner material until it pops through? Or until it presses

against a rock or stone on the opposite side, pinching the liner until it breaks a hole? (Between a rock and a hard place.) Can you guarantee someone isn't going to step on one of the loose rocks in the waterfall or around the pond and get hurt because the rocks aren't secure? Can you install a skimmer or bottom drain and guarantee either one from leaking?

HOW I OPERATE

I do not sell liners and their associated products, skimmers, biofilters, sump pumps, mechanical floats and so forth. One reason that I do not use or market these products is because I have seen so often over the years how poorly they function. My conscience simply won't allow me to use them.

I don't sell rebar or concrete either, but I highly recommend their use in constructing a professional waterfall and pond. I do market high efficiency pumps, and I advise clients to invest in them over sump pumps so they can save hundreds of dollars in energy and maintenance costs.

I recommend the use of Aqua Ultraviolet Ultima II biofilters and ultraviolet lights not because they are my own, but because I have seen how all the other bio-filters on the market perform. Bottom line: there is no comparison; all our ponds are healthy, clear and clean because we always use the Aqua Ultraviolet Ultima II and UV light. Show me a better product and I'll switch tomorrow.

We guarantee our ponds from leaking not for 3 or 4 years, but for as long as the client owns the pond! Yes, we can guarantee the bottom drains and skimmer from ever being the source of a leak. Yes, we guarantee that you can walk on any rock in the waterfall or around the pond without it moving. With our construction methods we can guarantee you will not see any concrete above water level when the project is finished.

Because we don't have to worry about damaging a liner, we don't have to be cautious with the size or placement of our rock. This enables us to create realistic and natural looking arrangements of the rock (as opposed to cute little

necklaces around the pond's edge to hide the liner). If I seem to be coming down a little hard on the "liner guy," it's because I have personally seen so many of my clients hurt financially and emotionally over the years.

Recently someone pointed out to me some promotional literature from the "liner guy" who was bragging about how you could dig a hole, throw in a liner, pump and filter, and make five to six thousand in one day. We make five to six thousand in five days, but we use materials and methods and equipment we can guarantee. We offer nearly maintenance-free operation to achieve a clear, clean and healthy pond with no leaks!

Because of our pool skimmer, Venturi valve and double bottom anti-vortex drain system, pond cleaning is minimal.

Once or twice a month, depending on the number and type of nearby trees, our clients empty the skimmer basket, which takes one minute. They clean the leaf basket on the pump which takes two minutes.

They backwash the bio-filter by simply pushing down on a

handle and turning it 180 degrees for a couple of minutes, then back to the rinse position for another minute, then back to the filter position. Finally, one more minute to work the wiper rod back and forth a few times on the ultraviolet light, to clean off the lens tube which holds the bulb and they are done.

We are talking about an easy, trouble-free seven to ten minutes, once or twice a week in the summer, and one to two times a month in the winter.

Over the past few years we have replaced most of the other bio-filters with the Ultima II. This has reduced the maintenance time in some cases by over an hour, not to mention eliminating altogether the stinky mess involved.

In most cases these were replaced for a minimal fee. This is done simply by attaching a 1½" hose to the drain part of the filter so the discarded, back flushed wastewater can be directed to the plants, garden beds and trees in the surrounding area, or to fill 5-gallon buckets and transport to garden areas. The wastewater from the filter is high in nitrogen and other es-

sential nutrients vital for healthy plants.

NOTE: When utilizing high performance pumps, it may be necessary (depending on the gallons per hour rating and the size of the filter) to add a spa blower to aid in stirring, agitating and breaking loose waste material from the beads in the filter.

These blowers are inexpensive and because they work so well in totally removing waste, they are recommended in all Ultima II filter installations to insure maximum results.

DISPELLING SOME MYTHS

What do liner salesmen say about professional installations and their use of steel and concrete, rock and mortar?

MYTH #1: "One problem with concrete and mortar construction is the problem of cement alkali leaching out for some time after construction, poisoning the pond water with high alkalinity. Also, leaving slight deposit build-ups at the points of exit and on the surface of rocks in the waterfall."

NOT TRUE! With our construction methods, if the concrete you use to pour the

shell is a 7-sack with fiber mix and 50% pea gravel, the concrete is so dense that no leaching can occur.

Also, because of the density of the concrete (3000 psi), it is not only waterproof, but stronger than normal 5-sack mix used to pour driveways, patios and sidewalks (2000 psi).

MYTH # 2: "When you use mortar mix to secure the rocks in a waterfall, the water that seeps in and around the mortar leaches out alkali and phosphorescence that poison the pond.

NOT TRUE! With our construction procedures, regular mortar is porous, allowing water to pass through, dissolve and collect the cement residue. Mortar mix is not as strong as concrete because it does not contain pea gravel. However, using concrete to affix rocks in a waterfall is unsightly due to the inability of the joints between the rocks to be smooth.

However, regular mortar is not always efficient in holding the rocks securely if a large surface area of the rock is not covered with it.

Aquamedia has developed a mortar mix that is three times stronger than regular mortar and is totally water-



proof, and will not leach any alkali after it cures (3 to 4 days). This mix is so strong in its holding ability that once it cures, a sledge hammer is needed to remove a rock. In most cases, the rock breaks up before coming free from the mortar. It is not only waterproof, but it bonds so well with all types and textures of rocks that it creates a watertight barrier that comes in handy when building the waterfall and channeling the water above the level of the concrete shell base.

This feature of Aquamedia's mortar mix allows for much more creativity with the ability to raise the water level above the confines of the concrete shell base.

Aquamedia Mortar Mix is not yet distributed nation wide, however the formula can be purchased by readers of this

manual from the Aquamedia Corp. at a nominal fee after signing a non-disclosure form. It took years of experimentation and much trial and error to achieve the proper formula.

The proper combination of existing products are mixed together using products that are readily available from all home improvement stores or lumber yards. This new product has revolutionized the professional concrete and steel pond industry. This proprietary formula and directions for use are also currently available for purchase to licensed contractors only.

We demonstrated Aquamedia Mortar Mix's bonding ability during a swimming pool conversion project. (This story has been published in the July 2001 issue of Ponds Magazine.) A 4,000 gallon





swimming pool was converted into a koi pond with two waterfalls and an 8' x 12' island. When the project was completed, all the surfaces were given a mild acid wash, the pond was filled, Dechlor was added, and the following day \$3,000 worth of my own personal koi fish were transferred into the pond. They all swam calmly around the island inspecting every nook and cranny.

None of them experienced any stress and they remained in their temporary quarters for three months with no incidents.

COLD CLIMATE

The integrity of concrete ponds may be compromised by the frost in colder regions. Frost does not pose a problem in any pond constructed with our structural recommendations. Certain methods, such as heaters or aerators, are used to prevent ponds from freezing solid and allow the use of the waterfall year round. It is also helpful to locate the pond in an area with good drainage, above the existing water table. Install french drains around the perimeter to remove groundwater that could freeze, putting hydraulic pressure on the pond's shell, or causing it to float up out of its excavation.

TO THE HOMEOWNER

If you have purchased this book, you are obviously interested in water features. You know they will be a source of pleasure and enjoyment to you as a homeowner. If I accomplish only one thing by the time you are done reading it, I want to educate you on the pitfalls of using a liner for your pond.

You may have already spent hours on the web checking out all the sites for pond construction. Did you get the impression that there is only one way to construct a pond? Most of the sites contain free advice and instructions on how to build your own liner pond.

Did you also notice that 98% of them were recommending the use of synthetic liners? Surprise, surprise! What a coincidence, all of them just happened to have a liner to sell you on their web site!

I guess offering free information about the benefits of constructing a pond professionally using steel and concrete doesn't generate revenue.

You can't sell rebar and concrete over the internet.

This book will teach you how to build a pond and waterfall that will last as long as the home you live in, and probably longer. I promise that if you have any basic construction knowledge or experience, this book will save you thousands of dollars. If you currently have none, by learning the information and instructions that follow, you can be your own contractor, hire laborers and/or subcontractors, and still save hundreds of dollars on the completed project.

CHAPTER 8

LAYOUT AND EXCAVATION

Now the fun can begin!

First of all: know what you want. If you need some ideas, visit the library or your local book store and browse through landscape books, garden and pond magazines. You can also search the web and read and study as much as possible.

Layout is the most important phase of the entire project. I have heard many complaints from disappointed clients after they had a chance to get used to their new addition to the landscape. “I only wish we had made it bigger.” “...made it deeper,” “...added an island,” “...made it longer and constructed a bridge,” “...built it closer to the house,” “...installed a larger water pump for the waterfall,” or “...built the waterfall higher or wider.”

Most of these wishes could have been granted for a reasonable cost before or during construction. But waiting until afterward means incurring a major expense that may be

cost-prohibitive. If your choice is to omit it because of its cost, then make structural preparations to allow for adding one later. You can plan and design the landscape to allow for easy additions to the pond later on just by the placement of trees, sprinklers, drain lines, and much more.

When you decide exactly where you want to place the pond, take your time laying it out. A garden hose is popular for this job because it can easily be moved around until the desired shape is achieved. Once that is accomplished, you



Paint was sprayed on the ground to layout the shape prior to excavation.

can use construction paint and

spray the ground in the outline of the hose.

If there is any doubt about where to locate the pond, give it a couple of days and ask for outside opinions. Then walk around the yard while you observe the proposed spot from various angles, especially views from inside your house.

Remember to take everything around it into consideration. How close is the nearest tree; will its roots pose a problem later? Is there going to be sufficient sun throughout the day? Some water plants require more sun exposure than others, such as lilies. Make sure you know where the main power, water and sewer lines are routed to the house. Do not land-lock a section of your yard that may later need drains, sprinklers or heavy construction material.

Place or remove such items or install necessary drains and sprinklers.



If it is not convenient to run the sprinklers at this time, run sleeves made of 4” drain pipe

under the stream or section of pond necessary to enable running lines later.

When it comes to the pond depth, if you plan to have it more than 18" deep, you'll need to check with the local building department to determine if a building permit is required, which will probably call for a 6 foot fence, door alarms and self-closing gates that swing in.

If the pond site is not level, don't worry about it; you'll have all the excavated dirt from the pond to level out uneven terrain and get creative with terracing for an upper pond and waterfall or a sloped portion of the yard for a stream or creek.

A pond can be placed on the side of a hill by constructing a retaining wall to hold back portions of the hill. Drive a stake in the ground until the top of it represents the water surface of the pond. Continue with additional stakes in the shape of the proposed pond using a level as you go.

Keep in mind how deep you decide the pond should be and begin removing the dirt. As you do so, note the condition of the soil and determine if you will need only shovels and a pick, or if you'll have to rent a jackhammer. Also, if the soil is sandy and unstable, you may need to shore up the

sides with plywood forms and supports.

DUMPSTERS

Most often the soil from a pond excavation can be used to create berms in the landscape plus mounding for a waterfall. If the pond is large the excavated dirt can be used to terrace a level back yard, facilitating a second, elevated pond.

If there is not access to the back yard for a bobcat or excavator, additional soil will need to be removed by wheelbarrow and can be dumped into a rented trash bin or dumpster.

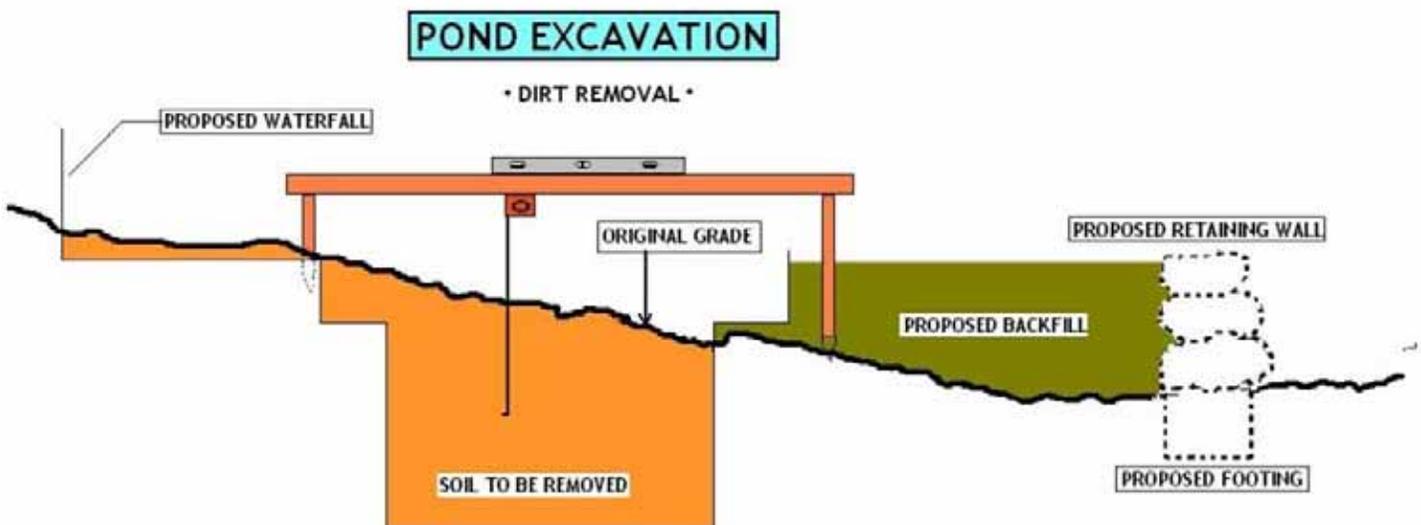


FIGURE 1



When excavating a pond in a backyard with no access for a Bobcat or backhoe, it is necessary to remove the dirt by hand and transport it to a dumpster in front, using a wheelbarrow and a plank for a ramp.



After the pond is excavated, a laser level is used to level the green bender board forms to establish the level of the ponds perimeter. Stakes are placed and marked first and the board screwed to stakes.



Dobie blocks are used to hold the rebar off the ground so the concrete will totally encase it. Also, flexible PVC pipe can run between the rebar and ground in the two inch clearance provided by the blocks.



By excavating into the bank, a patio is created to provide a place for a bench, accessed by a wood bridge.



CHAPTER 9

METAL AND CONCRETE

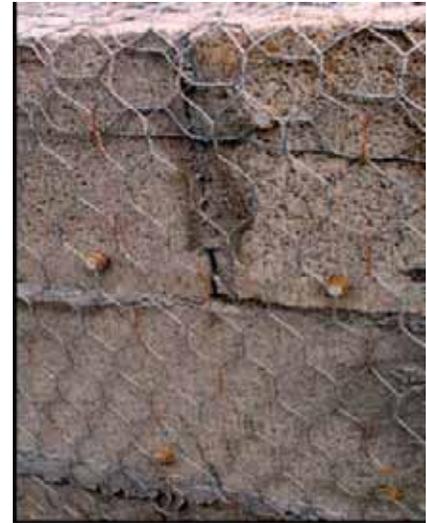
REBAR AND WIRE

When placing the rebar, start with the pond floor. Bend the rebar at a 90 degree angle around the outside. Check-

board the bottom of the pond in both directions. Then wrap one long piece of rebar or a series of shorter ones around the perimeter every 8 or 10 inches from the bottom to the top rim of the pond. Tie all the vertical rebar to all the horizontal ones. The vertical rebar should continue and connect with the horizontal

rebar. After installing the rebar, mount the skimmer to the rebar using tie wire. A rebar in the rebar using the power of leverage. By placing two benders on one rebar, it can be bent simultaneously in two separate directions.





of the stucco wire to cover it on the face of the wall. Attach the stucco wire to the rebar every 10” to 12” using twist



If you feel the installation and bending of the rebar is too difficult, there are subcontractors that do just that for a living. One experienced rebar bender can do an entire swimming pool in four hours. So it wouldn't take long at all to do a koi pond.

When cutting a path through a retaining wall, you must tie the waterfall rebar to

the wall rebar. The rebar from the pond walls becomes the framework for the surrounding bog planters.

The next step is to apply stucco wire to all vertical surfaces higher than 12” using twist ties. This is to retain the concrete behind the rebar when pumping concrete. Then the concrete is stacked and troweled over the surface

ties or tie wire.

Twist ties are preformed wire ties designed to be used with a twist tie hand tool. There are two types: the ratchet type and the wooden handled twirl type. The professionals use Lineman pliers and tie wire that comes on a

roll and is hung from a wire/spool holder, attached to a belt around the waist. It requires a developed skill to snip off a piece of wire and twist it around two rebars using the pliers.

The preformed twist ties are relatively easy to use for



anyone. By wrapping the wire around the rebar and hooking the tool in the looped ends with a quick pull of the



tool, the wire twists around itself. [See fig. A, page 55]

CONCRETE PUMPING

On large projects (anything over 2 or 3 yards) it is best to order concrete pre-mixed and apply it with a concrete pumper. The first application is pumped behind the stucco wire and then, by holding the hose against the wire, it can be force-packed against the wire quite easily by starting at the bottom and piling it up. Finish it off with a trowel where it didn't hold to the stucco wire and slid down.

Prior to pumping the concrete, make sure there is 1½" to 2" clearance between all rebar and dirt. Also, place some dobie spacer blocks under the rebar on the pond and waterfall floor to hold it off the



dirt. This will assure that when the concrete is poured, all rebar will be completely surrounded by concrete. If any is exposed to the dirt, it will begin to rust, pulling moisture inside and causing the rust to spread like a cancer. As the rebar begins to decay, it will expand. In doing so, the resulting hydraulic pressure of the expanding rebar could crack the concrete, causing it to lose its watertight integrity.

When ordering redimix concrete, order a 7-sack mix with 40% pea gravel and fiber mix. Normal concrete used for sidewalks, patios and driveways is a 5-sack mix with 30% pea



gravel. The 7-sack 40% with fiber mix has a cured strength of 3000 psi. The fiber mix consists of tiny, short fiberglass hairs which act as miniature rebar tying together the gravel, sand and cement for additional strength.

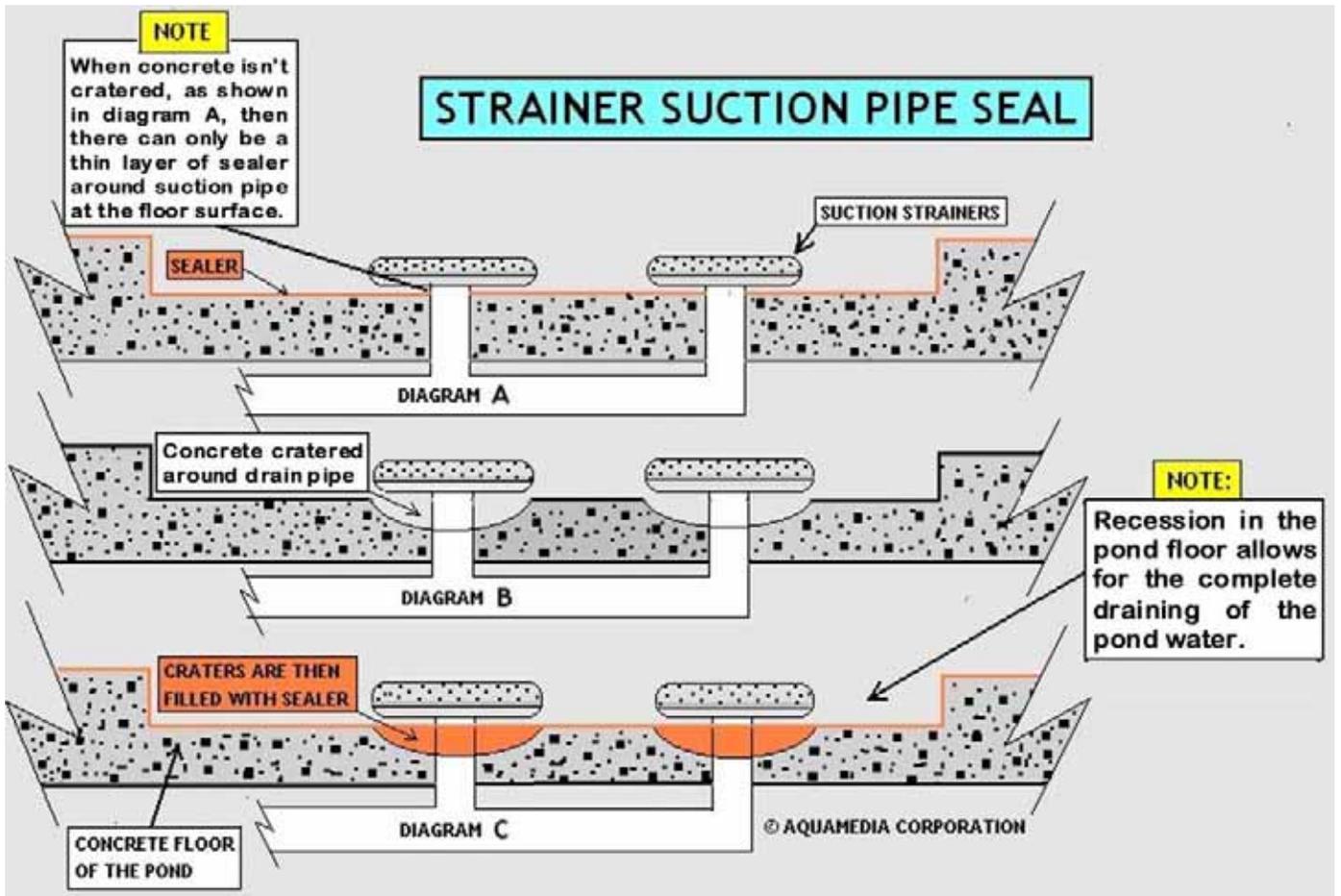
You should also order the redimix with a 2 to 3 inch slump. Slump is the measurement of water content: the lower the number, the drier the mix. Normal concrete for pouring sidewalk, patios and driveways is a 6 to 7 inch

slump. The reason you'll need a 2 inch slump is so that it will stay behind the stucco wire and not run through. It will also stack up better on the outside surface of the wire when troweled on. If it is not dry it won't stay up – it will sag and fall.

Keep in mind that the drier the concrete, the quicker it will set up and the faster you'll need to work if the temperature is above 70 degrees.

When troweling the concrete onto the wire surface, pull the concrete up with a couple

of strokes, forcing the concrete with each stroke through the wire and packing the rest on the surface. The troweled concrete will grab hold of the concrete that was pumped on the back side of the stucco wire. Work one area at a time, starting at the bottom, working your way up, and moving horizontally after each couple of strokes. After covering a 5 or 6 foot distance, come back to the beginning and add two or three more trowel strokes of concrete. This will give each



section a chance to set up before disturbing it again. Take care not to over-trowel in one area.

If you stay in one spot and trowel there constantly, the water will work out of the cement and cause it to become sloppy and limp. It could even sag and fall from its position on the wire.

FINISHING CONCRETE

The secret here is not to get in a rush. The beauty of this concrete work is that you don't have to have a smooth, finished surface, like you do with flat work such as sidewalks. Just get it troweled out as smoothly as possible and after it starts to set up, wipe areas over the surface with a wet sponge. Dip the sponge occasionally into a bucket of water to keep it moist and wipe down the rough spots, such as where the trowels left ridges on grooves. Sponging the surface creates a uniform, slightly rough surface on which to apply the ThoroSeal.

PATCHING PIPES

When finishing around the drains, skimmer and venturi valve, scrape out some of the concrete from around the pipe making a crater to facilitate WaterStop (*Quikrete* Product) later. See Diagram B



(WaterStop is a brand name for a concrete product manufactured by *Quikrete* and can be purchased in most lumberyards or home improvement stores that stops water leaks.) When you fill the space around the pipe, it will expand as it cures and totally block and seal any space between the concrete and pipe. It bonds well to both concrete and PVC pipe. Dia. C **WARNING:** WaterStop sets up very fast, so work fast and don't mix a lot at a time.

THOROSEAL

After patching the skimmer, drain pipes and venturi

valve, apply ThoroSeal to the entire surface of the pond and waterfall shell. ThoroSeal is a cement-based concrete sealer that comes in dry powder form and is mixed with water to apply. The manufacturer recommends that you mix it with one gallon of Acryl 60 acrylic admix (a type of acrylic glue). We have discovered three important facts about Acryl 60's use with ThoroSeal.

(1) It is very expensive (between \$20 and \$30 per gal-



lon).

(2) It works no better than white glue at \$3 per quart. One quart of white glue when mixed with water will product three gallons of admix. This is equivalent to the effectiveness of three gallons of Acryl 60 and is a cost savings of between \$19 and \$24.

(3) When you add Acryl 60 to ThoroSeal, it acts like paint when applied to concrete. It



basically coats the surface and does not penetrate because of the glue rendering the ThoroSeal too viscous. Consequently, once it cures it becomes brittle.

Then, if the surface is struck by a rock during construction, it will chip off like paint. Adding extra water to make the ThoroSeal thinner is all you need to do. It will be absorbed into the concrete's surface up to 1/8 inch. The second coat can be added im-



mediately after the first, and it will bond well without adding any admix.

However, if for some reason you are unable to add the second coat before the first one dries, you should then mix in the admix so it will bond properly to the first



You can apply ThoroSeal with a large brush or a broom.

application.

If these directions are followed, it will perform at higher levels. Now, when a rock strikes the surface, the sealer does not chip or peel. If part of the surface is scarred you can still see sealer material underneath.

The truth of the matter is, despite the effectiveness of ThoroSeal, it is really not necessary to use it. The 3000 psi concrete with the seven sacks of cement per yard is so dense that water cannot penetrate it.

After pouring the pond of a recent project, it rained for

two days. We were unable to resume work right away, yet three days later the rainwater was still sitting at the same level it was when it stopped raining.



We not only didn't seal the pond, we hadn't sealed around the bottom drain pipes either. Regardless of that fact, we still apply sealer on every job.

DRAIN INSTALLATION

The next step after applying sealer is installing the anti-vortex suction drains. Anti-vortex drains are used in swimming pools and are designed to prevent whirlpools or water tornadoes. Without this special drain, air is sucked down the trough of a whirlpool and causes the pump to lose its prime.



First, cut the pipe off flush with the surface of the concrete. Spread a ring of WaterStop around the perimeter of the drain pipe, and seat the base mounting ring into the ring of WaterStop. Then smooth out the WaterStop evenly around the exterior and interior edges of the ring. After the WaterStop has set up, connect the cover with the two mounting screws.

CHAPTER 10

ROCKS AND MORE ROCKS

ROCK PLACEMENT

This is my favorite part of waterfall construction, but it's important not to be in a hurry! By the time you get to this stage, you'll be getting anxious to see the waterfall running. The "liner guy" brags about how easy this stage of construction is. "Just stack the rocks in place to cover the liner!" is what he says. Their video and photos even show a human assembly line of rock passers in a continuous stream where a rock is placed randomly as it arrives in the hands of the last person to receive it. That process would never work if you want your finished product to look natural and be safe to walk on.

Most liner style water features are built with only 6" to 12" rocks. There are several reasons for this: 1) convenience, 2) ease in lifting, 3) cost-

cutting, 4) large boulders possibly harming the liner, 5) not knowing any other way to do it, and 6) just mindlessly following directions from someone who has no vision of the finished waterfall. You need only to look at waterfalls in



nature to see that they never are made up entirely of small, uniform cobble rock. The majority of rocks in a waterfall created by nature are huge in

size. These are often the ones that fell down the mountain first. Keep this in mind when building yours, and incorporate some larger-sized rocks or boulders throughout your project. Some can be set in place even prior to digging the pond

since once the excavation is completed it would not be possible to bring in a boulder without a crane. Don't overlook the possibility of

using a crane to set a few large rocks. Cranes can cost \$100-\$200 per hour, depending on the size, plus a move-on fee and travel time. A couple of

hours of crane time and approximately \$600 worth of boulders and trucking will make an difference in the finished project.



Cranes are perfect for reaching inaccessible areas of the yard. We crane rocks over houses all the time.

I recently completed a project that required an 85-ton



properties were in line, down the side of the mountain. The waterfall started in the back yard of the first house continued to a pond at the bottom house, 135 feet below. Because of the position of the crane, the crane operator and the placement crew were unable to see each other and use hand signals. So we used 2-way radios with hands-free head sets. Believe me, craning over a house is not that big a deal!



If you have access to the yard, the boulders can be placed by a bobcat or backhoe. (page 62) In the event you are unable to use any heavy equipment, 500 to 800 pound rocks can be moved with fairly little effort or manpower using a large hand truck – the type

crane to set tons of boulder in the back yards of three separate homes. The crane was set up on the side of Mt. Soledad in La Jolla, California. The three



used at nurseries to move large boxed trees. These hand trucks can be rented from most equipment rental companies.

TRUCKING

Getting the rock to the job site is the easiest part. At the rock quarry an end loader will load the rock into the truck.



The size of your project will determine what type of truck is needed. A small dump truck or “bobtail” can hold eight to ten tons (5-6 yards) and an end



dump (18-wheeler) can haul 20-21 tons (23-24 yards) of rock.

If the truck does not have access to the back yard and you have no place to dump the rock in the front yard, you can lay six to eight sheets of 1/2”

plywood in double width in the driveway or, depending on the



local zoning laws, in the street, using caution tape and construction cones to surround the material for safety.

ROCK PLACEMENT

When you start placing rocks on the shell of the waterfall, pay close attention to how the water will flow. You can channel and direct the path of the water by the care-



ful placement of your rocks. As you go, create pockets within the water's course for water plants. Decide where to

place lights so you can install the low voltage wires for them as you proceed. Do not place the planters in front of the lights, since as they grow they may eventually block the light.

First, place all of the large boulders and then fill in around them with the smaller ones. Move all of the rock to the construction site, spread them out around the perimeter of the pond and waterfall shell. This will permit easy access for spotting and picking out cer-



tain rocks that you want to start with. Begin laying rock at the bottom of the pond and work your way up. This will allow you to build caves for the fish and from the inside wall for the bog planters.

Large rocks can be moved into position using 2 x 12 foot planks to roll the rocks across. When placing rock around the perimeter of the pond, use a few large boulders and bury some partially below grade.

Creating a couple of bog planters around the perimeter not only breaks up the uniform edge but adds a patch of green bog plants between the pond and the bordering landscape. Where the landscape consists



Another possibility for “border dressing” is to position a large, flat rock at the pond's edge and cantilever it over the water. And a nice addition to the pond's edge is a large rock with a flat top which can serve as a seat. When placing large rocks around the pond area, remember that grouping two or three together looks less contrived and more natural while providing

a spot for plants or a tree nestled in between them.

LIGHTING

As you start the rock work, run two or three low voltage wires in different directions to provide lighting in and around the perimeter of the pond and waterfall. Check with the local building code to determine what type of light can be used in a fish pond. Most states and

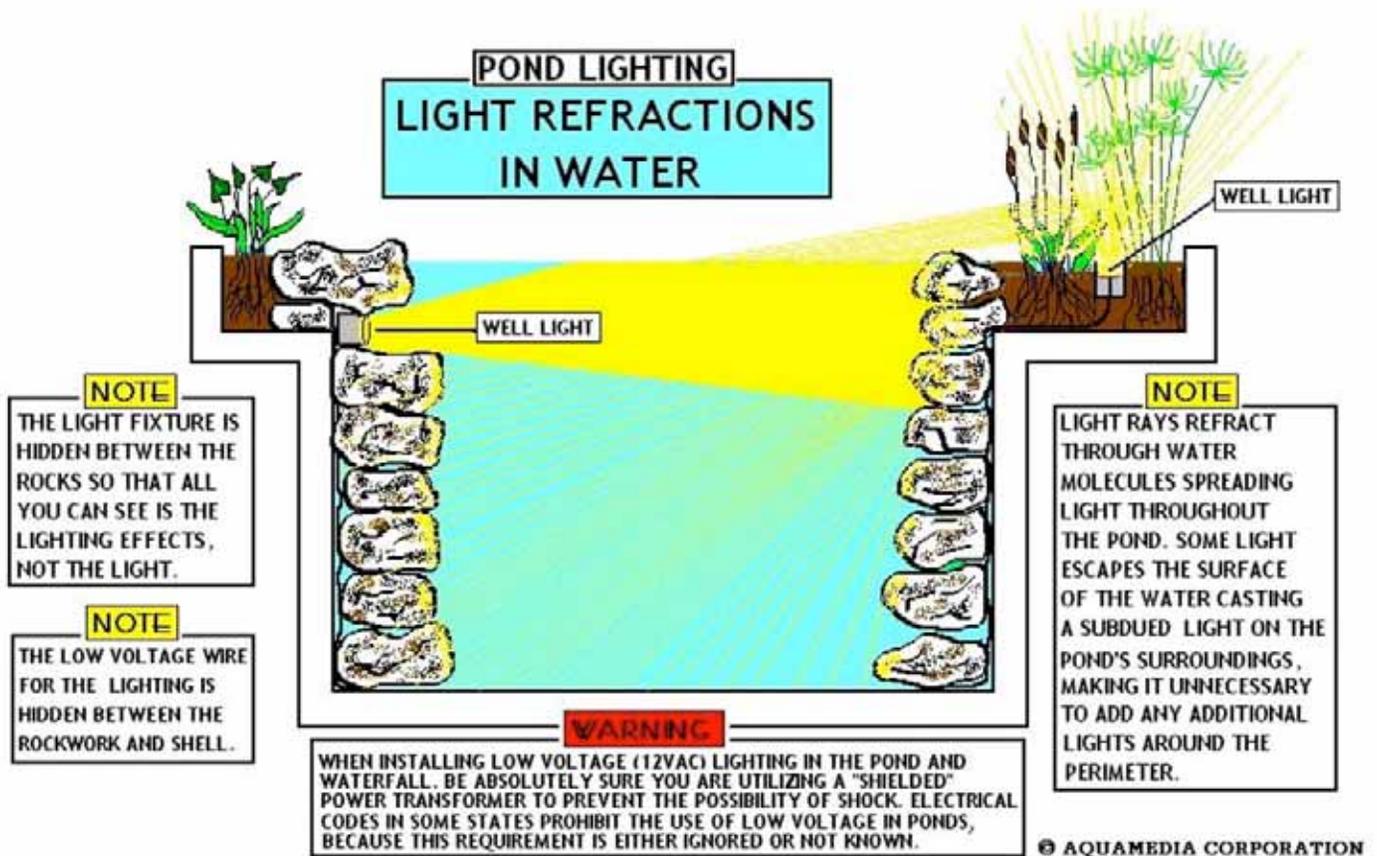


of a concrete or wooden deck, the bog plants create an interesting transition from water to land.



A large rock at the pond's edge can serve as a seat.





cities require the use of an insulated and shielded transformer. Be sure to add adequate lighting to the pond and provide the wire and necessary spots in the rock work to place the fixtures.

Make sure you place the lights near the surface for easy access to change the bulbs. Position the lights where they will not shine directly into your eyes when standing in the traffic areas. Place them on the

deck side of the pond pointing across to the other side, away from the viewer.

AQUAMEDIA
MORTAR MIX



Because Aquamedia Mortar Mix is not available in all

areas of the country, we are providing a certificate containing its proprietary formula with the purchase of this book. Unfortunately, if you are not the owner of this construction manual, you will not be able to receive this information.

When mixing the A.M. Mix, it should not be such a thick consistency so as to easily stick to surfaces without the need to wet them first. However, you should have a small,

2-gallon basket and 3” paint brush available to wet any rock first so as to assure a tight, even bond of the mix to the rock. Also, wet the surface where the rock is being placed. This procedure is imperative wherever a tight, waterproof seal is required, such as preventing water from leaking through the sides of the waterfall.

When applying rock in these areas also take care to apply an adequate amount of mix to the area where the rock is being placed. Seal it well with brief, short movements of the brush to ensure the elimination of air pockets and evenly distributing the mix over both surfaces.

Because A.M. Mix is so strong, it is not necessary to use as much as regular mortar. This fact makes cleanup much easier since there isn't as much mortar between the rocks to tuck point (smooth out) or mess on the surface of the rock to clean off with a brush.

Every time you complete a section of rock work, go back over the area with the 3” brush with water and clean off any excess mortar or residue, starting at the top and working

down. If you start at the bottom, you will be cleaning it again by the time you get to the top and the washed off mortar runs down over the area you have already cleaned.

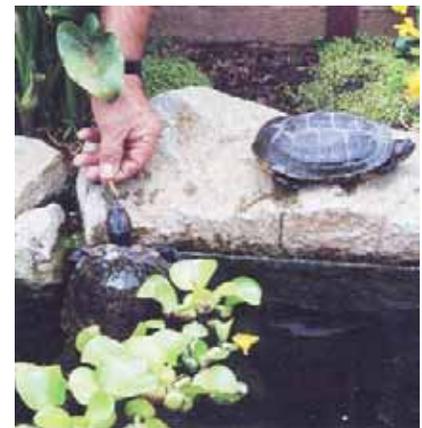
TURTLE ROCKS

When picking out rocks, find a flat one for a turtle platform or island. You can build a rock column with smaller

these techniques make it easier for the turtles to climb aboard!

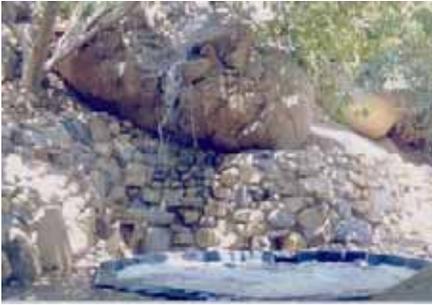
With larger, deeper ponds, a turtle island can serve two purposes. The support for the turtle rock can consist of stacked rocks which form hollow caves.

These serve as hiding places for both large and small fish, including turtles. (Photo #1) Turtle rocks basically ensure that your turtles will stay there. Turtles are a great addition to any pond. They are fun to observe and can become exciting pets for hand-feeding.



ones to place the flat rock on top so it will barely sit above the surface of the water. You can also tilt the rocks so a portion of them is under the surface. Both of





EXISTING ROCK

An existing rock can be incorporated into your water feature in such a way to appear as though it was an original component of it. When possible, you can also take advantage of existing pathways and other surrounding features.

One major secret to natural looking rock work is: don't get too fussy with their placement. When rocks fall down the side of the mountain, they don't all land perfectly lined up with all the voids filling in. If you keep this in mind, you can occasionally place one so that it juts out from the rest. Or you can make a larger rock appear as though it is balancing on a smaller one. This can be done using mortar and locking them permanently in place.



combination of the two. The stairs can start up one side and then cross over the falls by using stepping stones across the waterway.



Trees and bushes can easily become a part of your water garden.

WATERFALL STAIRS

Most waterfalls are viewed from one vantage point: the bottom. Waterfalls should be enjoyed



HARDSCAPE

Many landscape remodels consist of incorporating existing hardscape such as sidewalks, patios and stoops into the new design. This can save money on demolition and replacement of concrete. However, it proposes a new challenge: the need to match surface textures.

There is a striking difference in the color and texture between old and new concrete. Maybe the old concrete was stamped, broomed or salted. The challenge can be met by resurfacing both the old and new concrete with a coating,

from all angles, however. To make this possible, a natural stone stairs can be incorporated into the waterfall. The stairway can be part of the waterfall or completely separate or a



tile or stone, such as quartzite.

You can consider replacing concrete with a natural material such as small river gravel, crushed rock or bark.

Another material somewhere between crushed rock and concrete walkway is compacted DG (decomposed granite). This provides a natural dirt path effect, yet gives a harder, cleaner surface. (Note: make sure when using DG that you elevate the walkway to allow for proper drainage.)



Another attractive natural clean approach is use of a combination of materials. Rock and ground cover goes



well between crushed rock and stepping stones as does bark path with

stepping stones, board walkway or bridge with crushed rock. You can also mix the two dis-

similar materials in a walkway separated by a bridge such as brick and stone.



CHAPTER 11

EQUIPMENT

An ideal configuration of equipment for a waterfall/pond combination is the use of two pumps in conjunction with a back-flushable biofilter and ultraviolet light.

With two pumps, one can be running 24 hours a day, providing a continuous flow of water for agitation of pond water and for maintaining healthy water plants within the waterfall itself.

Most water plants require the constant presence of water to survive. However, water

ter and ultraviolet lights because the main pump has a lower horsepower (hp). The overall cost is less to operate.

The alternate or secondary pump can be the same hp, creating twice the water flow when in operation. Or it can be a greater hp so as to create a more dramatic effect over the falls.

The secondary pump usually draws water only from the bottom of the pond as opposed to the main or primary (continuous) pump pulling from the bottom drains of the skimmer. The primary pump sucks water both from the bottom of the pond and the skimmer. (page 72, Dia. C) The balance of water drawn is controlled by a Jandy (3-way) valve in line with the pump.



The configuration of two pumps can share one suction line or two individual ones. (page 72) The major advantage of using two pumps is having the option of a greater water flow over the falls, resulting in changing the effect and mood of the surrounding atmosphere.

plants are the plant kingdom's hardiest survivors. Many of them go dormant in a drought and then become rejuvenated later with a new water supply.

The primary pump is usually the one with fewer gallons per hour (gph) and is the pump that provides filtration and disinfection through the biofil-



A 3-way valve controls the flow of water and divides it, depending on the pond's current condition. If it is the time

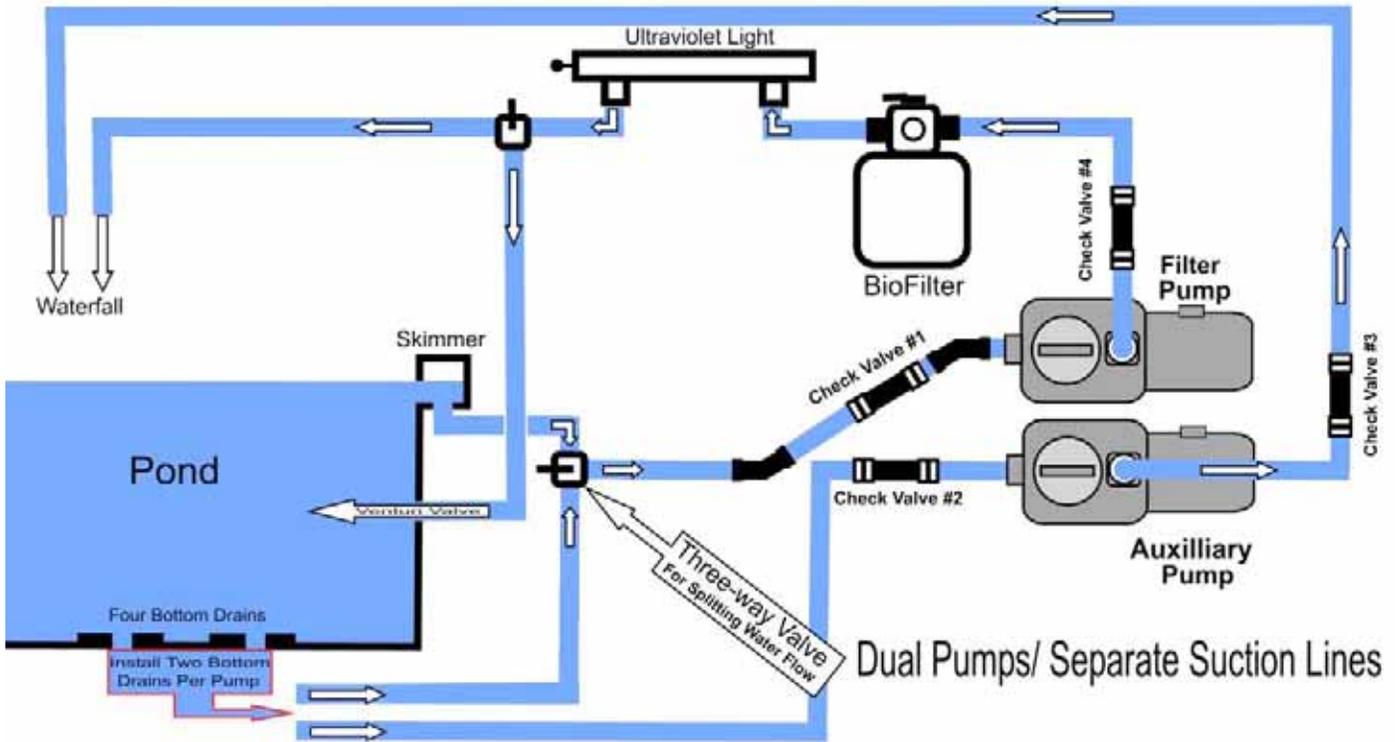


Diagram C

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Check Valve Operation (for equipment that is above pond water level.)

- #1 prevents the auxilliary pump from pulling water through the filter pump when it is off.
- #2 prevents the filter pump from pulling water through the auxilliary pump when it is off.
- #3 prevents water from flowing back to the pond when the auxilliary pump is turned off.
- #4 prevents water from flowing back to the pond when the filter pump is turned off.

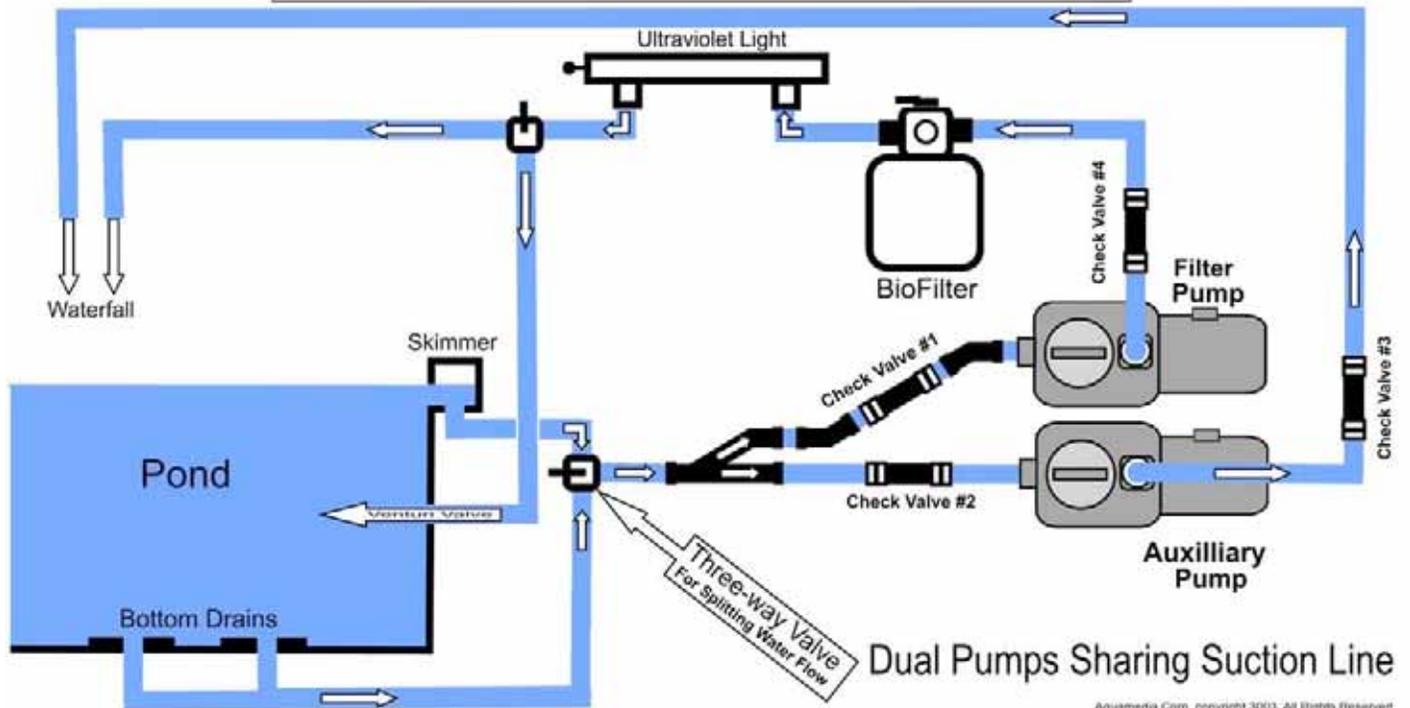


Diagram D

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Dual Pumps Single & Seperate Suction Lines

of year when debris is falling into the pond (spring blossoms or autumn leaves, for example), you would want to adjust the 3-way valve to create a greater suction from the skimmer, drawing in floating debris more aggressively. During these times of year you should empty the skimmer basket more often to keep the water flowing freely through the skimmer. At other times of the year you may want to drain most of the water from the bottom drains.

Since all waste eventually settles to the bottom of the pond, much of the material is sucked toward the drains during its suspended stage. Fish waste and other debris will remain suspended for a period of time before settling. At this stage the skimmer and bottom drains remove the debris before it reaches the bottom.

The secondary pump (sometimes a larger one) not only affords more dramatic changes in sound and looks, but because of the increased flow, the settled debris in the falls and pond are agitated, giving the skimmer and drains an opportunity to remove them from the pond.

Keep in mind that, after

the operation of the secondary pump for a period of time, it is advisable to backwash your biofilter to remove the recently collected debris. The best time to backwash the filter is when the water flow of the falls diminishes as the filter becomes depleted of its ability to hold more waste.

When using pool pumps, because of the high amperage, rating it is necessary to run a 20-amp circuit (in some cases 30 amps) to the equipment location. This usually requires running a conduit from the main breaker panel and, depending on its location (usually at the front side of the house) could be quite costly.

In addition to requiring a licensed electrical contractor, major labor intensive obstacles could exist such as the sidewalk poured tight to the house, patios, pools, asphalt or concrete driveways.

If you use a sump pump, it is advisable to use flexible hose



to facilitate easy removal for cleaning and servicing.

Besides the energy savings in using high efficiency pumps, there can be a major savings at the installation stage. These pumps draw very little amperage, ranging from 1.6 amps for



2400 gph to 3.0 amps for 4500 gph. Since the amperage draw is so small (1.6 amps is only 135 watts), it is possible to operate the equipment from an outdoor receptacle on the back of the house. The conduit can be run from there to the site with a 10- or 12-gallon extension cord, depending on the distance from the plug to the equipment.



It is important to check with your local building codes before deciding on the best approach here. For example, California recently passed a law requiring plastic waterproof covers on any outside receptacle. You will also need an approved junction box at the equipment with a disconnect switch.

One of the options we offer is an out-of-pond pump system which includes a high efficiency pump, dual anti-vortex bottom drains, a skimmer, biofilter and ultraviolet



light. By offering this package as an option, it reduces the base price of the water feature by \$2,000. And because of all the benefits these options offer the customer, it is an easy

package to sell. The high efficiency pump alone pays for itself and the other components in a surprisingly short period of time from energy savings alone. Not to mention the time saved by lowered maintenance when utilizing the optional equipment.

For example, a submersible pump requires regular attention to keep it free of leaves, algae and other debris. The pump has to be pulled from the pond each time cleaning is required. Out-of-pond pumps



utilize a filter basket, allowing the removal of debris by opening a lid for easy access. The ultraviolet light kills the spores of the suspended algae that turn the pond water green if left unchecked.

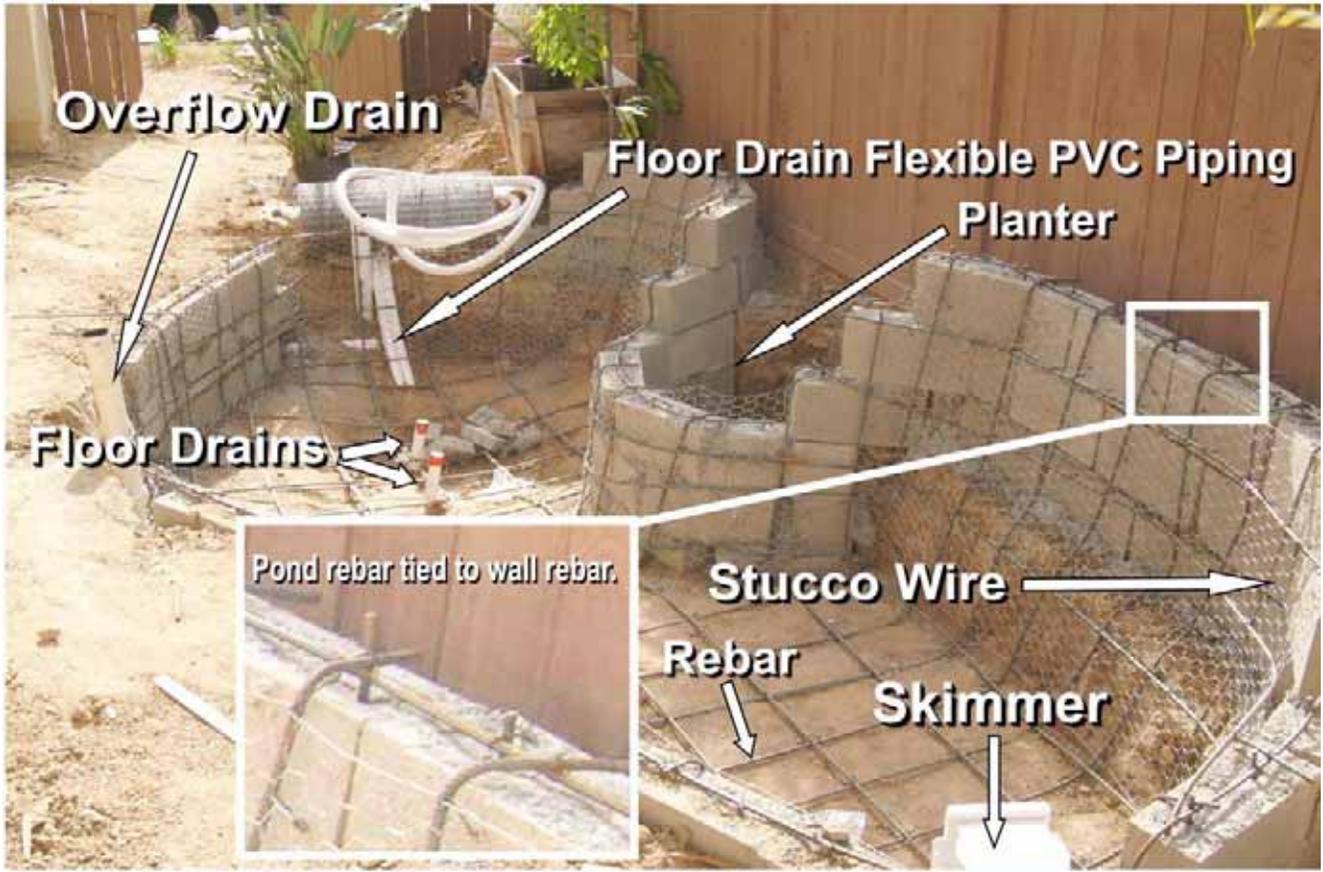
Another time saver

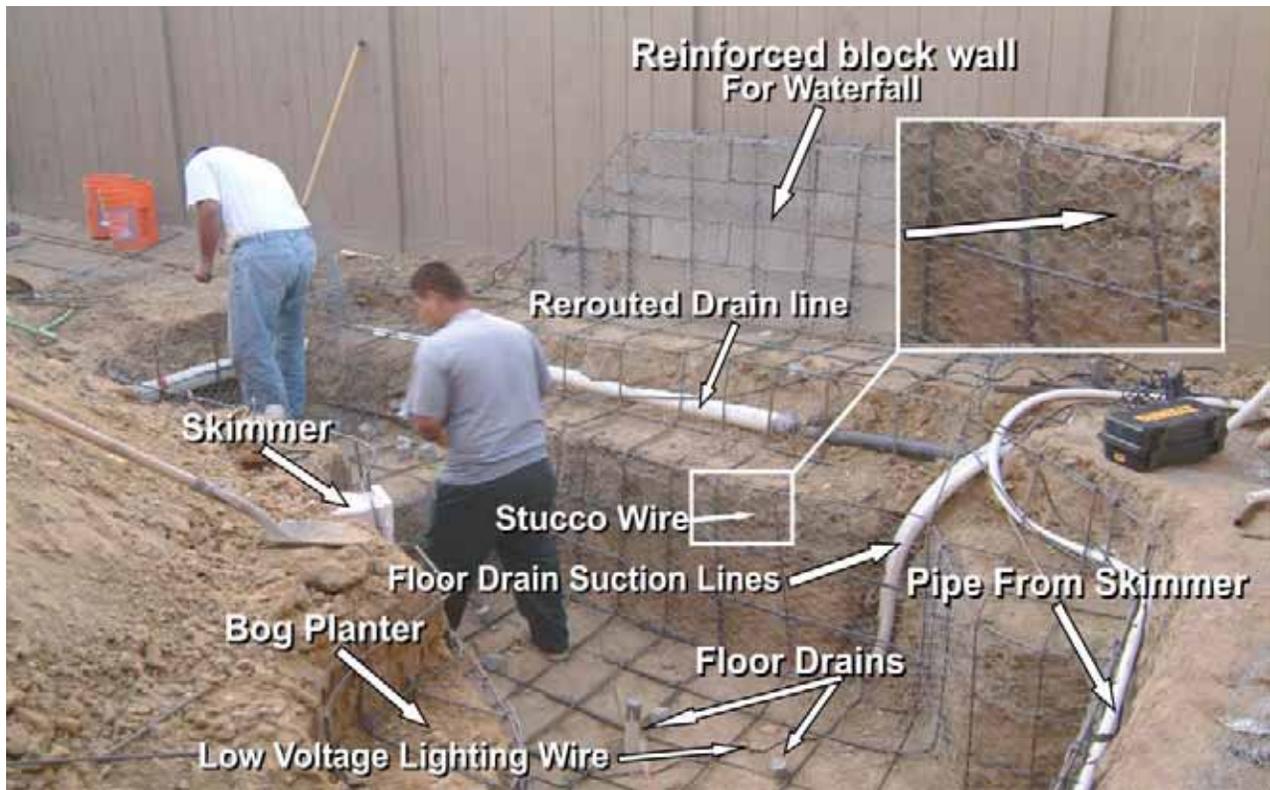


in the optional equipment package is the skimmer. Debris such as bugs, leaves, and grass clippings from mowing the lawn are pulled from the pond's surface by the skimmer. This keeps it from becoming waterlogged and sinking to the bottom where decay builds up and produces ammonia which will cloud up the water considerably. A pond that utilizes a skimmer can go two or three years without needing to clean the bottom.



Skimmer is recessed back under rocks to hide it. Notice AquaFill float hidden under the bridge.





Skimmer and overflow drain for pond just prior to pumping concrete.



CHAPTER 12

FILTRATION AND MAINTENANCE

Biological filters aid the pond in ridding itself of harmful toxic by-products produced by its inhabitants. Because most man-made ponds contain more aquatic life per cubic foot than found in a natural pond, compensation must be made for that fact.

This is done by pumping a continuous flow of pond water through a compartment containing a variety of filtering media. This strains the water of tiny, suspended particles and provides a harbor for various organisms that work together to break down harmful toxic wastes and chemicals into beneficial, life-supporting compounds.

BIOLOGICAL FILTERS

Ammonia (NH_3) is a waste excreted by fish and produced by decaying organic matter. It is toxic to most pond life, but certain bacteria in the filter feed on the ammonia, transforming it into nitrite (NO_2).

This, too, is toxic and harmful; however, another beneficial bacteria occupying the bio-filter converts it into nitrate (NO_3), which is used by the aquatic plants as food.

In addition to various bacteria found inside the filter, many other single-celled organisms, fungi and larger life forms (including worms, bugs and water fleas) feed from the waste entering into the filter. This eliminates many small particles, including algae, that turn the water green. These diverse organisms convert most of the wastes into less polluting material called "floc," which builds up in the bio-filter and needs to be removed periodically.

CHOOSING A FILTER

Biological filters vary considerably in their quality and effectiveness. Make sure to match the proper size filter to your pond or it will not function adequately and require frequent cleaning. Purchase your filter from a knowledgeable pond supplier who can assist you in your selection. It is important to choose a filter with long life, a high-quality

filter medium, and easy cleaning. For example, does it have a drain plug or do you need to bail out the water? The filter should have a means to aerate the filtered water using a spray bar, jet nozzle or venturi apparatus. A cover keeps out leaves and debris while providing shade to prevent algae growth. An overflow drain is vital in case the filter should clog. For larger ponds a multi-chamber filter will handle large volumes of water and more adequately process waste material.

Bio-filters must run continuously because the organisms need a constant supply of nutrient-rich, oxygenated water to survive. The organisms will die in just a matter of hours after the pump is turned off. It normally takes three to eight weeks for the filter bacteria to become well established. The maturing process can be accelerated by using bacterial cultures available from a pond supply store or obtained from another pond filter. Also, water taken from an established pond will suffice, though not as rapidly due to the lower quantity of organisms.

When cleaning a filter, only rinse it out with pond water, never tap water. And never clean it thoroughly because you will be removing beneficial organisms. It is better to clean more regularly and less thoroughly. The best biological filters are the pressurized bead filters, such as the



Aqua Ultraviolet Ultima II.

with water, and tossing in some fish “does not a fish pond make.”

Think of the nitrogen cycle as a circle with each of the stages occurring in the circle as a domino. Each time a chemical reaction takes place at one point in the cycle, it’s as if a domino falls down. It’s as difficult to stop the chain reaction in the nitrogen cycle as it is to stop the domino effect once the first domino is put into motion.

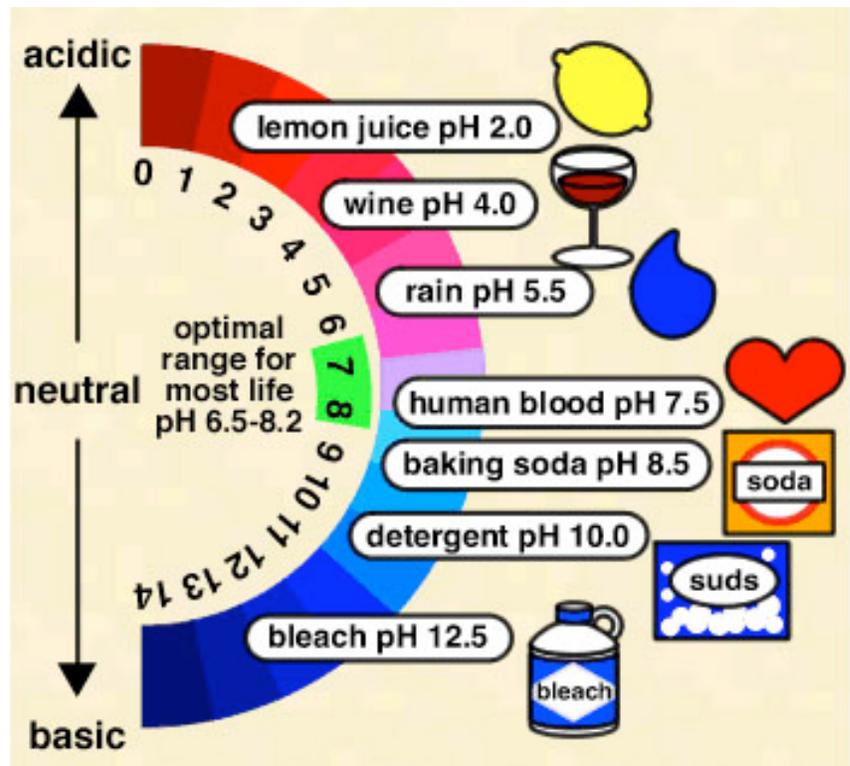
The most basic conditions of water chemistry are the pH factor (which stands for potential Hydrogen) and water hardness. These factors alone can determine the life or death of your pond’s inhabitants.

The pH of water is measured on a scale of 1-14, with a reading of 7 considered “neutral.” Any reading above 7 is alkaline; anything below 7 is acidic. Most fish prefer a pH value of 7.2 to 7.6, or just slightly on the alkaline side of the scale. However, koi and goldfish can adjust to gradual changes in pH from as low as 7

WATER CHEMISTRY

NITROGEN CYCLE

A complete nitrogen cycle is needed for a complete and healthy fish pond. Just like our body’s ability to process food and turn it into all the necessary elements required to function, the nitrogen cycle is imperative for all the necessary processes to occur in a healthy pond. Remove any of the individual steps in the process, and the entire cycle will be greatly affected. Simply digging a hole, lining it, filling it



to as high as 8.5 and still remain healthy and flourish.

Hardness or buffers in the water can raise the pH levels. Even though hardness is a separate measure from pH, the two respond to each other chemically.

Pure or “distilled” water has a pH of 7 and an absence of buffers or hardness. Neutral pH is unstable, however, and if it has no buffers or hardness, it can drop to the lower (acidic) end of the pH scale – as low as 4.2 to 4.8. At this level of acidity the fish’s gills become burned and eventually become unable to extract oxygen from the water, ultimately suffocating.

Should the pH in your pond water ever drop to these levels, never try to raise the pH too quickly. By placing coral gravel, dolomite, or oyster shell gravel in a nylon filter bag inside your filter or directly in the waterfall, moving water can pass through it and the pH will rise to 7.0 or 7.3 in less than two days.

To prevent the drastic fluctuation in hardness buffers affecting pH, include one or more of these gravels in your filter system at all times – espe-

cially if you are replenishing your pond with soft water. The gravel should be replaced every 9 to 12 months since all the buffers will be leached out by that time. If the buffers are used up and the pH level drops to 6.0 or lower, the nitrifying bacteria that break down the toxic fish waste, ammonia, and nitrite will stop functioning. At a low pH, highly toxic ammonia chemically changes to relatively non-toxic ammonium. If you raise the pH rapidly, the ammonium will also quickly return to ammonia, which could be fatal to your fish.

ALGAE

Algae can effect a change in the pH level as well. Green water is the result of thousands of single-celled plants. Algae spores are present in the air and will colonize any new body of water. Like all plants, algae produce oxygen through photosynthesis and use up carbon dioxide. During the nighttime hours the process is reversed: carbon dioxide is produced and oxygen is used up. The pH of the water changes with the amount of hydrogen ions that it contains. During day-

light hours, photosynthesis of the algae can increase the hydrogen that is present and raise the pH to as high as 9 or 10. At night the process is reversed, resulting in lower pH counts.

This change in pH related to the presence of algae can be tolerated by the fish.

AMMONIA

Once fish are added to the pond and are provided with food, their waste by-products are broken down into ammonia by aerobic bacteria (using oxygen) – more (liquid) ammonia than the fish have already produced with their liquid waste. These aerobic bacteria reproduce at higher rates than do the beneficial Nitrosomonas bacteria which actually break down the ammonia. So aerobic bacteria compete for oxygen with the Nitrosomonas and use so much of it that the area they inhabit becomes anaerobic, or oxygen-deficient.

The ammonia by-product of fish waste being broken down by aerobic bacteria is now “attacked” by Nitrosomonas. This further breaks it

down into toxic nitrite. Then the nitrite is broken down by other aerobic bacteria called nitrobacters, which convert nitrite into beneficial nitrates in the form of food for the plants.

There are numerous varieties of aerobic bacteria, some of which cause diseases in your fish. By allowing solid waste to accumulate in the pond bottom for extended periods, the area can become anaerobic, allowing anaerobic bacteria to thrive. They will begin consuming nitrates and phosphates, resulting in hydrogen sulfide or methane gas by-products. If left unchecked and allowed to collect over a long period of time, enough hydrogen sulfide or methane gas can be generated to kill your fish.

For this reason, it is important to occasionally remove leaves and other debris that collects on the bottom of your pond. By incorporating a skimmer into your filter system, most debris will be skimmed from the water's surface before it can waterlog and sink to the bottom.

Incidentally, if you live

in a cold winter climate, it is extremely important to clean your pond well before the winter months. Methane gas can become trapped under the ice and accumulate quickly to a dangerous level. One precaution you should take is to maintain an opening in the ice, allowing any gas to vent.

BIOLOGICAL FILTERS

Contrary to common belief, biological filters do not process or filter the solid waste of fish. They continue to build up and putrefy, creating a breeding ground for harmful species of heterotrophic bacteria which are pathogenic to fish. As stated, the biological filtration process utilizes Nitrosomonas bacteria to break down ammonia into nitrite

and nitrobacter, further converting nitrites into nitrates. Plants now utilize the nitrate and phosphate for fertilizer; if you haven't provided an adequate ratio of water plants to fish, "hard" algae (growing on rocks and pond shells) and floating" algae use nitrate and phosphate to reproduce. The key to preventing this condition, called "algae bloom," is to provide enough non-soil bearing plants such as water lettuce and hyacinths to compete for the nitrate and phosphate. Since these two plants are tropical and can only survive in warm climates, hardier varieties such as Elodea and Anacharis will perform well in cold climates. These plants are



commonly used in bio-filter ponds.

A bio-filter pond is used in conjunction with shallow ponds with small populations of fish and eliminate the need

for mechanical bio-filter and the need for a second pump to operate it. The bio-filter pond is located higher than the main pond for two reasons. One, this prevents the fish from eating the plants and allows the water from the waterfall to be filtered as it passes through the plants prior to spilling into the lower pond. An adequate ratio of plant cover for the water's surface is approximately 20 to 30 percent. This is a basic rule of thumb and many factors can change this equation. Some of these are fish population, water temperature, and debris accumulating from leaves or over-feeding the fish.



“NUISANCE” ALGAE

If your pond is healthy, it will start to exhibit characteristics of ponds found in nature. A common plant species is one that can grow in masses of threads or clouds, tangling around other plants or forming dense mats in shallow areas of the pond, or even creating a frothy scum on the surface. These algae blooms are also called blanket weed, thread

algae, or silk weed and are incorrectly perceived as harmful. If left unchecked they are unsightly, at worst, and rarely become problematic in balanced conditions. They can be controlled easily by harvesting.

Simply pull them out of the pond by hand. I do not recommend using algacide to kill them; this would be the equivalent of applying weed killer to a lawn instead of mowing the grass.

ALKALINE PONDS

Generally speaking, alkaline conditions are more common than acidic in ponds, es-

pecially the newer ones. If the pH remains over 8.5 for any length of time, the fish will become stressed or diseased. Here are some helpful examples:

Symptoms

- Lethargic or listless fish due to damaged mucus coating; prone to fungal infection and other disease.
- Plants chalky in appearance due to calcium deposits.
- Prominence of waste chemicals which harm pond life.
- Biological filter loses effectiveness.

Reasons

- Introducing fish too soon into a newly constructed pond; the lime or alkali from the cement will raise the pH to the top of the scale. Even a shovel full of concrete or mortar can cause serious problems.
- Lime leaching from cement products such as blocks, stepping stones and similar materials over a period of time.
- Lime in stone products subject to erosion.

- Excessive growth of algae.

Solutions

- If high alkalinity is from the pond being new, allow adequate time for the pond to age. To speed up this process introduce bacteria found in a pond starter solution.

- Institute a partial pond water change to dilute the alkalis.

- If high alkalinity is due to an over-abundance of algae, remove excessive growths of thread algae.

- If these steps do not result in a lower pH, use acidifying compounds or pond pH buffers.

ACIDIC PONDS

Low pH conditions occur less often than alkalinity in fish ponds.

Symptoms

- Fish become stressed resulting in sickness; they may start dying off.

- Oxygenating plants such as hyacinths, water lettuce, Elodea and Anacharis become discolored and wilted.

- Biological filtration ceases to operate correctly.

Reasons

- Pond water may have lost its buffers due to excessive amounts of rain, which is soft and very acidic in many areas due to pollution. Loss or decrease in buffering agents can create drastic fluctuation in pH.

- There may be high levels of humic acid or other organic acids produced by build-up of decomposing plants and leaves.

Solutions

- Regular partial water changes

- Adding buffers to pond by placing a mesh bag of oyster shell gravel, dolomite or crushed coral gravel in filter or waterfall. Water passing through the material will pull out the calcium carbonate and raise pH.

- Using pond-buffer salts (sold in pond supply stores)

PARTIAL WATER CHANGES

Wastes and toxins tend to build up in most ponds, despite use of a biological filter. As water evaporates, pollutants remain and build up over time, becoming dangerously concentrated. For this reason it is highly recommended that you drain and replace 20 percent of the water every two or three months. This water should be siphoned or pumped from the bottom of the pond, where the majority of pollutants collect. No more than 20 percent should be replaced since larger amounts could easily upset the balance of the pond, especially if the replacement water is softer or contains high levels of chlorine or chloramines.

If you are adding water with a garden hose, it is best to adjust to low volume and a mist that sprays gently through the air before entering the pond. This will allow some of the chlorine to evaporate. If you add the water quickly, add a dechlorinating product to the pond to neutralize the chlorine

and chloramines. Unless you are adding water to your pond by means of an auto-fill system, always use some type of a timer or alarm to remind you to turn off the water! If left unattended for an extended period of time, you could find your pond overflowing and your fish dying from chlorine poisoning.

OXYGEN LEVELS

Adequate oxygen is essential for the health and survival of your fish and other pond creatures. As pond life utilizes the oxygen content of the water, it needs to be replaced. Oxygen enters the water where the two contact each other – primarily at the pond’s surface. That is why a waterfall is such a vital adjunct to your water feature. As the water passes over and splashes against the rocks, it picks up large quantities of oxygen, aerating the water. Aeration can similarly be achieved with a fountain or venturi valve. These methods increase the area of water coming into contact with the air; in addition,

the resulting circulation prevents stagnation of the water.

Oxygen is also produced by submerged “oxygenating” aquatic plants and algae.

Some symptoms of oxygen deprivation

- Fish gasping at the surface for extended periods of time.
- Overnight deaths of fish, especially the larger, more sensitive ones.
- Water that appears murky black and emits an unpleasant odor.
- Fish are attempting to jump out of the pond.



Venturi valve

Reasons

- Oxygen is being consumed by large quantities of

decomposing debris on the bottom of the pond.

- Excessive amounts of algae are using up the oxygen during nighttime hours with shorter daylight hours.
- Too many fish for the size of the pond.
- Surface covered over with lily pads.

Solutions

- Remove debris
- Decrease algae growth
- Decrease number of fish
- Decrease number of lily pads.

PLANTS

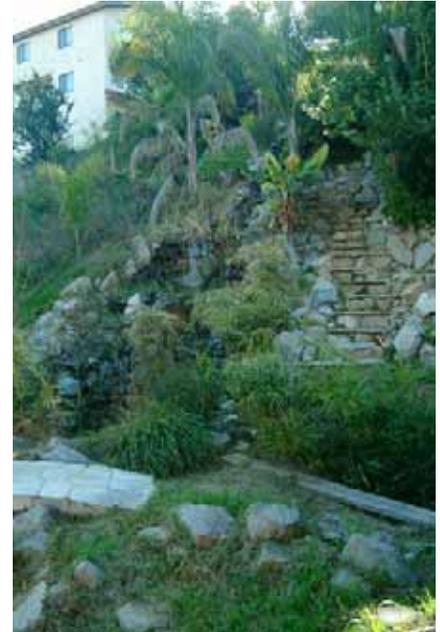
Plants not only help regulate the oxygen levels of your pond; they cool off the surrounding area as well. Plants that normally would not survive in direct sunlight or desert climate thrive in the immediate vicinity of a waterfall due to the high evaporation rate. The water splatters and thins out as it rolls over rock, increasing the surface exposure. The resulting evaporating water becomes a heat exchanger, cooling the

surrounding air by as much as 15 to 20 degrees. The evaporating water increases the humidity protection to the plants from the harsh rays of the sun.

When adding plants to a waterfall there are many places that can facilitate plants such as baby tears and different types of moss. Places that would not be conducive to actual water plants could be flat or craggy areas that receive



overcrowding when they become mature. these two photographs were taken only five months apart.



a specific root base can be placed almost anywhere in a waterfall such as water pea and parrot feather .

A nice attribute of moss or baby tears is that it doesn't require a large amount initially

FISH

splashing, providing the necessary moisture for the moss, baby tears or isotoma. Other water plants that don't require



Many clients who want a waterfall and pond do not want fish to take care of. Actually, a pond will require less attention with fish than without. If a pond has a waterfall to aerate the water, fish will produce waste that is broken down by nitrifying bacteria into nitrate nitrogen, and water plants will use the nitrogen and thrive. In turn, the fish eat the algae and small water insects that live on the rocks and plant roots. A prop-



to look great. If it receives the proper amount of moisture, it will spread and grow rapidly. It's important to plant the proper type of vegetation to prevent

erly balanced pond like this will pretty much take care of itself.

Fish food can get lodged in the plants, rocks & vegetation around the perimeter of the pond. If the fish cannot find the food it simply decays, adding unnecessary nitrates to the water and resulting in more food for algae to grow. To eliminate this problem we developed a fish food corral made from PVC pipe and elbows or



a single piece of PVC flex and a single coupling, creating a circular corral. The corrals allow for the proper proportioning of food its easy to tell if you've given the fish too much, and its easy to collect the extra food that the fish don't eat. With a small net it is easily removed from the corral. Eventually you will know exactly how much food to feed the fish

and that amount should be consumed within the first 2 minutes. Any food left after that should be removed. It's better to feed them too little than too much. In a case like this, more is not better. Sometimes my clients originally expressed a concern that fish would be a burden or a hassle. They would worry about having to feed them daily, or what they would do when going on vacation. I would explain that

the fish are extremely important with regard to their contribution to the nitrogen cycle. The nitrogen cycle is what makes a pond low in maintenance and

nearly self-sufficient.

The fish waste provides the nutrients for the plants, the plants and bacteria clean up the waste, and the fish eat the plants and algae. As long as you only stock the pond with small fish such as guppies and mosquito fish, they will never need to be fed since they can exist solely on food that the pond provides naturally.

A chlorinated pond, on the other hand, requires many times the maintenance. The chlorine dissipates from the water as it flows over the falls and turns into chlorine gas. This means that fresh chlorine needs to be added regularly and the waterfall will smell like a swimming pool all the time. The chlorine also causes many minerals and suspended particles to precipitate out and build up on the rocks, causing unsightly white stains in the water's path. When chlorine is not added regularly, leaves and other decaying debris in the pond will cause algae to grow, turning the pond green. So after convincing the client to give my suggestion a try, I return a few weeks later to find that they have not only purchased some large fish, but have given them all cute names.

If the client wishes to have larger fish such as koi, the nitrogen cycle will need a little extra help from a biological filter and an ultraviolet light. The larger the number and size of the fish, the greater the waste material produced, which means some of it must be removed from the water.

Increased quantities of nitrates and nitrites increase the amount of ammonia and other by-products such as pea soup algae, the type that turns the water green. A biological filter will aid in the breakdown of toxic nitrites into less harmful nitrates, and an ultraviolet light will kill algae spores and disease-causing pathogens as they pass through the UV light on the way to the filter.

THE FILTER PLUS FISH FORMULA

There are many different types of filters available today which require regular cleaning. The decaying matter needs to be removed from the filter, flushed and cleaned with a garden hose – a labor intensive job if there ever was one! Biological filters are designed to filter out bio-filter and organic substances. By utilizing anaerobic bacteria-laden filter media, a bio-filter breaks down harmful toxic substances into harmless by-products. Busy ponds without a bio-filter will develop an environment harmful to its inhabitants as a result of the build-up of fish waste, decaying pond creatures

and leaves and other debris that have settled to the bottom.

The size of the bio-filter used in a pond is in direct proportion to the number of fish per gallon. The more fish, the more waste and the bigger the filter that is needed. Do you really need a filter? No, not if you follow nature's guidelines. Natural lakes and ponds don't have mechanical bio-filters and they are a home for many healthy fish. If, however, the fish began to overpopulate the lake and start running out of food, they would thin out naturally until the population was small enough to be sustainable.

Such a hypothetical overpopulation would cause an imbalance in the nitrogen cycle by producing too much nitrite from the fish waste. Then the increased pH of the water would create an algae bloom that could fill the lake and choke off the fish.

Man-made ponds can be controlled mechanically and chemically to allow for larger numbers of fish per gallon than would be found in nature. Many formulas exist for dictating the proper number of fish a pond can hold, whether it's fish per square surface foot,

fish per cubic foot, fish per gallon, pound or cubic foot. The bottom line here is: healthy water equals healthy fish.

If your water is fish-friendly, the number is insignificant, within reason.

If the air was pure, you had plenty of food and water, and a healthy way to eliminate, you could live in a small house with 30 other people and stay reasonably healthy if it were not for one thing: stress. Koi fish are like humans in that respect. If it gets too crowded, the fish will try to leave the pond. If fish are jumping out of a pond, it isn't because they have an exploring nature; it's either too crowded or the quality of the water is less than desirable.

FILTER TECHNOLOGY

Man-made devices stretch the natural parameters set by nature, allowing the pond to support more life than it normally would. The biological filtering system is the best way to accomplish this. The more advanced the technology, the more effective its ability to treat

water. There are as many different types and configurations of filters as there are people wanting to get rich off manufacturing and marketing their own filters. Almost every pond or water gardening magazine contains more advertisements for filters than any other product. Which one is the best? First, let's discuss the various types that are available.

The most common filters are the up-flow, down-flow, submersible, recycling and pressurized types. The most common problem plaguing the operation of any filter is channeling. Water will always take the path of least resistance. Filters use a variety of filter media or material for the water to pass through. Pond water contains a large amount of suspended matter that collects in this filter media, eventually blocking or plugging the spaces between the material. As this occurs, the water will divert to another available path until it, too, clogs. Eventually, the water flow will find a permanent channel, avoiding the filtration process altogether until the media are removed, cleaned and replaced.

In the case of a down-flow filter, it operates on the principle of gravity, as opposed to pressure or up-flow. So when the media begin to clog, gravity is not sufficient to force the water through the available channel at the same rate that water is being pumped through, so it spills out the overflow drain back into the pond, unfiltered.

The most efficient filters are pressurized filters that have a backwash feature. A bio-filter contains filter media on which nitrifying bacteria reside, which break down the toxic nitrites into less toxic nitrates that can be used by the water plants. Consequently, the more surfaces that are available per square centimeter of material, the more effective the filter.



Recent technology developed by Aqua Ultraviolet of Temecula, California produces special hexagonal beads which possess the greatest maximum

available surface area of all existing filter media. They are tapered so beads are less likely to group together. Back washing forces water through the filter in the opposite direction, breaking loose solid material and flushing it free by way of a drain outlet. Maintenance involves a simple turn of handle for about one minute.

Down-flow or up-flow and submersible filters require disassembling and washing of all enclosed media, and then returning it to the filter -- a dirty, stinky, messy process. Unfortunately, pressurized back-washable filters are costly and are designed for larger projects for use with out-of-pond pumps which are needed to adequately back-wash the filter. Thus it is necessary to settle for the high maintenance, less effective filters for smaller ponds up to 300 gallons.

PROFESSIONAL HELP

Because there is such a wide range of information to be learned on this topic and so much technical information out there, you may decide to

seek professional assistance to complete part or all of the water features. Remember: asking friends or neighbors for recommendations is always an option, but they are unlikely to have had experience in the water feature business. It is advisable to seek the help of a specialist and ask for references. It is particularly helpful to find a professional who can supply the names of the last four or five customers who have been serviced satisfactorily. Providing a few good references is not usually difficult, especially if the contractor decides to pick and choose the best handful from the past 20 or so jobs. It is quite another matter to divulge the last four or five customers consecutively and to note whether they are satisfied with the work ethic of the contractor.

Don't be shy about speaking to these previous customers. Find out whether the work was done on time and came in on budget. Ask to visit the project in order to inspect the work first hand! Contact the American Society of Landscape Architects (ASLA) or the Association of Professional Landscape Designers (APLD)

for referrals to professionals in your area. Always interview more than one professional to have a better idea of expected costs and finished product. However, you should never make your choice based on cost alone; rather, consider what you can afford coupled with good references and experience.

Finally, you should always insist on a written contract with detailed descriptions of the work to be performed. Don't forget to demand a reasonable time schedule and payment plan. This procedure protects both parties against misunderstandings that can arise later.

CHAPTER 13

FUNDAMENTALS OF SALES

To all those contractors out there who are ready to switch from building room additions to creating beautiful water features, I would like to share with you some of the "secrets" to my selling success over the course of my career. I hope you can learn from them and in applying them to your own business, improve your bottom line.

First of all, price your project high enough that you can afford to discount it later as an incentive for the hesitant customer to sign the contract. You can always come down in price, but you don't want to find out later that the other bid they received was twice as much as yours. Caution: if you do discount, you do not want to appear desperate for the work. Nor do you want to discount so much that it appears you have copious amounts of profit built into the project.

Tell them you can offer a discount only because you're starting another job in their area, so you can afford to do their job for less by constructing both at the same time. What constitutes "in your area?" If you conduct business in Columbus, Ohio, for example, and the project you're discounting is on the south end of town and you have another one on the north side, it constitutes the "same area" as opposed to Cleveland. The phrase "same area" is a relative term.

Maybe you really want to work with these people and they don't seem sold on you yet. Tell them that you went over the figures and found a few places where you could cut costs without compromising the quality, functionality, or integrity of the project. You could actually lose a job for as little as the difference of a few hundred dollars. Therefore, try to establish what the customer's budget is right up front and then stay within the budget when pricing the primary features. You can list optional features separately to achieve a "value added" to increase the profit.

Many cars do not need a salesman to sell them. If the customer likes the model and it fits their budget, nothing more is needed to complete the actual sale.

However, if an eager salesman were to begin explaining how surround-sound stereo, power windows, sun roof, navigation system and power seats were to bring them so much joy and long-term pleasure, they may be willing to go over their stated budget for the tempting upgrades. This is the difference between sales and simply order writing. If the items were not presented as optional and were included in the original sticker price, the total may have scared them away. Ice cream is ice cream; toppings are the profit.

Another incentive in closing a contract is "throwing in" a couple of the optional features. The car salesman might say, "If you buy this car today, I'll throw in the Michelin tires and undercoating." For me, the options with low cost and high profit margin have been the plants, pond set-up fee, and an Aquafill automatic water leveler.

During the initial sales call, use whatever material and facts you have on your company to establish credibility. I explain that I have been in business for twenty-two years, built over eighteen hundred projects, been published on the cover of seven magazines, and that I'm a free-lance writer and photographer for six national magazines.

Then I hand the customer the material to back up what I've told them, such as a CD rom containing about 350 projects, a brochure on my company, and a portfolio of our accomplishments, which I let them skim through. I share a couple of testimonials, explain our non-profit educational program for local

schools called "Ponds for Kids," talk about our "Water Gardens Designed" program and its benefits.

I explain that we use state-of-the-art equipment in all our projects -- "the best money can buy" -- to ensure a maintenance- and trouble-free water feature. I share how we include product brochures with our bid to give them an opportunity to price the equipment on their own. (They never do!) We break down the bid so they can see what they are paying for and list all components and options separately so that they can pick and choose to fit their budget.

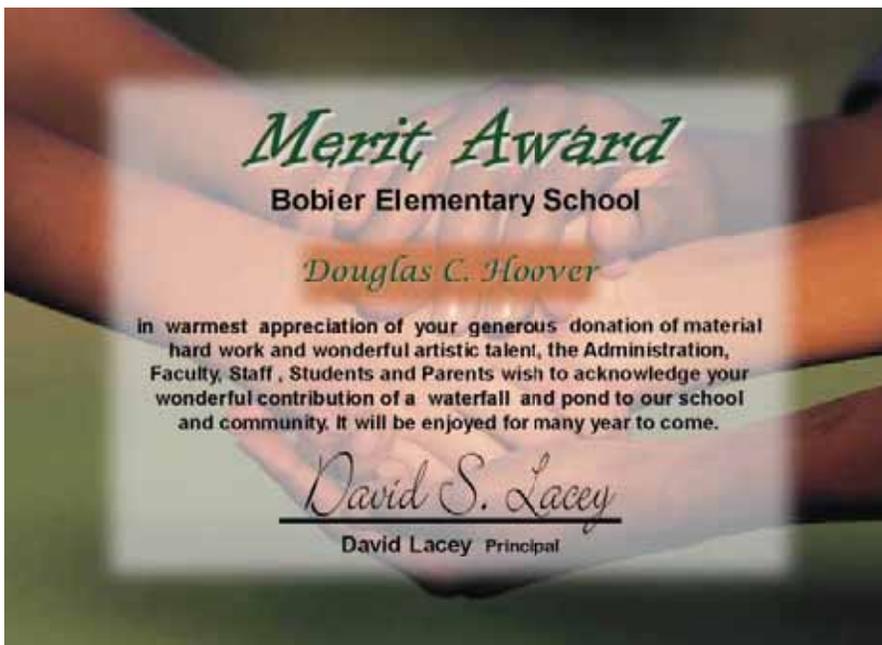
When we step into the back yard, I start by explaining that over the years the one

complaint I seem to receive most often is that I did not explain all the possible configurations of the water feature for their yard. Later they tell me they wish it had been taller, or wider, or the pond bigger or deeper. By giving a client at least two options to choose from, they are more likely to pick one.

I have several clients who will pick the cheapest design they are offered, only to talk themselves into the deluxe model later on. Consequently, I cover all the bases and possibilities right up front, letting the customer decide what is affordable for them.

Initially I explain that we can offer twenty-two years of experience in the water garden industry. We do not use liners, which all eventually leak for a myriad of reasons. We have constructed over eighteen hundred projects and have never had a leak because we use steel and concrete instead of plastic liners. Yes, it costs more initially (though not that much more), but it will last many lifetimes.

I explain that when we submit our proposal, we include a booklet containing ba-



sic information such as techniques of pond and waterfall construction in order to explain the wide range of equipment on the market. This teaches the customer many of the pros and cons involved in pond construction and maintenance. This knowledge will help make them proficient in obtaining and analyzing other bids from various contractors.

Bottom line: this shows the customer that you are not only the most organized but also the most knowledgeable in your industry and, in many cases, the customer doesn't even bother to get additional bids.

If your client asks for a price up front and insists on a rough estimate, they are actually doing you a favor. Now you can pre-qualify them on whether they can afford you or not. It is easy to pre-qualify someone by using this simple method while talking to your customer. Say something like this:

You may have noticed that more and more customers don't know many people who own a waterfall and pond. This is because most people cannot afford the cost. The

size of the project has a direct bearing on the cost. If you can share with me your budget for the water garden, I can save both of us a lot of time because I can show you exactly what I can do for that price. It won't do either of us any good if I come back with an elaborate plan which is way beyond what you can afford.

If the customer has a couple of thousand dollars in mind to spend on the project, then you have saved yourself time and money early in the negotiations. Plus, you can explain that some folks think they can get a custom waterfall and pond for a couple of thousand, but the fact is, Mr. and Mrs. Customer, that will buy you a small fiberglass stand-alone unit that you can bring home in the back of a pickup truck!

As I said earlier, we don't use rubber liners. They all eventually leak. Instead, we construct our waterfalls and ponds using steel rebar and 5000 psi concrete. And by using concrete and mortar for rock placement, the rocks always stay in place. There is no danger of a rock moving when someone steps on it in the wa-

terfall or on the perimeter of the pool. Most water features contain liners because it cuts the labor time and material costs, thus increasing profit margins. Liner contractors who write articles for dealer and industry magazines brag about their profit margins, while never mentioning the repercussions of leaky ponds and waterfall liners. I certainly hear about them when I've been called to fix the problem and I explain there is nothing I can do about it except to rip it all out and do it right.

What is shocking is that I find the liner guy charges almost as much for the liner pond as I do for my concrete and steel ponds. They boast that the liner will last fifty years. Actually, that is true. . . if you leave it in the box!

The moment you install it, the liner becomes an open target! It is susceptible to damage by gophers, ground squirrels, chipmunks, rats, roots from trees, plants or weeds. All these forces of nature compete to see who can breach the water tight integrity of the liner. We've seen it all.

Plus, just the weight of a rock sitting on plastic can

eventually stretch and poke a hole. Or it can press slowly against a sharp stone or debris on the opposite side and pop a hole there. It doesn't take much of a hole to be noticeable. One the size of a pin head can create what is known as "a drip per second." Just one tiny drop per second can result in five gallons of water every twenty-four hours. That's fifty gallons in ten days – all from a tiny pin hole!

THE BEAUTY OF OPTIONS

Adding special features to the proposal as options for the customer keeps the basic cost of the bid down, making it more affordable and less likely to create sticker shock. It is easier to explain, promote and sell the options after the basic (and less costly) proposal has been presented to the client. Explaining to them that the reason for listing the additional features as options allows them to pick and choose according to their budget.

Let's face it: they really do need the water plants and they'll only end up getting them later. Most customers

don't know where to go to buy them anyway, let alone know how much they cost.

I explain that the lighting in the falls and pond aren't necessary, except that it's wonderful to watch the dancing light reflected off the water on the surrounding rocks, plants, and trees at night. It's like a symphony of light and sound and it's great to see the koi fish swimming around in the pond while watching the sparkles dance down the falls in a cascade of light.

HELP! I FORGOT TO TURN OFF THE WATER!

Another option is the electronic autofill system. You explain they really don't need that either, because they can add water to the pond as needed with a garden hose. However, with the high rate of evaporation in the summertime associated with waterfalls, you will be needing to add water every other day. But so they don't get horrified by the water loss statement, you explain that the average waterfall loses from five to ten gallons a day from evaporation, but that is the same amount of water as

flushing your toilet only twice. However, five to ten gallons a day equates to 35 to 70 gallons a week you would need to replace with the garden hose.

Also, there is always the danger that eventually you may get distracted with a phone call or want to perform another chore while waiting for the pond to fill, then end up forgetting about it. If too much water is put in at once, you could end up killing your fish with an overdose of chlorine and chloramines. The Aquafill Float control system automatically adds water to the pond as needed, keeping it at the specified level at all times. Plus, it is electronic, not mechanical, like the floats in swimming pools and toilet tanks that can corrode and stick, causing a flood. Especially when you're away from home or on vacation!

If the client plans on having fish, they really should sign up for the pond set-up option. This involves getting the pond chemically balanced so it is safe to introduce fish. Buffers need to be added and balanced along with the pH. We add nitrifiers, aerobic and anaerobic bacteria, nitrobacter and salts. We chemically balance

Biological Pond Clarifier and Deodorizer

For cleaning and deodorizing ponds and lakes

POVD SAVER™ is a concentrated microbial based product containing 4 billion CFU's (colony forming units) per gram of proprietary blend of bacterial strains that quickly biodegrade the nutrients, organic matter and hydrocarbons in water which would otherwise contribute to clouding, sludge and foul odor. **POVD SAVER™** is a natural biodegradable product and nontoxic to humans, animals, and fish. It is used to restore a balanced aquatic ecosystem, and to clean up and clarify small ponds and lakes used for landscape, irrigation, drainage, or nutrient recycling. **POVD SAVER™** works in non-chlorinated water over a broad pH range between 5 and 8.5.

Product Benefits

- Improves water clarity and quality
- Reduces sludge and organic sediment buildup
- Reduces nutrients that lead to buildup of surface sludge
- Controls methane and sulfur odors
- Reduces harmful hydrocarbons

Guaranteed Bacterial Content

Total Bacterial Count	Minimum 4 billion CFU's per gram
<i>Four Billion colony forming units (CFU's) of spores of the bacterial genus Bacillus, per gram of product, containing 17 strains of bacteria that degrade ammonia, nitrates, phosphorus, hydrocarbons and plant organic matter as follows:</i>	
Ammonia (NH ₃) Utilizing Bacteria	Minimum 0.8 billion CFU's per Gram
Nitrate (NO ₃) Utilizing Bacteria	Minimum 0.8 billion CFU's per Gram
Phosphorus Utilizing Bacteria	Minimum 0.8 billion CFU's per Gram
Hydrocarbon Degrading Bacteria	Minimum 0.8 billion CFU's per Gram
Plant Material Degrading Bacteria	Minimum 0.8 billion CFU's per Gram

The bacteria in Pond Saver are live, proprietary strains fermented under strict, quality control conditions to meet labeled specifications and performance claims. The bacteria are mixed in a proprietary blend of enzymes, sugars and growth factors to maximize product efficiency and performance.

Aquamedia Corp

3755 Mt. Abbey Avenue; San Diego, CA 92111
(619) 223-2557 FAX (858) 715-8443

the pond and monitor it for two to three weeks prior to introducing the fish. We supply test fish when finished with the pond set-up process.

The options above can add as much as three thousand dollars to the total bid. You can explain to your client that even though none of these op-

tions are necessary, they would make their water feature so much more enjoyable.

I remind my clients several times that the money they spend on their water feature will bring them more long-term joy and pleasure than anything they have ever spent money on in their lives. Also, I

promise them that when it is finished, they will say it is way more than they ever expected.

Even after they sign the contract, I continue to remind them as often as possible that they made a wise decision and won't regret it. Having a water feature is like having the Discovery Channel in their back yard. They will be out there at every opportunity to enjoy their waterfall and pond. How do I know this? Because nearly every customer I've ever had says this very same thing!

Surprise your customer with a pair of turtles and a couple of nice koi fish when you're finished with everything. That will go a long way in terms of P.R. and good will. With every project I try to

throw in a bonus by building the waterfall a little wider, the pond a little bigger or deeper, or maybe add a couple of extra lights. The long-term appreciation and friendship goes a long way for the additional cost or effort expended.



Two more examples of upper ponds with exiting streams. These streams however, spill into small ponds rather than wells or cisterns. Rather than utilizing a submersible pump to return the water to the pond, a bottom drain with an above ground pump would be a more energy efficient way to design it; locating this pump with the other equipment.





Beaches add charm, character and interest to any pond. However, a beach, if not constructed properly can provide a ramp for predators to wade in and dine out. These beaches may appear to descend gradually into the pond as most natural beach would. If a crane or egret were to wade in, they would quickly be surprised.

These beaches only extend a foot into the pond and only three or four inches before dropping off vertically, straight down to the floor, three to four feet. The concrete pad for the beach sand has a raised lip along the edge to provide a retainer to prevent the sand from eroding and sliding into the pond.





Water features and water gardens are enhanced by incorporating natural materials in the construction of side walks, stairs and pathways, such as rock, flagstone and ground cover rather than using the more traditional material such as cement, concrete and or tiles.





Many people have difficulty imagining what the finished project will look like, this helps!



Waterfall Into Existing Pool



The rebar for the waterfall shell is tied to the existing rebar of the swimming pool.

Suction lines

Threaded base for drain.

Most building codes require double suction drains to prevent the possibility of entrapment from clothing or hair being sucked into a single drain. A double drain splits the suction force allowing for the easy removal of any object trapped against the drains surface.