

SWIMMING POOL DESIGN & CONSTRUCTION



10/4/2014

SWIMMING POOL DESIGN & CONSTRUCTION

*Information Supplied is based on Standards Which Should Apply
When Having a Pool Constructed in New Zealand*

The following is an informational overview that will empower you with the basic knowledge required in the design and construction of your pool.

PLANNING

When looking to install a Pool there are numerous issues which need to be looked at and considered:

- Site location, Topography and Soil type can have a huge bearing on the type of Pool which can be installed and its final cost
- Depending on the above an Engineer may need to become involved. Generally on a flat section the Pool Construction Firms general Engineering certificate will be sufficient
- Positioning of the Pool for the sun and away from prevailing winds
- Site access for construction work and machinery etc.
- The presence of a Water table will increase costs in the construction especially providing under floor drainage and pumping stations while construction is underway
- Is Resource Management consent required?
- Fencing considerations will have a huge bearing on the overall aesthetics of the completed project. Each Council is a world unto themselves and have different interpretations of the Fencing Act
- Positioning of existing Storm Water, Sewer systems and Power



LANDSCAPE DESIGN & CONSTRUCTION

The construction of a new Pool will lead to some form of Landscaping. In its simplest form you may only be looking at some Hard Surface areas, Planting and Fencing. In a more extensive situation you will be looking at integrating the indoor and outdoor living, how it flows and how the construction mediums work in together. The money put into a Landscape Designer as either a consultant or to ultimately prepare plans and project manage the works is certainly money

well spent. Time spent here in working through design aspects will lead to work flowing well and cost over runs reduced. Work with accredited Designers or Architects from either the NZ Landscape Association or NZ Landscape Architects to ensure you are working with qualified firms.



BUILDING PERMIT

All in ground Pools require a permit from the Council. Pool construction should not take place until this has been carried out. Permits will set out the location of the Pool against the House and Boundaries etc. locating Drainage, Sewage and Power lines as necessary. If the Topography of the land is not flat, profiles of this will be required. Proposed placement of the Filter Shed and Fencing will be required and how Backwash etc. from the Pool is dealt with. On Rural sections boundary locations may deem that Resource Management consent is required and this will be subject to the local council's boundary distance requirements and its zoning.

Most Pool construction firms have standard engineering drawings which are held at the Council offices. This means that as long as the Pool is constructed in line with normal practices they will accept these. If the Pool falls outside these guidelines further Engineering work may be required. This would be mainly when the site is contoured or the ground would not support the pool structure (e.g. Peat and soft sands).

Some Council's may require Engineering drawings and Resource Management consent on an individual basis as the normal criteria for the construction of a Pool.



When discussing the permit with the Pool Construction firm they should be aware of issues prior to construction and all costs need to be established prior to commencement of work. It is good to be able to supply relevant scaled drawings of the property with all buildings and services located. A little bit of homework on your part can save a lot of time.

CONTRACTS

All Pools should only be built when there is a written contract signed between the two parties. This may be as simple as a quote on the firms letter head and signed to more detailed contracts which out line legal issues and warranties. Contracts are mainly required when things go wrong

and supporting documentation is paramount. A contract should outline what you are having constructed, its costs and warranties and discuss hidden costs if any which may occur in the construction process. Again working with a company who is a member of the NZ Pool Builders Association will give you some assurance that you are working with qualified and experienced Pool Construction firms.

Most problems occur because of lack of communication and documentation from both the client and the Pool construction firm. Contracts are only as good as the person that signs it and dealing with a reputable firm who provides recommendations from previous clients or enables you to ring and view recently built pools will always give you confidence. Warranties on the Pool shell should be clear and distinct from those on the plumbing and electrical side. To some degree you maybe faced with the term PC Sum. This will be mainly in conjunction with earthworks and if final decisions have not been made on products or the sourcing of these products used in the Pool construction. A PC sum is not an open financial amount but should be within 10-15% of what is allowed.



CONSTRUCTION

The main types of construction are:

1. Concrete sprayed with a plaster or tiled finish
2. Pre-molded Fiberglass
3. Fiberglass liner constructed on site

All of these types of Pools work and if completed to a good level of workmanship, will give you years of good service. Trying to compare the attributes of each type of pool can end up a confusing exercise.

There are other methods but the above have the largest share of the market place. All Pools can be categorised as either structural or non structural Pool. A pool is deemed structural when built utilising engineered specifications, has enough strength to make the shell of the pool independent of the environment it is constructed in when no water is present. A pool which is non structural requires the presence of the water in the pool and the passive resistance of the ground it is constructed in to provide its structural integrity. These types of pools have the potential to fail if the water is removed.

Sprayed Concrete Steel Reinforced

A concrete reinforced sprayed shell will always be the strongest medium to build out of and gives the flexibility of being able to customize to any shape or size. Concrete is sprayed via a compressor over a steel cage and is able to be shaped to any size or configuration. It is generally constructed against the excavation lines so requires little back filling. They are a structural pool and can be built in environments where others may struggle and pools can be emptied under supervision. This shell can then be rendered with various Plaster or Tiles finishes.

Pre-molded Fibreglass

This type of Pool had a lot of problems in their early days with Osmosis and Black Spot. These were directly related to manufacturing issues which have largely been sorted out with new technology in Vinyl Ester Resins, Gelcoats and Manufacturing conditions. They have various sizes and colours but lack the ability to be customised. The Pools are non-structural and require the resistance of the surrounding soil as they are backfilled to keep their shape as water is introduced. Removal of water is not recommended.

Fibreglass constructed onsite

This type of Pool can be constructed to any size or shape with a mould made from timber and lightweight cement sheeting. A lightweight unreinforced concrete floor is utilised to finish the mould and then a 5mm Fibreglass skin is then applied followed by a coloured gel coat. As the water is placed into the Pool cement binded sand is compacted into the cavity between the ground and the mould. The pool is finished with a ring beam of reinforced concrete to accept the coping. Again this is a non structural Pool and should not be emptied. Working with resins etc. outside, leave these types of Pools susceptible to problems with curing of the Fiberglass and Gel coats.

If you are dealing with a reputable firm and you feel personally you are working well together, this will go a long way to achieving a good standard pool. The big advantage of dealing with pools which are constructed onsite is the customization that can be provided in pools filtration, circulation, size, shape and colour.

The actual pool surface will give you the different colours in the pool. In plaster based systems look for tried and proven systems such as Quartzon, Hydrazo etc which have smooth surfaces. Stay away from exposed aggregate systems such as pebbles. If you go for tiles ensure they are suitable for full immersion in the water. Again good builders will utilize good products make sure you are clear on what the structure of the pool is and how it is achieved before construction starts. To a large degree clients have no knowledge of the Pool industry and are very reliant on the information gained from the construction firms. Those firms which freely discuss their systems and options available are again going to be the firms you feel most comfortable dealing with.

UNDER FLOOR DRAINAGE

An area which is largely overlooked but should be an integral part of the Pool construction is dealing with the potential of water under the pool via either natural causes or broken pipe work. In situations where the pool is not constructed on free draining sands allowance should be made for under floor drainage to allow the free movement of water under the Pool. This should be linked to one or more hydro-static valves which will open if there is more pressure under the Pool than in it and is especially vital when a water table is present.

If a pool is constructed in a water table a pumping station will be required to allow the pool to be constructed. There are various methods but utilizing a plastic 225 litre drum with perforated holes and surrounded by drainage metal will allow the use of a submersible pump while construction is taking



place and then the installation of a pipe with a foot valve on it this station can then be utilized after construction, if the pool needs to be emptied at any stage to lower the water table.

A main drain (which can be extended to be the hydro-static valve) is good construction practice as it enables the pool to be emptied via your own filtration system and can form part of the suction side of this system but is not essential.

PLUMBING & FILTRATION

This is an integral part of the design of the Pool as poor construction in this area will lead to high working pressures, lack of water turnover and uneven pressure through the return outlets. The plumbing should be well documented in the quote and a plan of the finished pipe work should be supplied at the finish of the work so if remedial work around the pool is required in

the future everyone knows where it is. Pipe work from the Pool to the Filter Shed should be at a depth which will allow work on hard paving surfaces to proceed without damage to them. The return plumbing pipe should have a continuous ring around the Pool to give balanced pressure through return outlets. Pipe work in the Filter Shed should be tidy, simple and level with any valves labeled.

You cannot over filter water. The basis of the water quality in the pool is how water gets to and from the pool and at what pressure and the size and type of filter. In a domestic situation you should be running your pool a minimum of 12 hrs over a 24 hr period in summer. Your pool water should be turned over every 6 hrs through the filter. The selection of the pump size should reflect this and the filter should be sized to the pump. For the sake of a couple of hundred dollars have the pool filtration sized and then go to the next size. Over 80% of the water clarity in the pool is delivered by the filter system. Correct pipe sizing and the number of inlets and outlets for the pool have a large bearing on the turnover of water and at what pressures the system may work at. A big pump means nothing if it can not get water from the pool and through the filter at good pressure levels. You should expect a good designed pool to run between 70 and 80 KPA in its standard form. Heating options may raise this by up to 10 KPA.



A standard 10.0mtre pool carrying 70,000 litres of water should have:

- 50mm plumbing on suction
- 50mm on the return side to the pool. (Plumbing ringed around pool)
- Pipe work on the suction side should be valved so flows can be adjusted or pipework balanced
- Two Skimmers valved so flows can be adjusted
- 5-6 returns jets placed around the Pool
- Return jets should be adjustable in the size of the opening to maintain good pressures around the pool or designed in such a way that a relatively even pressure is achieved
- Pump with true 50mm suction and return ports
- Sand Filter with true 50mm valve head
- Any valves should be 50mm

These recommendations give a high water turnover at low pressures. Do not go by the Kilo Watt size of a pump as it is the capacity of the water flow you are interested in. Bigger is not

always better. It is important that the pump size is matched to the turnover of the water required and then the sand filter can be sized to this based on its backwash requirement. Most suppliers and manufacturers of filter equipment have standard combinations of pumps and filters for any given volume of water and brochures will indicate whether sizing is correct for your pool.

All suppliers have brochures for equipment supplied and having these supplied at the quote stage can make things easier to understand if you need that background knowledge.

There are other forms of filtration media but sand still forms the basis of the market and filters to an acceptable level in most domestic situations. For smaller Pools or Spas cartridge filter systems would be an option.

SANITISING THE POOL

Sanitizing is a huge subject but given that the filter system provides most of the water clarity you are really relying on the chlorination side to make the water sanitized. If you have a good turnover of water around the pool the easier it is for the chlorination to work and the less that it is required to produce. Most systems require chlorine or bromine to be produced to sanitize the water. There are systems such as Ozone and Nature2 which reduce the amount of chlorine required but will not survive alone in your pool as a dedicated solution. Electrical controlled systems such as Ozone. Nature2, Salt and Liquid chlorine all seem to develop problems because of the environment they are asked to work in with water vapor and chlorine prevalent. A good size filter shed that breathes can reduce this. What you need from a system is to be able to control the amount of sanitizer produced either manually or automatically and chemically does not move too far from accepted standards. E.g. The PH of our eyes is approx 7.4 so the pool chemical balance of neutral is based around this. Higher it is alkaline and lower it is acidic. The ideal condition is to some degree governed by the type of pool you have built. A pool will be easier to maintain if this parameter is stable.

Types of Chlorination systems available

Tri-feeder

This allows the manual adjustment of the Chlorine level via the amount of water that passes over compressed tablets and monitored by doing weekly pool chemical tests. Depending on the type and price of the compressed tablets you will achieve good water clarity. This is where buying a good brand of tablets will give you better results.

Ozone with Tri-feeder

Ozone is PH neutral and is a great sanitizer but requires a very high degree of water turnover in the pool to work as it only is present in the pool for 20 minutes after production. You still need the production of low levels of

Chlorine or Bromine to be present in the pool to get into areas the Ozone has not reached.

Liquid Chlorine Systems

Although automatic are best suited for commercial situations where monitoring of the water is carried out regularly and correct handling of chemicals is adhered to.

Nature 2 Systems with Tri-Feeder

Produce copper and silver ions. Silver is produced to look after sanitation and copper to look after algae. By itself it will not look after your pool but it will reduce the amount of chlorine required by the Tri-feeder.

Salt Chlorinators

By adding salt to the pool water and placing a small electric charge between plates chlorine gas is produced. Chlorine levels can be adjusted by way of testing the water each week and adjusting the output. Some people like the feel of salt which is about a quarter of that of the sea. It is regarded as low maintenance but Chlorine gas is extremely alkaline and you will need to manage your PH carefully. Good idea to add an automated Liquid Acid dispensing system to look after the PH.

Magnesium and Potassium

New system to the market, well worth a look if you are interested in healthy options.

The old saying to keep it simple is one that should be applied here.

LIGHTS

Lights will tend to give trouble at some stage usually after the factory seal is broken.

They are a nice look in the pool but are expensive and you can do a lot of outdoor lighting for the same cost.

POOL COPINGS

This again is a huge subject and will come down to personal taste. There are not as many varieties as you may think. We are a small market with limited imported products. This is an area where the workmanship is very evident and many a good pool has been ruined at this stage. The product chosen should be even in sizing and depth so that a good finish on the top and underside looking from both the pool and surrounding landscape are tidy. Joints should be even

and grouts in between should be smooth. Setting out is the key here so that small cuts are not prevalent and when moving around curves and corners cuts are even and balanced.

Products to look at would be:

- **Various rebated clay pool copings** - 300 by 300 approx.
Stick to well-known brands, Heritage etc.
- **Various clay pool copers** - 230 by 115 (for curved pools)
Stick to brands PGH, Norbrik, Clay pave etc.
- **Various Sandstones** - Look for even sizing especially in depth and pay the extra for good quality
- **Hinuera stone** - Beautiful but expensive
- **Tiles in various sizes and types** -
Good look for modern pools if you want a square edge on the pool.
Again stick to reputable brands.
Ensure you have someone doing the work who knows what he is doing. Can be prone to chipping.
- **Forms of Basalt** - etc. which are imported. Good for the same look as tiles but in a higher price bracket.
- **Sandstones**
- **Various pre-molded concrete bullnose** - Pavers made locally. Can purchase big size units but quality sometimes lacking. Always inspect these prior to purchase as they vary in depth quite a bit which make them hard to lay.
- **Poured Concrete** - Finishes including the Coping

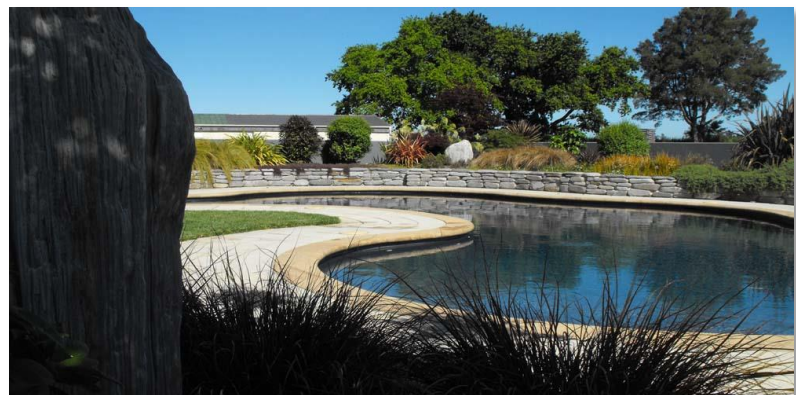


If you are looking for a superior finish to the pool, put good money into this area, you will always see it and it is the first impression gained with a pool.

POOL SURROUNDS

Another important topic in pool design, aesthetics and the practical requirements of surfaces around a Swimming Pool.

Surrounds can range from Timber, Pavers, Tiling, Slate, Stone etc. This area will have a huge influence on the overall finished Landscape and the style you are trying to achieve. With the use of any surround there



must be consideration on installing a construction joint separating the Pool from its surrounds. This is certainly required with any concrete as it can expand during summer to the point it puts pressure on the Coping and can lead to these coming loose. This area is where your Landscape Designer can provide you with a lot of options and the pros and cons of these mediums.

HEATING AND COVERS

Really only two options with Solar and Heat Pumps making up the bulk of the market with gas to a lesser degree. Value for money with electricity at present prices is a Heat Pump. Solar has a lot of power and can survive without a blanket but it still has running costs of approx a 1KW pump and finding roof area can be problem and is dependant on the weather. Modern technology has improved systems but still a bit unsightly.

Heat Pumps require a heat retention blanket to allow proper heating. The blankets are ugly at the end of the pool but can be hidden into pits etc if required and automating them is possible with various systems. Any shape can be covered but generally a straight line pool is best, especially keep it simple if you are automating the cover. The systems are sized for use 6 months of the year but can be sized for all year round use. Heat pumps work hard at the beginning and tail of the season providing temperatures around 26 to 28 degrees but are only used to maintain the heat over the normal season. Heat pumps should be rated to work in low temperatures and should have reverse cycling. Heat pumps have a lot of technology in them and have titanium heat exchanges for long life. Beware of overseas models which seem cheap and servicing can be an issue.

Gas is more available in town and can put a lot of power into the pool and would be suited to those who want a faster heating option. The most expensive and do not have titanium heat exchanges so are prone to problems with pool chemicals if they are not maintained.

Blankets by themselves are always an option and you may be surprised how much effect they have by themselves. These come in the form of Bubble covers which generate Heat into the Pool but do little to hold it in. Heat Retention covers will retain heat in the pool which is generated from an outside source.

Various automated covers are also available which can be set into the Pools so they are not so visible.

SWIMMING POOL DESIGN & CONSTRUCTION OVERVIEW

Hopefully from this review you will make up your own list of questions. I have only given an overview of the more relevant parts to having a pool built. Your Pool builder and Landscape Contractor should be providing information on a range of things, I believe the main criteria's are:

- Informative, clear and accurate quote based on site visit
- Accurate dimensioned drawings of the proposed Pool
- Clear contract documentation showing price, warranties, construction detailing and timing of the work
- Documentation should also be concise if sub-trades are involved in where the Pool Builders obligations start and stop
- Open communication at all times is paramount
- If there are changes to the original contract, document it and sign it
- Have an active and personal involvement in the process
- Construction outside may lead to delays but once a job has started you would expect a continual flow of work happening onsite
- It would be normal to have a deposit paid to secure a date for construction and to allow for a permit to be issued. Payments should be arranged along the lines of 10% deposit, 30% upon start of work, 30% upon completion of shell and a final payment of 30% when you are happy with the work. Large deposits should be a warning sign
- When work is completed the pool should be cleaned and water balanced and the client educated in how to look after the pool. A basic set of chemicals should be supplied along with a test kit. You should feel comfortable in understanding the mechanics of the pool and also have a clear understanding of basic pool chemistry and water clarity. This should not be an additional cost.
- A well-constructed, filtered and chlorinated pool should provide you with years of use with minimal maintenance and should be able to be maintained with just a couple of hours work per week



By David Collins
 Landscape Designer
 HERITAGE POOLS LTD
www.heritagepools.co.nz
dave@heritagepools.co.nz