

WATER LEISURE CENTRES

THE ENVIRONMENT FOR MEMBRANE STRUCTURES

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SYNOPSIS

Recent times have been seen a healthy growth in the conversion of open public pools into enclosed water recreation centres. **This** trend is set to accelerate.

Some of the background to this is set out in the paper, as is a discussion of important planning, environmental and economic factors essential to understanding the place of membrane structures in future developments.

INTRODUCTION

One likely statistic in which Australia leads the world is the number of 50m Olympic swimming pools per head of population!

A great number of these are well over 25 years old and are not now effectively serving modern day demands. Almost invariably they are open, rectangular with a deep end and shallow end, a 3m wide concrete surround than either lots of grass or a fence. By 1950, standards, good; by 1990 standards, **spartan!**

Some of the factors leading to their demise are worth noting.

Firstly, the ever growing variety of recreation and entertainment possibilities reduced peoples' interest in ordered lap swimming, which was basically what such pools were built for, so that seasonal attendances gradually fell away. The package backyard pool added no little pressure in this regard.

Greater personal mobility meant that the 'local pool' no longer held a captive market. New pools with greater variety, some operating all year round gained customers at the expense of the local open 50m rectangular box which could service at best 6 months of the year, and in some locations as little as 4 months.

The upshot of all this was that these pool facilities constructed with much justifiable pride by Local Authorities in their day became a financial drain. It is not uncommon today for a Council 50m open pool complex in, **say**, Melbourne to have an annual operating deficit up to \$400,000.00. **This** does not even allow for any capital redemption! It is not hard to see why there are so few private facilities of this type given the lack of any return on investment.

Councils are certainly not slow to seek ways of reducing such deficits and, hopefully, target a surplus. The economic times demand frugal management of public funds, and this then marks the keynote in contemporary thinking on public swimming centres.

A new term has crept in viz, 'Aquatic Leisure Centre'. Such a term connotes a variety of things in different people, and, indeed, that is exactly what its all about.

While only a small but growing number of centres is being developed at the present time, there is considerable interest in Victoria and New South Wales in the conversion or upgrading of existing facilities to something like Aquatic Centre status.

Today's Aquatic Leisure Centre is intended to be a 'people place' where friends can meet and relax or participate in a range of activities through sport and recreation to health therapy. No longer is lap swimming the centre's primary function.

Diving and scuba training, water polo, even underwater hockey and kayak handling are being eagerly sought by schools and clubs. The most successful centres offer hot spas, turbo pools, water slides, beaches, child's play areas, etc. for those intent on pure fun and leisure, while others offer aquarobics, sports medicine, therapy programs and a gymnasium to satisfy the burgeoning health industry.

Such facilities, of necessity, tend to a more free-form layout that has hitherto been the norm.

The driving force behind this type of 'development has been to offer greater variety and choice for today's diverse public, which builds up attendance, and, in turn, makes for a much more efficient operation, for which read profitable operation.

Just two examples of this turnaround are the North Sydney and **Lilydale** pools. Both were tired conventional **50m** public pools closed during winter, then converted to year-round operation by heating and enclosure. Daily attendances in excess of **1000** in winter months are regularly recorded.

This then is the background to a potential market just right for membrane structures. Authorities the world over agree that there will be no more single purpose swimming centres such as those for the Tokyo and Munich Olympics, the first of which has been demolished and the latter greatly modified. Centres such as **Brisbane's** Chandler are a dead duck because of its lack of attraction for the public at large and its frightening annual operating losses. The new Adelaide centre seeks to offer the best of both worlds.

For the foreseeable future, the new breed of Aquatic Leisure Centres will go out of their way to cater for the widest range of sport, leisure and therapy demands of today's **communities**.

Membrane structures **can** build on their already good performance and acceptance in this area.

MEMBRANE STRUCTURE USAGE

Recent decades have seen a great array of structure types employed for enclosing pool and related facilities.

That water activity and membrane structures are not common everyday things gives them an affinity with each other. The freedom of water **can** be complimented by the vibrant and often free forms of membranes and by their continuity and minimal nature.

Large flat, opaque surfaces and the ponderous nature of masonry and concrete seem out of place in a water recreation environment seething with its movement, freedom and personal removal from normal routines.

Membrane enclosures have been both permanent or temporary, and, sometimes a mix of each.

The scale and span ranges required by 25 or 50m pools play nicely into the **hands** of membrane structures being neither too small nor too great for economy.

Pneumatic structures mostly in the **form** of the conventional air house have long been employed. The simple rectangular house **has** been varied by **L-shapes** or circular plans coming to ground or springing off permanent walls.

On occasion, high pressure rib or cushion structures have proven effective where their double layer with captured air space **has** provided both structure and insulation.

In many projects, framed membranes have been employed as continuous arch or point supported structures, giving a variety of possible forms to suit linear or curved boundaries and cross sections.

The pliability of structural membranes adds the temptation, often accepted, to provide the facility with a totally or partially opening roof. From experience has come the general observation that such flexibility comes not without cost, a moveable or opening membrane roof in common with all other roofing systems costing often twice that of a fixed roof. Another interesting note is that Operators tend to leave such roofs in their fixed position after a year or so either through customer demand or from perceived or sometimes real difficulties and cost of their opening. Many large air houses fit into this category.

Claimed advantages of framed over pneumatic structures are the ease of future extensions, and the provision of large entry and escape areas.

Experience has also shown that while some Clients will not have a bar of air houses, there are others who state quite categorically that an air house is exactly what they want!

Suffice to say at this point that for all the water recreation centres thus far conceived membrane structure solutions have not been found wanting, and their use and acceptance continues to increase.

An extension of the main enclosure in both tropical and milder climates alike is the growing need by public demand for shade either total or partial in such areas as car parks, **walkways**, queuing lines for water slides, in sun-baking areas and as an integral element of outdoor seating, barbeque areas and the like.

THE WATER ENVIRONMENT

Unlike the oversized sheep dip image swimming centre of old, today's aquatic leisure centre is a place of freedom, variety, action and brightness. A continuum of **'inside/outside'** is widely sought and this **can** often be achieved with a suitable mix of a translucent membrane roof and extensive glazed walls. Disireably, large areas of wall can be opened for people to spill out into extensively landscaped surroundings while the landscape reaches into and partially around some of the water areas.

This requirement of uniform light without glare puts a membrane roof streets ahead of its opposition. As little as 4-6% light transmission through a white or off-white fabric can be effective even on overcast days. Extensive areas of strong colour should be avoided.

A big challenge to all materials is the constant damp and often saturated interior conditions. Condensation requires, care both in the choice of fabric and in control of drips and mass run-off on the side. At regular intervals too, the pool surrounds are hosed down.

These factors demand the utmost performance of both the fabric and the seams to control **wicking**. Lap seams should, where possible be made to allow condensation to run away from the seam rather than **into** it. Full sealing of base cloth is paramount. Fabrics should be chosen which have a positive anti-mould agent in the thick, uniform coating.

Good pool system management will ensure plenty of fresh air movement around all surfaces, while good design will eliminate 'dead pockets'. Notwithstanding these precautions the control of mould needs constant vigilance in an enclosed water leisure centre; this applies to all materials not just structural fabric!

The same rules for cleaning the membrane apply for water enclosures as for any other application, viz. soft solutions, soft brushes, soft hands!

Because of the ever-present dampness, careful selection of metal elements and their finishes such as support structures, clamp plates, bolts, etc. must be made. Aluminium alloys and stainless steel **can** be used uncoated, (though not in contact with each other), however, steel should be located whether galvanised or not. A good range of conventional baked powder coatings is available.

A somewhat related subject is that of vandalism. Fortunately, attacks on membranes **which** are under reasonable surveillance are rare. Air houses are the most common targets, yet even here cuts made are usually negligibly tiny in relation to the scale of the structure, and deflation does not occur.

One of the advantages of framed membrane roofs with glass or other walls is the reduced opportunity for malicious damage.

A requirement for successful indoor water recreation centres is maintenance of a fairly constant water and air temperature. Water temperatures in the **major** pools (as opposed to hot spas, **etc.**) vary with locality from about 26 deg. **Celcius** up to about 32 deg. Celcius. Some in Europe are even higher.

External air temperatures throughout the day and year vary also and differentials must be allowed for in the overall design. A single membrane behaves somewhat similar to a sheet of glass, and, as such, has negligible heat insulation value. In generally warm to hot areas, eg. Sydney and **Brisbane**, the thermal performance of a single membrane during winter **can** be overcome by increased plant capacity, whereas in generally cold areas, eg. Hobart, a double layer membrane with contained air gap should be considered for optimum plant operation.

Of course, where the reverse occurs, **i.e.** a membrane enclosure is retained in place during summer months, some air cooling with additional air movement would be necessary to achieve internal comfort conditions in the warmer climate zones.

This reference to air movement, which is defined roughly by mass air changes per hour leads to the comment that modern indoor water centres are being designed to remove the 'chlorine smelling atmosphere' common in the past. Water treatment by ozone, for example, goes a long way to achieving this end.

A design point to note is that of acoustic performance. Generally, the transmission of noise through the membrane either into the space or out of it has not been found to be a problem in practical terms provided reasonable open space exists around the structure.

What is a more important consideration is the noise environment within the enclosure.

Any large bland surface will allow sound to bounce around the enclosure leading to poor acoustic conditions. conventional air houses fit this description and need significant added baffles on the inside to break up the large volume.

Cone and multi-faced shapes perform much better in this regard which is another factor favouring framed structures for modern pool enclosure.

It is well to note that enclosures such as we are discussing are places for public assembly. While it is well-nigh impossible to **rationalise** a fire threat from **inside** the facility, the same may not be so from outside. **This** should be thought about in the selection of fabric type, the need for smoke detection and design of access ways.

AUSTRALASIAN PROJECTS

It is not surprising that the earliest fabric pool enclosures were at the domestic level. Both air supported and simple arch frame structures continue to be used though, surprisingly, not in numbers that one could expect given the extent of home pool ownership. Last year nearly 100,000 domestic open pools were installed in Australia which represents a vast untapped market for simple membrane enclosures. The time is ripe for combining fabric structures and solar heating to give all year round home pool usage.

The conventional **air** house has proven its suitability for enclosing both 25 and 50m pools. Some examples are:

- Clarence, Hobart - **58m x 32m, 1982**
- North Sydney - 66m x **26m**, 1981,1987
- Papakura, New **Zealand**- 1700m², **L-shape** plan, 1987
- Lilydale, Victoria - **72m x 36m, 1989**

The Clarence Structure had an internal liner and is one of those many enclosures intended for seasonal use only but, after a time, left in place permanently.

The first cover for the North Sydney pool was installed in 1981 and subsequently replaced 6 years later. Numerous glazing ports along one side were a notable feature, as was the large coat of arms of the Client Council applied on the outside.

Enclosure of two pools was achieved by the **L-shaped** Papakura structure, which, in common with North Sydney is removed in summer and erected in winter.

The latest air house at **Lilydale** is the largest so far and encloses an upgraded **50m** pool and a series of new leisure pools at one end. Fairly extensive glazing has been used. While this structure was designed for seasonal use it looks set to become another permanent installation.

One of the earliest and largest framed structures was the Corio Centre near **Geelong** using the '**Portamod**' system to cover a **50m** pool. A similar system was used at Singleton, N.S.W.

A more contemporary design with a stressed fabric roof over internal frames and continuous glass walls was erected in 1989 over a 25m pool at Wollongong.

The new pool enclosure proposed for Fairfield near Sydney will have a similar overall design but with external frames.

All of these were primarily covers to conventional pools. Probably the first of the new free form water leisure centres **was** at Porter Bay, S.A., which was enclosed with a mast supported stressed membrane semi cone roof in 1984.

COMMENTS ON COST

In considering the cost of membrane structures for pool enclosure it is informative to set out some comparisons.

The cost of upgrading an old 50m pool and its **surrounds** plus heating and air handling plant will often be in the order of \$0.6 M. At **\$300/m²** of covered area a new membrane structure for such a facility could cost about the same.

Paring down the cost of the enclosure by as much as **15%**, if possible, does not, therefore, have an enormous effect on the overall project cost. Now we all know **that** such savings on an otherwise correctly chosen and finely designed structure and only come from reduced quality. **This** of course, is totally taboo around public pool areas where the physical demands are critical and the structure must be equal to them.

Another point to be aware of, is **that** the cost of fabric structures slots in between the cheapest conventional roofing systems such as steel **frame/coated** steel **roof/hung** ceiling, and the top of the range glazed roofing systems. We have noted that single and even double layer membranes cannot match the thermal insulation obtainable from heavy weight conventional systems, therefore they must be sold on their advantages, viz. good appearance, reasonable economy, modern concepts, excellent translucency, speed of erection, ready demountability, clean open spans, etc.

When a pool is enclosed it is necessary to install water and air heating and air circulating plant. This is one of the features on which an air house solution **can capitalise**. The annual cost of running such plant is usually less than half of the **total** annual cost for the whole facility of which staffing and consumables represent the major component.

For a large **50m** facility such annual running costs could be **as high as** \$0.4 M. **This** again reinforces the comment that anything less than the highest standards in materials, plant and design is complete false economy.

CONCLUSION

The increasing public awareness of leisure and fitness together with pressures on Local Authorities to stretch every dollar has initiated a wide program of upgrading and building new water sport and leisure centres.

Such contemporary centres are requiring contemporary thinking. The one time open 50m public pool is being turned **into** a sophisticated enclosed facility where sport, leisure, recreation and therapy are offered by a dynamic Management.

Membrane structures have a good track record thus far in meeting the space and environmental demands of such projects and the future **looks** good.

Membrane structures, in offering a good mix of physical attributes with economy and flexibility are well placed to command a worthwhile segment of this growing market.