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Dragonfly Pond – The Ponds, NSW >

Photograph – CLOUSTON Associates

Dragonfly Pond is a wonderful example of infrastructure that is as much a part of, as it is protector of, its immediate environment.

Every design detail has been carefully considered, every element crafted with a purpose beyond the purely functional.

Dragonfly Pond is an important sustainability initiative at The Ponds, a new suburb of 3,000 residents in Sydney's western suburbs.

It's designed as a series of holding and treatment ponds to filter 2.5 million litres of urban stormwater before it flows into the Hawkesbury-Nepean catchment.

At 85-metres long and located at a key entry juncture to the estate, the Dragonfly Pond was always going to be much more than just a water treatment facility.

Landscape architects CLOUSTON Associates have embraced that opportunity, creating something that complements the landscape and embellishes the public domain.

The conceptual design was done very quickly," says CLOUSTON's Associate Director, Martin O'Dea.

"It was tied to the land form but we also wanted to reference The Ponds estate logo in the circular shapes of the two bottom ponds.

"One of the early challenges was how to make the water body visible. We wanted the pond to create a strong arrival presence to the estate, to reflect light and be quite visible in the distance."

Photograph – CLOUSTON Associates

Photograph – Landcom

"We were able to resolve this because of the need to reticulate the water to prevent algal growth in summer. This meant we could slightly 'perch' the top ponds to improve their visibility and achieve the reflective quality we were after."

Water is reticulated from a 100,000 litre underground concrete balance tank that sits below the bottom pond and captures its over-flow in heavy rain events.

In drier times this stored water can be pumped to the top pond, ensuring constant water flow through the system.

Concrete has been used as the principal construction medium for Dragonfly Pond.

The five holding ponds in the chain are defined by Class 2, off-form, 200mm wide concrete edging – a construction solution that creates safe, clean edges and helps prevents erosion.

In addition, the macrophyte planting beds in the three top ponds are separated from the main bodies of deeper water by zig-zagging concrete walls that sit just below the surface.

"We didn't want the open water areas of the ponds to be swamped by the macrophyte plantings. The clear water in the adjoining deep zones creates the mirrored reflection we were looking for, as well as promoting UV disinfection of the water," O'Dea says.

A concrete blade wall runs along one side of the chain of ponds, tilted along its axis by five degrees. This powerful gesture is decorated with a series of Corten steel panels that feature a laser-cut dragonfly motif.

Photograph – Landcom

Photograph – CLOUSTON Associates

Adjoining the blade wall is an off-form concrete chute, cantilevered over the bottom pond and designed to cope with high run-off flows of up to 315 litres per second.

A conical, sculptured concrete 'bowl' sits slightly above and over the bottom pond in the chain.

"The bowl was very tricky," O'Dea recalls.

"Because of the cantilever and the way it was designed, the engineers didn't want any construction joints. So it had to be done as one pour.

"It was further complicated by the fact that we had a dripline in there, and we had to incorporate a 15-metre-long lip at the front to allow the water to cascade into the lower pond.

Photograph – Ford Civil Contracting

Photograph – CLOUSTON Associates

"We modeled the design with 3D software, which was very useful to the contractors. They were genuinely excited by the complex formwork challenge and did a great job."

The safety of the community was also an important consideration for the design team.

Dragonfly Pond has a nominal depth of 300mm around all accessible edges, with a 450mm climb-out and a long walk to deep water.

The 200mm-wide walls that separate the macrophyte beds from the deep water zones have a 45 degree chisel cut at the top, leaving only a 40mm wide top edge. While difficult to build, the intention was to discourage adventurous children from trying to walk on them.

The chiselled top edge became part of the overall design language, repeated on the blade wall.

The success of Dragonfly Pond as both a water treatment facility and an attractive feature of the urban landscape is aptly expressed in its name.

"Dragonflies need clean water to breed. They won't breed in stagnant ponds," says O'Dea.

Through considered design and skillful execution, the team behind this project has ensured that dragonflies – along with their human neighbours - will indeed have a happy home at The Ponds.

Client – Landcom and Australand
Principal Engineer – J. Wyndham Prince
Landscape Architect – CLOUSTON Associates
Principal Contractor – Ford Civil Contracting
Specialist Concrete Subcontractor – T and T Concrete
Concrete supplier – Boral
Photographer – CLOUSTON Associates, Landcom and Ford Civil

Darling Quarter, Darling Harbour >

Sydney's Darling Harbour has been revitalised following the completion of Darling Quarter, a vibrant new public space situated between Tumbalong Park and Harbour Street.

The project featured in Issue 12 of The *Public Domain* as a case study on the value of on-site prototyping of insitu concrete forms and finishes.

As the images of the now completed precinct show, the attention to detail and close collaboration between landscape architect and contractor – as evidenced by their approach to prototyping – has paid enormous dividends.

"It was an incredibly useful and successful exercise," reflects ASPECT Studios National Studios Director, Sacha Coles.

"It saved us a lot of time, money and effort. It enabled us to bring everyone together on site – the clients, the trades and subbies who were doing the work - and make informed decisions for the right reasons."

Darling Quarter is a $500 million mixed-use project that encompasses two low-rise 'campus style' commercial buildings, separated by a new pedestrian extension of Day Street - known as the Civic Connector - that leads visitors down from Town Hall Station and through to the 'green heart' of Darling Harbour, Tumbalong Park.

From a public perspective, the 'jewel in the crown' is the new open space overlooked by these buildings, incorporating community 'greens' and a 4,000sq metre playground featuring a sculptured, interactive water-play area and custom play equipment.

The major constructed elements of the water-play area are the water streams. These insitu concrete forms are coloured with a black oxide (three percent), hand seeded with 50 to120mm white quartz river pebbles, and feature hand-finished edges.

"We used concrete because of the fluidity of the material – the fact that we could shape it," says Coles.

The water-play area has the characteristics of a delta system, with four streams breaking off into eddies and larger water body areas. 'Scattered' along the concrete streams are a series of precast concrete boulders that act as devices to mediate between junctions, as well as provide seating for parents, carers and children.

Photograph – Florian Groehn

public space

Photograph – Mark Bowmer

Photograph – Florian Groehn

These boulders also serve as a reminder of the site's industrial past. The cast-in 'cog' motifs on the boulders are a nod to the historic mill that once stood on the site.

The industrial theme is repeated in the various stainless steel water-play elements, ranging from stainless steel sluice gates and hand pumps to an Archimedes screw that draws water up and channels it back into the streams.

The other key structural elements on the site are insitu concrete paving and low concrete walls that define the area. The walls have a Class 2 finish that has been lightly shot-blasted (as has the paving).

The sculptural quality of precast concrete has been explored in seating benches and two table tennis tables.

The Civic Connector that runs between the two buildings reads as a classic boulevard – open, spacious and welcoming. It also features precast furniture, precast concrete interpretive elements in the paving, as well as a linear, concrete-edged water feature.

Since it was opened by NSW Premier Barry O'Farrell in September, Darling Quarter has been swarming with children and parents keen to experience the unique water-play and adjoining 'dry' playground areas.

Photograph – Mark Bowmer

And in so far as these elements have already proved their value, Coles says the real success of the project is the strategic thinking behind the site masterplan.

"You can't design a public space like this in isolation. It has to be about making it accessible," he says.

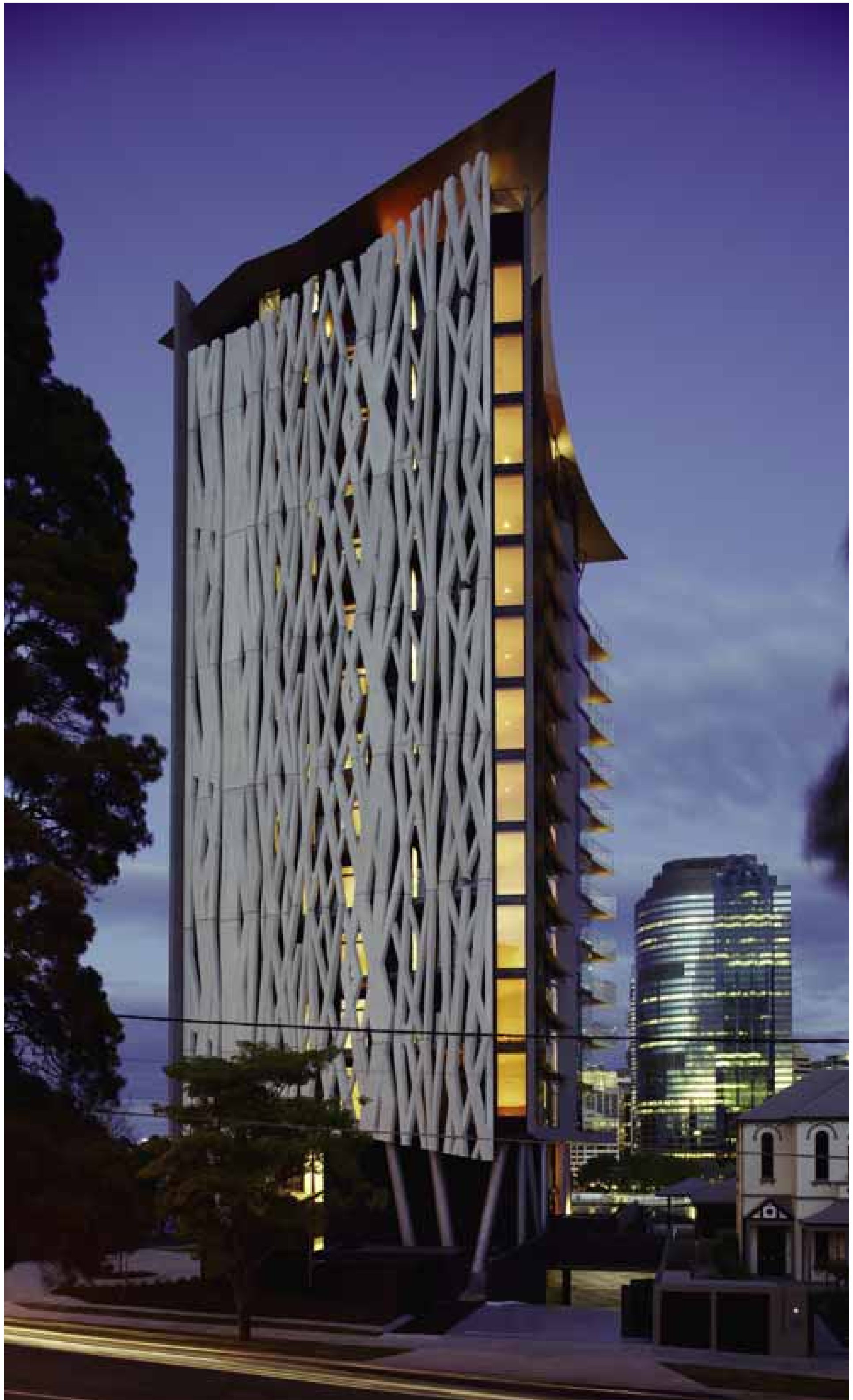
"That's how we see it. We see the playground as a great success but our key role was in the design of the public domain - from Darling Harbour south to the water, and from the city back down to Darling Harbour.

"It's all about access and community. If you don't get that right, people won't come."

Client – Lend Lease
Landscape Architect and Public Domain – ASPECT Studios
Architect – FJMT Architects
Principal Contractor – Lend Lease
Principal Engineering Consultants – Arup
Specialist Concrete Contractor - Landscaping – British Paving and Christies Civil
Photography – Florian Groehn, Hamish Ta-me and Mark Bowmer

Photograph – Hamish Ta-me

Photographs – Mark Bowmer



Scott Street Apartments, Kangaroo Point, Brisbane >

The design of a new luxury apartment building on one of Brisbane's most prominent riverside sites presented both an opportunity and a challenge for architects Jackson Teece.

Backed by a supportive client, the design team relished the chance to create and deliver a building that would become an instant landmark on Kangaroo Point.

But that in itself created its own pressures. The eastern façade, in particular, was visibly exposed to the southern approaches of the iconic Storey Bridge, challenging the architects to 'get it right'.

Their solution was a three-dimensional, precast concrete screen – part functional, part artwork – that has, in effect, set a new benchmark for this type of application on high-end residential buildings.

Director of Design with Jackson Teece Architecture, Damian Barker, says the building design addresses both the local context and its position as a 'marker' at the entrance to Kangaroo Point.

"The eastern façade came about as a response to the building's prominent location at the entrance to Kangaroo Point," he says.

"There were obvious practical considerations. We wanted filtered views from hallways, bedrooms and bathrooms, as much as we didn't want exposure to passers-by or the full solar load.

"At the same time, we saw the façade as a huge canvas for an artwork that would give the building its character."

Jackson Teece worked through an extensive process of investigation before deciding on precast as the medium for its artwork screen.

"Very early on we looked at GRC. We looked at fibreglass technology. We looked at laser-cut aluminium panels. We even looked at boat-building technology and all sorts of mouldings," Barker says.

"In the end we came back to precast concrete because of its longevity and its monumentality. We knew we would get the three-dimensional qualities we were looking for, and we knew it would stand the test of time."

Jackson Teece used sophisticated 3-D software to come up with a design inspired by the forms found in the nearby mangroves beds on the Brisbane River, and the textures of Melaleuca forests.

The design team then worked closely with the main contractor, Hutchinson Builders, engineers Alliance Design Group, and specialist sub-contractor, Precast Concrete Products, to transform vision into reality.

"Our first consideration was designing something that could be lifted off the truck without breaking," Barker says.

"It was a really involved and complex design process. The moulds and the reinforcement design were artworks in themselves."

Sixteen moulds were used to create the off-white, interlocking, two-level high panels, each weighing about seven tonnes. The corner panels, meeting at an acute angle, were particularly challenging. As part of

functional artwork

the process, protoype panels were cast and tested to ensure all the necessary attributes were achievable.

“Because of the complexity of the job, all the guys were really committed and took an enormous amount of pride in what they were doing,” Barker says.

“They knew it would look great and they paid special attention to getting it right. That was a really nice part of the process.”

This attention to detail paid off, with the panels going up and on without a hitch.

Barker credits his client for having the vision and courage to go with the artwork/screen design.

“This type of opportunity comes up from time to time in commercial and public architecture, but very rarely in residential architecture,” he says.

“Some people would argue that the money (spent on the screen) was unnecessary. But when you consider the value in terms of the character of the building, the contribution of the screen as a percentage of the overall budget was minimal.

“Our client was committed to creating something very special, a high quality residential building that would stand out from its competition. They understood and supported us all the way.”

Client – Waterford Properties
Architect – Jackson Teece Architecture
Principal Contractor – Hutchinson Builders
Principal Engineer – Alliance Design Group
Specialist Concrete Sub-contractor – Precast Concrete Products
Photographer – Sharin Rees

Beat the heat with good concreting practice >

With summer here again, it's timely to consider the impact hot weather can have on the placement, finishing and curing of concrete.

While combinations of **high temperature**, **wind** and **low humidity** can cause problems with concrete placement and finishing at any time of the year, these problems are more likely to present in summer.

In practical terms, the responsibility for dealing with these issues rests with the builder and/or contractor.

But designers and clients should also be familiar with the potential problems and possible fixes. After all, if something goes wrong it impacts in some way on everyone involved in the project.

AS 1379 places a 35°C limit on the maximum concrete temperature at the time of delivery. However, when the air temperature rises above 30°C, it is usually recommended that precautions be taken, particularly if there is also hot dry wind.

This is firstly to ensure an acceptable concrete temperature at the point of delivery, and secondly to avoid problems with plastic shrinkage cracking and premature stiffening of the concrete.

Most of the problems associated with placing concrete in hot weather conditions relate to the increased rate of cement hydration at higher temperatures, and the increased rate of evaporation of moisture from the fresh concrete.

Effects of hot weather conditions

The properties of concrete that may be affected by hot weather conditions include:

- **setting time** - as concrete temperature increases, setting time is reduced;
- **workability and slump** - higher temperatures reduce the workability (or slump) of the concrete more rapidly with time. Adding more water is not the answer because it decreases strength and increases permeability, ultimately affecting the durability of the concrete;
- **compressive strength** - higher water demand and higher concrete temperature could lead to reduced 28-day strengths;
- **concrete temperature** - hot weather conditions may accentuate the temperature rise in concrete caused by the heat of hydration. In large sections thermal gradients through the element may cause thermal cracking;
- **poor surface appearance** - with the increased rate of evaporation, the surface of the concrete will dry out and stiffen. In the case of flatwork this may lead to premature finishing of the surface, trapping an amount of bleed water within the mix. The compacted surface layer (from finishing) may cause the rising bleed water to be trapped below the surface, resulting in debonding of the surface layer and subsequent flaking. Also, colour differences on the surface may result from different rates of hydration and cooling effects;
- **plastic shrinkage cracking** - hot weather conditions accelerate the loss of moisture from the surface. If the rate of evaporation is greater than the rate of bleeding (rate at which water rises to the surface), surface drying will occur, resulting in shrinkage of the concrete. When the shrinkage stresses exceed the tensile capacity of the concrete, cracking will occur. The likelihood of plastic shrinkage cracking is therefore greater whenever hot weather conditions increase evaporation or the concrete has a reduced bleeding rate;
- **thermal cracking** - concrete is at risk of thermal cracking when it is first placed, and the heat of hydration raises the temperature of the interior of the concrete. Rapid changes in the temperature of the external concrete surface, such as when concrete slabs, walls or pavements are placed on a hot day followed by a cool night, lead to thermal gradients between the warm/hot interior and the colder external surface. Depending on the temperature differential, cracking of the concrete may result.

Minimising the effects

These effects of hot weather conditions can be minimised by:

- **controlling the concrete temperature** - there are a number of options to control the temperature of concrete, including adjusting the temperature of the ingredients and/or cooling of the concrete mix;
- **admixtures** - various types of chemical admixtures can be beneficial in hot weather conditions. For example, water reducers (plasticisers) can be used to reduce the water content or to aid the workability, while set-retarders can provide additional time to place and finish flatwork - although the latter should be used with some caution, as the surface may appear ready for finishing but the concrete below may still be plastic from the retarder;
- **cement type** - using slower hydration cements (eg Type LH) with lower rate of heat development can provide extra time for placing and finishing, reduce the concrete temperature and the risk of thermal cracking upon cooling of the concrete;

> **cement content** - the temperature increase from hydration of cement in a given concrete is proportional to its cement content. The cement content therefore should be limited to that required to provide strength and durability.

Precautions in hot weather

The first option to be considered in hot, adverse weather conditions is whether or not to postpone the placement of the concrete. It is often better to wait than risk costly repairs (or even replacement) of defective work and dissatisfied clients seeking compensation.

If work is to proceed, proper planning - from careful selection of materials to procedures for hot weather work - is essential if the associated risks are to be minimised.

Builders and sub-contractors (and their clients) should be aware/alert to all of the possibilities, such as:

- where hot weather conditions are likely to present a problem, consult the concrete supplier as early as possible;
- have standby equipment and manpower for all stages;
- use the largest size and amount of coarse aggregate compatible with the job. This also helps minimise the tendency of the concrete to crack;
- in determining the slumps of the concrete to be used, consider the effects of hot weather on the ability to place and finish the concrete;
- program concreting for the cooler parts of the day, or even schedule night-time placement if possible;
- specify the maximum acceptable delivery temperature of the concrete so that the supplier can plan to cool the materials as needed;
- avoid delays at all stages;
- plan the locations of construction joints ahead of time with hot weather contingencies in mind;
- consider spacing contraction (control) joints at slightly smaller intervals than when concreting at lower temperatures;
- use sunshades or windbreaks;
- delay construction of indoor slabs on grade until the walls are up and the roof is on;
- pay attention to the rate of concrete placement. Be ready to notify the concrete supplier promptly of any changes in schedule, which may become needed as the job progresses; and
- keep an evaporative retarder (aliphatic alcohol) on site in case conditions require its use.

Delays in delivery can undo the best mixing practices. The concrete supplier should set up and maintain a good delay-free schedule for delivering the concrete to the required location on the site.

For successful placing and finishing, it is necessary to provide an environment in which workers and equipment can function well, and concrete can be adequately protected from rapid warming and/or drying.

Also, it is essential that all surfaces be kept continuously moist by curing the concrete, since drying, even intermittently, can produce drying shrinkage and/or crazing type cracking on the concrete surface.

Following these simple guidelines can help avoid problems and ensure the finished job is one that all parties can be proud of.

More information on this subject can be found in the CCAA data sheet, Hot-Weather Concreting, which is available as a free download at **www.ccaa.com.au**

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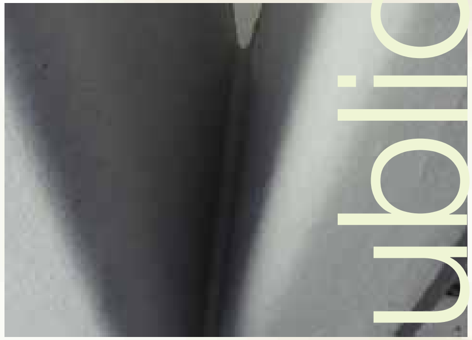

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