POOL CONSULT

Professional Swimming Pool and Associated Works Consultants

1 Yolsum Close, Haddenham, Aylesbury, Buckinghamshire. HP17 8DG

Email: ian@poolconsult.co.uk Tel: 01844 290139 Mobile 07432 483483

REPORT ON REFURBISHED AND MODIFIED INDOOR DECK LEVEL SWIMMING POOL, SPA AND ASSOCIATED WORKS

At

Emerald Quay
Shoreham-by-Sea
West Sussex
BN43 5JP

Report prepared by Ian Betts BSc CEng MICE FISPE MCIWEM MCMI

INTRODUCTION:

My instructions in this matter were received from V&S (No.3) Limited via their managing agents, Orchard Property Management, to carry out an inspection and survey of the refurbished and modified indoor deck level pool and spa, to evaluate and assess the suitability and the performance of the pool, spa and the associated works with particular reference, to its compliance with SPATA Standards, PWTAG (Pool Water Treatment Advisory Group) recommendations and BS EN 15288 Swimming Pool Type 2 (classification), relating to non-domestic swimming pools.

1. BACKGROUND

The pool originally installed at Emerald Quay was a freeform skimmer pool having a maximum length of some 9.5m and a maximum width of 5.5m with water depths varying from 1.1m at the shallow end to a maximum of 1.85m at its deepest point. The associated octagonal shaped spa was 2.0m wide with a 450mm wide seat all round and a maximum water depth of 1.0m and water depth at the seat of some 500mm.

It is understood that some 6 - 7 years ago the pool and spa were completely refurbished and at the same time the swimming pool was modified to operate as a deck-level pool, increasing the water depths to 1.2m at the shallow end and 2.0m at the deepest point.

Following the refurbishment and modifications to the pool and spa, Emerald Quay were notified by Southern Water of the excessive water usage, relating directly to the pool and spa. Investigations identified that there was a substantial water loss due to the failure of the MDPE mains water supply to the pool water-top up facility and some modifications were undertaken to replace and re-route the supply pipework and re-position the automatic top-up control valve.

Since the modifications and refurbishment of the pool and spa and the repairs to the water supply service, the effective operation of the pool and spa have been compromised and further water losses from the pool and spa have been recognised.

It is understood that the circulation pumps for the pool and spa have suffered from reduced water flow caused by air entrainment and on several occasions have been adversely affected by a complete lack of prime, running dry, causing the pumps to overheat and the pump motors to ‘trip’.

Prior to my inspection and survey, Bell Leisure have undertaken some pressure tests on the circulation pipework relating to the pool and spa with the following results:

Pool
Main return pipe **failed**
Floor return **failed** but slow leak
Suction not tested as access required into overspill grating. (unknown if leaking)
Lights showed no obvious leaks or cracks

Spa
Sump pipe **failed**
Skimmer pipe **failed**
2 x booster suction leaks around shell but pipe ok
3 x booster returns **failed**
3 x spa returns **failed**
Light seems to be ok
Water level drops indicating **main spa shell is leaking.**

2. INSPECTION, OBSERVATIONS AND MEASUREMENTS.

a) Deck Level Pool.

The 'freeform' ovoid shaped reinforced concrete deck level pool as modified has a maximum length of 9.4m and a maximum width of 5.44m The pool has an estimated water area of approximately 44m² and varies in depth from 1.2 at one end to 2.0m at its deepest point. There is a set of in-situ access steps at one corner of the pool with an associated stainless steel handrail.

The total capacity of the pool is calculated to be some 44m³ (44,000litres or 9.680 Imperial gallons)

During the refurbishment of the pool, the surface water skimmers were removed and the circulation fittings and associated pipework modified, completely changing the flow regime in the pool.

The modifications to the pool included for the provision of an overflow channel around the majority of the perimeter. The newly formed channel is some 150mm wide and 290mm deep and has a total length of 24m. I understand that overflow channel has been lined with fibreglass.

The channel overflow weir tile is some 300mm wide and new rear edge tile some 200m wide was provided. The overflow weir tile was supported over the channel on metal supports and the overflow water was circulated through a single slot (see Plates 1 and 2).

The overflow weir tiles have been fitted permanently and does not allow for any access to the channel for cleaning or general maintenance or for access to the automatic water top-up control which is in the channel.

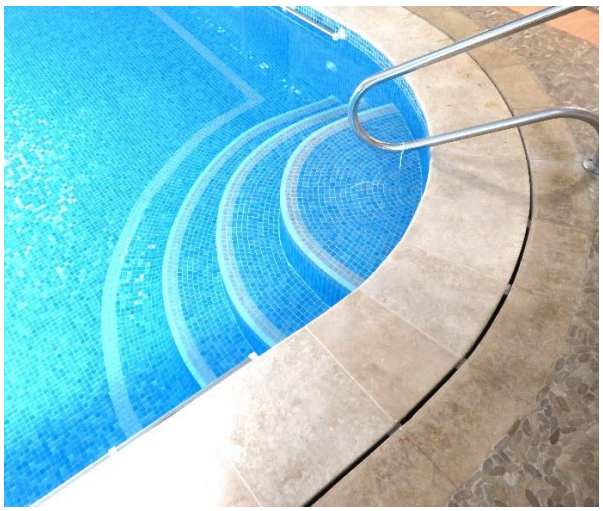

Plate 1 : Overflow weir with single slot

Plate 2: 14mm wide single overflow slot.

At the time of my inspection the pool was not operating and it was not possible to observe the overflow regime into the channel or to check the accuracy of the level of the overflow weir.

The pool surrounds have been laid to a fall towards the overflow channel and in commercial deck level pool facilities, splash water from the pool should not drain back into the channel and the surrounds should be drained via a separate system to waste. In addition, is important that any chemicals used in the cleaning pool surrounds should be compatible with the pool water chemistry, specialist products are available for this purpose.

Based on the total volume of the pool the minimum circulation required to achieve a maximum 2hours 30minutes turnover period in accordance with the PWTAG recommendations is some 17.6m³/hour.

Under normal operating conditions, it is recommended for a commercial Type 2 installation, that the overflow system should be designed to accommodate a 100% of the circulation rate and any other suction fitting should also cater for 100% of the design circulation rate.

Note: The overflow slot at the channel is some 14mm wide (see Plate 2) which is considered a toe entrapment hazard (maximum opening allowed is 8mm)

The main circulation fittings and associated pipework in the modified pool consist of the following:

1 No. 2"Ø channel suction outlet connected to 2"Ø (53mm ID) Class C ABS pipework. (Maximum design capacity of 11.93m³/hour at the maximum recommended velocity of 1.5m/sec).

1 No. Certikin HD53 wall inlet return connected to 1½" (42mm ID) Class C ABS pipework. (maximum capacity 10m³/hour).

1 No. Certikin HD33 main drain suction fitting c/w a CK33S grille which has been converted to a pool return and connected to the existing 1½" (42mm ID) Class C ABS pipework. (maximum capacity 10m³/hour).

b) Overflow Channel.

On deck level pools where no balance tank is provided the overflow channel should be designed to act as the balance tank. To achieve this, the overflow channel would normally be designed as a deep channel of sufficient capacity to cater for the following

The volume of the deep overflow channel should take into account the following:

Bather surge based on 100% of the design bather load and allowing for 80 litres per bather.
(Based on a maximum bather load of 6 = 0.480m³)

Filter backwashing based on a maximum of 40m³/m²/h for a period of 4minutes.
(Based on deep bed DBF30 760mm Ø filter with a media area of 0.45m² = 1.2m³)

Additional volume for recovery for operational safety based on a rise of water level in the pool of 15mm (area of the pool 44m² x 0.015m = 0.6m³).

In addition to the required water volume the following water levels in the channel should allow for maximum water level when pool is not being utilised (no bathers). The minimum water level in the tank should take into account the volume of water required for backwashing the filter/s and to ensure the circulation pumps can be operated without drawing air and a vent zone above the maximum water level, normally around 100 to 150mm.

Based on the above, the total minimum static water volume in the channel is 1.8m³.

The existing channel is some 150mm wide and 24m long and the minimum water level to be maintained in the channel is 1.8÷015÷23 = 0.522m (522mm). To allow for the additional surge volume of 0.48m³ this increases the minimum depth of the channel by 133mm.

Assuming a minimum vent zone of 100mm channel would need to be 522+133+100 = 755mm deep. The top-up control in the channel should be set to maintain a water level in the channel of 530mm.

The capacity of the newly constructed channel is insufficient to allow for safe operation of the pool.

c) Pool Filtration and Circulation Plant.

The installed swimming pool plant consist of the following:

Filter: Waterco DBF30 (760mm Ø) deep bed high rate sand filter complete with 2" (63mm Ø) multiport valve and associated pressure gauge. The filter has a media area of 0.45m² (maximum flow through capacity at 50m³/m²/hour is 22.5m³/hour). The recommended minimum backwash rate for sand media is 40m³/m²/hour which would require backwash flow of 18m³/hour to achieve acceptable filter media cleaning.

Circulation Pump: Davey Silensor Pro VSD200 variable speed (1,550 to 3600rpm) circulation pump. (based on the pump curves the flow through capacity of the pump against an 8m head is 18m³/hour at speed setting 9 and a maximum of 21m³/hour at maximum speed of 3600 rpm.

Assuming a maximum flow through of 21m³/hour this would achieve a turnover of 3hours 15minutes at a filtration rate of 46m³/m²/hour.

PWTAG recommend a maximum turnover period of 2hours 30minutes at a filtration rate of no greater than 25m³/m²/hour (medium rate filtration)

A circulation rate of 21m³/hour would require the suction pipework from the pool and at the inlet manifold to be 3" (76mm) Ø, based on the maximum recommended suction velocity of 1.5m/sec and the pressure return pipework from the pump to be a minimum of 2" Ø based on a recommended maximum velocity of 2.5m/sec and to install at least 2 No. inlets at the pool.

d) Pool Water Treatment and Heating

Treatment: The pool water is monitored and dosed via a EMEC WDPHCL automatic dosing system and is dosed via peristaltic pumps with Sodium Hypochlorite (liquid chlorine) and Hydrochloric Acid (pH adjustment one way only).

The chemical dosing feed tubes from the pumps to the injectors should be sleeved completely from the outlet of the pumps to the connection at the inlets to the injectors. Although some sleeving was provided it was of insufficient length to provide the required protection.

Pool Water Heating: Electro G2HE-49T heat exchanger with titanium tubes. Primary heat to the exchanger provided by the facilities main heating boiler.

f) Spa Pool.

The existing 'freeboard' skimmer octagonal spa pool was refurbished at the same time as the main pool was modified and has been tiled to match the swimming pool. The spa is some 2.0m wide a 450mm wide seat all round and a maximum water depth of 1.0m and water depth over the seat of some 500mm. It is recommended by PWTAG that all commercially operated spa pool should be deck level.

The approximate capacity of the spa is 2000litres and a maximum bather load of 6

e) Spa Pool Circulation and Filtration

Filter: Certikin Alpine (650mm Ø) deep bed high rate sand filter complete with 1½" (42mm Ø) multiport valve and associated pressure gauge. The filter has a media area of 0.33m² (maximum flow through capacity at 50m³/m²/hour is 16.5m³/hour). The recommended minimum backwash rate for sand media is 40m³/m²/hour which would require backwash flow of 13.2m³/hour to achieve acceptable filter media cleaning.

Circulation Pump: Davey Silensor Pro VSD200 variable speed (1,550 to 3600rpm) circulation pump. (based on the pump curves the flow through capacity of the pump against an 8m head is 16.5m³/hour at speed setting 8 and a maximum of 21m³/hour at maximum speed of 3600 rpm.

Assuming a maximum flow through dictated by the filter size is 16.5m³/hour this would achieve a turnover of over 7minutes 16seconds minutes at a filtration rate of 50m³/m²/hour.

PWTAG recommend a maximum turnover period for a commercial spa of 6minutes.

A circulation rate of 16.5m³/hour would require the suction pipework from the spa and at the inlet manifold to be 3" (76mm) Ø, based on the maximum recommended suction velocity of 1.5m/sec and the pressure return pipework from the pump to be a minimum of 1½" Ø based on a recommended maximum velocity of 2.5m/sec.

Booster Jet Pump: Zodiac Aqua Drive 1200 0.75kW pump providing power for the spa jets.

f) Spa Pool Water Treatment and Heating:

Treatment: The pool water is monitored and dosed via a EMEC WDPHCL automatic dosing system and is dosed, via peristaltic pumps with Sodium Hypochlorite (liquid chlorine) and Hydrochloric Acid (pH control one way only).

The chemical dosing feed tubes from the pumps to the injectors should be sleeved completely from the outlet of the pumps to the connection at the inlets to the injectors. Although some sleeving was provided it was of insufficient length to provide the required protection.

Spa Water Heating: Electro G2HE-49T heat exchanger with titanium tubes. Primary heat to the exchanger provided by the facilities main heating boiler.

g) Pool and Spa Plant Room.

The pool plant room was relatively small and not well planned. Service access to the plant was restrictive. It is recommended that all control valves are clearly labelled and flow arrows attached to the pipework to assist the end user (pool plant operator). There were lengths of pipework that are not adequately supported and prone to damage or distortion,

It is recommended that all pumps are connected via rotary isolators and Walther Type commando plug and sockets so that they can, if required, be disconnected without engaging a qualified electrician.

All electrics in the plant room should be compliant with BS 7671 18th Edition of the IET Wiring Regulations and should be inspected and certified as such.

h) Pool Hall Air Heating and Ventilation.

The heating and environmental control is provided by a Heatstar XF EC 1000 Super, with primary heating provided by the facilities main heating system. The Heatstar unit provides pool hall air heating, dehumidification control and reheat ventilation. The warm air handling capacity of the Heatstar unit is 2500m³hour and the maximum exhaust ventilation capacity is 2000m³/hour.

The recommended primary hot water flow through the Heatstar is 1.8l/sec.

At the time of my inspection the Heatstar environmental control unit was not operating and I understand that there has been no problem encountered with its operation or the control of the pool hall environment.

3. CONCLUSIONS.

Based on my inspection and survey and in consideration of the pressure tests carried out on the circulation pipework of the pool and spa, by others, that even if the circulation pipework to both the pool and the spa are replaced or repaired the facility would not be 'fit for purpose' or compliant with the relevant industry standards and therefore could not be considered to be operated safely.