SPORT ENGLAND

Design
Guidance Note

Creating a sporting habit for life

Appendix 3 Construction and specification considerations

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(To be read in conjunction with the main document)

Swimming Pools

Updated Guidance for 2013

the asa
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Construction and specification considerations

The need to pay particular attention to the detailed construction and specification for swimming pools can scarcely be overstated. The building must withstand a warm, humid and aggressive internal environment and external temperatures expected in the winter season. This can be a highly technical, complicated and demanding subject, requiring the services of specialist consultants. Key factors include:

- Heavy wear and tear and possible abuse during use
- Avoidance of interstitial and surface condensation that can lead to corrosion/rot and failure of various elements - particularly those concealed within the structure
- Ease of maintenance to ensure a clean and hygienic environment that eliminates dust, dirt and water traps
- The creation of safe conditions for users.

The following notes are intended to illustrate the range of potential problem areas and point to the need to ensure experienced professional expertise is available in all areas of the project team and that due account is taken of current research and recommendations.

Types of pool tank design

The pool tank and the pool surround need to be designed as water retaining structures with high levels of insulation (insulation to the pool surround will only be required for thermal compliance) [1]. There are two main construction techniques:

Concrete pool tanks

These would normally be constructed from shuttered in situ reinforced concrete to *BS 8007*. They can be formed with or without a screed/ render and normally have a ceramic tile finish.

Waterproofing additives can be used to reduce the risk of leakage. The tank structure should be thoroughly tested for water tightness, through a full depth tank test, before finishes are applied. Any faults should be remedied before tiling or lining work is undertaken. Most repairs will be more effective from the wet side.

Pre-cast concrete panels should generally be avoided due to problems of guaranteeing water tightness at the joints. Permanent shuttering should also be avoided due to risks of deterioration if leakage does occur over the life of the pool tank or problems identifying any leakage path for repair.

Structural movement joints in the pool tank should be avoided where possible. Joints between the tank and the pool surround should also be minimised where possible. If joints are unavoidable, these must have an effective proprietary water bar system suitable for their application.

Pool surrounds should be designed to the same standard as the pool tank, and provision made to prevent lateral water travel to other areas.

Materials should be selected with regard to their environmental sustainability, while also ensuring durability and lifecycle qualities:

- ***Recyclable content***
- ***BRE green guide rating***
- ***Environmental profile.***

Other concrete pool construction forms include sprayed concrete (gunnite) and concrete blockwork permanent formwork filled with reinforced concrete. These forms are primarily associated with private and hotel pools, and there are considerations in respect of their use in larger pools that will require very careful attention. Expert independent advice should be sought before considering these forms of pool construction.

The use of tanking membranes in the pool surrounds, as an alternative to water retaining concrete, should generally be avoided. However if tanking is unavoidable great care must be taken in the selection, detailing and testing of the membrane. The risk of damage due to thermal shock when the pool is emptied or filled with water and heated is a critical issue. This must be taken into account and integrated into the design, construction and operation of the building as set out in Table 1 below.

Activity	Rate [2]
Max fill/empty rate	0.03 m/hour (0.75 m/day)
Max heating rate	0.25°C/hour (6°C/day)

Table 1

[1] *Approved Document L* requires a minimum U-value of 0.25W/ m2/K where the pool tank is ground bearing.

[2] *BS5385: Part 4: 2009 Wall and floor tiling – Part 4: Design and installation of ceramic and mosaic tiling in special conditions – Code of practice.*

Stainless steel pool tanks

Prefabricated sectional stainless steel tank structures are becoming more common, although in the UK these are still an emergent market. They are supported on a concrete slab and are either site welded to form a complete tank structure or are bolted together. A welded reinforced plastic liner may also be used for the walls and/or floor of the tank.

Tank under construction in stainless steel panels with an integrated overflow and raised end

Advantages of the stainless steel pool include:

- They are quicker to assemble and install (but will require an extensive period for design and off-site fabrication)
- Elimination of issues associated with a conventional concrete pool tank
- Finished quality and dimensional tolerances of the tank can be more closely controlled.

Issues to be carefully considered as part of the system selection and design process include:

- The need for independent structures for the steel pool tank support framework and pool surround retaining walls, allowing periodic checks for potential leaks and degradation
- Selection of the support structure and panel materials and their fixings to avoid or minimise the risk of corrosion
- Establishing that the pool system will last the intended design life of the building. A 'cost in use' appraisal for the proposed life of the building is recommended
- Provision of a watertight joint at the junction between the steel tank and the pool surround needs careful consideration. The pool perimeter details are critical: a tanked pool surround may be required, and the interface of the pool and surround needs careful detailing in order to avoid leakage. Where pool liners are used, the pool wall panel liner should be fully bonded to the metal panel
- Fixed pool equipment: The pool surrounds require a number of fixing points for temporary equipment associated with the various elements of the swimming progamme. See pages 10-11 for details
- The length of manufacturer's guarantees for the polymer liner and the risk of mechanical damage.

Pool tank construction

A comparison of the essential key differences (assuming other factors can be treated as equal)

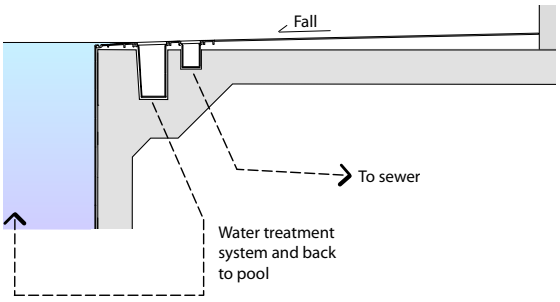
	Concrete	Stainless Steel
Structural	Option 1: • Monolithic design for whole of tank and pool surrounds when constructed from in situ water-retaining concrete to *BS 8007/ BS EN 1992 Part 3* gives a highly-stable structure	Option 1: • Stainless steel side walls incorporating structural back framing fixed to a reinforced concrete floor
	Option 2: [3] • Gunnite sprayed reinforced concrete • Reinforced concrete blockwork with waterproof renders/coatings An Integral transfer channel is the most common option Fixtures and fittings need to be integrated into the tank design	Option 2: • Polished stainless steel side walls and floors incorporating structural back framing and welded seams Stainless steel wall panels are generally available up to 3.0 m depth only – deeper pools will need a composite wall of concrete (lower) and stainless steel (upper) An integral stainless steel transfer channel can be part of these systems Some fixtures and fitting can be integrated into an integrated transfer channel Junction with pool surrounds and floor structure need special care
Waterproofing	• Inherent within well-constructed in situ reinforced concrete pools meeting BS 8007 / BS EN 1992 Part 3 • Can be augmented by waterproof liner and/or render	Option 1 • Factory bonded PVC-faced galvanised or stainless steel wall panels and loose PVC floor liner, with all seams thermally welded
		Option 2 • Bare polished stainless steel wall and floor panels with welded panel joints
		Option 3 • Structure as option 1 with loose fitted PVC waterproof pool liner with thermally-welded seams
Finishes	Option 1 • Fully ceramic tiles on render backing is the preferred finish	Option 1 • PVC factory applied finish to wall panels and loose PVC liner sheet to floor
	Option 2 • Specialist finish renders and paint finishes have been used where long-term durability is not so important	Option 2 • Ceramic tile option to upper wall sections subject to design and stiffening
		Option 3 • Loose PVC liner

[3] Gunnite and reinforced concrete construction are more commonly used for private / hotel / fitness centre pools and are unlikely to achieve the long-term life of an in situ RC pool.

	Concrete	Stainless Steel
Robustness	• Robust - minimal risk of damage from vandalism or pool hall activities • Durable • Stable construction • Workmanship is critical to waterproofing and long term life of the pool	• PVC lining is liable to mechanical damage from sharp objects. e.g. puncture resulting in leakage • Potential movement issues at the junctions with loose linings and more rigid wall/floor and wall/surround • Workmanship is critical to waterproofing and long-term life of the pool
Service life	Proven long service life. Examples c 100 years +	• Periodic replacement of liners required (c 10 years) • Oldest examples c 40 years
Maintenance	Minimal long-term maintenance of pool tank structure. Re-grouting of ceramic tiles may be required c 20 year intervals. Life of finishes will depend upon quality of materials, maintenance of pool water quality, wave action and chemicals utilized	• Regular inspection and quick repair of PVC liner damage required • Annual inspection of stainless steel structure to check for pitting/ corrosion
Construction	• Long construction period for building the concrete shell • Wet trade for pool finishes require an extensive period for application and curing • Lack of a long-term warranty (Depending on type of contract, the latent defects period will be 6/12 years and the patent defects period will be 12 months) • Long overall construction program	• Lengthy off-site design and prefabrication time requires early placement of the contract • Short installation period • Maximum warranty period 15 years • Reductions in programme time are possible compared to a concrete pool (likely to be more appropriate for temporary and portable facilities)
Quality control	• Resolution of severe defects and leakage can be complex requiring potential drainage of pool and resulting in extended closure • Dimensional control dependent on quality of workmanship on site	• Resolution of severe defects and leakage can be complex requiring potential drainage of pool and resulting in extended closure • Dimensional control achieved through factory prefabrication and site control
Costs		
Tank construction	Normally used as benchmark	Cheaper in terms of capital costs and short-term expenditure
Other associated costs in the construction process	Dependent on the undercroft and basement plant room configurations and the contractors allowances for preliminaries	Dependent on the undercroft and basement plant room configurations and the contractors allowances for preliminaries • Shorter contract prelims are likely
Periodic lining replacement and closedown costs (over a 60 year period)	Over a period of 60 years, periodic close down of the pool would be expected for repairs to tiles and grouting. Possibility of retiling in refurbishment terms from 25 years	Over a period of 60 years, periodic close down of the pool would be expected for replacing the lining from 10 years
Other maintenance costs		Mechanical damage to lining would require urgent repair

Pool and pool surround drainage principles

BS EN 15288-1: 2008 requires the pool surround to be designed to avoid contamination of the pool water by water flowing on to the floor. Drainage of the pool surround areas should be independent of the deck level pool water recirculation drainage channel. This can be achieved using twin channels on the pool surround incorporating either individual grilles over two separate channels or a single grille spanning over an integral twin channel system. However, careful consideration of grille width and selection of a suitable specification is needed, in particular to achieve the necessary slip resistance / health and safety requirements.



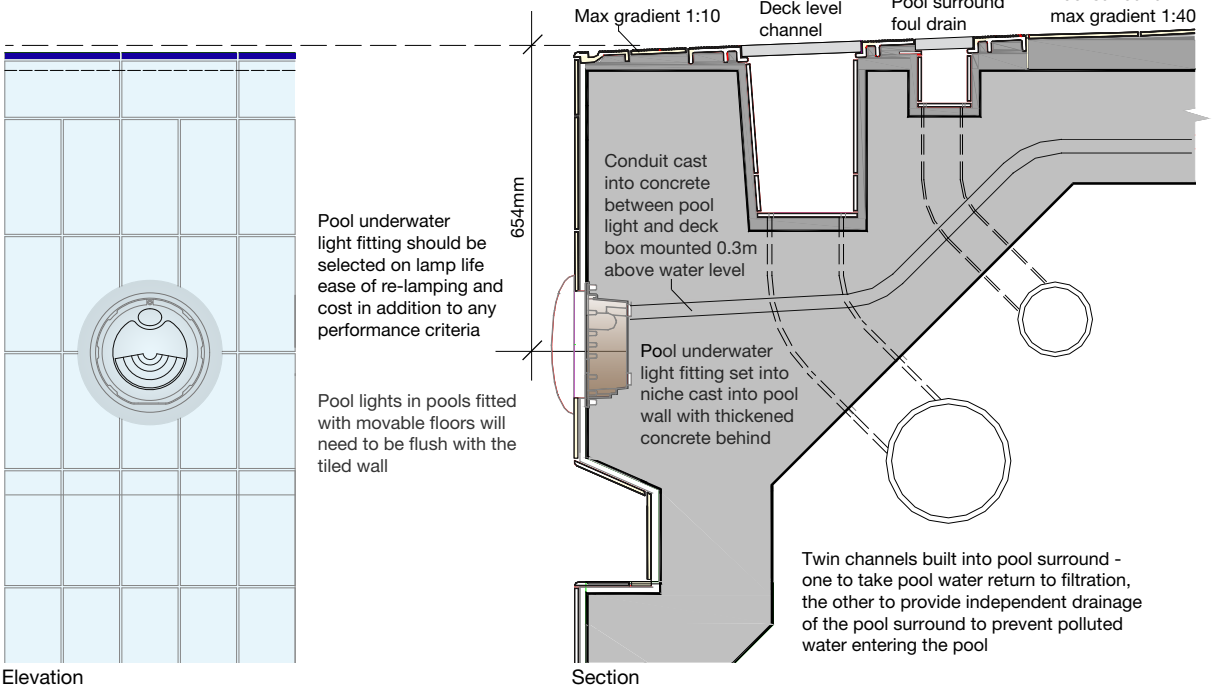
Example of pool channel drainage to meet *BS EN 15288-1 : 2008*

Pool edge details

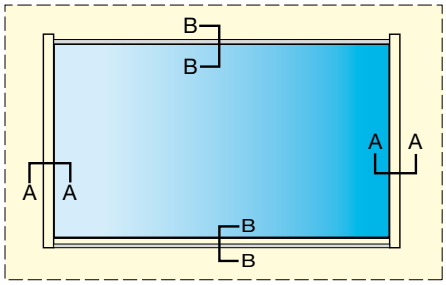
The pool edge detail can be formed with proprietary solid, pre-cast ceramic units, or cast as part of the concrete pool edge profile, where the deck level channel is set back away from the pool edge. In both cases, the channels are covered with a slotted plastic grille. The following are important factors regarding finishes to a pool:

- An appropriate surface treatment to concrete pool tanks is required to provide a key for applied finishes. This is usually achieved through mechanical keying of the concrete surface to expose the coarse aggregate
- Compatibility of the tiling specification with the tile adhesive and grouting
- Soft water, aggressive chemicals, rapidly moving water or heavy wear may require tiling to receive epoxy based adhesives and/or grouts in lieu of cementitious based ones

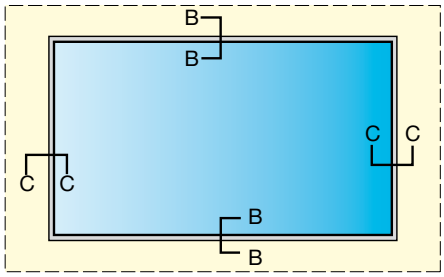
  However, for cost, application and programme reasons, the use of epoxy grouts should be minimised
- Waterproof membranes should generally not be used between pool tiling and a concrete pool structure, as these can be the cause of subsequent failure of the finishes if there is any shocking of the tank during emptying or heating of the pool. The pool tank should be designed to be waterproof
- The noise of the circulating water continuously falling into the deck level channel can be distracting. In order to minimise the impact of water flow, the pool side of the deck level channel should be set at an angle so that the water runs down the channel side face rather than tumbling into the channel. See Section B-B overleaf.



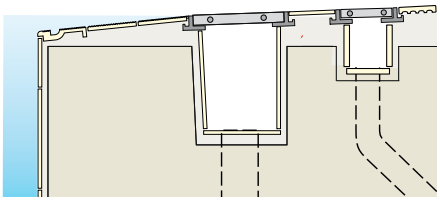
Typical low voltage recessed underwater light fitting



Example plan of a competition pool with permanent raised pool ends with deck level edge channels provided along the sides of the pool tank

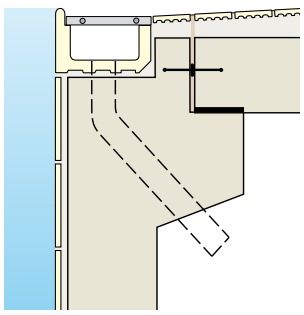


Example plan of a general purpose swimming pool showing deck level edge channel provided to the perimeter of the pool tank. For competition use removable turning boards and starting platform can be used



Section B - B - Example of deck level twin edge channel (Builders work)

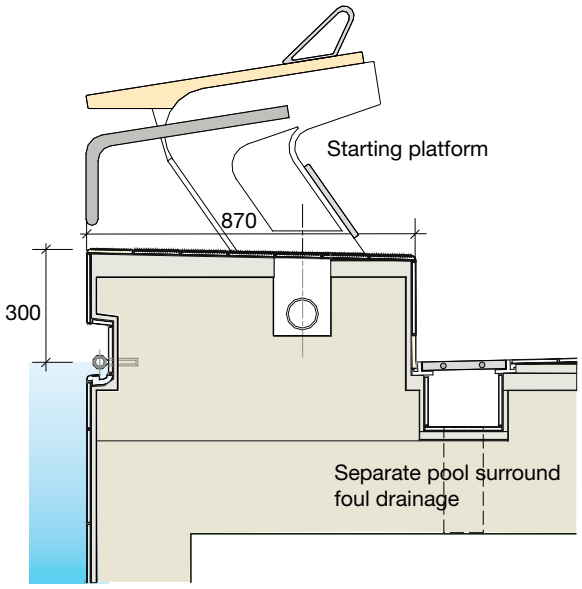
Note: Rake to front face of channel to reduce water generated noise. Twin channels built into pool surround - one to take pool water return to filtration the other to provide independent drainage of the pool surround to prevent poluted water entering the pool.



Section B - B - Alternative example of deck level edge channel ('Weisbaden' ceramic channel).

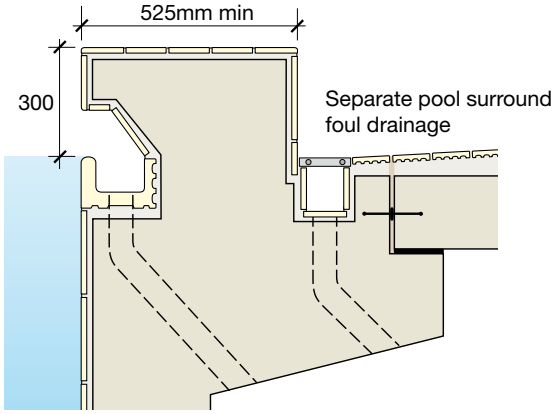
Note: The Weisbaden pool edge detail is unlikely to be suitable for larger pools due to the limited capacity of the channel. Advice should be obtained from the services consultant before selecting this detail.

Examples of pool edge details



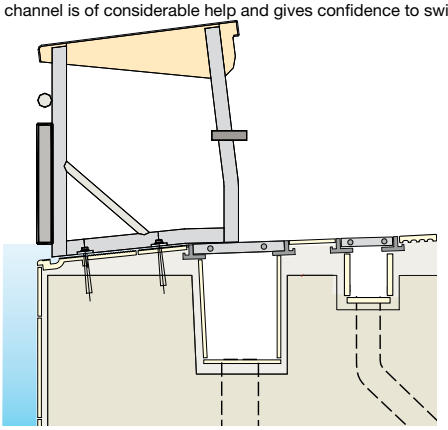
Section A - A - Example of builders work raised end excluding filtration channel and with finger grip provided at top

Note: The provision of permament raised ends should be limited to pools where extensive competitive use is an essential requirement. Lifeguard supervision will also need to take account of any additional risks the provision of raised ends may present to bathers.



Section A - A - Alternative example of raised end with integrated ceramic filtration 'scum' channel providing a finger grip at water level

Note: For inexperienced swimmers the channel may present a hazard during tumble turns. For poor swimmers and older people however, particularly those with limited shoulder mobility taking part in length swimming, the channel is of considerable help and gives confidence to swimmers.



Section C - C - Example of deck level pool end with twin edge channel and removable starting platform with integral turning boards (if required - bolted to pool surround)

Note: rake to front face of channel to reduce water generated noise.

Points to consider:

- ***Permanent raised ends help to prevent swimmers misjudging the end of the pool and avoid the need for turning boards for competitions***
- ***A drainage channel is still required to drain the pool surround behind the raised ends if the surrounds fall towards the pool edge***
- ***A hand hold is required***
- ***Fixings for lane lines, starting platforms, turn boards (if no raised ends), touch panels and automatic timing equipment.***

Finishes to wet areas

Tiling to all wet areas should be laid to a fall. A gradient of 1:40 is generally adopted, but should not be steeper than 1:35 or flatter than 1:55 for safety and proper drainage.

A consistent datum level around the deck level channels is particularly important to ensure a consistent flow of water over the weir and the proper functioning of the deck water circulation system. Structural movement joints must be coordinated with tile joints, and sealants must be selected on their suitability for use in a pool.

Finish tolerances	
Floors generally	< 0.005 m *
Floors laid to falls	< 0.003 m *
Finished tile level of leading edge of deck level pool channel consistent datum level	0.000 m *
* The greatest distance between the straightedge and the tile surface measuring over a distance of 3 m.	

Table 2

Stress relieving joints in the tiling must also be carefully considered. *BS 5385 Part 4* recommends stress relief joints at all changes of direction and every 6 m where tile grout joints are less than 5 mm wide. However, for the purposes of good practice stress relief joints should be considered in any pool regardless of joint size.

The selection of slip resistant tiles can be complex in the UK. The majority of ceramic tiles are tested for slip resistance under the German DIN Standards, DIN 51097 (bare foot) and DIN 51130 (shod foot) [5] both of which are excellent for establishing a tile's inherent slip performance. However, these are tests undertaken in a laboratory and it is not possible to assess tile performance once installed.

In the UK the HSE pendulum and micro-roughness tests [6] are increasingly used to establish in situ slip performance. This is mainly due to the HSE slip resistance test being portable and is being used in legal injury compensation cases.

Slip resistance tests can be influenced by a number of factors, including surface profile, extent of tile joints in addition to any inherent slip resistant properties of the tile. All floor finishes should be selected to have a low slip potential. Also, slip resistance can degenerate due to poor care during construction or poor cleaning techniques during use.

It may be necessary for the tiles to be additionally tested at specification, post-installation and during use to enable comparison in actual performance.

The primary benefit of the HSE tests are that they can be undertaken to test a particular tile in situ, to enable a comparison of the tile's performance and assist in identifying the potential cause of any slip problem as supplied, installed or maintained.

Generally, bare foot only trafficked areas should have the highest grade of slip resistance. These would include pool surrounds, flume towers, showers, shallow water areas (less than 1.35 m) where the buoyancy is low and anywhere where barefoot users might be tempted to run. In other areas where barefoot and shod foot traffic is shared, the ability to easily clean and maintain the tiles also needs to be considered. In all cases, flooring should provide a minimum pendulum test value of +36 using the appropriate test equipment and likely pollutant (e.g. water).

Note: The slip resistance requirements of tiling in the pool tank is specified in *BS EN 15288-1:2008.*

[5] HSE Technical Information Sheet *Assessing the Slip Resistance of Flooring* and *UK Slip Resistance Group Guidance.*

[6] See Appendix 2 and BSEN 15288: Part 1: 2008 *Swimming Pools: Safety requirements for design.*

When selecting tiles, avoid selecting on the basis of marginal passes in tests, as construction and use will inevitably allow some degradation in performance.

A mid-tone colour is usually considered most practical for keeping a clean appearance. Avoid white and dark colours on pool surrounds or any heavily trafficked areas as these can show stains and are difficult to clean.

Tile manufacturers should be asked to provide independent slip resistance test data in accordance with HSE guidance in addition to DIN standard test data.

Structural frame

The structural spans involved in a swimming pool design usually involve a framed structure. Steel or timber laminated beams and columns are commonly used. However, load bearing masonry and steel or timber beams can be a feasible solution on small projects.

The protection of the structure from corrosion and/or rot is of the utmost importance, particularly as the material's strength and stability can also be impaired. For example, some adhesives in laminated timber can be adversely affected by the pool atmosphere and steelwork can be badly corroded when concealed within the wall construction.

Steelwork must be protected with a specialist proprietary paint system that involves specified thicknesses of zinc-rich paints that are often epoxy or polyurethane based. All protective coatings should be carefully discussed with the specialist coating company and be based upon intended use, expected environment, exposure and a life to first maintenance, normally not less than 10-15 years.

Roof structures will need to support:

- Suspended services such as ventilation ducts and light fittings
- Equipment such as safety harnesses in diving pools.

Roof enclosure

Critical factors are the avoidance of interstitial and surface condensation and material corrosion. Key design checks should assess condensation risk, vapour resistance gradient, thermal insulation gradient, and ventilation.

The roof construction / ceiling finish should be designed to:

- Provide high levels of insulation and to prevent condensation
- Be resistant to the pool environment
- Provide sound absorption
- Have no effect on the colour of the pool water
- Withstand ball impact if the pool is used for water polo
- Provide a good surface reflector for the spread of light.

A number of proprietary panel systems are available that are a composite of an outer weathering sheet, insulation, a vapour barrier and aluminium inner lining sheet. They can eliminate internal voids and use the self-finish lining layer as a vapour barrier. However, other factors such as the need for fixings for an acoustic underlining need to be considered.

Rooflights should be of the double-glazed diffusing type, not more than 25% (approximately) of the total roof area.

Where suspended ceilings are considered, it is important that the space is not subject to a risk of condensation. This can be done by designing the roof structure as a 'warm roof'. Care must be taken to avoid piercing vapour barriers with fixings. For ceiling hangers or suspended services, protected fixing systems are available to hold the roof to the structure.

External walls

The principles of design to avoid 'cold bridging' and avoiding interstitial condensation in the roof apply equally to the walls.

External walls should be constructed to:

- Provide high levels of insulation
- Withstand damage from vandalism
- Provide an attractive, durable, low maintenance finish
- Allow for structural movement as required by the structural engineer
- Be resistant to the pool environment.

Masonry and metal cladding systems as external materials are very common. Increasingly common is timber cladding, which should be designed in accordance with the TRADA publication *'External Timber Cladding'.*

The Building Regulations new *Approved Document L2* requires higher levels of insulation and special consideration will need to be given to thermal bridging, vapour barriers and dew point control due to enhanced risk of condensation.

Internal skins of external walls should preferably be of masonry or concrete blockwork (with or without applied finishes).

Lightweight structural framed systems are being used for some conventional construction projects, but due to the aggressive pool environment (including condensation and corrosion risks) specialist advice must be sought before considering as this may impact upon the building's expected life.

Gypsum walling products (e.g. plasterboard) should be avoided.

Glazing

Glazing will need to be double or triple glazed. Large areas of glass can cause cold radiation which can be reduced by local ventilation or electrically heated glass (expensive). High thermal performance glass will be a requirement to meet current Building Regulations [7], particularly for large glazed elements.

Where areas of thermally insulated glazing are used, particularly if including solar control glass, thermal shading coefficient checks should be made.

Glazing adjacent to the pool surrounds must be able to resist body impact and if the pool is to accommodate water polo, also ball impact. Refer to *BS 6262* and *BS 6399: Part 1*. The risk of injury if glass is broken should be given careful consideration in all barefoot areas. In addition, glass when immersed can be very difficult to see, therefore glass should be laminated. Consider toughening glass prior to lamination for maximum safety.

For resistance against rot, glazed assemblies are commonly aluminium proprietary framed units with a powder coated finish and integral thermal break.

Where the glazing is formed using structural glazing e.g. planar type systems, great care must be taken in respect of material use – stainless steel glass support fittings in particular need consideration due to corrosion risks.

If timber windows are to be used, select from a proprietary range with known performance in pools. Important considerations include:

- Timber species & grade
- Method of rot protection
- Finish
- Exposure rating and risk of wetting
- Structural requirements
- Fire requirements
- Life to first maintenance.

Rooflights

There are a wide range of rooflight materials that are suited for use in a pool environment. The primary considerations for their selection should be:

- Structural requirements – span and impact upon the primary roof structure – particularly vaults or stressed skin systems (e.g. inflated ETFE – Ethyl-tetra-fluoro-ethylene) where lateral tension or compressive loads can be transferred
- Resistance to corrosion – selection of materials and finishes
- Condensation through framework – the need for a thermally broken system, or through the glazing. Avoid glazing with separate skin multiple units where condensation can become trapped between the glazed skins.

Curtain walling

In addition to the requirements for glazing above, large areas of curtain walling will require a secondary support structure, normally of steel hollow section or possibly laminated timber, attached back to main structural frame members.

Steel secondary frameworks will need similar corrosion protection as the main structure and dissimilar materials must be isolated to minimize risk of galvanic action resulting in corrosion of metals in contact with each other.

Glass balustrades

These are a common feature in swimming pool facilities that provide spectator viewing to the pool area. However, the glass must be designed to *BS 6262* and *BS 6399: Part 1*. Structural supports must be designed to obviate the risk of corrosion and bare stainless steel should be avoided (see page 12).

[7] Building Regulations Approved Document L2.

Internal walls

The internal construction/finish should:

- Withstand body impact (and ball impact if the pool is used for water polo)
- Prevent water penetration at low level from regular hosing down of pool surrounds
- Allow for structural movement as required by the structural engineer
- Resist staining and absorption of body fats
- Have no effect on the colour of the pool water
- Provide sound absorption above 2 m from pool surround level
- Be capable of supporting loads, including services, pool cover, bench seating, including the loading of person(s) standing on them
- Avoid use of 'stud' partitions, particularly those with gypsum wallboard products. Where studwork is unavoidable, ensure all framework is of galvanised steel (not timber), further coated in severe locations and select wallboards suitable for constant wetting without deformation, absorption or degradation. Avoid use where fittings are to be fixed to the wall
- Provide horizontal dpc's at top of skirting level to prevent rising damp into the wall.

Movable floors and bulkheads

The movable floor / bulkhead design, construction and installation should:

- Comply with the recommendations of *BS EN 13451: Part 11, BS EN 15288-1:2008* and the HSE publication *HSG 179 - Managing Health & Safety in Swimming Pools* '*Physical Environment'* section
- Have sufficient structural stability to avoid the ASA / FINA certified competition length of the pool being compromised when lane ropes are fitted (see Appendix 1 page 6)
- Allow for easy movement of the floor/bulkhead
- Not interfere with, or compromise in any way, the circulation of the water in the pool.

Bulkheads that are part of a deck level surround should have a black line to denote the edge.

Bulkheads that are used to separate pools of different depths or are used for access by swimming officials during an event should have portable stainless steel hand or barrier rails and a handhold at water level.

The floor/bulkhead manufacturer should provide detailed information regarding installation requirements and accuracy of the pool tank necessary for their proper operation.

Fixed pool equipment

For competition use, a pool will require a range of fittings and equipment (see also section on *Typical fixtures and fittings on pages 14-16*):

- Automatic officiating system (timing) including timing pads, electronic interface to special starting platforms, connections for starting with both audible and visual signals and computer interface for scoring
- Electronic scoreboard(s), timing clocks
- Starting platforms and (for pools without permanent raised ends) turning boards
- Lane ropes
- False start rope posts
- Water polo goals
- Back stroke warning flags and posts
- Diving boards (spring boards and platforms).

The officiating equipment and scoreboards can be temporary or permanent systems depending upon use. For regular use, a system including permanent wiring and ducts should be considered. Specialist advice should be sought at an early stage to identify builder's work needed to be incorporated. The selected system should meet ASA/FINA requirements.

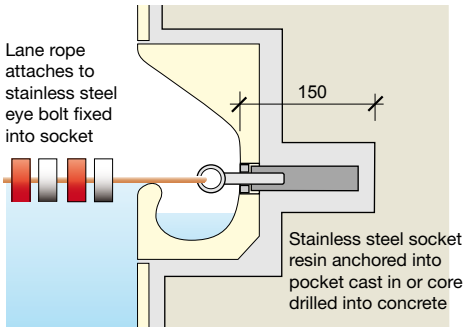
Diving boards will need to comply with the ASA/ FINA requirements. Springboards are generally required of an approved type and manufacturer. (See also section on *Diving pools* in *Appendix 1*).

The remainder of the equipment noted above is normally mirror polished grade 316 stainless steel and re-movable, but would require stainless steel permanent sockets to be fitted into the pool and pool surrounds. Examples of these are shown on the following diagrams. These are normally core drilled into the finished floor/wall and set in epoxide grout rather than cast-in, in order to achieve accuracy of placement. However the pool structure will need to be designed to accommodate the fittings without undermining any waterproofing and the sockets may, in some cases, need to resist pull-out loads.

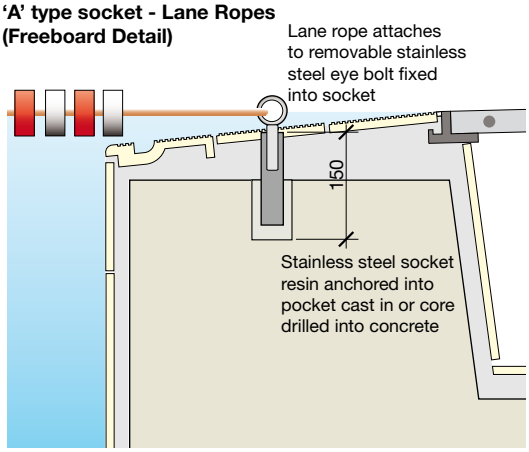
BS EN 13451 Parts 1 to 11 inclusive covers the safety requirements for items of all equipment used in a swimming pool. See *Legislation and standards* section of *Appendix 5* for a complete list of the various parts.

Fixed pool equipment

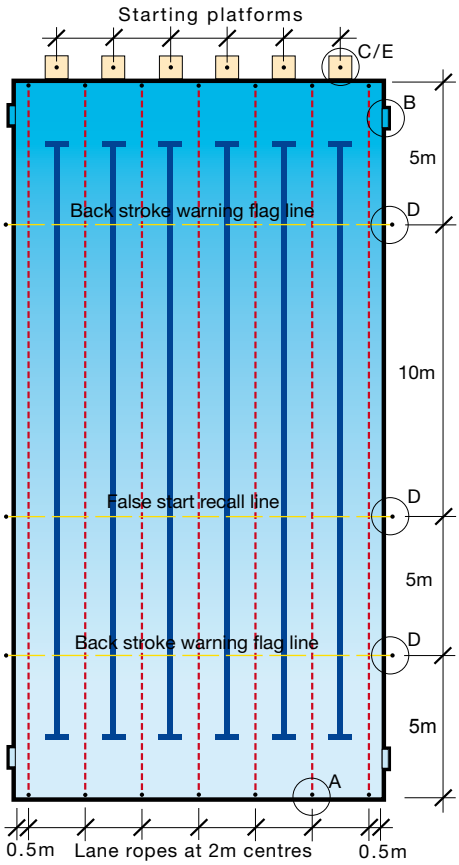
Pool equipment locations and fixing details for a 6-lane 25 m swimming pool

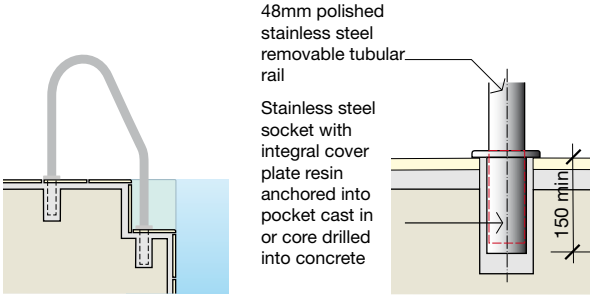


'A' type socket - Lane Ropes (Freeboard Detail)

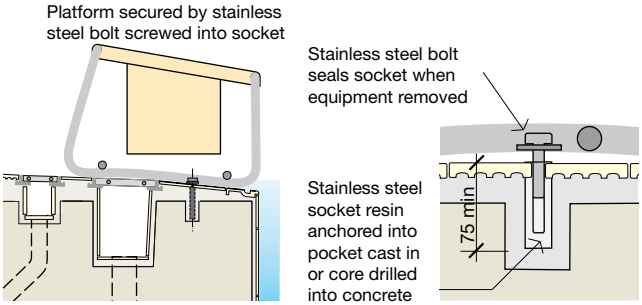


'A' type socket - Lane Ropes (Deck Level Detail)

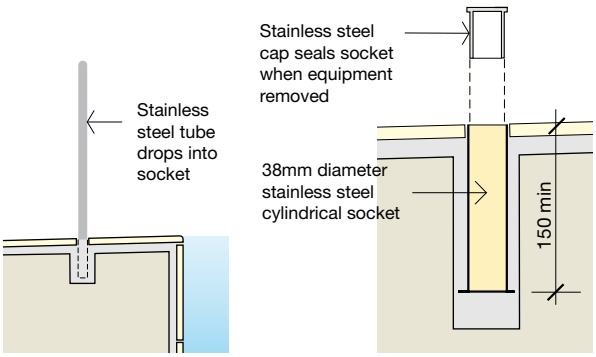




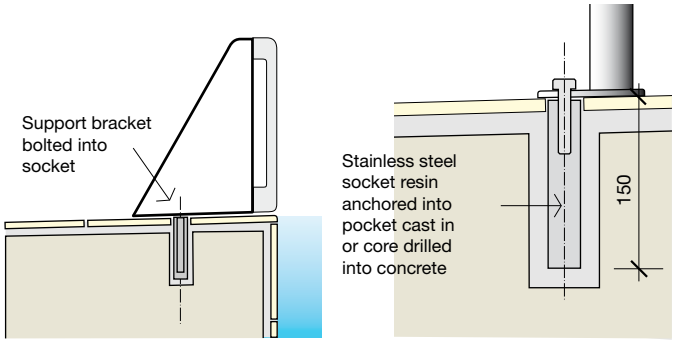
'B' type socket - Pool entry step handrails



'C' type socket - Starting platform



'D' type socket - False start/backstroke warning poles



'E' type socket - turning boards

Stainless steel in the pool hall environment

Stainless steel is not corrosion proof and needs special consideration for swimming pool applications. There has been a marked increase in premature failures of the material in recent years that has been linked to the way swimming pools are being constructed and used. This includes:

- Higher pool water operating temperatures at (30°C+) and thermal gain through glazing that creates air temperatures that are considerably higher
- Pool features, such as flumes and water sprays increase levels of water vapour and chloramine pollutants in the atmosphere
- Increased use of stainless steel in highly-stressed structures, particularly under tension
- Inadequate control of ventilation and moisture content
- Increased use of cold-formed stainless steel components, or mixture of cold and hot-formed materials in components such as bolts.

These conditions cause degradation of the passivating layer stainless steel normally produces to protect itself from corrosion. If left unchecked, pitting and crevice corrosion quickly occur. This can lead to stress corrosion cracking (SCC) and premature failure of components.

Corrosion of stainless steel balustrading and control panel exposed to pool atmosphere

This can be particularly serious if stainless steel components are used for structural support, such as roof trusses and ventilation ductwork.

If stainless steel is essential in structural situations avoid details in which key components are under high stress [8]. Avoid bare stainless steel components and consider a protective coating.

Operators should instigate a regular inspection routine and put in place maintenance practices to make good any visible corrosion before it becomes serious - refer to Section 6 of the main document *Use and aftercare*.

Corrosion to stainless steel fittings

- ***Only use bare stainless steel in situations within the pool splash zone and where it can be easily and regularly cleaned and inspected***
- ***Consider grade and finish of stainless steel to minimise maintenance and risk of corrosion***
- ***Consult with the Nickel Development Institute (NiDI) and the British Stainless Steel Association (BSSA) regarding ideal grade for each application***
- ***In other situations, stainless steel should be given a factory applied protection e.g. powder/ epoxy coated.***

[8] NiDi document 12 010 *Stainless Steel in Swimming Pool Buildings*.

Doors and frames

External doors need to be well-insulated and avoid cold bridges. Robust timber doors treated with preservative have been commonly used, but thermally insulated steel or aluminium powder-coated doors are preferred. The door specification must withstand severe temperature variations, damp conditions and will need adequate corrosion protection.

Internal door construction should be solid-core, rot-protected, water and boil proof grade doors with plastic laminate facing, lipped on all sides, suitable for a swimming pool environment. Door frames should also be heavily protected, particularly the end grain near to or in contact with the floor.

However in very wet locations or where the operator is likely to wash/hose down surfaces, timber doors should be avoided in favour of more robust doors and frames such as proprietary glass reinforced polyester (GRP) encapsulated non-timber cored doorsets.

Hinges and screw fixings must be corrosion-resistant, and if not stainless steel, should be powder-coated.

Acoustics

The acoustic environment of the swimming pool hall should be considered from the earliest stage of the design. Pools on school sites are required under the building regulations to comply with *DfES Building Bulletin 93: 2003* and this is also recommended for all pools in which swimming instruction and coaching will take place.

There are potential conflicts between the acoustic absorption qualities of finishes and the resilience required to withstand the exacting atmospheric conditions and heavy wear and tear. Large areas of hard impervious finishes, glazing and the water's surface are all efficient reflectors of sound. The roof deck provides the largest potential area for sound absorption, although it may be broken up by service ducts, fittings or rooflights. The control of reverberant noise requires relatively large areas of sound absorbing material.

Many pools are built with a proprietary profiled metal roof deck with a degree of perforation. In some instances, proprietary sound-absorbent baffles or panels are used. In all instances, moisture penetration must be avoided.

Reverberation times

The overall hall construction should provide control of the reverberation time (RT) to between 1.5 and 2.0 seconds at 500Hz [9]. It is essential that advice is sought from an acoustic engineer in respect of the acoustic performance of a pool hall, not just for the comfort of all swimmers, coaches, lifeguards and spectators, but also for the ability to hear audible fire alarms, public address and evacuation calls. This is vitally important in swimming pool halls with large internal volumes, particularly where formal spectator seating is included. During swimming competitions and galas, a very high background noise level can be expected.

Ambient noise levels / sound insulation

Control of ambient noise levels in the pool hall from the building services and external noise is also an important part of creating an acceptable environment and the building fabric should include appropriate sound insulation. Noise from building services (heating, ventilation and electrical) and external break-in noise should be limited to NR40 in terms of $L_{eq.30mins}$ [10].

Breakout noise

In some situations, the sound that may be emitted from the swimming pool may also be an issue that will have implications for the overall building structure and envelope.

[9] BSEN 15288: Part 1: 2008 recommendations.

[10] See *Accessible Sports Facilities* available from the Sport England web site for issues for people with hearing difficulties.

Typical fixtures and fittings

Typical fixtures and fittings for a standard 25 m pool			
Location	**Item**	**Essential**	**Desirable**
Exterior	Signage with name of centre, logo	•	
	Directional signage	•	
	Notice boards		•
	Smoking area and cigarette bins	•	
	Salt grit bins		
	Cycle racks	•	
	Litter bins	•	
	CCTV cameras	•	
Entrance lobby	Automatic doors	•	
	Directional signage	•	
	Dirt absorbing surfaces	•	
Entrance area / social refreshment area	Seating and tables		•
	Notice board(s) and refuse bin(s)		•
	Vending machines		•
	Social Storage for vending		•
	Pool temperatures signage		•
	Swimming club notice board		•
	Trophy cabinet		•
	Public telephone		•
Public toilets	WC's and hand basins	•	
	Urinals	•	
	Mirrors and soap trays	•	
	Refuse bin(s)	•	
	Sharps sealed bins	•	
	Sanitary towel dispensers and disposal unit	•	
	Towel holders, paper dispensers and hand dryers	•	
	Soap dispensers and toilet role holders	•	
	Clothes hooks	•	
Toilet for users with disabilities	WC and wash basin	•	
	Mirror	•	
	Support basin	•	
	Toilet roll holders and clothes hook	•	
Reception Desk / Office	Worktop with wheelchair space under shelves	•	
	Lockable drawer/cupboard	•	
	Computerised till / ticket issuing machine	•	
	Telephone switchboard	•	
	Band board [11]	•	
	High chair(s)	•	
	Clock	•	
	Refuse bin(s)	•	
	Lost property container	•	
	Pool alarm	•	
	Desks, chairs	•	
	Meeting table	•	
	Key cabinet	•	
	Whiteboard		•
	Noticeboards		•
	Filling cabinet(s) stationary cupboard and desk light		•
	Computer(s)		•
	Induction loop	•	
	Fire alarm, intruder alarm public address [12]	•	

[11] Will depend on how sessions are organised.

[12] Serving the whole building.

Location	Item	Essential	Desirable
Male and female toilets and showers	WC's	•	
	Urinals	•	
	Washbasins	•	
	Washbasins set within vanity units		•
	Showers	•	
	Soap trays	•	
	Refuse bin(s)		•
	Towel holders, paper dispensers and hand dryers	•	
	Soap dispensers		•
	Toilet roll holders	•	
	Hat and coat hooks	•	
	Sanitary towel dispensers	•	
	Mobile hoist in changing rooms	•	
Vanity areas	Hairdryers		•
	Mirrors and shelves		•
	Refuse bins		•
Changing areas	Bench seating for open plan and group rooms		
	Hat and coat hooks	•	
	Changing cubicles and clothes storage lockers	•	
	Real-time clock	•	
	Cleaning materials	•	
	Washdown point & hosepipe	•	
	Speakers for PA	•	
	Nappy changing units	•	
	Refuse bin(s)		•
Staff changing/toilets	Lockers	•	
	Bench seating	•	
	Shower/toilet	•	
Staff rest room	Table	•	
	Chairs	•	
	Work top, sink and drainer	•	
	Kettle, microwave, toaster, waste bin, clock	•	
Pool hall	Pool cover		•
	Sockets [13]	•	
	Lane ropes and storage wheels	•	
	Dividing (lane) ropes	•	
	Sweep hand timing clock	•	
	Life saving poles	•	
	Life saving resuscitation and other equipment	•	
	Life guards chair	•	
	Pool step ladders / grab rail	•	
	Water depth and safety signs	•	
	Automatic officiating system (for competition use)		•
	Whiteboards		•
	Real-time clock	•	
	Speakers for PA	•	
	Drowning alarms with repeaters at reception and plant room	•	

[13] For securing lane ropes, starting blocks, turning panels, backstroke warning flags and false start warning equipment.

Location	Item	Essential	Desirable
First aid room	Couch		•
	First aid cupboard	•	
	First aid equipment including sealed sharps bins	•	
	Respirator spinal board and stretcher	•	
	Dressing trolley		•
	Chair		•
	Mirror		•
	Screen		•
	Sink with integral base unit	•	
	Refuse bin	•	
	Pinboard		•
	Accessible toilet including WC and washbasin		•
Pool equipment store	Shelves	•	
	Teaching aids	•	
	Lane line reels	•	
	Pool equipment [14]	•	
	Portable seats [15]		•
	Canoes [16]		•
	Waterproof wheelchairs	•	
	Portable transfer equipment	•	
	Lockable cupboards	•	
Cleaners store	Sink	•	
	Shelving for storing cleaning material	•	
	Brush for dragging pool		•
	Long-handled brush		•
	'Wet' and 'dry' vacuum cleaner		•
	Floor scrubber		•
	Pool vacuum cleaner		•
	Hosepipe		•
Plant room(s)	Work bench and tool rack		•
	Speakers for PA	•	
	Real-time clock	•	
	Whiteboards		•
	Pinboard		•

[14] May include starting blocks, turning panels, backstroke warning flags and false start warning equipment and water polo equipment.
[15] If required for competitions.
[16] If required and not stored in pool hall.

