SPORT ENGLAND

Design
Guidance Note

Creating a sporting habit for life

Appendix 1
Pool types and technical design issues

- Main / competition pools
- Learner / learner training pools
- Diving pools
- Leisure pools

(To be read in conjunction with the main document)

Swimming Pools

Updated Guidance for 2013

the asa
funding partner

Swimming Pools

Design Guidance Note

Main / competition pools

General criteria

The following should be noted:

- **Certified length of pool tank:** For ASA/FINA competitions and high-level training in 25 m and 50 m pools, the end walls should be parallel and at right angles to both the swimming course and water surface.

  The actual length of the finished surfaces from 0.3 m above and 0.8 m below the water surface should be certified by a surveyor approved by the ASA.

  The certified length must not be less than that required for the actual competition (i.e. 25.000 m or 50.000 m) but with a minimum tolerance to achieve 'fast swimming times'.

  Recommended International standards are to work to a maximum dimensional tolerance between the finished wall surfaces of pool tanks of + 0.030 m. This assumes that there will be 2 no. 0.010 m thick timing touch pads (one at each end [1]) and an allowable construction tolerance of + 0.010/-0.000 m.

  However, the thickness of timing touch pads can vary from one manufacturer to another and tolerances may need to be adjusted accordingly.

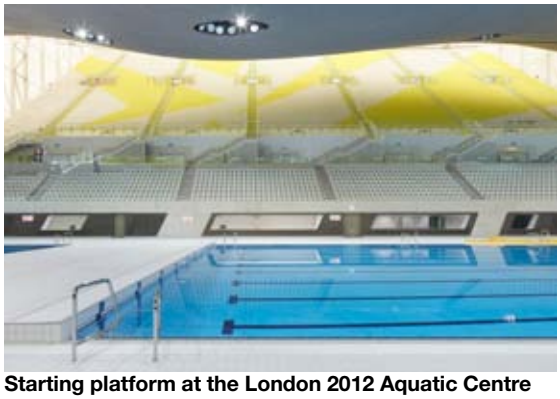
  The timing touch pads should be rigidly located on the end walls to achieve the necessary certification and to withstand the continuous pressure from swimmers during training - see diagrams on page 6.

  For 25 m community pools, it is recommended that the + 0.030 m tolerance is also used so that timing touch pads can be added in the future for local competition.

- **Width of pool tank:** depends on the number and width of swimming lanes and extra margins of water required for the two outer lanes to improve swimming conditions. The minimum lane width is 2.0 m for 25 m pools. Competition pools used at regional, national and international levels should be provided with lanes of 2.5 m width.

- **Water depth:** should not be less than 0.9 m in shallow water areas of 20 m and 25 m community pools. However, where a learner pool is provided and in larger pools, the depth should be increased to a minimum of 1.0 m to facilitate tumble turns.

[1] If timing touch pads are proposed only at the start end and not at the turning end, this should be agreed, before construction, with the Amateur Swimming Association (ASA) http:/www.swimming.org/asa



Starting platform at the London 2012 Aquatic Centre

The depth of the water can also affect the speed that swimmers can attain. Pools used for swimming competition under FINA rules, require a minimum water depth of 1.35 m extending from 1.0 m to at least 6.0 m from the end wall for pools with starting blocks. Elsewhere a minimum depth of 1.0 m is required. However a depth of 1.8 m is preferred [2], increasing to 2.0 m minimum or 3.0 m preferred for World and Olympic events. Dedicated competition pools may be set at a constant depth.

- **Colour of tank finish:** white or pale blue finishes are preferred as they have high reflectance factors. This makes it easier to see swimmers below the water and to judge by eye the clarity of the water.

- **Pool tank profile:** should be considered in relation to the range of activities to be accommodated and whether movable floors and bulkheads are planned (see page 5).

3 m constant water depth at the London 2012 Aquatic Centre which features a movable floor

[2] The ASA and CIMSPA (formerly the ISRM) stipulate a minimum depth of 1.8 m for the teaching of shallow entry dives from the poolside. See ISRM publication *Diving and Jumping into Swimming Pools and Open Water Areas* which also has advice on the use of starting platforms and the ASA Competitive Start Award. For the teaching of shallow dives where the freeboard is greater than 0.38 m, the FINA standards for the depth of water under a 1 m platform should apply.

For safety, variations in water depths below 0.8 m should be achieved through gradients of 1 in 20 (5%). For variations between 0.8 m and 1.35 m, gradients should be no steeper than 1 in 17 (6%)[3]. Where pool depths continue down to 1.5 m or 1.8 m the same gradient should preferably be continued. See diagram for tank profiles, depths and gradients on page 5.

The 1.35 m depth line should be conspicuously marked on the pool floor by a contrasting line to identify the start of deeper water.

Dedicated competition pools may be set at a constant depth of 1.8 m preferred, or 2.0 m minimum for World or Olympic competition (see FINA handbook).

- **Pool edge detail:** a 'deck level' edge is the most effective and attractive option. This allows pool water to constantly overflow the edges of the pool tank and drain into a continuous channel set into the pool surround. The channel can be positioned at the pool edge or set back behind a tiled margin of approximately 0.30 m.

  Deck level edge pools have advantages over the older freeboard (scum channel) pools:

  - Easier pool entry and exit, particularly for disabled people
  - Improved surveillance of the pool tank from the poolside
  - Improved air movement across the surface of the pool, enabling more effective removal of airborne chemical pollutants
  - Improved surface draw-off removing pollutants from the water surface more efficiently
  - Reduction in water turbulence, improving conditions for swimmers in the outer lanes and people learning to swim.

  The deck level edge must be designed to allow swimmers to obtain a grip and also have a dark coloured edge demarcation to allow the edge of the water to be more easily seen by swimmers and those on the pool surround.

- **Raised pool ends:** provide a clearly visible vertical surface in deck level pools for tumble turns to be safely executed and remove the need for separate turning panels. The ends should be 0.3 m above the water level and incorporate a hand grip. Where the water depth permits they can be used to teach diving.

  They are an advantage for competitions and training, but are not required for fitness swimming. They allow easier integration of automatic officiating equipment for competitive events.

  For occasional competition use, temporary starting platforms and turning boards should be used.

  The ASA advocates that turning boards should be installed during lane swimming sessions for fitness in all lanes but particularly in the fast and medium pace lanes.

- **Lane markings:** positioned on the pool tank floor and end walls in the centre of each swimming lane, they help swimmers judge the end of the pool tank when turning and are required for competition. They should be dark blue or black, contrast with the pool tank finish, and be set out to meet ASA/FINA standards.

- **Vertical access steps and ladders:** should be recessed flush with the pool tank walls and positioned at each end of the pool tank about 1.0 m from the end walls. Extra steps can be provided mid-way along the sidewalls. For 50 m pools, additional steps will be required at mid-point and adjacent to any bulkhead parking locations. For diving tanks, steps should be positioned to allow divers to swim away from rather than towards the diving boards after a dive.

- **Rest ledges:** are useful where the water depth is greater than 1.8 m. They should be fully recessed into the finished surface of the tank wall at a water depth of not less than 1.2 m.

- **Underwater lighting:** can contribute to a pleasant atmosphere and if of sufficient intensity[4] can help staff see people beneath the water more easily. Lighting should only be installed in the sidewalls of the tank. See Sport England's new *'Artificial Sports Lighting'* Design Guidance Note.

- **Underwater windows:** are useful for surveillance in those pools used for serious training and competition. These are normally installed in the side walls of the tank. However they can be installed in the end walls if more than 0.8 m below the water surface to avoid interfering with turning.

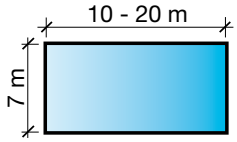
[3] *BS EN 15288:1:2008* - Sport England have adopted the 'preferred' gradients (rather than the 'minimum' gradients) as their standard.

[4] *CIE 62* suggests that an underwater lighting intensity of 1000 - 1500 lm/m^2 would be required to help reduce the veiling effect of reflected light on the water surface.

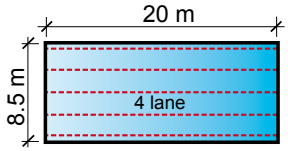
Swimming Pools

Design Guidance Note

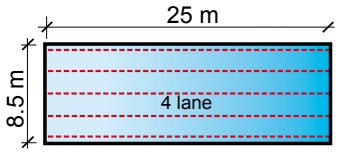
Layouts and dimensions



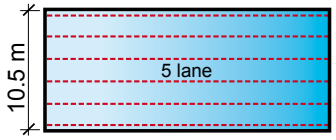
7 x 10 - 20 m learner pool **



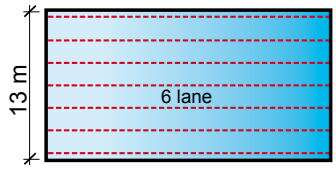
20 m 4 lane community pool **



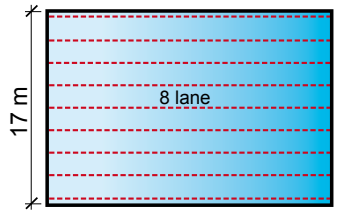
25 m 4 lane community swimming pool **



25 m 5 lane community swimming pool **

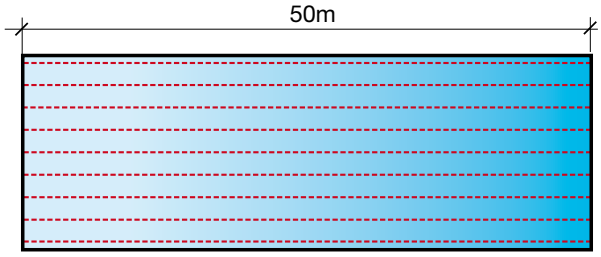


25 m recommended community swimming pool +**

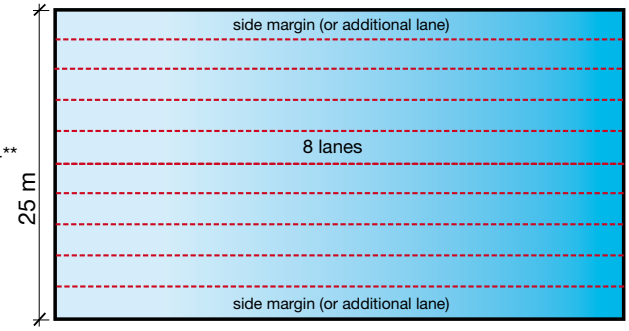


25 m County Standard pool +**

For water depths of 0.8 m or less, changes in pool depths should be achieved with gradients of 1 in 20 (5%). For water depths between 0.8 m and 1.35 m, changes in pool depths should be achieved with gradients no steeper than 1 in 17 (6%). Where pool depths continue down to 1.5 or 1.8 m the same gradient should preferably be continued. See diagram for tank profiles, depths and gradients on page 5.



50 m training pool - Width varies depending on need. Minimum width of 10 m - 4 lanes x 2.5 m or 5 lanes x 2 m **



50 m FINA international competition pool + **

Pool Type	Length (m)	Width (m)	No. of Lanes	Lane Width	Side Margin (m)	Depth (m)
Learner Pool **	10.00-20.00	7.00	2	2.00	N/A	0.60 - 0.90
Community 20 m **	20.00	8.50 10.50	4 5	2.00	0.25	0.80 - 1.00/1.50
Community 25 m **	25.00	8.50 10.50 12.50	4 5 6	2.00	0.25	0.90 - 1.50 min 1.00 - 2.00 pref
Competition +	25.00*	13.00	6	2.00	0.50	1.00 - 1.80 min
Short Course Championship +	25.00*	17.00	8	2.00	0.50	1.80
Training Pool	50.00	10.00-17.00	4 - 8	2.00	0.50	1.00 - 1.80 min
ASA National Competition +	50.00*	19.00 21.00	8	2.25 *** 2.50	0.50	1.00 - 1.80 min 2.00 pref
FINA National Competition +	50.00*	21.00	8	2.50	0.20 min 0.50 pref	1.35 min 2.00 pref
FINA International Competition +	50.00*	25.00	8	2.50	2.50	2.00 min

* For competition pools, an allowance should be made for automatic timing touch pads and for the finished dimension between surfaces of the timing touch pads / walls to be certified by an approved surveyor (see page 6).

** Provision of a movable floor allows the pool to be put to multi-purpose community use.

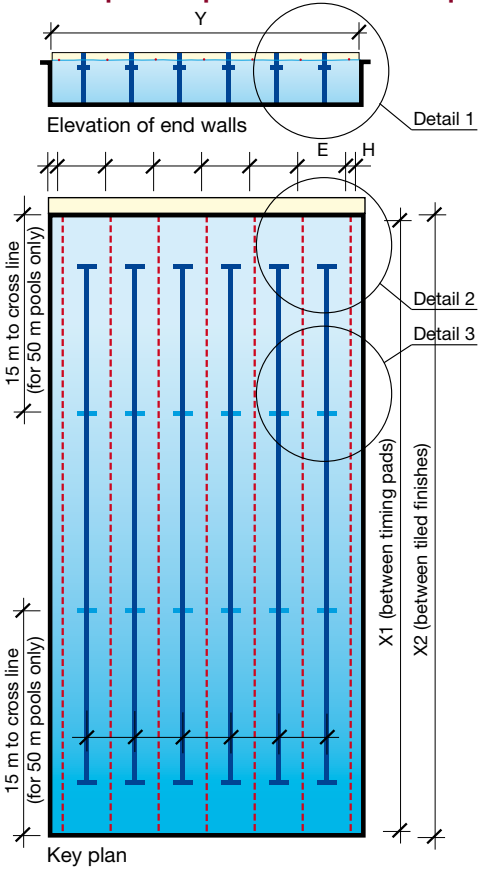
*** Standard timing pad widths are 1.9 m (2 m lanes) or 2.4 m (2.5 m lanes). 2.25 m wide lanes require bespoke timing panels.

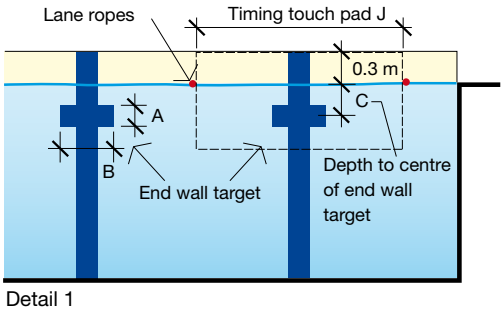
\+ Spectator and competitior seating provision appropriate to the level of competition should be discussed and agreed with the ASA / FINA

Swimming Pools

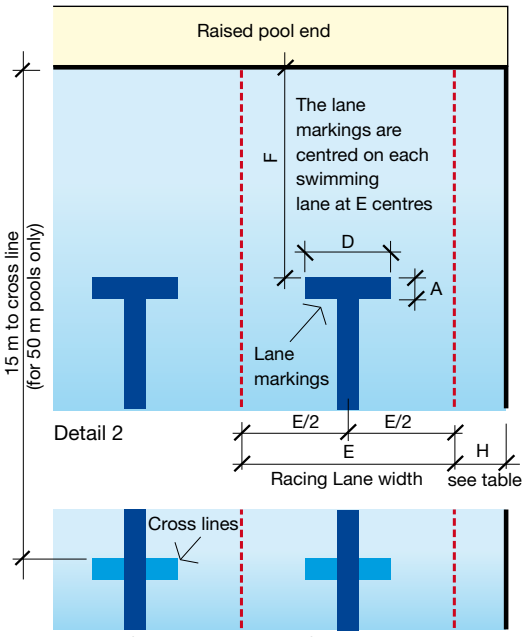
Design Guidance Note

ASA/FINA competition pool dimensional requirements





Detail 1



Detail 2

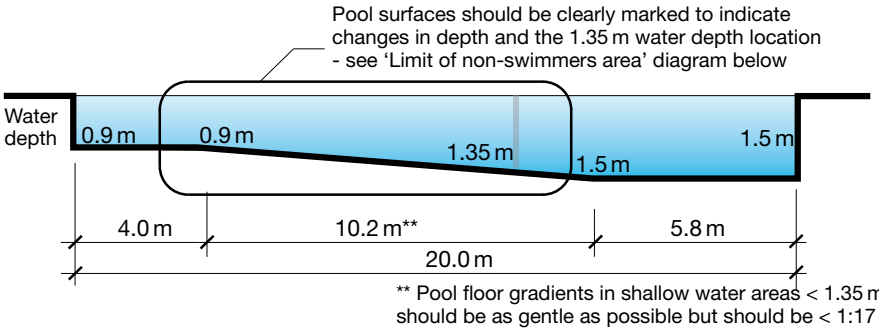
Detail 3 (for 50 m pools only)

All sizes in metres		ASA	ASA	FINA
Pool Length (minimum certified length)	X1	25.00	50.00	50.00
Pool Length (with maximum tolerances)[1]	X2	25.03	50.03	50.03
Pool Width	Y	8.50 / 10.50 / 13.00 / 17.00	17.00 / 18.00 / 19.00 / 21.00 / 25.00	21.00 / 25.00
Width of lane markings, end lines, targets	A[2]	0.20	0.25	0.25
Length of end wall targets	B[2]	0.50	0.50	0.50
Depth of centre of end wall targets	C[2]	0.30	0.30	0.30
Length of lane marker cross line	D[2]	0.80	1.00	1.00
Width of racing lanes (Pool widths 8.5-17 m)[3]	E	2.00	2.00[4]	-
Width of racing lanes (Pool width 18 m)[3]	E	2.125	2.125	-
Width of racing lanes (Pool width 19 m)[3]	E	2.125	2.25	-
Width of racing lanes (Pool widths 21 m / 25 m)[5]	E	-	2.50	2.50
Distance from cross line to end wall	F[1]	2.00	2.00	2.00
No. of lanes (Pool width 8.5 m)	G	4	-	-
No. of lanes (Pool width 10.5 m)	G	5	-	-
No. of lanes (Pool widths 17-25 m)	G	8	8	8 / 10
Outer margin (Pool widths 8.5 m / 10.5 m)	H	0.25	-	-
Outer margin (Pool widths 13-21 m)	H	0.50	0.50	0.50
Outer margin (Pool width 25 m)	H	-	2.50	2.50
Timing touch pads	J[2]	1.90[6]	2.40[6]	2.40

[1] This assumes 2 no. 10 mm timing touch pads and a maximum + 10 mm construction tolerance (see page 5).
[2] Dimensions A, B, C, D, F and J are subject to a +/- 0.05 m tolerance.
[3] ASA 25 m or 50 m pool.
[4] Lane widths of 2 m relate to 17 m wide pools used for training purposes.
[5] FINA 50 m pool.
[6] Timing touch pads for lane widths other than 2.0 m and 2.5 m (e.g. 2.125 m or 2.25 m) will require bespoke manufacture.

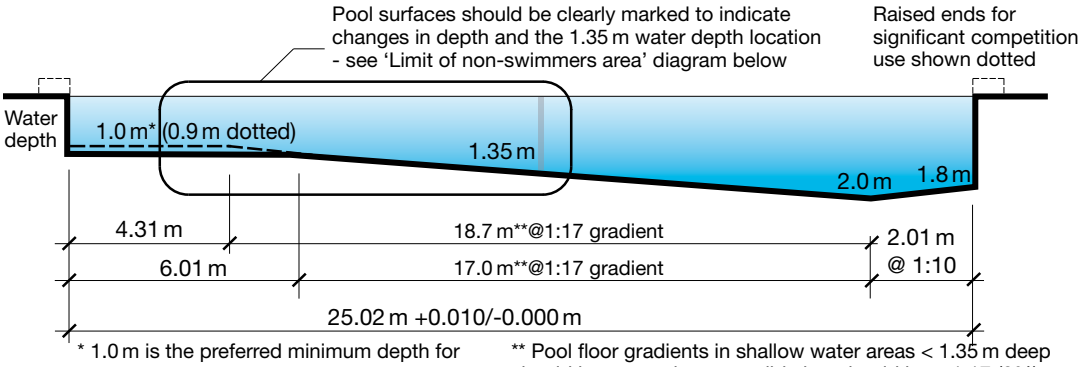
Examples of tank profiles for 20 m and 25 m pools

20 m pools - general guidance



- For small rural community pools without a separate learner pool, the shallow water depth can be reduced from 1.0 m to 0.9 m which is considered more appropriate for young children and teaching.
- 1.5 m water depth allows basic life saving / teaching / training and water based aerobics to be practiced.
- Teaching recreational bathing, fitness swimming and training can be accommodated in this profile.
- Slopes should not exceed 1 in 17 in water depths less than 1.35 m - the gradient should be continued down to depths of 1.5 m where possible.

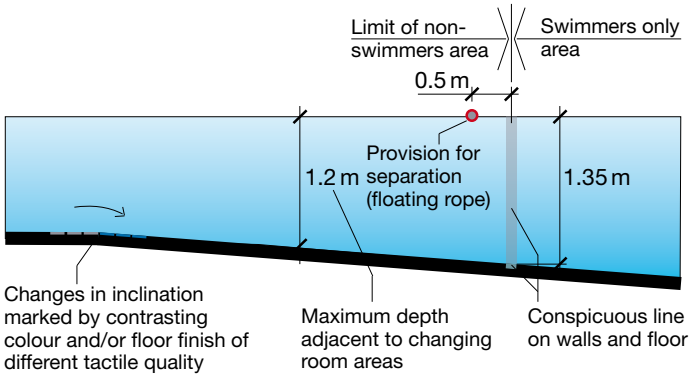
25 m pools - general guidance



- 1.0 m to 1.35 m is the most useful depth for teaching.
- 1.8 m is the advisable minimum depth for life saving practice.
- Races should be started from the deep end of the pool, subject to it being more than 1.35 m deep for 6.0 m.
- Slopes should not exceed 1 in 17 in water depths less than 1.35 m - the gradient should be continued down to depths of 1.5 m / 1.8 m where possible.
- The contour of the floor allows the pool to be used for the teaching of shallow entry dives at the deep end but is not suitable for other types of diving or the use of diving boards. If diving boards are to be provided then the water depth will need to comply with FINA Facilities Rules, the area under the boards will need to be physically separated from the other activities taking place in the pool (for example, by the use of a bulkhead) and the separated area will need independent supervision.

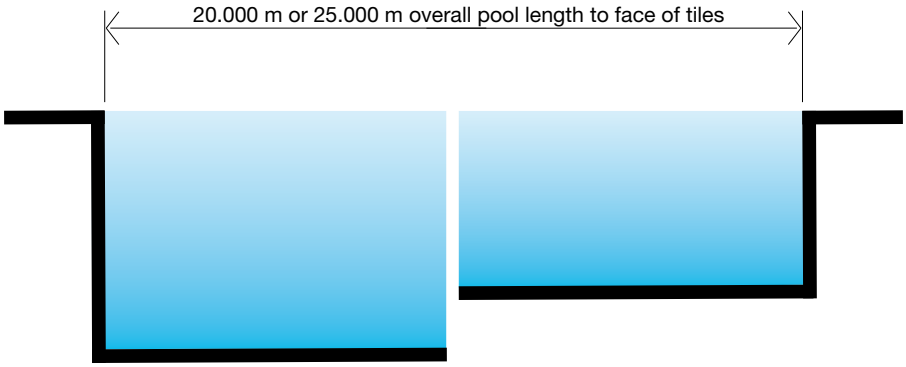
Limit of non-swimmers area

- Abrupt changes of depth are not permitted
- Gradient to be ≤ 6%
- Slip-resistant flooring to be used that does not cause discomfort



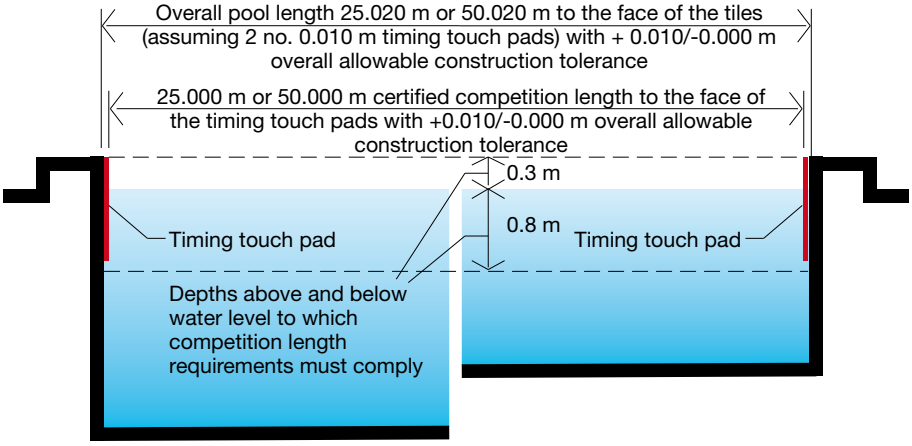
Pool tolerances

Community pool

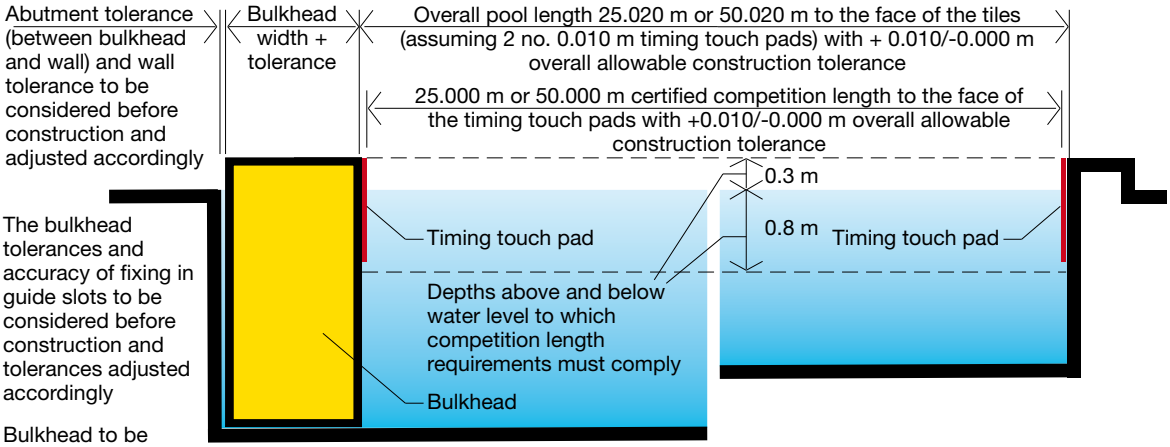


Competition pool with timing touch pads

- The need for timing touch pads to be only placed at the 'start' end of the pool to be agreed with the ASA on an individual project basis



Competition pool with bulkhead and timing touch pads



- The bulkhead tolerances and accuracy of fixing in guide slots to be considered before construction and tolerances adjusted accordingly
- Bulkhead to be designed to resist distortion from the tension/loading on the lane ropes

Learner and learner/training pools

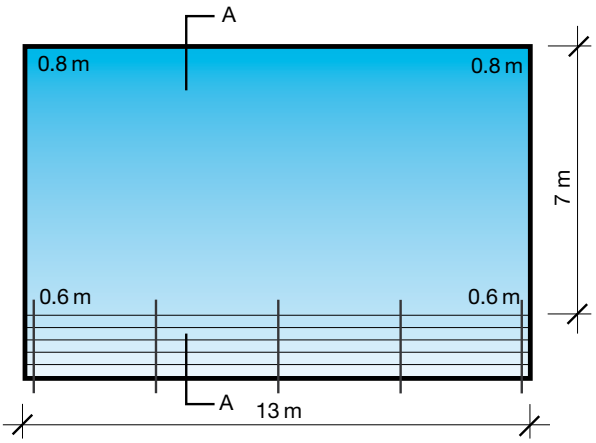
The ASA recommend that learner pools are provided with an integral movable floor to increase programme flexibility for community use. Refer to page 32 of the main document for further details.

The following criteria apply:

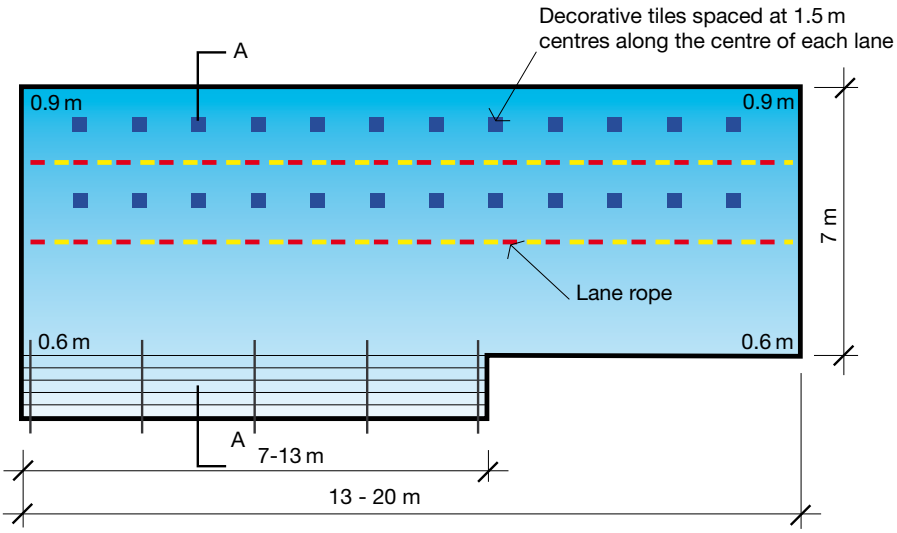
- **Length:** not critical although 13.0 m is the preferred minimum length and 20.0 m is a preferred length if the pool is also used for training.
- **Width:** should be wide enough for learners to make several strokes to get from one side to the other – 7.0 m is acceptable.
- **Water depth:** 0.6 m sloping to 0.8 m or 0.9 m preferred across the width if the pool is used for training. This can be accommodated in various layouts.
- **Colour of pool tank finish:** white or pale blue.
- **Pool tank profile:** the shallowest part of the pool should be at the base of the pool access steps, with the pool bottom sloping to its deepest point, preferably across the pool width.
- **Pool tank gradient:** should be no steeper than 1 in 17 (6%) for water of less than 1.35 m and 1 in 20 (5%) for water less than 0.8 m [5].
- **Pool tank markings:** can be provided for interest and to space school groups evenly throughout the pool. These should not be a colour or a shape that could be confused with a child in the water. Markings in lines can help a child to learn to swim in straight lines.
- **Access steps and ladders:** ladders must be fully recessed. Steps should be positioned along the length of the pool rather than at the pool end and should be recessed within the pool surround. Steps should be gently graded with treads of not less than 0.3 m and risers of approximately 0.14 m. There is a need for handrails to help children and ambulant disabled people walk down the steps into the pool.
- **Pool edge detail:** It is generally agreed that a deck level pool, with the water level the same as the surround, is preferable. A hand grip for swimmers and an edge with a distinctive colour contrast should be provided.

Learner/training pool with handrails and shallow steps

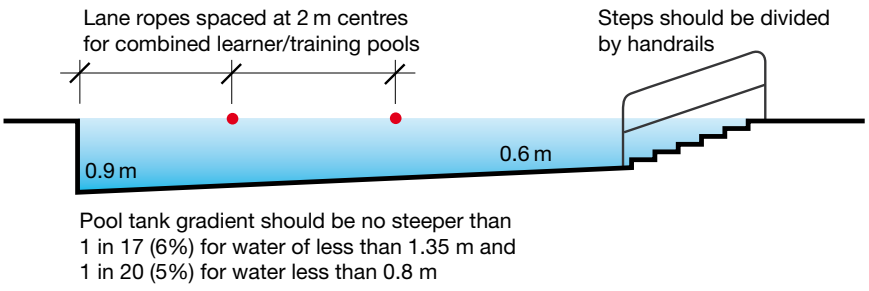
[5] *BS EN 15288: Part 1: 2008 Swimming Pools: Safety requirements for design.*



Example of a typical stand-alone learner pool layout



Example of a typical combined learner/training pool layout



Pool tank gradient should be no steeper than
1 in 17 (6%) for water of less than 1.35 m and
1 in 20 (5%) for water less than 0.8 m

Section A-A pool profile.

Diving pools

The HSE document *'Managing Health and Safety in Swimming Pools'* HSG179 states that as a general principle, when new pools are being designed, diving stages and springboards should only be installed over a separate purpose designed pool.

However, if diving boards are incorporated into a swimming pool, then the area of the pool needed for safe diving will need to:

- Be physically separated from all other activities taking place in the pool e.g. a movable bulkhead
- Comply with FINA *Facilities Rules for Diving*
- Have its own independent supervision.

The addition of a movable floor can also increase flexibility.

The following criteria apply:

- **Minimum dimensions:** the tank and the boards should conform to the minimum dimensions set out in the FINA *Facilities Rules for Diving*. However, the preferred dimensions should be adopted where possible. For Olympic pools, the preferred dimensions become the minimum requirement.

  A movable floor will allow the pool to be used for a wider range of activities but if provided, the tank depth should be increased to accommodate the movable floor. The overall dimensions could be increased to suit other activities, such as synchronised swimming and water polo.

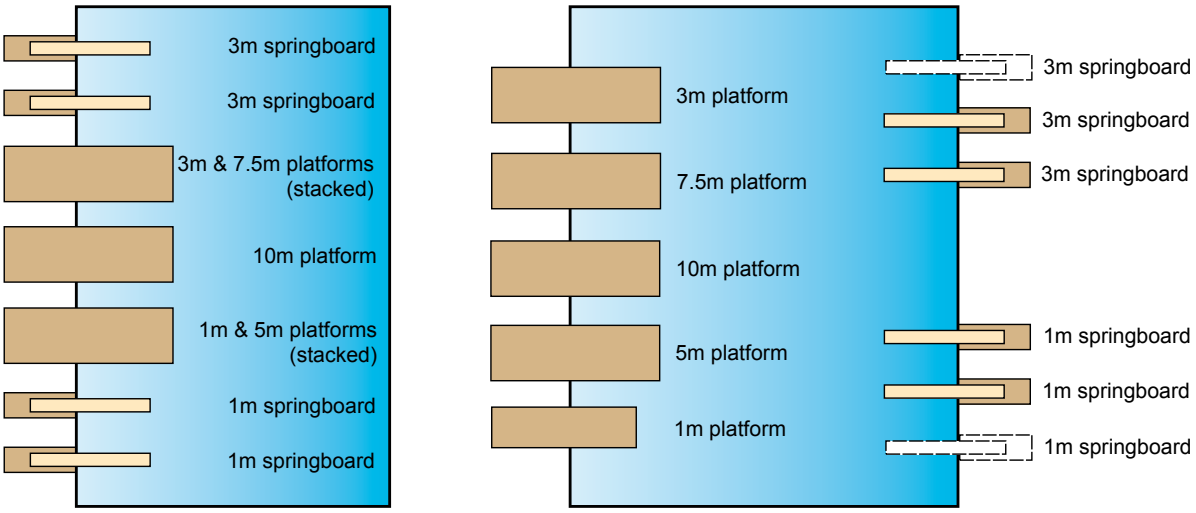
- **Colour of tank finish:** walls can be white or pale blue. A dark-blue floor is preferred as this, in conjunction with agitation of the water surface by water sprays, assists divers in seeing the water surface and will minimise accidents.
- **Pool tank profile:** dimensions will be determined by FINA requirements and whether a movable floor is installed. Where the diving tank also acts as a 25 m training pool, the lane markings should be provided in a colour which contrasts with the floor of the pool. The makings should be 0.2 / 0.3 m in width and each lane shall end 2.0 m from the end walls of the pool with a distinctive cross line 1.0 m long. Target lines should be provided on the end walls in the centre of each lane. These should extend without interuption to the floor of the pool and have a cross line 0.5 m long 0.3 m below the surface of the water.
- **Pool edge details:** Should be level with the water (i.e. without a raised hand grip lip) to help swimmers maintain contact and balance before diving. Raised sections of the surround with a flat edge can also be helpful for teaching and coaching.
- **Ladders and steps:** should be recessed. They should be positioned to encourage divers to follow a safe route to rapidly exit the water after completing their dives, while avoiding the danger areas of other boards.

Diving pool at the London 2012 Aquatic Centre

The type and positioning of steps will be affected by the board layout, other activities accommodated in the pool and whether a movable floor is planned.

- **Rest ledges:** if provided, must be fully recessed at a water depth of not less than 1.2 m.
- **Surface agitators:** a FINA requirement to help divers in their visual perception of the water surface. Normally the agitation is made via water sprays directed on to the surface of the water.
- **Bubbler:** a 'bubbler' is installed on the pool floor to provide a compressed air cushion of bubbles to help protect divers from injury.
- **Underwater lighting, windows and surveillance:** see page 2.
- **Training harnesses:** consideration should be given to the provision of training harnesses attached to the roof structure for some of the boards.
- **Shower and spa pool:** used by divers to warm up and relax muscles while out of the water for long periods.
- **Dry land training area:** an estimated 30% of diver training is in a dry springboard training area. Ideally situated adjacent to the diving pool and equipped with trampolines, dry boards with foam landing areas, weight training area and training harnesses.
- **Lighting:** should be an even level of 600 lux measured at 1.0 m above the surface of the water. Glare / specular reflection on the water surface must be avoided. A similar standard of lighting should be provided in the dry land training area.

See the FINA web site for current dimensions for diving facilities at http://www.fina.org/H2O/ .



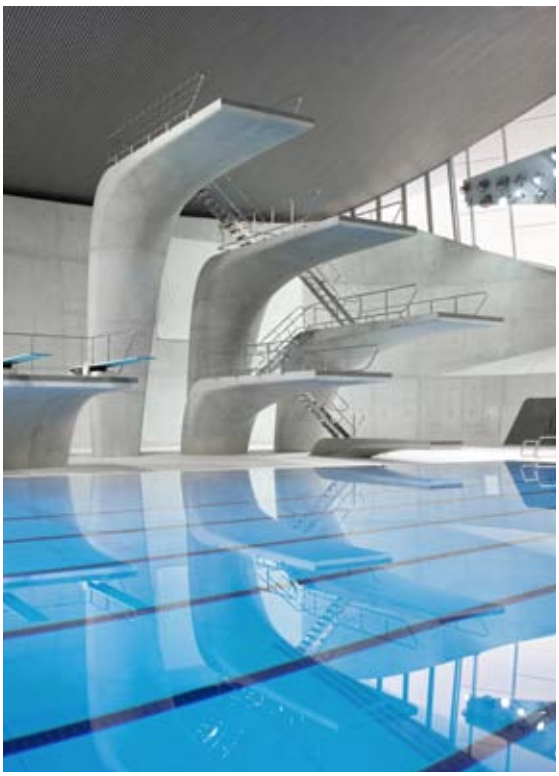
Examples of dedicated diving tank layouts (incorporating synchronised diving)

FINA standards recommend that diving platforms are not stacked above each other, but in the event that this is unavoidable, clearances and set-back of plummet lines need to be provided. This may be a requirement where the pool size does not allow springboards to be located opposite the platforms.

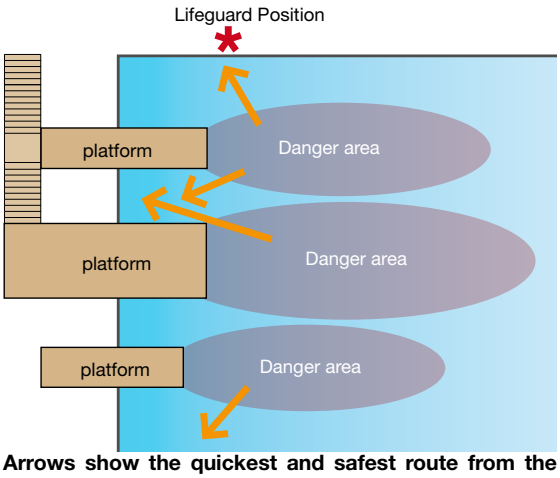
Preferred diving pool size 25 x 21 m or 25 m for two sided use (right hand example above). Other formats depend upon available space - a minimum diving tank to accommodate a full range of diving platforms and twin 1 m and 3 m springboards will be 25 x 15.75 m based upon minimum FINA standards and stacking (left hand example above).

The ASA required diving provision is for 3.0 m wide platforms at 3 m, 5 m, 7.5 m and 10 m levels and 2 no. 1 m and 3 m springboards is the minimum requirement to accommodate synchronised diving at training and competition levels. However, there is a preference for 3 no. 1 m and 3 m springboards where possible. The level of provision will depend upon the pool size and space available. Harness rigs should be provided for one 1 m and one 3 m springboards for training purposes.

ASA/FINA diving requirements (plans)



Diving platforms at the London 2012 Aquatic Centre

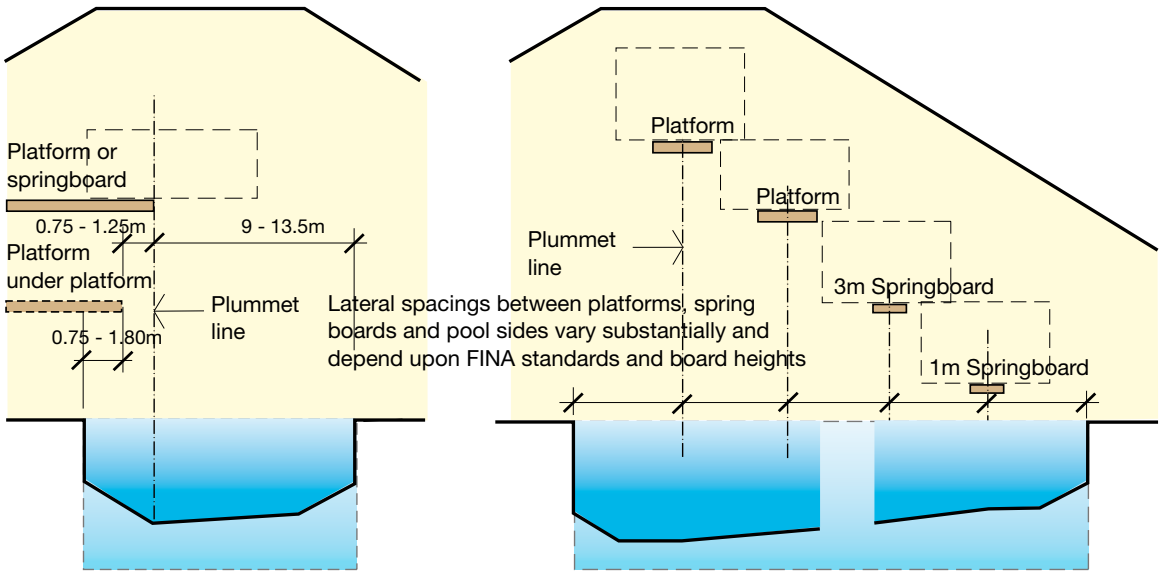


Arrows show the quickest and safest route from the danger areas

The diving pool overall dimensions could be increased to suit other activities, such as synchronised swimming and water polo.

ASA/FINA recommend that diving platforms are not stacked above each other. However, where this is unavoidable the lower platforms are set back up to 1.25m, whilst still maintaining the distance back to the pool wall. This may impact upon the pool tank size.

Ensure that ASA/FINA headroom clearance standards (shown dotted) are followed as these are substantial, and will impact on diving layout and roof structure design & height.



ASA/Fina diving pool requirements vary depending upon diving height and board/platform layout and setting out - refer to tables produced by the ASA/FINA.
It is common for a rectangular diving tank to be used with a movable floor to allow more flexible use of the pool, rather than the profile shown within the ASA/FINA standards, provided that the pool fullfils the dimensional requirements.

ASA/FINA diving requirements (section)

Leisure pools

The Sports Council *Handbook of Sports and Recreational Building Design: Volume 3* is still a useful reference to the provision of leisure pool facilities. However, discussion with experienced specialist consultants should take place to establish new trends and changes since the handbook was written.

The concept of leisure pools goes back to the 1970's where free-form shaped pools and various water features started to be used to widen customer appeal.

Leisure pools aim more towards recreational swimming, with water play features, and a more interesting environment that attract all the family. Individual buildings vary greatly and some show considerable inventiveness and complexity: Large areas of shallow water or beaches with wave machines; moving water rides; geysers; water cannons and theming to create a strong facility brand such as 'Coral Reef', 'Splash' or the 'Time Capsule'.

Leisure pools can combine a wide range of exciting water rides attracting the public in large numbers

Some larger centres have become popular 'destination' centres where families travel considerable distances for a 'day out'. Others are conceived as regional tourist attractions.

Alternatively, leisure features can be seen as a way to complement a conventional swimming pool [6]. For example, the overall leisure pool shape can accommodate 25 m lane swimming and at the same time have linking areas to a beach or shallow water. Similarly a 25 m or 50 m rectangular pool might be complemented by the provision of a learner pool which contains some water play features.

Example of a fun pool successfully integrated alongside a learner pool as part of a multiple pool facility

The use of colour, internal planting and exciting design has had a steady influence on general swimming pool design and to some extent raised the level of customer expectation.

Leisure water features can add significantly to the complexity and costs of a project. Key issues include:

- The increase on the overall size of the facility: wider surrounds, beach areas and planting areas
- Increased height requirement for facilities such as flumes and water rides
- Increased circulation space to cope with very large numbers of users. Particularly during school holidays
- The time bathers spend in the pool can be up to several hours
- Careful consideration of the safe occupancy rate for the pool in the context of HSE / SE recommendations [7]
- The need for increased catering facilities
- Increased requirements of car and coach parking and external site areas
- High bathing loads due to high number of bathers being concentrated in shallow water areas [8]

[6] Sports Council Policy document *Provision for Swimming*.

[7] The HSE document *HSG179 Managing Health & Safety in Swimming Pools* uses 3 m^2/ person as the base point for safe maximum occupancy for un-programmed sessions. The depth, size, shape and number of swimmers congregating around some features all need to be factored into the risk assessment for a leisure pool. See also *BS EN 15288: 2008 Parts 1 and 2.*

[8] *Swimming pool water - Treatment and quality standards for pools and spas* produced by the Pool Water Treatment Advisory Group (PWTAG 2009) refers to water treatment rates being based on a bathing loads of 2.2 m^2/person for water less than 1 m deep.

- Appropriate water treatment and environmental systems to reduce the levels of water and airborne chemicals, to minimise unwanted effects on bathers (e.g. ozone or ultra-violet)
- Higher water temperatures, particularly in the shallow water areas
- Need for cooling and dehumidification to maintain comfort conditions for spectators.

Features are increasingly sophisticated to cater for users who expect thrills and excitement rather than exercise and may include:

- Wave pools with beach
- Complex pool shapes
- Lazy rivers or falling rapids (usually with rubber rings)
- Fast moving water e.g. Rapids, whirlpools
- Warm spa pools
- Water features e.g. water jets and canon, geysers, water sprays
- Water based specialist play equipment e.g. small slides, pirate ships etc
- Outdoor pool links
- Surfing pools or laminar flow water rides
- Water slides and flumes, some of which can be more like roller coasters.

Water rides can be highly complex requiring a clear understanding of their three dimensional paths through a building during design stages

The majority of leisure pools are designed and developed by specialist design consultants who have built up extensive knowledge, experience and expertise over many years.

Early design consultations should take place with well-established specialist equipment suppliers and installers, particularly those experienced in water treatment and features design, as these have specific area and volume impacts on the building.

Theming is an integral part of the leisure pool, adding to the user's enjoyment and excitement

