
Pool Equipment & Materials

Pool Shell Construction Materials

- Poured cement
- Shotcrete
- Guniting
- Pre-cast concrete
- Glass block
- Stainless steel
- Aluminum
- Fiberglass
- Vinyl

Pool Surface Materials

- Plaster (Marcite)
- Fiberglass
- Sprayed liquid vinyl
- Exposed aggregate
- Tile
- Coatings (Paint)
- Reinforced PVC membrane

Selecting Surface Materials

- Initial cost
- Ease of application
- Required downtime
- Regular maintenance
- Frequency of replacement
- Cost over the lifetime of the pool
- Friction coefficient
- Aesthetics
- Appropriate for the primary programming use of the pool
- Heat retention
- Effectiveness at creating a water tight shell
- Reaction with pool water and chemicals
- Known problems

Plaster (Marcite)

Plaster

- Success of the plastering job is dependent on the strength of the bond between the plaster and the material over which it is applied
- Original plaster applications tend to last much longer than replaster jobs because the gunite, shotcrete or poured concrete pool surface is rough and porous and forms a better bond with the plaster
- White Portland cement used to make plaster is non-porous, brittle and lacks tensile strength
- Crushed white limestone or marble aggregate are added to white cement
- Mix 1 part Portland cement to 2 parts aggregate with water in a cement mixer

Plaster

- Dissolve flake or granular calcium chloride in water then add to the plaster mix
 - Use technical grade, or better, calcium chloride
 - Calcium chloride should not exceed 2% of the cement weight
- Prevent foreign matter (dirt, leaves, bugs) from getting into the mix
- Allow at least 10 minutes to thoroughly mix the plaster
- Apply the plaster mix to the pool shell and trowel by hand to a smooth textured finish
- Allow plaster to cure
- Fill pool within 36 hours to prevent crazing or check cracks that may develop from normal shrinkage

Plaster Advantages

- Holds water well -- watertight
- Has a high compression strength (hard)
- Durable
- Available in a variety of colors and finishes
- Smooth finish
- Plaster finish can be cleaned, repaired or patched
- Most common public pool surface material in the U.S.

Plaster Disadvantages

- Plaster mottling, spot etching, ghosting, bond failure, staining, and other surface deterioration problems are common
- Problems have been attributed to:
 - Improper troweling equipment
 - The application process
 - Textural or composition defects in the marcite itself
 - Improper water quality maintenance
 - Climatic conditions
 - The cement to sand ratio of the mixture
 - The grade of calcium chloride used
 - Method of filling the pool with water, and start-up procedures

Fiberglass

Fiberglass

- Two application methods:
 - Fiberglass mat is hand laid
 - Chopped fiberglass is pneumatically sprayed on
- Proper surface preparation includes sanding, sandblasting to remove old surface materials, patching of cracks, and tile repair
- Application process:
 - Carefully mix and prepare materials in compliance with manufacturer's directions
 - Stir materials before application to produce a mixture of uniform density, and to obtain a complete and even dispersion of catalyst.

Fiberglass

- Do not stir film which may form on coating surfaces into the material. Remove film and if necessary, strain the coating material before using.
- Apply a primer coat first to bond to the concrete in all etched or delaminated areas
- Apply the fiberglass mat by hand in accordance with the manufacturer's installation specifications
- Mold and shape fiberglass to the interior of the pool
- Provide water stops along all edges, fixtures, and fittings by grinding or saw cutting a small rectangular groove and inserting resin to expand against the sides of the grooves.
- Apply a liner to the groove

Fiberglass

- Apply a base resin coat, and base finish of fiberglass mat
- Apply a standard finish seal coat to cover the fiberglass strands and give the shell a strong, smooth finish
- The bonding agents, additives and glass fibers should form a seamless, integral surface coating with a minimum thickness of material of 1/16th inch.
- A heavier, thicker application should be applied over stress areas in the pool and expansion joints
- Apply fibers, sand or other non-slip materials to all surfaces where the water is less than 5 feet in depth

Fiberglass

- Use rollers to eliminate all air bubbles and to insure a positive bond to the pool surface
- After fiberglass is tack free, inspect the entire surface of the pool
- Hand sand rough areas
- Allow the surface to cure for a minimum of 72 hours.
- Apply lane lines, turning targets, drop-off lines, depth markings, and step edge markings by infusing black paint into the fiberglass resin.
- Allow to cure for another 72 hours before filling the pool

Fiberglass Advantages

- Most reputable fiberglass companies will warrantee the surface for up to fifteen years
- Long lasting, easily patched or recoated, and simple to maintain
- Its smooth surface retains heat, doesn't leak, is stain resistant and inhibits algae growth
- Fiberglass is inexpensive when compared to the alternatives

Fiberglass Disadvantages

- If the surface is not properly prepared, the fiberglass may not bond
- Freezing and thawing may cause delamination
- Cobalting discoloration may occur
- Color will wear off quickly even if it's impregnated into the resin
- Styrene or PVA may leach into the water if the fiberglass resin does not cure properly
- Exposed fibers may oxidize, break off into the water, and become an irritant to swimmers

Sprayed Liquid Vinyl

Sprayed Liquid Vinyl

- Sprayable liquid vinyl plastic (PVC) coating
- Developed as a substance to protect ships from exposure to the elements . Used to “moth ball” the fleet after World War II.
- Elastometric vinyl copolymer coatings developed for swimming pool use in the 1950s
- Can be applied over bare metal pools, or deteriorated plaster, gunite, or fiberglass

Sprayed Liquid Vinyl

- Application process:
 - Pool shell is sandblasted to remove old coatings, and cleaned
 - The surface must be thoroughly dry before beginning the application process
 - A non-porous, bonding glue, primer coat is sprayed, brushed or rolled over the pool shell, then allowed to dry for 15 - 45 minutes between each of 2 coats
 - An elastic vinyl, pigmented (white), middlecoat membrane is applied (5 - 7 layers) with a pressurized spray gun, then allowed to dry for 15 - 60 minutes

Sprayed Liquid Vinyl

- The PVC finish coat is rolled on, then allowed to dry for 15 - 60 minutes
- Fill the pool within 24 - 48 hours of application
- The coating (14 - 20 mil total thickness) will cure underwater in 48 - 72 hours

Sprayed Liquid Vinyl Advantages

- Does not crack, leak or discolor
- Completely seals small cracks in the pool shell
- Elastic -- will stretch to accommodate shell movement, expansion and contraction
- 10 year warranty typical
- Resistant to pool chemicals, oils, solvents, acids and salt water
- Good waterproofing capabilities
- Smooth, non-porous finish
- Algae resistant

Sprayed Liquid Vinyl Disadvantages

- Experience has shown unsuitability for commercial pool applications. Not recommended.
- Glossy surfaces do not meet minimum friction coefficients.
- Trained specialist must apply the coating.
- More expensive than painting, plastering or fibreglassing the pool.

Exposed Aggregates

Exposed Aggregates

- Pebble surfaced pools
- Quartz aggregate with additives

Pebble Surfaced Pools

- The exposed aggregate consists of worn, rounded, washed river stones
- Stones are mixed with white cement and shot onto the pool wall in a manner similar to plaster, then troweled to a smooth finish
- While troweling, the cream coat is washed with a high pressure hose to expose the aggregate (stones)
- Troweling and washing process is repeated several times
- Eventually the stones move closer together until you can only see stones and no plaster
- 24 hours later, the pool is acid washed with a dilute solution of muriatic acid and water
- The acid washing removes any remaining plaster, and shines the stones

Quartz Aggregate

- Crystalline quartz (inorganic crushed granules) with a permanent colored ceramic glaze
- Quartz granules are translucent
- Manufactured and blended by 3M as “Colorquartz Aggregate™”
- Sold under brand names such as: Diamondbrite, Gemite, Krystal Krete
- Quartz is embedded in polymer enriched white Portland cement
- Dyes can also be added to the plaster to achieve a more uniform pool shell color

Quartz Aggregate

- Traditional plaster application techniques can be used
- Prepare the old pool surface by sand blasting or acid etching, patching, cleaning with TSP to remove dirt, oil, grease, and loose materials
- Wet the surface of the pool
- Apply a prime coat
- Mix resin, potable water and aggregate together until free of lumps, in a 1:4 or 1:5 ratio by volume
- Dump the mixture into the pool in rows, and trowel immediately
- Apply to the walls first, then to the pool floor

Quartz Aggregate

- Trowel to a uniform thickness. A 1/8, 3/8 or 1/2 inch thickness is recommended, by different distributors. Use plastic coated trowels.
- When the cream coat is still pliable, but hard enough to hold the aggregate in place, begin exposing the aggregate
- Control the amount of aggregate exposure by washing the finish cream coat lightly with water and a cleaning solution
- Allow the surface to cure over night

Quartz Aggregate

- After being allowed to set up (harden until no longer tacky), sand or grind the surface to remove sharp edges of aggregate exposed above the plaster
- Wash with a 25% muriatic acid and water solution to brighten the exposed aggregate
- Rinse with water, then fill the pool

Exposed Aggregate Advantages

- More natural looking than plaster or fiberglass finished pools
- Pebble and exposed aggregate surfaces are variegated in color and hide dissolved mineral stains and other cosmetic blemishes
- Less prone to etching than plaster finishes
- Large number of color choices
- Quartz aggregate finished pools sparkle or twinkle when lit
- Long life expectancy when compared to traditional plaster pools -- longer time between recoating

Exposed Aggregate Advantages

- Quartz aggregate pigments resist fading from chemical or UV exposure -- colors won't wear off
- Seamless finish (Note: Do not apply over expansion joints)
- Slip resistant
- Comfortable on bare feet
- Absorbs solar heat
- Limited warranty (5 years typical)

Exposed Aggregate Disadvantages

Potential problems with pebble surfaced pools:

- The application process is expensive because one company controls the availability of the stones, and training of employees in the application process, and a royalty must be paid to the company by the applicator for each job completed
- The quality and level of the surface depends on well trained applicators, and good weather conditions during the application process
- Surface may be uncomfortable on bare feet
- Friction coefficient may be too low and surfaces slippery
- Overexposed stones may keep falling out of the walls

Exposed Aggregate Disadvantages

Potential problems with quartz aggregate pools:

- The timing and length of cream coat removal to achieve the desired aggregate exposure requires training and skill on the part of the applicator
- More expensive than paint or plaster, but less expensive than other alternatives

Ceramic Tile

Tile

- Follow current Tile Council of America (TCA) specifications for swimming pools P601-95
- Tile size should not exceed 2 inches by 2 inches square
- Tile should have eased edges and an unglazed surface finish
- Coefficient of dynamic friction must exceed 0.6 - 0.7
- Should have a moisture absorption rating of 0 - 0.5 %
- Mix setting mortar (the scratch bed) in proportion of one part Portland cement and four parts damp sand by volume
- Spread the setting mortar until the surface of the bed is true and even
- Soak the setting bed with water

Tile

- Using a rod, float the setting bed until uniform and level
- Dust Portland cement uniformly over the surface of the setting bed immediately preceding the setting of the tile
- Coat the back of the tile with grout
- Wet and remove the paper backing from the tile sheets. Use a liquid detergent in water to help remove the paper if necessary.
- Set the sheet mounted tiles into place
- Computer generated murals, logos or graphics can also be installed at this time
- The dri-set or thinset method (using latex) may be used, per ANSI A108.5 and A118.1

Tile

- Some manufacturers recommend a conventional mortar method over the thinset method to assure a successful bond
- Apply with a small notch trowel to prevent the thinset from coming through grout joints
- Tamp the tile firmly into place in the setting bed
- Tile sheets will need to be broken down into single rows or individual tile pieces to apply tile in coves, corners, transitions between pool walls and floors, or other small spaces
- As soon as the mortar setting bed has set sufficiently, wash the tiles with water and grout the joints with non-staining white Portland cement grout. Force grout into the joints.

Tile

- Grout all joints and voids
- Grout should be the same color as the tile
- Grout must conform to ANSI A118.6 and be a cementitious type resistant to shrinking and fading
- The grout must be acid resistant
- Finish flush by parging, removing surplus grout, and wiping the face of the tiles clean
- Make sure there aren't any pinholes in the grout
- In pools with expansion/contraction problems, or hot water pool and spas, a more flexible silicone rubber caulking is sometimes used instead of grout

Tile

- Fill the pool with water immediately
- Note: If (Venetian, Byzantine or marble) glass mosaics are used instead of ceramic tile, follow Ceramic Tile Institute specifications CTI-U-106, CTI-66-2-9 (R-35), and CTI 82-1-4 (R-85)

Tile Advantages

- Longevity -- tile will last the life of the pool
- Although initial cost of installation is high, the cost over the life of the pool is low
- Durable
- Low maintenance
- Stain resistant
- Smooth feel
- Aesthetic appearance -- elegant
- Thousands of colors and shades to choose from
- Resistance to frost damage and harsh weather
- Does not absorb oils, chemicals or liquids

Tile Disadvantages

- Initial cost of finishing a complete pool in tile has become prohibitive for many aquatic organizations
- Improper water balance may dull the finish
- Dye lots and tile color may vary slightly from shipment to shipment. Don't mix lots from different periods of time. Purchase extra tile from the original lot for future repairs.
- Tiles can chip or crack
- Replacement problems
- Trained, qualified, experienced craftsmen are needed to properly set the tile
- Tile must be perfectly level. Slight variations ($> 1/8$ inch over the length of the pool) are visible.

Coatings (Paint)

Coatings (Paint)

- Pool coatings
 - Acrylic water based
 - Chlorinated rubber or synthetic rubber
 - Vinyl resin
 - Enamel epoxy coatings
 - Solvent based epoxy coatings
- When resurfacing a pool, it's important to use the same type of paint to achieve a good bond between the old and new coat
 - If a different type of paint is used, the old surface must be removed by sand blasting or water blasting
 - Exception: Water based acrylic paints can be applied over previous acrylic paints or rubber based paints

Coatings (Paint)

- In preparation for painting:
 - Drain the pool
 - Inspect the entire surface of the empty vessel
 - Remove all loose material
 - Scrape or sand off any excessive calcium build-up
 - Make sure the pool is dry and you have taken all appropriate safety precautions if working with an electrical sander
 - Sandblasting or water blasting may also be necessary

Coatings (Paint)

- Wash the entire pool with TSP:
 - Use 1 cup of granular TSP (tri sodium phosphate) per 1 gallon of water
 - To remove oils, scum and other organic matter which has built up over time
 - Scrub the pool walls with a stiff bristled brush, then scrub the pool bottom in a similar manner
 - Be careful not to slip
 - Rinse the pool with fresh water from a hose with a high pressure nozzle

Coatings (Paint)

- Acid etch the pool surface to roughen it so the paint will adhere
 - Wear protective clothing that covers all areas of exposed skin
 - Wear a full face shield and respirator with fresh acid cartridges, rubber boots and gloves
 - Make sure that the area is extremely well ventilated, that you are not working alone, and that both you and your partner are knowledgeable in first aid procedures for acid burns, and respiratory emergencies if one of you should be overcome by fumes
 - Mix a diluted solution of 1 part muriatic acid to 4 parts of water in a plastic sprinkling can

Coatings (Paint)

- To avoid excessive fuming, add the acid to the container of water, not water to the acid
- Doing a small area of the pool at a time, pour the acid mixture from the deck down
- Scrub until the surface feels like fine sand paper
- Keep the rinse water on at all times
- Neutralize the acid with soda ash (sodium carbonate) before disposal
- Make sure you have a permit if you're disposing of the solution to a storm sewer
- Keep the sump pump running and reposition the pump frequently so you don't get a pump "footprint" on the pool bottom from the vibration of the pump

Coatings (Paint)

- After completing the acid wash, rinse the pool several times with fresh water
- Re apply the TSP and water solution to the entire pool to remove and neutralize the acid
- Follow the manufacturers instructions when mixing the paint and blending colors
- Do not start if weather conditions are threatening or outside temperatures do not coincide with the manufacturer's specifications for proper conditions for paint application
- Mix enough paint at one time to cover the entire pool

Coatings (Paint)

- Use a sturdy lambskin roller with an extension handle and a 1/2 inch nap for an even coat and uniform color
- Use a small paint brush to paint around the tile lines, trim, steps, in corners or hard to reach areas, and around lights, inlets, drains and other pool fixtures
- Sprinkle silica sand or other commercially available slip resistant materials on the pool steps and other heavily used shallow areas of the pool to increase the friction coefficient
- Try to finish painting in the shallow end of the pool so you don't accidentally paint yourself into a corner and get stuck in the pool

Coatings (Paint)

- A second coat of paint may be necessary
- Water based epoxy paints dry rapidly, but you should wait 72 hours before applying the second coat of paint unless the manufacturer advises otherwise
- Some manufacturers recommend that the pool be filled with water the same days it's been painted while other suggest waiting 3 or 4 days before filling to allow the paint to dry completely

Coatings (Paint) Advantages

- Painting is an inexpensive method of resurfacing and improving the appearance of the pool
- Newer water based epoxy paints:
 - Kinder to the environment
 - Easier to work with and clean up
 - Less costly initially
- Specially designed for pool use
- Can withstand constant submersion and contact with common pool chemicals
- Epoxy paints can be:
 - Applied indoors or outdoors
 - Applied over wood, metal, fiberglass, or concrete
 - Tinted to a desired shade using coloring agents

Coatings (Paint)

Disadvantages

- Chlorinated rubber and solvent based epoxy paints are being phased out
 - Environmental concerns
 - Stronger air quality control standards
- Newer water based epoxy paints have a short life expectancy
- Commercial pools will probably need to be repainted on a yearly basis
- Frequent downtime for maintenance
- High cost over the life of the pool

Reinforced PVC Membrane

Reinforced PVC Membrane

- Surface preparation includes patching depressions and pitted areas, and removing loose materials.
- Before the blankets are installed, the pool surface is rinsed with water using high pressure hoses.
- Algaecides and anti fungal agents are applied to prevent algae and fungal growth below the membrane.
- An adhesive is applied to hold a felt cushioning, slipsheet layer in place, and prevent any shifting under the membrane.
- The felt layer is applied. This layer separates the membrane from the pool shell and smoothes out surface imperfections.

Reinforced PVC Membrane

- A stainless steel band or PVC coated steel termination band is installed around the outer pool perimeter.
- PVC is suspended from and attached to the steel band.
- The 60 mil thick reinforced PVC membrane is rolled in strips into place in the pool, and is trimmed to fit the shape of the pool.
- Gaskets are installed around lights, drains and inlets.
- Membrane strips are heat welded together.
- Lane lines, targets, depth markings, drop-off lines, edge and tier markings, and other color contrasting markings are heat welded on top of the membranes.

Reinforced PVC Membrane

Advantages

- Long life expectancy of approximately 20 - 25 years.
- No need to re paint, plaster, caulk, grout, or sandblast on a regular basis.
- Does not affect water chemistry.
- Less porous than many other pool surface materials. More difficult for algae to adhere.
- Does not impart irritating products to the water.
- Can be patched under water.
- Not affected by temperature changes.
- Warranted by the manufacturer. Ten year warrantee typical.

Reinforced PVC Membrane Advantages

- Creates a shell within the shell. Leaks will be eliminated and structural shell damage will be mitigated.
- Can be installed over damaged or stained surfaces, making the pool look “like new”.
- Tear resistant and durable.
- Impact absorbing.
- Non abrasive.
- Excellent coefficient of dynamic friction.
- Comfortable on bare feet.

Reinforced PVC Membrane Disadvantages

- The membranes can be easily vandalized or cut, so they're not recommended for use in outdoor pools where vandalism is a problem.
- Expensive to install.
- Few product manufacturers in the U.S.
- Wrinkles.
- UV inhibitors, but may discolor above the water line.
- Vinyl liners, although a “distant cousin”, are not approved for use in commercial pools in California. Some county health departments will not approve the use of reinforced PVC liners.

Pool Expansion Joints

- Expansion joints are often repaired when resurfacing pools.
- Before repairing, the joint must be clean and dry.
- Follow manufacturer's application instructions.
- Old materials should be completely removed and the joint burnished with a wire brush.
- The expansion joint should be designed to spread the load around the entire concrete deck or pool shell to eliminate cracking from expansion when:
 - the material heats up
 - moisture content increases

Pool Expansion Joints

- Placement of joints in pool decks should be at 12 - 15 feet O.C. (in both directions).
- Contraction only (saw cut joints) should not be permitted. Only full depth expansion and contraction joints should be allowed.
- A flexible type of closed cell polyethylene foam backing rod should be used to provide support below the sealant. It must fit neatly into the joint without compacting.
- The backing rod should be made of materials that do not absorb water and swell, stain or rot.
- Backing rods provide a stable, continuous surface on which to apply the sealant.

Pool Expansion Joint Repair

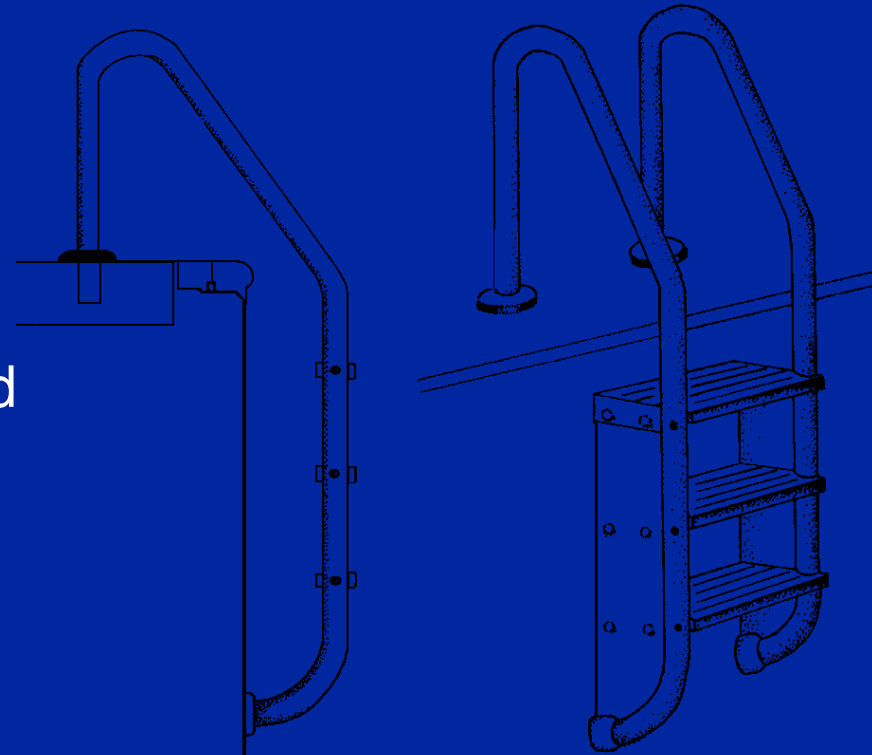
- Sealant must not bond to the back up material.
- Sealant depth should not exceed one half the width of the joint.
- Sealant should be of the polysulfide, 2 component type.
- Polyurethane and silicone sealing compounds should not be permitted.
- The joint sealing material should be highly resilient and have excellent recovery characteristics.
- Sealant should create a uniform, waterproof seal.
- Sealant should not discolor, get brittle or crack due to ultraviolet light exposure, or exposure to pool chemicals.

Pool Expansion Joints

- The tile surrounding the expansion joints in the pool is often replaced with tile which matches the water line tile for aesthetic purposes.
- If planning to sand for cosmetic reasons, do not sand the joint immediately after placing the sealant. Apply sand at least 1.5 hours after the sealant is placed so the sand stays at the top rather than sinking into the sealant and possibly preventing a proper cure.
- Cracking, cohesive or adhesive failures within 1 year of the joint placement, or failure of the sealant to properly cure within 24 hours is considered unacceptable.

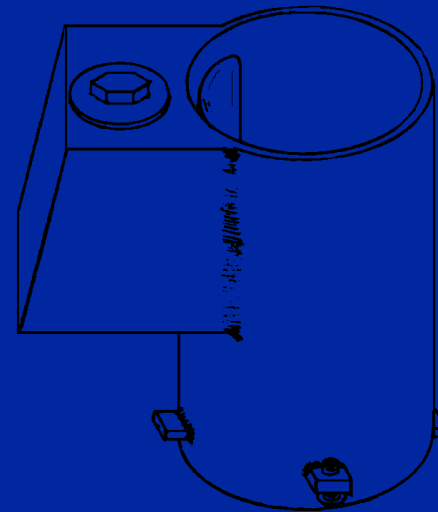
Pool Egress

- Recessed treads
- Steps
- Pool ladders
- Removable stairs & ramps
- Transfer tiers & raised deck edges
- Dry ramps
- Wet ramps
- Zero depth entry
- Lifts



Deck Equipment

- All deck equipment, including ladders, rails, skimmer lids, weirs, grates, stanchions, guard chairs, deck plates, diving boards, and starting blocks... should be inspected daily for wear
- Repair or replace as necessary



Acoustics

- Acoustical treatment must be considered in the design of the natatorium
- Reverberation time and background noise should not:
 - Make it difficult to carry on long distance conversations
 - Hear instructions
 - Listen to information over loud speakers
- Problems: hard surfaces, flat roofs...

Swim Lanes

- Swim lanes should be a minimum of seven, and preferably ten feet wide
- An additional 1.5' - 2' of open water should be installed outside the first and last lanes
- Lane markers should terminate 5' or 6'7" from each end wall

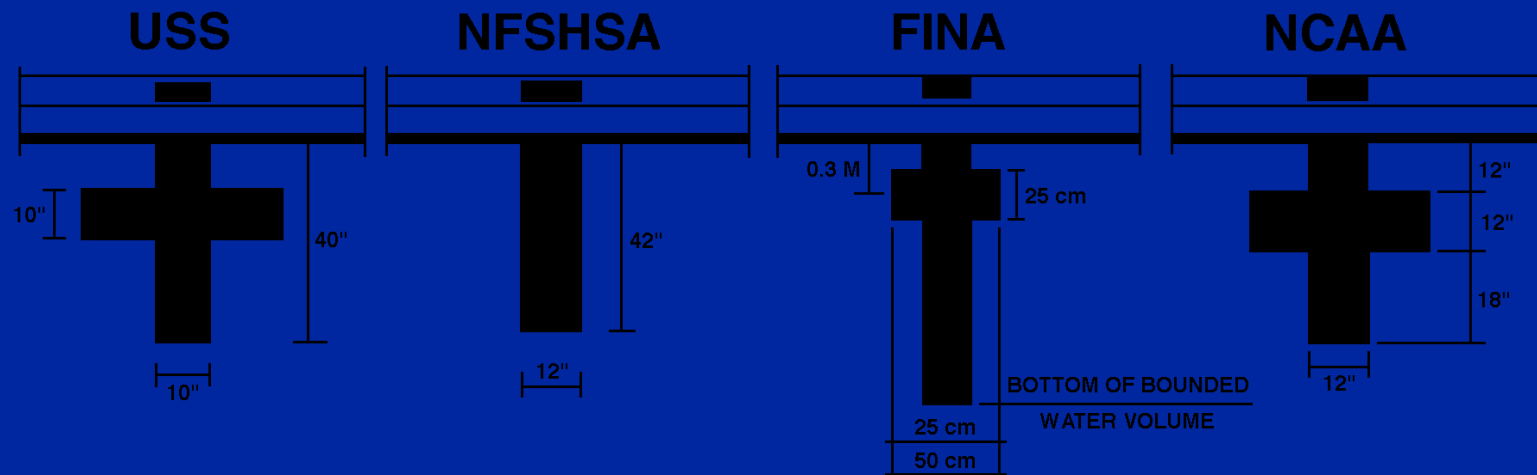


Swim Lanes

- Lane markers should be 10 or 12 inches wide
- Ceramic tile lane markers should have a minimum coefficient of dynamic friction of 0.6
- Lane lines should terminate in a cross line 3' - 3'4" long and either 10 or 12 inches wide
- Allowances in course length should be made for space taken up in a swim lane by the competitive timing system touch pads
- Lanes are numbered from right to left as the swimmer stand facing the course

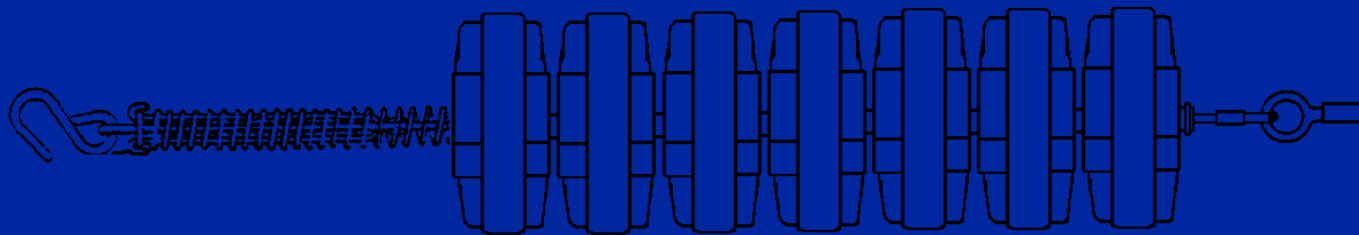
Targets

- Targets should be provided and be in alignment with the swim lanes



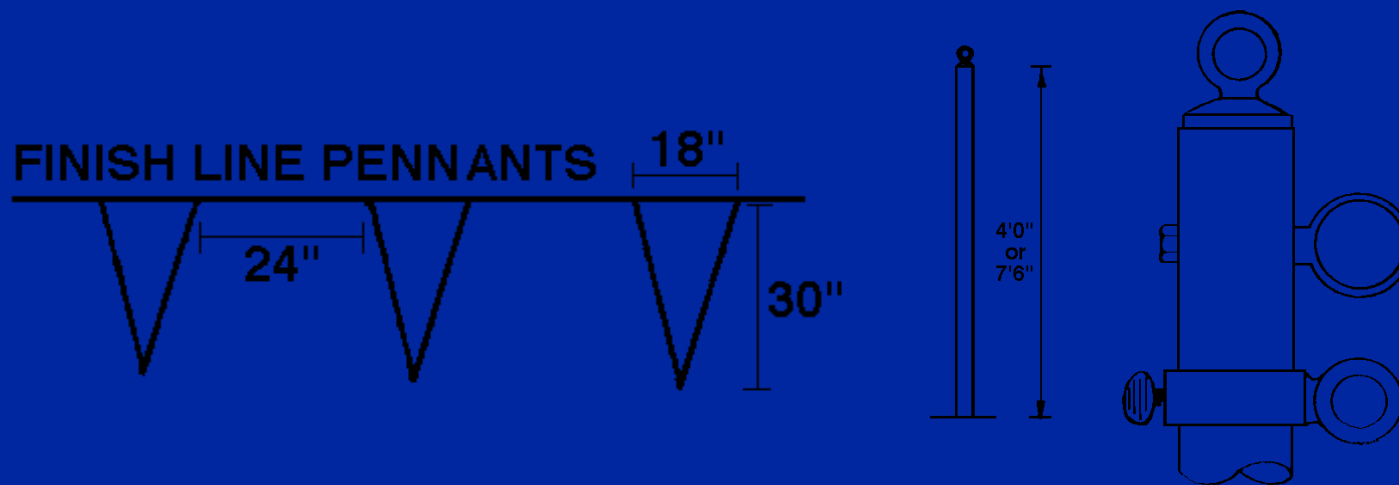
Racing Lines

- Floating lane lines should be secured to the pool with recessed hooks.
- Lines should be stored on a reel when not in use, and the lane line reel covered and stored off deck



Backstroke Flags

- Backstroke flags and support stanchions should be placed a set distance from each pool edge
- 15' (USS Short Course, NCAA and NFSHSA)
- 16' 5" (USS Long Course and FINA)



Underwater Windows

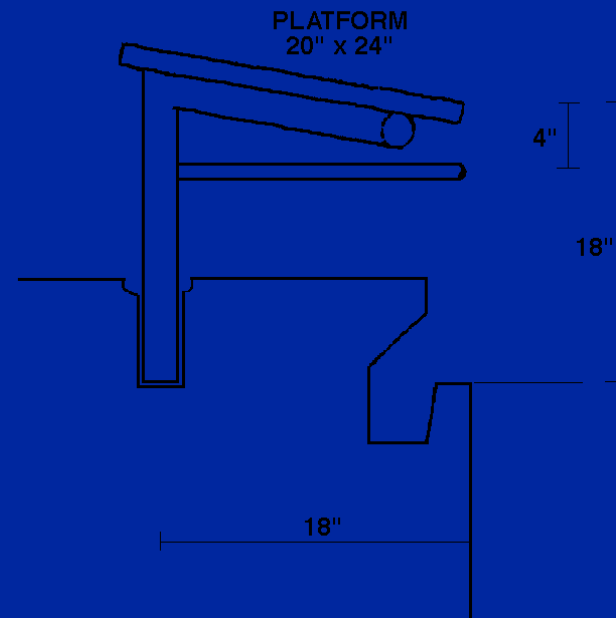
- Underwater observation windows must be mounted flush with the pool wall
- Hardware securing the window frame to the pool wall should not protrude or otherwise pose a hazard to bathers
- Do not install windows in line with swim lanes
- Do not place TV cameras directly against the windows when filming events

Starting Blocks

- Starting blocks should not be installed over shallow water
- Pike-scoop dives should be discouraged since they expose divers to a greater risk of injury
- Warning labels must be affixed to each side of the platform so that the warning can be read from either the deck or the pool
- The use of starting blocks should be prohibited excepts under the direct supervision of an instructor or coach during competition or training for competition
- Starting blocks should be removed or be made physically inaccessible when not in use

Starting Blocks

- Front edge of the starting platforms should be installed less than thirty inches above the surface of the water
- Backstroke starting grips must be located on the platforms between twelve and twenty-four inches above the water surface, and parallel to, and flush with the end wall



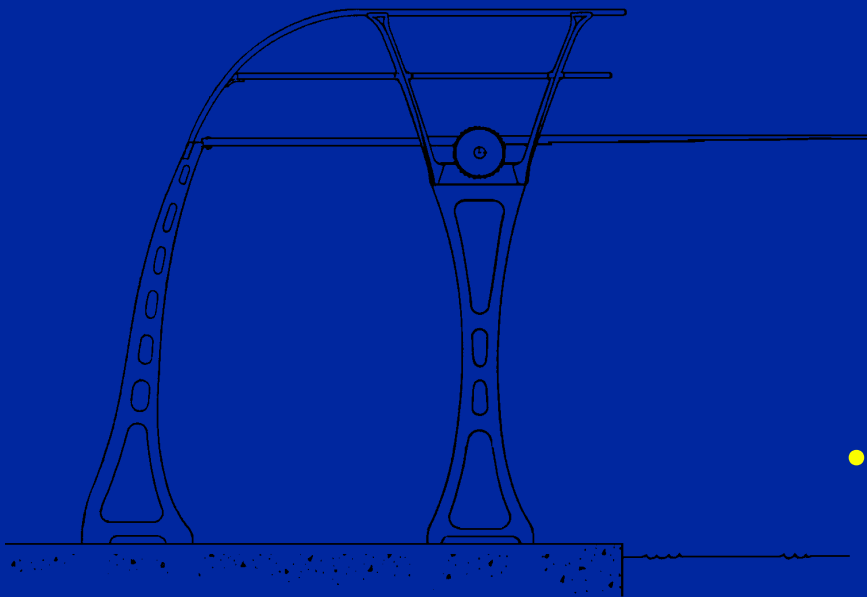
Starting Blocks

- Starting blocks should be installed flush with the face of the end walls
- The top surface of the platforms must be:
 - Non-slip
 - Numbered
 - Not sloped more than ten degrees from horizontal
 - Have a surface area of at least 1'8" by 1'8"
- Sleeves can be installed in the deck to allow blocks to be quickly removed without the use of tools
- When the starting blocks are removed, anchor sockets must be capped

Diving Boards

- One meter diving boards should be installed over water at least 12'6" deep.
- Three meter diving boards should be located above water at least 13'2" deep.
- The depth of water directly below and 18 feet forward of the board should meet or exceeds minimum standards.
- Springboards, jump boards, and diving platforms should be positioned in accordance with state and local codes, recommendations of national certifying agencies (U.S. Diving, FINA...), and common and acceptable standards of the aquatic industry.

Diving Boards



- Bottom, mid and top guard rails should be installed to prevent bathers from falling off 1 and 3 meter boards. The top guard rail should be installed 36 inches above the board.
- The leading edge of the guard rail should extend at least to and preferably 6 inches past the edge of the pool.

Diving Boards

- Ladder treads should be evenly spaced, should be of a slip-resistant design and tilted slightly downward toward the deck for drainage.
- Protective netting should be installed between guard rails.
- Unobstructed overhead clearance of at least 16 feet is needed.
- A sparge system should be installed in the in diving well.
- Diving boards should extend a minimum of 60 inches over the surface of the water.
- Some facilities enforce age or height restrictions for use of the boards.

Diving Boards

- Shock absorbing surface materials should be installed below diving stands.
- Adjustable fulcrum assemblies and footwheels should be properly maintained according to the manufacturer's directions, and adjusted to accommodate specific diving boards.
- Boards should be installed at least 5 feet off center from main drains.
- Distance between boards and the distance between a board and side wall of the pool should be a minimum of 10 to 15 feet, depending on code and the height of the board.

Diving Boards

- Duraflex and Maxi-Flex and Maxi-Flex model B, extruded aluminum alloy diving boards are the most common springboards installed in commercial pools today for competitive and instructional diving.
- The competition springboards were designed by Ray Rude, based on his original 1940's board adapted from a Lockheed aircraft wing panel.



DURAFLEX



MAXIFLEX

Diving Boards

- The Duraflex board was first used by competitive divers in the 1950's.
- The Duraflex board is tapered 7/8 or 0.875 inches at the tip to 1.875 inches at the end.
- The Maxi-Flex B "Swiss cheese" board was first manufactured in 1980.
- The lightweight tapered Maxi-Flex B boards incorporate approximately 200, 1.5 inch by 0.25 inch perforations, extending from the tip of the board and down the length of the board for 26 - 28 inches.
- The boards are manufactured by Duraflex International Corporation (formerly Arcadia Air Products), Tracy Clark Station, Sparks, NV 89431.

Diving Boards

- The boards are 16 feet long and 19.5 inches wide.
- Anchor and tip end caps are riveted to the board.
- The springboards are coated in a aqua colored epoxy resin.
- Sand and white aluminum oxide are applied after acid etching to the top surface of the board to provide a non-slip surface.
- The board can be bolted and fixed to the stand, or bolted to the stand with a hinge assembly, so that the board can be lifted away from the pool for competitive swimming activities.

Decks

- Decks should be cleaned and disinfected at least twice weekly -- daily in heavily used commercial facilities
- Decks should be algae free.
- Deck mats, raised grid interlocking tiles, or anti-bactericide runners, if used, must be removed daily for cleaning and disinfection.
- Decks on all four sides of the pool should be a minimum of 8 feet wide.
- Provide a minimum of 12 feet of unobstructed deck space behind diving boards or starting blocks.

Decks

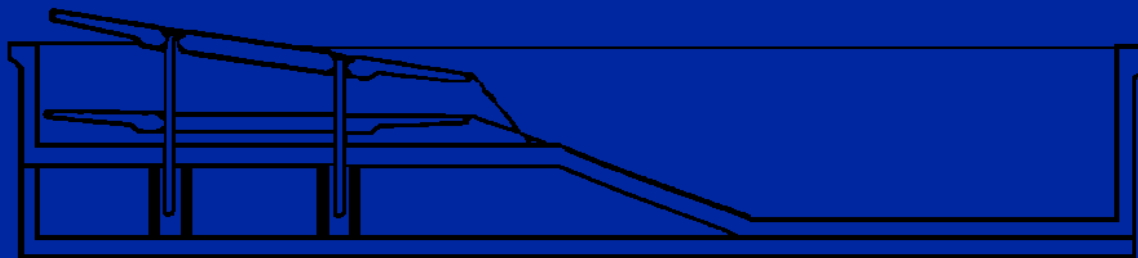
- The swimming pool should be separated from the wading pool, spa, or other pool in the same natatorium by at least 10 feet of deck space.
- Decks should be kept uncluttered. They should not be used for storage of teaching or maintenance equipment.
- Deck and all floors leading to the pool must be slip resistant and meet minimum friction coefficients (0.6 - 0.7).
- Spectator seating areas should be physically separated from the pool deck.
- Towel and equipment hooks should be installed in a way that does not present a hazard to bathers.

Movable Pool Floors

- Movable floors should be adjustable from a control panel to any desired depth -- from zero depth to maximum depth of the pool
- A movable floor can be installed over the entire pool, or just a portion of the pool, and used in conjunction with a: trailing ramp, rolling bulkheads, vertical wall which can be raised and lowered, or stainless steel removable fence

Movable Pool Floors

- Types
 - Reinforced concrete floor (AFW)
 - Stainless steel scissor jack floor with PVC planking (AFW - KBE Kaiser)
 - Glass fiber reinforced polyester floor operated by a cable system and hydraulic mechanism (Recreonics)
 - Treadmill (Hydro Worx)



Movable Pool Floors

- The floor should travel at speeds not exceeding 1 foot per minute.
- The slotted PVC edge strip should be securely fastened to the concrete floor with stainless steel sheet metal screws that can withstand the forces created when the floor is moved up and down through the water column.
- Slots should be 1/8 inch or less in width.
- It should be possible to raise the floor flush with the pool deck so that it is handicapped accessible.
- It should be possible to raise the floor above deck level for vacuuming or access below.

Movable Pool Floors

- Manholes should be built into floor for inspection below
- The water soluble lubricant or hydraulic fluid level should be checked weekly
- Sacrificial anodes should be installed to protect the stainless steel hydraulic cylinders from corrosion and should be inspected and replaced yearly
- If multiple hydraulic cylinders are installed, the cylinders should operate in unison.
- Floor should be perfectly level when in a raised position.
- The variable depth gauge should reflect true depth
- Permanent depth markings installed on the pool deck and vertical pool wall should indicate that depth varies

Movable Bulkheads

- Movable rolling bulkheads, rollers, and grating should be in good repair
- Bulkhead chambers can be inflated with compressed air to achieve buoyancy and should be moved properly to prevent staff back injuries, wear on rollers, and scratching of gutters
- If starting blocks are installed on the bulkheads, the bulkheads should be capable of supporting the anticipated maximum weight of swimmers, officials, starting blocks and timing equipment during a competitive event

Good Poolside Plants

- Trees, shrubs, perennials and vines which:
 - Act as windbreaks
 - Are adaptable to containers
 - Have large oval or broad rounded leaves
 - Can withstand splashing
- Most evergreen vines
- Trees such as palms, ficus, and tree ferns
- Korean grass and other zoysia's
- Shrubs like camellias, junipers and succulent jade plants

Good Poolside Plants

- Perennials including aloe and agave succulents
- Lilies--especially agapanthus (Lily-of-the-Nile), torch lilies, ginger lilies, and daylilies
- Ornamental vegetables like artichokes
- Evergreen perennials like African iris and yuccas
- Tuberous rootstocks like canna, taro, elephant ears, and amaryllis
- Bird of paradise
- Philodendrons
- Bog plants like papyrus

Plants

- Keep plants away from edges of the pool or from areas where they might obstruct the vision or rescue efforts of lifeguards
- Plants which shed or create litter, fruit or fronds should be avoided:
 - Small debris constantly falling into the pool will clog the recirculation system
 - Heavy debris may fall on and injure patrons
- Plants that attract insects, particularly bees, should not be planted at poolside
- Plants which are prickly or have sharp thorns which might injure patrons should not be used