NATATORIUMS

1. General

1.1 Installation Requirements
At least one indoor pool on each Army installation must have an area with a minimum depth of 11'-6" and be provided with at least one – 1 m board to accommodate training requirements.

1.2 Not used.

1.3 Functions within the Natatorium
A natatorium contains the following functions. The net areas for these functions are shown in *1.3-1 Table: Functional Areas.*

- Indoor Pool
- Associated deck around the pool
- Seating area, which may include bleachers if desired and programmed by the installation.
- Pool Office
- Staff Room/First Aid Station
- Storage
- Mechanical Room
- Chemical Storage
- Pool Equipment
- Showers/lockers/toilets, which should be combined with the similar area for the Physical Fitness Facility. Ensure this area is designed to accommodate wet bathers in the wet areas only, and ensure showers are provided for entry into pool area. If separate showers/locker/toilet areas are provided for the natatorium, they must comply with the requirements for the same spaces in the Physical Fitness Facility Standards (such as individual shower stalls with dressing booths, etc.)
- Family Changing Rooms. These must be provided for natatoriums, and are not typically provided in a Physical Fitness Facility
- Miscellaneous area (circulation, building structure, etc.)

1.3-1 Table: Functional Areas

Function/Space	**Net Area 25 yd x 6 lane pool**	**Net Area 25 m x 25 yd pool**	**Net Area 50 m x 25 yd pool**
Pool Surface Area	3964	6229	12,420
Deck Area	3827	4758	6234
Seating Area	199	312	621
Pool Office	100	120	144
Staff Room/First Aid	200	240	288
Training/Classroom	300	400	600

Storage	199	312	621
Structured Activity Space	1986	2207	2853
Showers/Lockers/Toilets to include Family Changing Rm	1715	2065	2800
Pool Equipment	300	350	500
Chemical Storage	40	40	60
Mechanical Room	868	1187	1944
Miscellaneous (circulation, structure, etc.)	1302	1780	2915
TOTAL:	**15,000 SF**	**20,000 SF**	**32,000 SF**

1.4 References

a. ASME/ANSI A112.19.9
b. ASME/ANSI A112.19.17
c. ASTM F2387
d. Consumer Product Safety Act
e. FINA
f. USA Swimming

1.5 Conflicts in Criteria

Where industry standards, to include the American College of Sports Medicine (ACSM) Health/Fitness Facility Standards and Guidelines, provide guidance which conflicts with the information provided below, the designer shall comply with the more stringent requirements.

2. Facility Requirements

Structures and finishes must be capable of resisting corrosion from moisture and chemical vapor, but many structural systems will fulfill this requirement. Natatorium structures pose opportunities for interesting geometry, lighting, and material use. Both interior and exterior walls should be masonry construction with brick, composite material siding, metal panels, stucco, or similar materials that are architecturally compatible with the installation specific guidelines. All surfaces shall be moisture and mildew resistant and easily cleanable. Dressing rooms, shower rooms, drying areas, and toilets shall be considered wet areas. All walls and floors in wet areas shall be impervious to water and able to be hosed down for cleaning. Wet area floors shall be non-slip, pitched to floor drains, and shall have coved bases at walls and equipment bases. Consider the need to provide elevated concrete pads for lockers and other equipment to facilitate cleaning and help eliminate the corrosive effects of frequent expose to water.

2.1 Natatorium Design

The basic challenge for enclosing pool areas is to economically span the required height and distance for pool and deck width with moisture resistant materials, such as concrete, galvanized steel, laminated wood, glass, and aluminum. Special care should be taken when enclosing existing outdoor pools because the existing slope of the deck

away from the pool may cause problems with corrosion or standing water if adequate drainage and dehumidification is not provided.

The minimum pool ceiling height above the water surface for natatoriums is 19 feet, 9 inches for facilities with 1-meter diving boards. A minimum ceiling height of 26 feet, 4 inches is required for facilities with 3-meter diving boards. Natatoriums should not have deck-level windows in walls facing pool ends to prevent glare. Deck level windows at the side should be tinted.

The pool office and/or staff room must have direct visual access of the pool for control and for better communication during an emergency or other incident.

2.2 Provisions for people with disabilities

All aquatic facility functional areas shall be barrier-free and accessible to people with disabilities as required by law. Site, building, and pool designs should enable people with disabilities to act independently and enjoy the full range of programs provided. Level changes may be included, but must be accommodated by ramps suitable for wheelchair access, both indoors and outdoors. Accessible entry to pools may be accomplished by utilizing zero entry depth ramps with ADA-ABD compliant handrails or by lift and assistance equipment designed specifically for people with disabilities. The need for special equipment, such as transfer benches, crane lifts, or ramps into the pool shall be considered during the design process. Consider the need for specialized therapeutic training to support medical facilities or other installation-specific programs.

2.3 Interior Design

Interior surfaces, details, finishes, fixtures, and fittings should be carefully selected for resistance to wear, impact, and vandalism. Because of the high humidity associated with pools and showers, all materials selected shall be resistant to water and mildew. Utilize professional interior designers with experience in aquatic facility design. Interior design selections shall be based on consideration of anticipated use, maintenance characteristics, life cycle cost, fire protection, and other safety requirements.

2.4 Interior Signage

Interior signage is important to support the functionality of the facility and for wayfinding. Use signs with words and graphic symbols, where appropriate. Interior signage shall comply with accessibility requirements for the visually impaired. Interior signage should be horizontal only and in upper and lower case text, except where specifically required to be in all capital letters according to ADA requirements.

2.5 Interior Finishes

The safety and hygiene of customers shall be considered in every aspect of the design development. Floor and deck surfaces in wet areas must be slip resistant. Wall surfaces should be selected to minimize abrasions in case of accidents or stumbles by customers and staff. Coordinate material, finish, color, texture, and furniture selections to compliment the overall building design and image. Use colors, textures, and finish materials on the walls and floors to help define circulation patterns. Select surface materials and furnishings to express a warm, intimate, and relaxed atmosphere. Use

local materials to the greatest extent practicable to reinforce the user's sense of place or region.

2.6 Flooring

Utilize non-skid ceramic tile, concrete, or other skid resistant material for bathhouse or natatorium floors and in other administration areas. All floors shall have adequate slope and drains to prevent standing water.

2.7 Interior Walls

Walls should be constructed with nonabrasive materials, like smooth block or brick. Walls may be painted CMU block, painted masonry, moisture resistant gypsum board, Portland cement plaster, or high strength gypsum plaster. Ceramic tile may be installed either full height or as a wainscot.

2.8 Ceilings

Ceilings should utilize acoustic, moisture-resistant materials, like sealed wood, moisture resistant gypsum board, plaster, galvanized metal, or other factory finishes impervious to water and mildew.

2.9 Acoustics

Acoustics must be considered in the design to minimize reverberation. Use of ceiling and/or wall mounted panels should be considered as long as the panels are appropriate for the humid environment, and will not require constant maintenance.

In accordance with the American College of Sports Medicine's "Health/Fitness Facility Standards and Guidelines, 2nd Edition", an indoor pool should have a STC rating of 45 to 55 and a measured reverberation time of 0.8 to 1.4 s. The recommended maximum background Noise Criterion (NC) level for an indoor pool is 35-40.

2.10 Furniture, Fixtures, and Equipment

Choose interior furniture, fixtures, and equipment (FF&E) that is durable, comfortable, and attractive. Consider modular or systems furniture components that match for the office, staff break area, and training room. Check-in and concession counter fronts are high maintenance and require highly durable materials because of the wear and tear. Consider metal, solid surface composite materials, or stone for the front counter panels and counter tops. Provide corrosion resistant and graffiti resistant furniture and materials in dressing rooms.

2.11 Ladders and Grab Rails

Steps and ladders shall be recessed or set into the pool wall. No ledges or projections are permitted under the water surface. Recessed ladders shall be provided in other areas. Grab rails and recessed steps are recommended over projecting ladders. Maximum spacing between grab rails shall be approximately 60 feet. Locate grab rails and recessed steps at both ends of the long walls near the corners for 25-meter pools. Intermediate grab rails shall be provided on 50-meter or uniquely shaped pools. Locate a ladder with grab rails no more than 16 feet, 5 inches from a diving board or water slide to get users out of the water quickly. This enables users to essentially head right back toward the edge of the pool directly, so the next diver or slider can proceed safely.

Position ladders so that swimmers don't have to cross the landing areas of diving boards and water slides if at all possible. This allows lifeguards to keep their focus at all times on the area around the board or slide by eliminating the need to track an exiting swimmer that has to leave the immediate area of the board or slide, which makes supervising the next diver or slider problematic.

2.12 Depth Markings

Provide pool depth markings every 10 feet or less. Depth markers are required at each 2 feet increment (or less) of water depth, at maximum and minimum depths, at transitions between deep and shallow water, and at diving areas. Shallow pool areas 5 feet or less shall be labeled “NO DIVING.” Depth markers shall be located on the pool deck beside the pool edge and on the vertical side of the pool wall or gutter system above the water line so they are visible from inside the pool. The figures shall be at least 4 inches high, in a color that contrasts with the background. Mark a black or dark blue line at least 4 inches wide on a sloping pool bottom wherever the depth reaches 5 feet.

2.13 Competitive Swimming

The type of competitive swimming events to be hosted at an aquatic facility has a major impact on the planning of the facilities to be provided. Facility requirements and rules may vary depending upon the different institutions that may be desired to sanction competitive events. For example, lane bottom and target wall marking requirements are different for many of the major governing institutions that sanction major events. Consider the impact of specific institutional and host nation requirements if competitive swimming will be a part of the program requirements. Major swimming institutional organizations include:

- **AAU** – Amateur Athletic Union
- **FINA** – Federation Internationale de National
- **NCAA** – National Collegiate Athletic Association
- **NFSH** – National Federation of State High School Associations
- **USS** – USA Swimming

2.14 Lane and Area Dividers

Lane and area dividers consist of a set of continuous floats strung on a cable or cord. They are attached at hoops anchored in the pool walls.

2.15 Racing Lanes and Target Markings

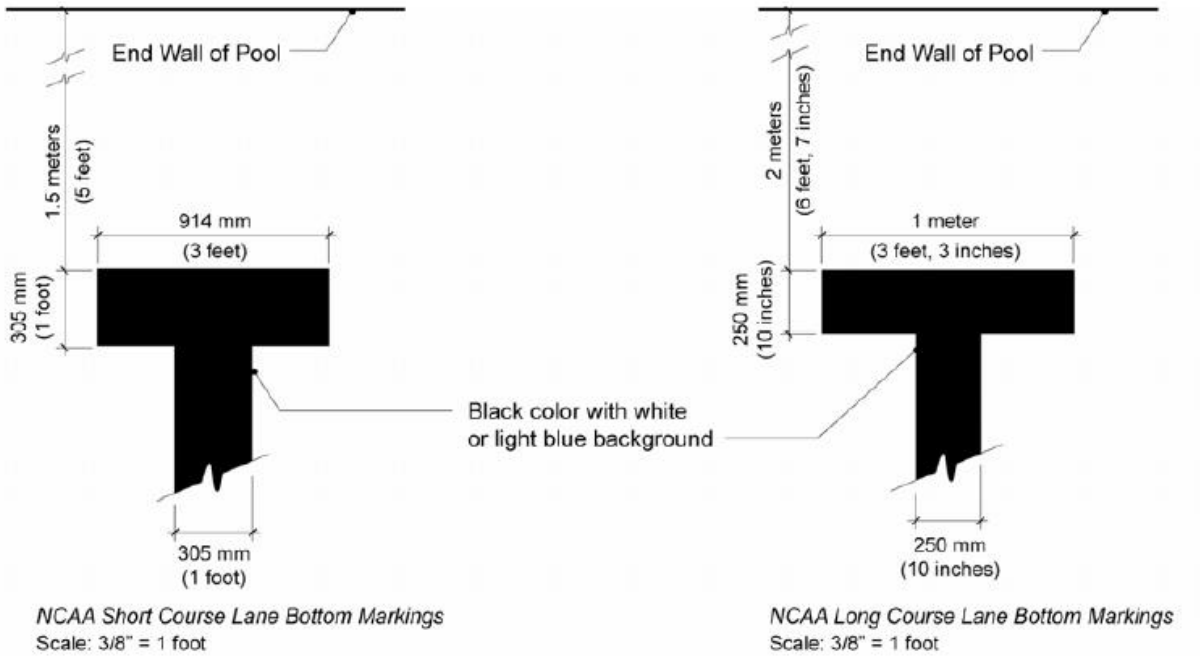
Provide racing lane and target markings according to the appropriate governing entity that may be involved in competitive events (NCAA, FINA, etc.). Consider the need for a recall line (for backstroke events) suspended above the racing course at least 4 feet above the water surface. For a 25-meter course, it shall be located 40 feet from the starting end. For a 50-meter course, it shall be located 50 feet from the starting end. Consider the need for finish contact pads. If utilized, contact pads shall be a minimum

of 6 feet, 6 inches wide by 2 feet in depth. They shall be installed in a fixed position in the center of the lane and flush with the water level.

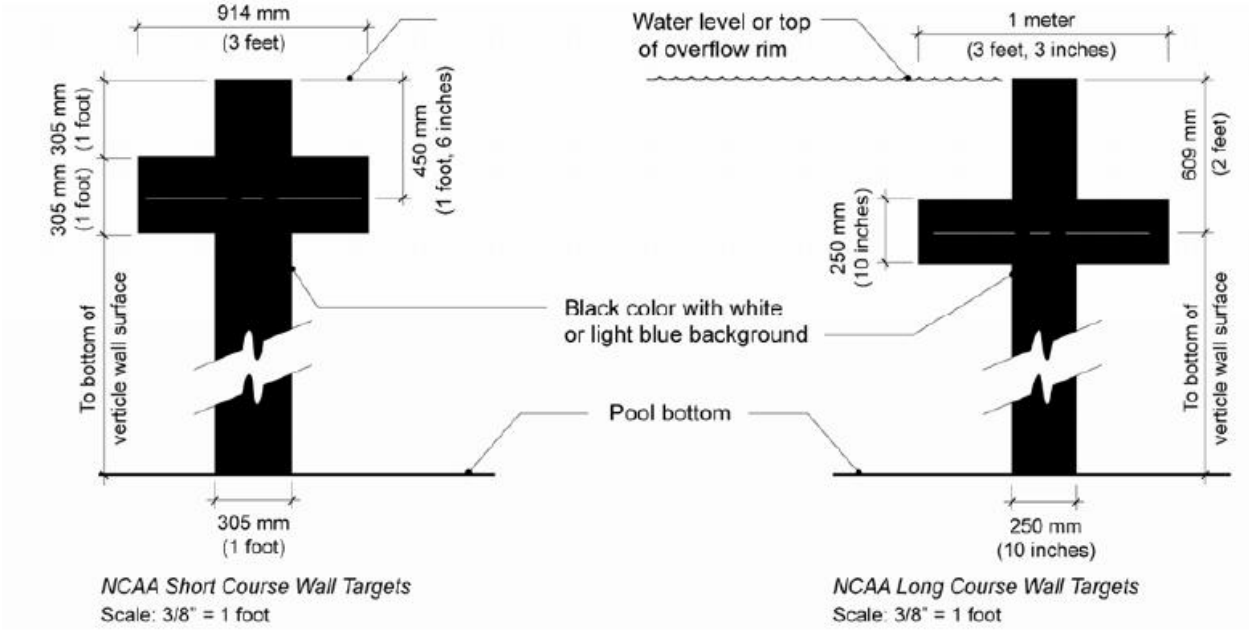
2.16 Starting Platforms

When competitive swimming is a program requirement, starting platforms shall be supplied for each course lane in the pool area. Starting platforms shall be 2 feet, 6 inches above the water level. The front edge shall be flush with the vertical end wall of the course. Platform widths shall be a minimum of 20 inches. Platforms shall be sloped at not more than 10 degrees and shall be covered with a non-skid finish. Number starting platforms beginning with lane one to swimmer's right as they face the course. Provide anchors embedded into the pool deck, as appropriate for the starting platforms to be utilized.

2.15-1 Figure: Racing Lane Bottom Markings



2.15-2 Figure: Racing Lane Wall Targets



2.17 Diving and Deep Water Areas

These areas are used for competitive diving, recreational diving, scuba training, survival training, and other activities requiring deep water. Diving and deep water areas may be accommodated in three possible ways:

- The preferred method is to locate diving areas adjacent to the deep end of a general use pool as demonstrated in the typical “L” shaped configuration.

- Incorporate the diving area into the deep end of a general use pool.

- Provide a separate pool exclusively for diving or deep water training and programs.

2.18 Diving Boards and Stands

Provide springboards, as desired, that are manufactured from aluminum, fiberglass, or wood coated with a non-skid surface. For springboards of 3 meters (10 feet) or more, an open-grating type of construction is required to permit divers to view the water below. Springboard dimensions are 16 feet long and 1 foot, 8 inches wide. The installation should be level. The number of springboards depends on the size of the diving area to be included. Springboard anchors should be embedded in the pool deck or other surface of sufficient mass. The fulcrum should be adjustable through a range of 2 feet forward from a point 5 feet, 6 inches from the rear anchor of the board. The fulcrum mechanism should be covered to prevent injury to fingers or toes. Diving boards over 2 feet in height must have 3 feet high handrails extending to the water’s edge. Provide a water surface agitator to increase diver visibility utilizing water jets from the overflow system or air bubble inlets in the pool bottom. Pool Depths for diving boards must meet FINA Standards as follow: For 1 meter boards, at least 11’-6” water depth. For 3 meter boards or platforms, at least 13’ water depth.

2.19 Heating, Ventilation, and Air Conditioning (HVAC)

Mechanical systems for natatoriums must be capable of maintaining an indoor air temperature 83°-89°F (3° higher than water temperature), water temperature of 80°-86°F (Lap swimmer/Swim Teams like it 80°-82°F; Instruction, Recreation, Water Exercise ask for 82°-86°F), relative humidity of 50-60%, and ventilation of at least 4 complete air changes per hour during high occupancy. Pool water temperature shall be monitored and be provided as an input to the HVAC Control System in order to maintain the indoor air temperature 3° higher than the water temperature. Deterioration of materials from condensation should be anticipated and minimized with proper mechanical design and wall transmission values. Air velocity in the immediate pool area should be minimal.

2.20 Plumbing

Water for showers shall be heated to at least 90°F. Provide automatic mixing valves on showers where hot water is over 105°F. Shut off valves shall be provided at all plumbing fixtures. Floor drains shall be provided in all dressing rooms, shower rooms, toilet areas, and janitor’s closets. Provide domestic hot and cold water, sanitary and storm drainage, plus propane or natural gas systems (if required). Provide metering that provides a pulse input into the Utility Monitoring and Control System for gas service, if utilized. Hot and cold water shall be supplied to all restrooms, sinks, and janitor’s closets. Hot water temperature shall not exceed 105°F at the outlet. Provide hose bibs to enable hose access to the entire pool deck. Provide a water meter that

provides a pulse input into the Utility Monitoring and Control System to monitor water usage.

2.21 Electrical

Electrical power, lighting and telecommunications shall be provided to the facility in accordance with APPLICABLE CRITERIA in accordance with GENERAL TECHNICAL REQUIREMENTS, in accordance with all IEEE Standards (including Recommended Practice) where the scope is applicable to this design effort, in accordance with all UL Standards where the UL scope is applicable to this design effort and where itemized, in the combined interdisciplinary areas cited and where itemized herein. Provide electric service and distribution equipment, wiring receptacles and grounding, interior and exterior lighting and control, emergency lighting, telephone, communication systems, fire alarm, other health and safety alarms, and intrusion systems in accordance with NFPA 70, National Electrical Code; IEEE/ANSI C2, National Electrical Safety Code; and the latest Installation design requirements. Perform a short circuit study as an integral part of selecting and sizing electrical distribution components (all equipment shall be fully rated; that is, do not use series-combination rated equipment). Perform a coordination study to ensure that protective device settings are appropriate for the expected range of conditions (depending on the design and construction schedule, it is acceptable to design adequate protective devices with adjustable features, followed by a coordination study required during construction to specify the correct settings.) Circuit breakers, disconnect switches, and other devices that meet the OSHA definition of energy-isolating device must be lockable. Do not exceed 5 percent combined voltage drop on feeders and branch circuits if the transformer providing service is located within the facility. If the transformer is located exterior to the facility, limit the combined voltage drop for service conductors, feeders, and branch circuits to 5 percent. Individual voltage drop on branch circuits should not exceed 3 percent. Branch circuits supplying sensitive circuits should be limited to 1 percent voltage drop. Service grounding system and all wiring methods must meet the current NFPA 70 requirements. All electrical equipment must be Underwriters Laboratories (UL) listed or published proof of safety and performance from an approved independent testing laboratory shall be provided. All service equipment must be Underwriters Laboratories (UL) listed as service equipment. Alternately, published proof from an approved independent testing laboratory may be provided. Provide electrical metering of the natatorium and provide monitoring of the electrical meter by Utility Monitoring and Control System.

Provide interior power per the general electrical requirements unless revised by the requirements of this RFP. When facility electrical design includes a 480/277V power distribution system, mechanical systems and lighting systems shall generally be fed from the available 480/277V power distribution system. All electrical outlets shall feature ground-fault circuit-interrupter protection for personnel.

Provide a sufficient number of floor and wall electrical outlets to accommodate current needs and potential future growth.

Provide an electric wall clock visible from the pool deck area. General convenience receptacles and special power outlets shall be specification grade.

2.22 Fire Protection and Life Safety

All new and refurbished buildings shall have automatic fire detection and fire suppression systems, which shall be monitored to send signals to the installation fire station, central control, or monitoring facilities. All materials and equipment shall be UL listed. Equipment selections should not be considered in isolation, but shall be reviewed in unison with the overall fire strategy for each building and installation.

2.23 Communications and Data

Two-way communication stations shall be provided at the check-in area and the office. At least one telephone and data outlet with high-speed Internet connections shall be provided in the check-in and office area.

2.24 Public Address System

A centrally controlled public address and two-way communication system is required for all pool facilities. Incorporate a public address (PA) capability with the phone system to allow paging from all staff phones, where possible. Provide a PA system at the control desk if it cannot be incorporated in the phone system. At least one public address speaker shall be provided in each dressing room, office, check-in, public toilet, and lobby. One indoor speaker shall be provided for every 800 sq. feet of net floor area.

2.25 Closed Circuit TV

A closed circuit TV system is required to address safety concerns, to monitor authorized access, and for general pool supervision. The system must oversee the lobby and entrances to the pool, and must provide full coverage of the entire pool area.

2.26 Interior Lighting

All artificial lighting fixtures in a given space shall be capable of independent switching and shall be located to allow for re-lamping from floor or catwalk surfaces with the aid of portable ladders or scaffolding, if necessary. Lights located above the pool shall be avoided unless a catwalk system is provided.

Skylights or open air configurations may be appropriate for the entry control, food service, and some administrative areas. Beyond the obvious constraints of modesty, which requires visual screening up to 8 feet, glass is possible in all areas of the dressing rooms, toilets, showers, etc. The opportunity for energy savings and day lighting offer a design freedom that exists in few other building types. Where a solar assessment shows an active solar application to be cost effective, it shall be included to supplement pool water or space heating requirements.

Indoor swimming pool areas: Provide interior wall mounted indirect ambient uplighting controlled with a “daylighting” light sensing control system. Lighting shall also be controlled with an automated time clock with a manual ON/OFF timed override feature. Select, locate and shield luminaires to avoid direct glare. Select luminaires to avoid a direct component that would result in direct glare. This is especially important considering that the water and a wet deck provide specular surfaces. The lighting design should avoid direct and reflected glare on the water surface. Also consider maintenance and accessibility. Locate luminaires above the deck and at the edge of the

pool to allow for access and relamping. Target Horizontal Illuminance (± 10%): For recreational class of play: 300 lux (30 fc). For other classes of play, see IESNA RP-6.

Fluorescent fixtures with low temperature, energy efficient ballasts and lamps are appropriate for most areas unless other lighting requirements are identified. Provide wet area rated fixtures in designed wet areas like the showers, dressing areas, and toilets. Utilize daylight lamps for most applications, because cool white lamps are too cold. Consider light fixtures that minimize glare and shadowing. Where natural light is available, provide lighting control systems, including ambient light dimmers to automatically reduce the intensity levels of artificial lighting.

2.27 Filtration, Circulation, and Heating Systems
Locate all pool mechanical equipment and chemical storage areas away from public access. Doors or openings shall be sized to permit the replacement of all equipment and ventilation is required for motors and heaters.

2.28 Chemical Storage
Provide a separate chemical storage room or structure for chlorine and other chemicals. Locate this storage area within the mechanical equipment compound or in a room adjacent to the pool equipment that is not accessible to the public. Doors shall be secure from break-ins and warning signs shall be posted concerning gaseous chlorine storage and the need for protective clothing and equipment. The chemical storage room shall be fire and explosion proof and shall have a vent fan capable of one complete air change in one to four minutes. An OSHA approved eye wash station, gloves, protective goggles, and gas masks are required in the pool equipment and chemical storage areas.

3. Pool Deck Design

The hard surfaced areas around pools serve as a circulation system and lounging area for pool users. Optional amenities, such as concession areas and spectator seating areas, may require additional deck space to accommodate the desired programs.

3.1 Deck Size and Capacity
The deck area normally required for natatoriums is normally .75 to 1.5 times the pool water area. Minimum and preferred dimensions follow:

SIDES	Preferred: 10 feet	Minimum: 9 feet
SHALLOW END	Preferred: 20 feet	Minimum: 15 feet
DEEP END	Preferred: 20 feet	Minimum: 20 feet

3.2 Materials and Surface Finishes
Pool decks shall be constructed of an impervious material, such as concrete, bluestone, ceramic tile, glazing tile, or other hard, non-slip surface. The perimeter 10 feet area around the pool is considered a wet area and needs to be designed to prevent slipping when wet. Water shall not be allowed to puddle or pond on the deck area. All areas shall be pitched to provide positive drainage away from the pool with a minimum slope

of 1/4 inch per foot and not more than 1/2 inch per foot. Water depths and “No Diving” signs that are integral to the deck surface shall be placed at the pool edge and inside the pool.

3.3 Spectator Seating

Seating for spectators shall be provided, as needed, according to the program requirements. The anticipated peak number of spectators shall be accommodated. For a small number of spectators, a raised platform with informal seating may be sufficient. Consider the need for portable bleachers for up to 600 people that can be rolled for convenient storage or moved for use at other sport facilities on the installation. For larger numbers, the following guidelines are suggested:

- Bleacher seating with 18 inches of length provided for each spectator.
- Provide 6 to 8 sq. feet of space for each spectator.
- Provide access so that spectators are not walking on the pool deck. In addition, direct access to the exterior would be beneficial for large swim meets.
- Locate spectator seating parallel to the racing lanes in the pool.
- Permanent bench seating shall be constructed from concrete, wood, non-corrosive metal (aluminum), or recycled plastic.
- Spectator seating shall be stepped in elevation to allow maximum visibility.

3.4 Deck Drains

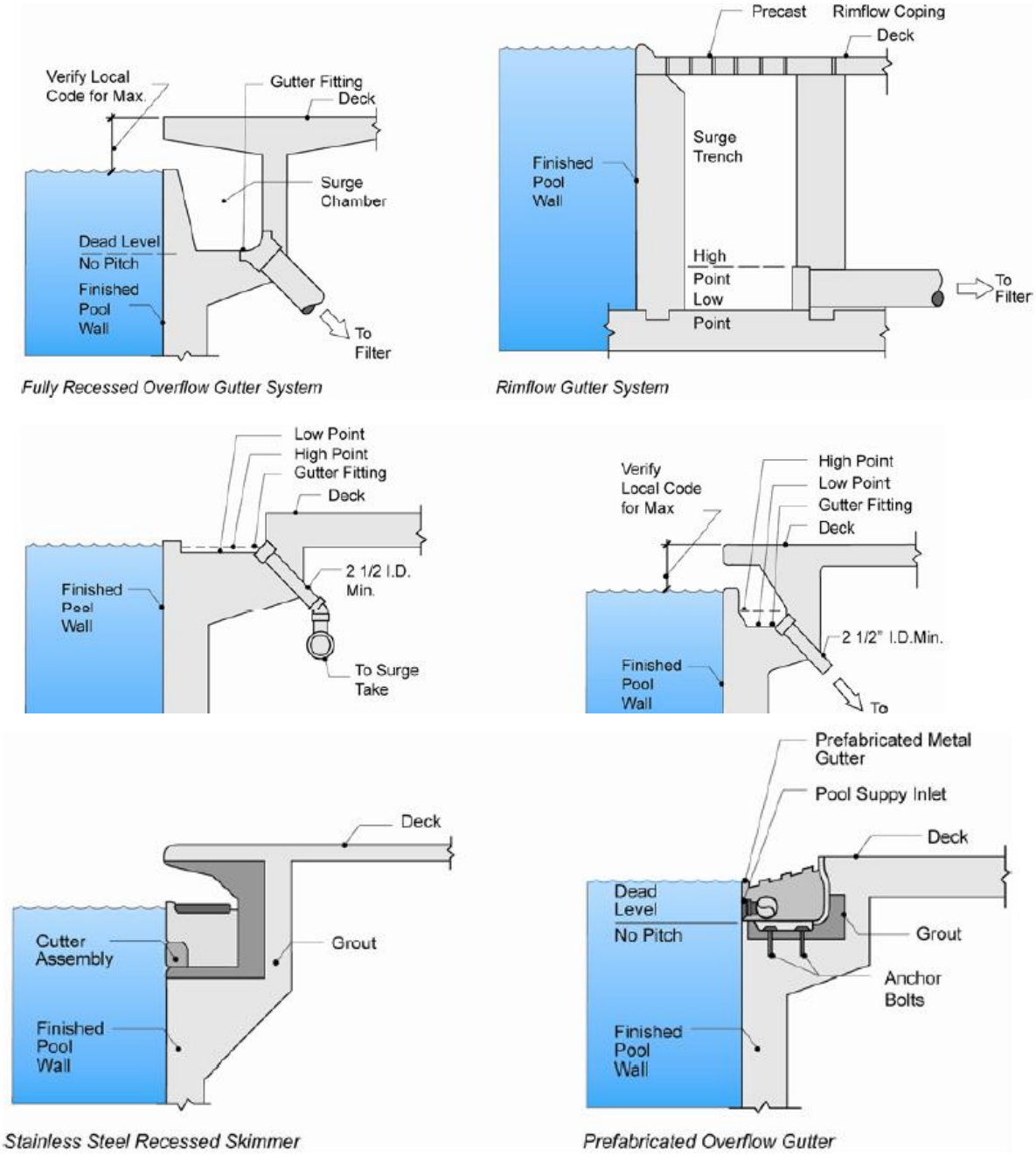
Drains on the deck must be drained to the sewer, and not be recirculated back into the pool.

4. Technical Requirements

4.1 Overflow Systems

A continuous overflow perimeter system is recommended in the main pool. Examples of this system are shown in *4.1-1 Figure: Overflow Rim Systems*. Prefabricated, stainless steel surge gutter systems are preferred because they provide constant skimming of the surface water to help remove debris and provide surge storage capacity for water displaced by swimmers. Scuppers that utilize a thin layer of water falling over a weir may be used to skim water from wading and training pools; however they do not adequately handle the surge requirements of main pools. Antiquated scum gutters offer little surface collection effectiveness and are generally used in conjunction with surge storage tanks and pump pits.

4.1-1 Figure: Overflow Rim Systems



4.2 Circulation and Filter Systems

All portions of the water distribution system serving the swimming pool and auxiliary facilities shall be protected against backflow. Water introduced into the pool, either directly or into the circulation system, shall be supplied through air gap fittings. There shall be no direct physical connection between the sanitary or storm sewer system and any drain from the swimming pool recirculation system. Provisions shall be made for complete, continuous circulation of water through all parts of the swimming pool by

appropriately sized, non-corrosive pipes. Heavy grades of schedule 40 polyvinyl chloride (PVC) or schedule 80 in active seismic zones may be utilized for most circulation piping requirements. The valves and draining system for the pool shall be sized to prevent flooding (surcharging) of the sanitary or storm drainage system. Circulation piping shall be designed for a maximum velocity of 10 feet per second. All suction piping shall be designed for a maximum of 6 feet per second. A hair and lint filter of stainless steel with removable basket shall be provided to filter and remove leaves, hair, and other solids entering the drainage system. A centrifugal circulation pump shall be provided of sufficient capacity to provide the minimum turnover rate to the pool, plus an additional allowance of 30%. Minimum turnover rates shall be:

- Main Pools: Six turnovers in 24 hours
- Wading Pools: Twelve turnovers in 24 hours

4.3 Recirculation System Minimum Requirements

A recirculation system, consisting of pumps, piping, filters, feeders, water conditioning equipment, city water make-up, surge tank, and other accessories shall be provided to clarify and disinfect a swimming pool volume of water in six hours or less, thus providing a minimum turnover rate of four times in 24 hours. For pools subject to heavy usage, the turnover rate shall be increased to three hours. Under normal operating conditions, water shall be re-circulated from the main drain and through the overflow gutter into the circulating pumps. Approximately 30% of the water shall enter the main drain, while 70% “skims” over the gutter system through the surge tank and hence into the pumping system. Additional information concerning swimming pool layout and recirculation requirements can be found at the National Swimming Pool Foundation website. All integral capacity motors shall meet the requirements for Premium Efficiency Motors per EPAct05.

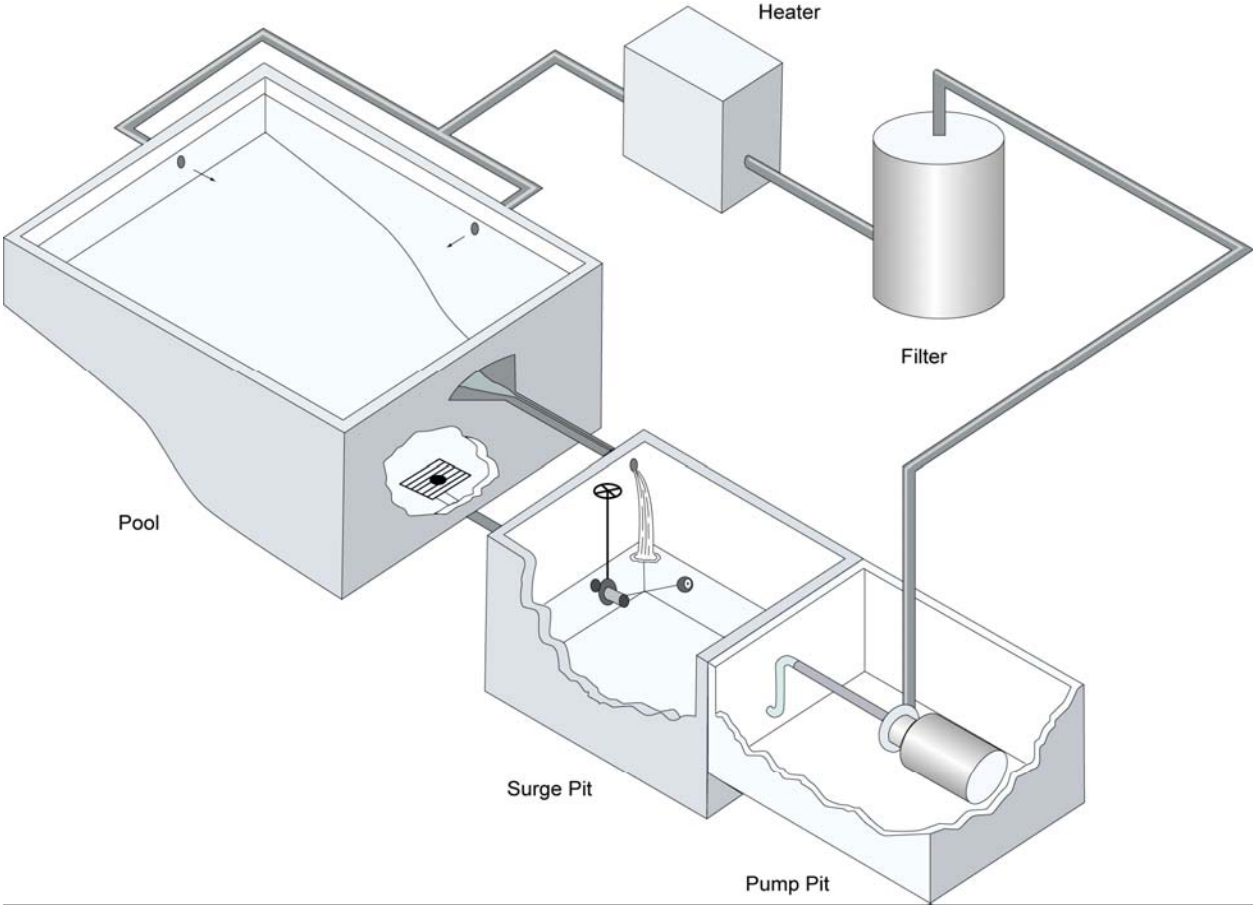
4.4 Surge Tanks and Surge Control

Circulation systems shall be equipped with concrete, cast-in-place surge tanks, unless the maximum surge requirements of a pool can be handled by a surge gutter system. The purpose of the surge tank is to allow water displaced by pool occupants to be collected in the surge tank and later returned to the pool as occupancy decreases. Provide flow control valves to modulate water flow from the main drain and from the surge tank. New gutter systems may eliminate the need for surge tanks, because the displaced water may be contained within the gutter overflow system. A surge tank and pump pit diagram is provided in *4.4-1 Figure: Surge Tank and Pump Pit.*

4.5 Motor Controls and Auxiliaries

Provide magnetic starters for the control of the circulation pump, including a stainless steel enclosure to prevent corrosion. Use non-corroding metallic components, such as aluminum and stainless steel, for all electrical and control items subject to corrosion.

4.4-1 Figure: Surge Tank and Pump Pit Diagram



4.6 Pumps

Pumps are utilized to displace a liquid or gas to create a directed flow and many different types of pumps may be required for pool equipment, such as chemical feed pumps, transfer pumps, vacuum pumps, circulation pumps, booster pumps, hydrotherapy pumps, and compressor pumps. Centrifugal style pumps are generally used for all circulation pumps that must be sized appropriately to handle the required capacity. Utilize mesh-bucket filters immediately in front of circulation pumps to protect the internal components of the pump from larger, solid objects and to strain hair and lint form the re-circulating water. A pump pit may be required adjacent to the surge tank to circulate water for filtration, heating (if required), and return it to the pool.

4.7 Flow Meters

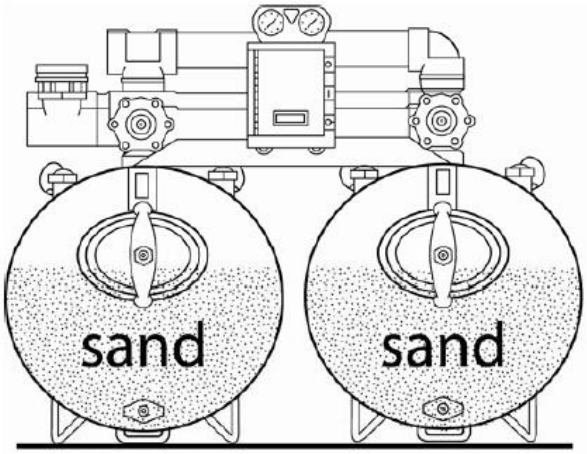
Provide a flow meter in each main line serving a swimming pool or wading pool. Flow meters are also demanded by the health department codes in most states and provinces. Install flow meters on a straight, uninterrupted section of pipe at least 10 pipe diameters down-stream from the last fitting with about five diameters distance "clean run" beyond so that the smooth, linear flow is not disturbed to ensure accurate readings. In addition, provide a mercury type manometer flow meter at the discharge of the circulating pump to control primary flow and backwash. Provide a flow control valve

so that the operator may manually control the circulation rate of the pump, thereby maintaining the turnover rate throughout a filter cycle from clean to dirty.

4.8 Filters

Filtration is the physical process of removing soils which would interfere or impede the disinfection process if not removed. Filters only remove solids and any dissolved elements must be removed as part of the disinfection process. The two major types of pool filters are sand filters and diatomaceous earth (DE) filters that both offer equal levels of effectiveness. Utilize high rate sand pressure type filtration banks that are National Swimming Pool Foundation (NSPF) approved because their effectiveness actually improves over time due to the buildup of trapped soil that becomes increasingly dense and resistant to water flow. Filters must be backwashed periodically according to the manufacturer's specifications and discharged directly into the sanitary or storm sewer where allowed by code.

4.8-1 Figure: Multi-Cell High Rate Sand Filters



Multi-Cell High Rate Sand Filters

Multi-Cell High Rate Sand Filters

4.9 Drains and Inlets

Dual main pool drains are mandatory to prevent entrapment hazards. Inlets and drains shall not protrude into the pool or allow entrapment of extremities. Drains and drain covers to be tamper proof and entrapment proof. Refer to the current guidance provided by the Consumer Product Safety Commission publication "Guidelines for Entrapment Hazards: Making Pools and Spas Safer" for information regarding the prevention of entrapment hazards. At least one main drain will be provided in the deepest part of the swimming pool. For pools at least 30 feet wide, multiple drains will be spaced no more than 15 feet from a side wall.

Each drain shall have a removable but secure grate that has sufficient area to maintain water velocity at or below 1 foot, 6 inches per second.

In accordance with VIRGINIA GRAEME BAKER POOL AND SPA SAFETY ACT, PUBLIC LAW 110-140, each public pool and spa in the United States shall be equipped with anti-entrapment devices or systems that comply with the ASME/ANSI A112.19.8 performance standard, or any successor standard; and each public pool and spa in the

United States with a single main drain other than an unblockable drain shall be equipped, at a minimum, with 1 or more of the following devices or systems designed to prevent entrapment by pool or spa drains:

(I) Safety vacuum release system.--A safety vacuum release system which ceases operation of the pump, reverses the circulation flow, or otherwise provides a vacuum release at a suction outlet when a blockage is detected, that has been tested by an independent third party and found to conform to ASME/ANSI standard A112.19.17 or ASTM standard F2387.

(II) Suction-limiting vent system.--A suction-limiting vent system with a tamper-resistant atmospheric opening.

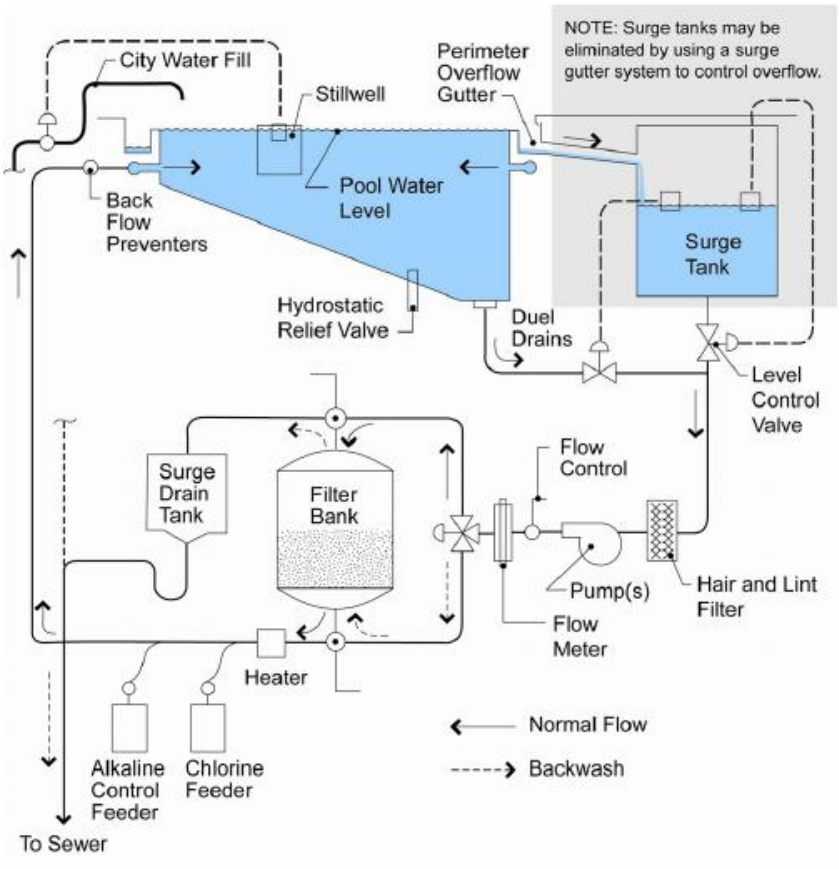
(III) Gravity drainage system.--A gravity drainage system that utilizes a collector tank.

(IV) Automatic pump shut-off system.--An automatic pump shut-off system.

(V) Drain disablement.--A device or system that disables the drain.

(VI) Other systems.--Any other system determined by the Commission to be equally effective as, or better than, the systems described in (I) through(V) of this paragraph at preventing or eliminating the risk of injury or death associated with pool drainage systems.

4.9-1 Figure: Water Circulation Systems Schematic



One inlet shall be provided for each 300 sq. feet or 15,000 gallons, whichever is greater and all inlets will be located on the pool sides or floor in a manner that completely distributes the water. Utilize butterfly, ball and globe style inlet valves made partially or completely of PVC or other high quality plastic for new pools and renovations. Fresh water may also be supplied through a fill spout at least 6 inches above the pool deck.

To prevent injuries and to slightly disturb the water for better diver visibility in the diving area, this spout shall have no sharp edges and be located under one of the diving boards.

4.10 Heating and Water Temperature

Heaters are necessary for all indoor pools. The selected water heater shall have the capacity to bring the pool up to the desired temperature within 24 hours. Pool heaters to meet the requirements of EPAct05 and ASHRAE 90.1. See paragraph 2.19 for air and water temperatures.

4.11 Water Quality

The design and method for pool disinfection must be coordinated with the installation. Use of chlorine gas, although cost effective and efficient, as a disinfectant in swimming pools is discouraged due to safety issues and the availability of less dangerous disinfectants (e.g., sodium hypochlorite, calcium hypochlorite). When economical, consideration should be given to the use of sodium hypochlorite generators that produce disinfectants from sodium chloride (salt).

Automatic Chemical Controllers are required which measure ORP and pH (this is part of the BLS).

An Ultra Violet (UV) System is strongly recommended for supplemental disinfection/ sanitation.

4.12 Pool Lighting

Surface lighting will provide at least 30-foot candles of illumination on the deck and pool area. Overhead flood lights should be mounted at least 20 feet above the water surface. Select flood lighting lamps to allow 1 watt per square foot minimum. Consult the specific requirements of the appropriate regulatory agency if competitive swimming events will be conducted. USS rules for championship meets require a minimum of 40-foot candles of illumination 3 feet above the water.

For nighttime or indoor competition, 100-foot candles are necessary at start and turning ends. Area lighting should be designed to reduce direct glare and reflections on the water surface. Ground fault circuit interrupters (GFCI) are required for all electrical equipment (vending machines, pool lights, water coolers, etc.). Provide power sources for additional lighting that may be needed for television, movies, and special events.

4.13 Underwater Lighting Criteria

Verify with the installation if underwater lighting is desired. Underwater lighting types and dimensions shall conform to the National Electric Code (NEC) Article 680 regulations. Underwater lights require 0.5 to 2.0 watts per square foot of water area and should be sized accordingly. Box connections for dry or wet niches should be a

minimum of 4 feet away from the side wall of the pool and 8 inches above the deck. Underwater light fixtures are available at standard voltage (120 volts), and at low voltage (12 volts).

Low voltage wiring should be used for all dry or wet niche lighting fixtures. This requires a transformer located, by code, a specific distance away from the pool wall and above deck. Either wet niche or dry niche fixtures may be used as described in *4.13-1 Table: Underwater Lighting Criteria*. If lights are provided at the start and finish ends of a pool used for competitive events, provide a turn-off switch for racing.

4.13-1 Table: Underwater Lighting Criteria

	Description	Installation Technique	Installation Depth	Servicing Technique
Wet Niche	Completely sealed but removable fixture that is constantly surrounded by water.	Mounted into recess in pool wall.	Maximum depth of 6100 mm (2 feet) from pool water surface.	Extra rubber covered electrical cord is coiled in the niche. Fixture is removed from niche and lifted to deck for servicing.
Dry Niche	Permanently enclosed fixture that doesn't come into contact with water.	Installed behind pool wall and covered by glass sealed to a metal frame with gaskets.	Can be installed at any depth, usually 6100 mm (2 feet) below shallow water surface.	Serviced via a pipe tunnel or manhole behind the pool wall.