



POSITION PAPER

Layers of Protection Around Aquatic Environments to Prevent Child Drowning

*Written by NDPA's Education Committee
Approved by NDPA Board of Directors: January 21, 2009*

INTRODUCTION

This position paper addresses the National Drowning Prevention Alliance's definition of "layers of protection" and how this concept can be utilized in aquatic environments to aid in the prevention of childhood drowning. The NDPA recognizes that multiple strategies are necessary to prevent drowning. The term "layers of protection" is one way to classify the majority of strategies directly affecting aquatic environments. Other important prevention strategies, such as community education, legislation, local enforcement, and public awareness, are not addressed in this position paper. This position paper is intended to be a general overview for use by safety professionals, educators, community leaders, parents, caregivers, and members of the media. Additional papers discussing more details on individual "layers" addressed in this paper will be forthcoming.

BACKGROUND

In an effort to standardize drowning surveillance and prevention research, drowning has been defined as "the process of experiencing respiratory impairment from submersion/immersion in liquid." Further, the outcome of a drowning incident can be classified as "death," "morbidity," and "no morbidity."ⁱ The more common terms used in discussions are "fatal" or "nonfatal" drownings. Furthermore, nonfatal drownings are usually described as resulting in no impairment, some impairment, or significant impairment.

While other unintentional injuries seen in emergency departments average about 4% hospitalization admissions, more than half of drowning victims are hospitalizedⁱⁱ. Many victims suffer life-long disabilities. Thus, prevention of drowning is critical.

Drowning is the leading cause of unintentional injury deaths for children 1-4 years, the second leading cause of unintentional injury deaths for children 1-14 years, and is the fifth leading cause of unintentional injury deaths for all ages in the United States (CDC, WISQARS, 2005).

Water-related injuries also affect a significant number of American children. It is estimated that as many as twenty percent of near-drowning victims suffer severe, permanent neurological disability.ⁱⁱⁱ

STATEMENT

The NDPA stresses that no single device or solution can prevent child drownings. Parents, caregivers, aquatic facility owners, managers and operators should use “layers of protection” to provide a system of increased security to prevent unauthorized access to bodies of water, especially important for children. This means that multiple strategies or devices are used constantly and simultaneously.

The layers include various types of strategies and physical barriers, including supervision, fences, pool covers, alarms, education, and more. Supervision is the one layer that should be ever-present no matter what other layers are utilized. If a physical barrier should be compromised or damaged, supervision is always the first and last line of defense against drowning. The addition of other physical layers will simply buy more time to react if unauthorized access should occur. Some physical layers aid in preventing access to the water, such as fences or pool safety covers. Other types of layers, such as alarms, will alert adults immediately if the barriers have been crossed, but don’t physically provide a restraint to access. And finally, some layers are intended to minimize injury should a child gain access to the water, such as swim instruction, proper rescue techniques, and knowing Cardiopulmonary Resuscitation (CPR).

Starting with supervision, pool owners and operators must choose carefully which additional layers will work best in their environment. The following information is designed to help with those decisions. Recommendations and definitions for “layers of protection” include:

Supervision During *Non-Water Activities*: The NDPA recognizes that the strategies for supervision are different when families are engaged in water recreation and when they are not.

- ALWAYS know where children are. Never leave a child unattended in or near water in a pool, tub, lake, river, canal or ocean, even when lifeguards are present. Containers that may collect water (buckets, ice chests, non-used “kiddie” pools, aquariums, etc..) pose a serious drowning risk to young children.
- ALWAYS be aware of potential dangers in all environments, such as when visiting other homes, while on vacation, or at public/community pools. Survey the area for secure fencing, locked gates, covered pools and spas, and protected backyard ponds. Never leave your child in an environment with unprotected water hazards.
- Instruct babysitters and caregivers about potential pool hazards and emphasize the need for constant supervision of children and barriers.
- If a child is missing or unaccounted for, always check the pool or spa first.

Supervision *During Water Activities*: Unfortunately, many drowning incidents have occurred when people are actively engaged in swimming or other water play, and adults *know* children are in the water and those adults are nearby.

- Whenever infants and toddlers are in or around water, an adult should be within an arm’s length, providing “touch supervision.”^{iv}
- In addition to parental supervision of young children, designate a “Water Watcher” to maintain constant watch over children in or near the water. The

- “Water Watcher’s” job is to watch the water at all times, *without* engaging in social activities, conversations, phone calls, reading, computer use, cooking, cleaning, or any other distracting activity. After fifteen minutes, a new “Water Watcher” should be designated so that supervision stays fresh. Ensure that the “Water Watcher” is a sober adult who knows CPR and has basic swimming skills.
- Do not use flotation devices as a substitute for supervision. “Water wings” or “floaties,” inflatable water rings, and other pool toys are **NOT** safety devices. Some flotation devices are designed to assist with building swimming skills and are designed to tilt children into a forward swimming motion. This could create risk for an unassisted young swimmer. Only US Coast Guard approved life jackets are designed and tested for safety.
 - Consider using a certified lifeguard for residential gatherings that include swimming activities.

Physical Layers Limiting Access to the Pool or Spa Area:

For residential pools and spas the first line of physical defense is to restrict unauthorized access to the pool or spa area in its entirety.

- **PROPERTY LINE OR PERIMETER FENCING** – In a home with a pool or spa, a perimeter fence basically keeps out the neighboring children and uninvited adults. While perimeter fencing is an important barrier, it does *not* restrict access to the pool area from the home itself. Unfortunately, the house structure is often used as the 4th side of the fence around the pool and does not protect those children who live in the house or guests invited to the home.
- **ISOLATION FENCING** – Isolation fencing completely separates the pool or spa area from the house or other structures. It restricts unauthorized access from neighbors’ yards, other nearby buildings, *and* from inside the house. Isolation fencing is the preferred configuration for pool and spa protection.
- **TYPES OF PERMANENT FENCING** – Permanent fencing choices are numerous, ranging from wood, aluminum, vinyl, Plexiglas, chain-link, or wrought iron. (Refer to CPSC Guidelines, available online at www.CPSC.gov, for fencing measurement recommendations and specifications for each fencing type.)
- **TYPES OF REMOVABLE FENCING** – Removable mesh fencing can be an affordable choice for many pool owners, especially those who do not have children living in the house and who want to restrict access only when children are expected to be visiting. When designed properly, installed correctly, and maintained according to the manufacturers’ instructions, removable mesh fencing can provide the same protection as an isolation fence made from other materials, but only when it is *in place*. The NDPA recommends that although the fence is removable, the fence should be kept installed, especially during parties and other gatherings. Pool owners should be aware that gates on removable mesh fencing should still be self-closing and self-latching.
- **FENCING CONSTRUCTION** – All fences must be non-climbable, meet all applicable local safety codes, and should be at least 60” tall*. Vertical bars on a fence should be set close to one another so that a small child can not squeeze through (no more than 4 inches of space). Horizontal bars on fencing must be far enough apart that they can not act as a “ladder” to climb over. The horizontal bar closest to the ground should also not allow enough room for a child to crawl under the fence. (*CPSC Guidelines recommend a minimum of 48 inches.)
- **GATES** – All gates to residential and public pool or spa areas should be self-closing and self-latching and accommodate a locking device. Gates should open

away from the pool and should never be propped open. Gates must be double-checked to confirm that the latching mechanism is securely fastened. Contact a professional or the manufacturer for adjustment or repair.

- **LATCHES** – The latch release should be out of the reach of children, at least 54” from the ground. If a locking latch is used it should be kept locked when pool is not in use. Store the key out of children’s reach and make sure all adults know where the key is kept.
- **ACCESS TO FENCE CLIMBING** – All items such as chairs, tables, storage bins, playground equipment, etc... that are kept outside the pool area should be kept at least 4’ away from the fence and secured in place. Even an ice chest could be used as an aid in climbing over the fence. Make sure that children and animals are not able to dig soil loose from under the pool fence. Keep trees trimmed so that children cannot use them to climb over a pool fence. Do not plant trees close to the pool fence area.
- **FENCE MAINTENANCE** – Check the entire perimeter of the pool fence and gate on at least a monthly basis for compromises or damage, such as loose or broken fence slats, that could lead to a breach and adjust the hinges or spring if the gate is not self-closing properly. Shifts in the soil due to ground settling or even small earthquakes can cause latches to misalign and not close.
- **HOUSE DOORS** – All doors providing direct access from the home to the swimming pool should be equipped with a self-closing, self latching device with a release mechanism placed no lower than 54 inches above the floor. Self-closing devices are available for use on sliding glass doors but will require more frequent maintenance to keep the track cleaned and the closing mechanism in proper working condition.

Physical Layers Restricting Access to the Water:

In addition to fencing other physical layers are critical in preventing unauthorized access to the water in the pool or spa.

- **POOL & SPA SAFETY COVERS** – Choose only safety covers that meet the ASTM International voluntary standard F1346-91. Covers should be properly used and maintained. Rain water that collects on top of the cover should be promptly removed. Although ASTM International standards require that safety covers hold a minimum of 485 pounds, keep children and pets off of all safety covers.
- **POWER OPERATED COVERS** – Power-operated pool safety covers are the most convenient, allowing for one-handed operation as frequently as needed and provide for daily or seasonal use.
- **SEMI-AUTOMATIC & MANUAL COVERS** – These covers are popular with some pool designs and are more prevalent in some areas of the country. Some lightweight manual and semi-automatic covers are designed for daily use. These covers must be replaced after every swimming session and require diligent commitment by pool owners.
- **POOL SAFETY NETS** – “Net” type pool covers work well for long-term cover, still allowing the pool to be serviced without complete removal of the net. Nets are easiest to remove and replace when more than one adult can help. These must also be replaced after every swimming session and require diligent commitment by pool owners.
- **WINTER SAFETY COVERS** – Made of mesh or vinyl, these covers provide a barrier to the water during the off-season, but require tools and some adult

strength for installation. These covers are not for daily use. Choose a customized cover that fits the contours of the pool. Check routinely for wear and tear. Vinyl covers require constant pumping to prevent the pooling of rain or snow melt on top of the cover.

- **SOLAR POOL COVERS** – Solar / floating pool covers are not safety devices and are a serious entrapment hazard. If solar covers are used, they should be removed **COMPLETELY** before swimming or using the spa.
- **LADDERS** – Above-ground pool ladders, when not in use, should be secured and locked, or removed. Ladders should never be accessible to children without adult supervision.

Alarms as Layers of Protection

In addition to the physical layers listed above, alarms are an important addition to creating a safer environment. Alarms can be added to windows, doors, gates and the pool to alert an adult of unauthorized access. While the primary goal of layers of protection is to prevent unauthorized access to the water, alarms are important to alert adults if access to the water has been made. Alarms can be your last line of defense and allow adults to respond to an emergency quicker.

- **DOOR & WINDOW ALARMS** – In the home, doors and windows that open to the pool area should be alarmed to alert adults when opened. The preferred system has a momentary shut off at the door located beyond the reach of children.
- **GATE ALARM** – Place a weather-resistant alarm on the gate mechanism, which can sound both at the pool and in the home, to advise when the gate has been opened. (85 dB for a distance of 10 feet)
- **SURFACE ALARMS** – Surface alarms are floating alarms that detect motion on the water's surface. The alarm can sound both at the pool and in the home when the surface of the water is breached. While very low cost, typically under \$200, most models have a high false-alarm rate due to wind and rain and should never be relied on alone.
- **SUBSURFACE ALARMS** – Alarm technology continues to improve and available models include underwater alarms which attach over the edge of the pool to the pool wall, or under water. The alarms are designed to sound an alarm immediately when a child enters the pool. Look for a pool alarm that is professionally installed, detects immediately, one that doesn't create false alarms and can reset after swimming.
- **ON-BODY ALARMS (PERSONAL IMMERSION ALARMS)** – These devices, which are worn on the body, will set off an alarm if they become wet. While these types of alarms can be a good layer of protection to be worn by children who are visiting a home with a pool or spa, or while traveling, it is not recommended as a daily layer of protection against an always-present water danger. These types of alarms require active discipline for proper use.
- **OTHER ALARMS** – Perimeter alarms work with lasers, similar to an automatic garage door system, and are activated when something crosses the laser. Pets could create false alarms.

Swimming Lessons as a Layer of Protection

- **EVERYONE SHOULD LEARN TO SWIM** – Swimming is not an instinctive skill for humans. We can not survive in water unless we are taught how to swim. All adults and children should learn to swim.

- **ROLE OF SWIM LESSONS** – Adults should be smart and aware; never consider children “drown proof” because they’ve had swim lessons. Nothing will ever eliminate the risk of drowning. Even an Olympic Swimmer can drown.
- **WHEN TO START** – Always speak with your pediatrician before considering any water safety/swimming lessons for children. With the right instruction, children can gain skills and a love for the water even at a young age.
- **INCLUDE WATER SAFETY** – Ensure that swim instruction includes water safety and survival education at the appropriate developmental level.
- **SELECTING A PROGRAM** – Check if the instructor is trained in swim instruction, child development, and currently certified in CPR (some are not). Observe classes before enrollment and monitor lessons for safety skills, the effectiveness of the instructor, the child’s reception to learning, and progress. Lessons should be continuous, year-round, not taken for just one season. Skills need to be developed and maintained.

Layers Addressing Emergencies:

- **TELEPHONE** – Keep a phone poolside (a land line with the pool’s physical address is best) for emergency use so that an adult can call for help if needed. (Calling from a cell phone won’t automatically tell the 9-1-1 operator the location.)
- **LEARN CPR** – Anyone who lives in a home with a pool should learn CPR and rescue breathing. Ensure that babysitters have current CPR training and certification. CPR training and certification should be refreshed every one to two years, depending upon the certification agency, or more frequently if there have been recent changes in recommendations. In a group, such as a pool party, at least one person should know CPR. Anyone who is the sole supervisor of a child should learn CPR and rescue breathing.
- **WATER SAFETY & RESCUE COURSE** – Pool owners and operators should enroll in a local water safety course that teaches proper rescue techniques. Course should include hands-on practice using a shepherd’s hook and life-saving ring.
- **RESCUE EQUIPMENT** – Keep a life-saving ring and shepherd’s hook at poolside. CPR instructions should be posted poolside. Know how to use the rescue equipment and perform CPR.
- **MISSING CHILD** – If a child is missing, always check the pool first. Seconds count. If a child cannot be located immediately, call 9-1-1 and enlist assistance in the search.

Layers for Other Types of Water

- **BUCKET** – Never leave water in buckets, unused aquariums or coolers.
- **BATHTUB** – Never leave infants, toddlers or young children in a bath tub alone or with another child, not even for a second. Bath seats are not a substitute for adult supervision.
- **SPA COVERS** – Ensure that spas have childproof safety covers and are locked when not in use. Check cover locks regularly for needed maintenance.
- **LIFEJACKETS** – When boating, all adults and children should wear lifejackets or personal flotation devices (PFD’s) approved by the US Coast Guard.
- **PONDS & FOUNTAINS** – Secure or place barriers between children and man-made (ex: fountains or decorative ponds) or natural (ex: creeks, retention ponds) sources of water so that children cannot gain access without adult supervision.
- **TOILET** – Keep toilet lids locked and shut when an infant or toddler is expected to be present. Keep bathroom doors closed.

Entrapment Prevention

- **ENTRAPMENT PREVENTION** – The Virginia Graeme Baker Federal Pool & Spa Safety Act of 2008 requires that public pools and spas be equipped with anti-entrapment drain covers by 12/19/08. Residential pools and spas should also install anti-entrapment devices on all drains, including vacuum hose drains.
- **DRAIN COVERS** – Ensure that swimming pool drains, in the bottom and sides of pools and spas, have anti-entrapment drain covers and a suction valve release mechanism and that all screws and bolts are secured.
- For an actual copy of the legislation and updates on the interpretation and implementation of this federal law please visit the US Consumer Product Safety Commission website at www.CPSC.gov and search for Virginia Graeme Baker Pool and Spa Safety Act.

Additional Recommendations

- **NEVER SWIM ALONE** – Neither adults nor children should swim alone, regardless of the age or ability of the swimmer.
- **RISKY TEENS** – Talk with teenagers about “risky behavior,” including diving or swimming in unfamiliar water, and the dangers of alcohol or drug use when engaging in recreational water sports or swimming.
- **TOYS** – Remove toys from in and around the pool when not in use.
- **CHLORINE DISPENSERS** – Don’t use floating chlorine dispensers that look like toys.
- **LIFEJACKETS VS. TOYS** – Only devices which display a US Coast Guard Approval number should be considered a safety device. Inflatable “floaties,” arm bands, swim aids, pool noodles, swimming rings, and other floatation devices are toys and parents should not lessen the emphasis on other layers of protection when children are using these devices.
- **DOCK AREA ELECTROCUTION** – Never allow swimming near docks, piers, or marinas with electric boat lifts, davits, or shore power to avoid electrocution.
- **BOATING CARBON MONOXIDE RISK** – Never allow swimming or water sports closer than 10 feet from the sides or back (stern) of a boat, whether anchored or moving, to avoid carbon monoxide poisoning. Never allow swimming underneath a motorized catamaran or pontoon boat, whether anchored or moving.

CONCLUSIONS:

Although adult supervision and four-sided isolation fencing are two key layers of protection against child drowning, not even the most diligent caregiver can have their eyes on a child 24-hours-a-day, 7 days a week and barriers can be breached. The NDPA urges using multiple strategies and devices simultaneously to help prevent injuries and deaths from drowning. These include active adult supervision; preventing unauthorized entry with four-sided isolation fencing, gates and latches; safety covers; alarms; learning to swim; learning CPR and rescue techniques, and having an emergency action plan, and those additional layers listed above. Each additional layer or strategy beyond the first could be the one that saves a life. Use as many as possible at all times.

END NOTES:

Source: National Drowning Prevention Alliance (www.ndpa.org)

Pediatrics Vol. 105 No. 4 April 2000, pp. 868-870. AMERICAN ACADEMY OF PEDIATRICS: Swimming Programs for Infants and Toddlers. Committee on Sports Medicine and Fitness and Committee on Injury and Poison Prevention

ⁱ E. F. van Beeck, C. M. Branche, D. Szpilman, J. H. Modell, & J. J. L. M. Bierens. A New Definition of Drowning: Towards Documentation and Prevention of a Global Public Health Problem. Bulletin of the World Health Organization. November 2005; 83 (11) 853- 857.

ⁱⁱ Gilchrist J, Gotsch K, Ryan GW. Nonfatal and Fatal Drownings in Recreational Water Settings - -- United states 2001- 2002. MMWR 2004 53 (21): 447-452

ⁱⁱⁱ Wintemute GJ. Childhood drowning and near-drowning in the United States. Amer J Dis Child 1990; 144,663-669.

^{iv} Pediatrics Vol. 105 No. 4 April 2000, pp. 868-870. AMERICAN ACADEMY OF PEDIATRICS: Swimming Programs for Infants and Toddlers. Committee on Sports Medicine and Fitness and Committee on Injury and Poison Prevention