Entrapment Prevention in Pools and Spas

by Shajee Siddiqui

ANSI/APSP-7 incorporates performance criteria for all recognized suction entrapment hazards.

Swimming pools and spas bring to mind relaxation and enjoyment. Users also expect them to be safe—but like so many things in the built environment, pools and spas can pose hazards if improperly designed, constructed, maintained and used. Although reports to the U.S. Consumer Product Safety Commission of entrapment incidents have declined in recent years even as the number of pools and spas in the nation has increased, these sometimes tragic occurrences have received a great deal of attention in the media and in legislative arenas.

The Association of Pool & Spa Professionals (APSP, formerly the National Spa and Pool Institute), an international trade association representing the swimming pool, spa and hot tub industry, has responded by developing the American National Standards Institute (ANSI) accredited ANSI/APSP-7, *American National Standard for Suction Entrapment Avoidance in Swimming Pools, Wading Pools, Spas, Hot Tubs and Catch Basins*. A voluntary consensus standard, ANSI/APSP-7 represents the most current and comprehensive approach to entrapment prevention by articulating how existing technologies and methods can be applied to

This article originally appeared in the January-February 2008 issue of *Building Safety Journal*, copyright International Code Council, and is reprinted with permission.

protect bathers from entrapment hazards in both new and existing installations.

Hazards

ANSI/APSP-7 addresses and articulates methods to prevent all five recognized suction entrapment hazards.

- **Hair entrapment**—hair knotted or snagged in an outlet cover.
- **Limb entrapment**—a limb inserted or sucked into an outlet opening with a broken or missing cover, resulting in a mechanical bind or swelling.
- **Body suction entrapment**—suction applied to a large portion of the body, resulting in entrapment.
- **Evisceration/disembowelment**—suction applied directly to intestines through an unprotected sump or suction outlet with a missing or broken cover.
- **Mechanical entrapment**—jewelry, swimsuit, hair decorations, finger or toe, etc. caught in the opening of an outlet or cover.

The three basic underlying physical phenomena that govern these hazards are water flow rate through an outlet or cover (the cause of hair entrapment), mechanical concerns (the cause of limb, clothing and jewelry entrapment), and suction or differential pressure (the cause of body entrapment and evisceration). Many of the entrapment mitigation provisions previously incorporated into safety codes do not protect against all three phenomena, and therefore do not protect against all five forms of entrapment. For example, a child can get a limb mechanically trapped in an exposed pipe or sump if the cover is missing or broken even if there is no water circulation or pressure.

Mitigation

Although there are a variety of standards aimed at specific components such as suction outlet (drain) covers and safety vacuum release system (SVRS) devices, these can only address one or two of the possible pool and spa entrapment hazards. ANSI/APSP-7 incorporates performance-based criteria for each of the five hazards, allowing national, state and local authorities to prescribe clear, effective mitigation provisions for use by designers, builders and safety inspectors.

First, it includes an option for pools and spas to be built without a main drain. There is a popular misconception that proper circulation requires floor outlets, but fluid dynamics analysis demonstrates that water flow is dominated by inlet jets rather than outlets.

Second, all submerged outlets of all sizes are required to be protected by approved covers. No other device can provide protection against all five recognized forms of entrapment, and none of the recent entrapment tragedies would have occurred if approved covers had been in place at the time. ANSI/APSP-7 is the first document to call for approved covers on all submerged outlets, and is the first to require that a pool or spa not be used when any cover is broken or missing.

Third, the standard provides for either multiple outlets spaced at least 3 feet apart or a single outlet that cannot be blocked by even the largest bather. A review of all reported incidents and communication with code officials across the country reveals not a single reported entrapment injury when properly spaced multiple outlets with appropriate covers were in place.

Fourth, ANSI/APSP-7 is the first standard that limits flow rate or water velocity. This means lower suction force, which helps prevent hair entrapment and limits the differential pressure if one of multiple outlets is blocked.

Finally, where a single outlet is present, the standard calls for use of an SVRS, vent line or any other method that complies with the 2002 edition of ANSI/ASME A112.19.17, *Manufactured Safety Vacuum Release Systems for Residential and Commercial Swimming Pool, Spas, Hot Tub and Wading Pool Suction Systems*. This requirement

is the result of testing which shows that an SVRS may only activate when there is blockage of the sole source of suction. Hence, there is no technical merit in mandating the use of SVRS devices where dual suction outlets comply with ANSI/APSP-7. SVRS devices also cannot protect against evisceration, limb, hair or mechanical entrapment. For reference, see "Association of Pool and Spa Professionals Technical Committee Report on Suction Outlet Safety and the Effectiveness of ANSI/APSP-7," available from the APSP website at *http://apsp.org/54/index.aspx*.

For existing single-outlet installations, ANSI/APSP-7 allows a single outlet if there is an equalizer line piped through the second port of a skimmer with an ASME-compliant cover, an ASME-compliant venturi debris removal system or an ASME-compliant channel outlet at least 3 inches wide by 31 inches long. If none of these is present, then an entrapment hazard exists and one of the following remedies must be provided:

- installation of an additional ASME/ANSI A112.19.8 compliant outlet;
- conversion of a suction outlet to an inlet, changing pipe and flow;
- conversion to a gravity flow system;
- installation of an engineered vent system;
- installation and testing of a manufactured SVRS; or
- permanent disablement of the single outlet by filling it with concrete or a glue-in plug, reversal of the flow, or disconnection from the circulation system.

Conclusion

ANSI/APSP-7 is the most comprehensive performance standard for the prevention of pool and spa entrapment. Recently adopted by the State of Florida and currently under review in a number of other major jurisdictions, it not only provides designers, builders and homeowners a range of options for the prevention of pool and spa entrapment, but leaves the door open for new technologies such as automatic pump/motor shut-off systems.

For more information, visit the APSP website at *http://apsp.org*. ◆

SHAJEE SIDDIQUI *is Director of Product Safety and Compliance for Jandy Pool Products, Inc., and currently serves as ANSI/APSP-7 Suction Entrapment Avoidance Standard Writing Committee Chairman.*

Pool and Spa Safety Act Signed into Law

The Virginia Graeme Baker Pool and Spa Safety Act was signed into law by President Bush on December 19, 2007, as part of H.R. 6, an omnibus energy bill. The legislation establishes a grant program for the states, to be administered by the U.S. Consumer Product Safety Commission. To be eligible, states would be required to enact laws adhering to the safety guidelines in the new federal law. Entrapment prevention and protective barriers around pools, spas and hot tubs are addressed along with safety education. The entrapment guidelines are consistent with ANSI/APSP-7.

Although the new law primarily relies on state action, several provisions are federally mandated. For example, after December of this year it will be unlawful to manufacture or market residential drain covers that do not conform with ANSI/American Society of Mechanical Engineers A112.19.8, *Suction Fittings for Use in Swimming Pools, Wading Pools, Spas and Hot Tubs*, and all public pools must be retrofitted with appropriate anti-entrapment drain covers. The entrapment guidelines also call for the use of several enumerated devices, including a safety vacuum release system or vent line, on installations that have one single main drain other than an unblockable drain. Installations with more than one drain or no drains, are exempted from these requirements.

With regard to barriers, the new law calls for the enclosure of all residential pools and spas by barriers to entry that will effectively prevent small children from gaining unsupervised and unfettered access to the pool or spa. ◆