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GUIDANCE FOR RDP CERTIFICATION OF FIELD-FABRICATED SUCTION OUTLET FITTING ASSEMBLIES

Engineering guidance for Registered Design Professional (RDP) SOFAs under ANSI/APSP/ICC-16 2017 and ANSI/PHTA/ICC-7 2020

Introduction – Effective 24 NOVEMBER 2020 (per ANSI/APSP-16-2017)

ANSI/APSP/ICC-16-2017 is the American National Standard for Suction Outlet Fitting Assemblies (SOFA) for use in pools, spas, and hot tubs. It establishes the design, material, testing, certification, installation, instruction, and marking requirements for submerged pool suction outlets, commonly called main drain covers. The standard uses the broader term Suction Outlet Fitting Assembly (SOFA) to designate any submerged suction outlet (main drain) incorporated into an aquatic facility hydraulic circulation system.

The standard addresses the following for compliant Suction Outlet Fitting Assemblies (SOFAs):

- Certified allowable flow rates
- Structural and physical testing
- Material and ultraviolet durability
- Hair-entrapment testing
- Body-entrapment testing
- Finger- and limb-entrapment testing
- Fasteners and attachment methods
- Product markings and installation instructions
- Manufactured assemblies and certain field-fabricated suction outlet configurations

The basic purpose of ANSI/APSP/ICC-16-2017 is to ensure that submerged suction outlets are designed and installed to reduce the risk of suction entrapment and remain secure throughout their stated service life.

Introduction (cont.)

The U.S. Consumer Product Safety Commission incorporated applicable provisions of APSP-16 as the successor drain-cover standard under the original 2008 Virginia Graeme Baker Pool and Spa Safety Act. Drain-cover products certified on or after May 24, 2021 are required to comply with the 2017 standard as incorporated federally. **The current published version is ANSI/APSP/ICC-16 2017 (PA 2021) which is the 2017 standard with the Provisional Amendment approved March 19, 2021.**

Manufactured SOFA's must be Tested to Strict Standards by an ISO 17025 Certified Lab (§1.3.2.1) to be compliant with all Federal Regulations, provisions including; suction entrapment, hair entrapment, finger entrapment, and UV durability.

The SOFA Manufacturer must provide all required Documentation in Compliance with ALL Standards and Testing Requirements.

Field-Built Sumps are required to be Designed and Certified by a Registered Design Professional (RDP) that is Registered or Licensed in all jurisdictions with oversight of the pool construction. (§1.3.6, §1.3.2.2).

For field-built sumps, certifying a SOFA as a Registered Design Professional (RDP) means taking professional responsibility for the site-specific design, hydraulic rating, physical configuration, applicable structural and entrapment criteria, installation requirements, documentation, and confirmation of the constructed installation of the complete suction outlet fitting assembly.

Introduction (cont.)

The RDP must be responsible for, and provide each and all of the following:

- Flow rate and water velocity compliant with all Federal Safety Regulations; field-built sumps are limited to 1.5 ft/s through the unblocked open area (§3.9.2)
- Compliant Engineering Plans and a Written Certification Report to the pool owner (§3.6.1, §3.9.4)
- Compliant Installation, Maintenance, and Winterizing Instructions (§3.4)
- Supervision of Installation of each Field Built Sump (§9.2.1)
- A compliant General Certificate of Compliance (§1.3.2.3)
- The Service Life of the Sump (§3.1.1, §3.4.3)
- Ensure protrusion, sharp edge, fastener, serviceability, and conductivity standards are all met - (§3.1.2, §3.1.3, §3.3.1)
- Documentation for the Part Number (§3.2.1)
- Documentation of Suction Entrapment Compliance (§6)
- Grates Compliant with and Certified to all physical requirements and all finger entrapment requirements (§4, §7)
- All Product Marking (§8)

- **Field-built sumps are not required to be in compliance with hair entrapment standards; therefore, a field-built sump may pose a RISK for hair entrapment (§5).**

Acknowledgement

The Council for the Model Aquatic Health Code would like to acknowledge the hard work and dedication of the subject matter experts at **Councilman-Hunsaker** who created the content of this document. We give our heartfelt thanks to them for allowing us to publish this guidance document.

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1. Purpose and scope

This guidance is intended for engineers and other Registered Design Professionals who design or certify fieldfabricated suction outlet fitting assemblies for swimming pools, spas, water features, and aquatic recreation facilities. It organizes the responsibilities assigned to the RDP by ANSI/APSP/ICC-16 2017 and coordinates those responsibilities with the system-level suction-entrapment provisions of ANSI/PHTA/ICC-7 2020.

The guidance is focused on RDP SOFAs - the term used by ANSI/APSP/ICC-16 2017 for the type of outlet that predecessor standards called a field-fabricated outlet. It is not a generic checklist for manufactured SOFAs, and it should not be used to convert a field-built sump beneath a manufactured cover into an RDP SOFA unless the complete assembly is being designed and certified as an RDP SOFA under the standard.

1.1 Terminology that matters

- RDP SOFA: a site-specific SOFA designed and certified by a Registered Design Professional and custommade for a specific pool.
- Registered Design Professional: an individual registered or licensed to practice the applicable design profession under the laws of the state or jurisdiction where the project is constructed.
- SOFA: the complete suction outlet fitting assembly, including the cover/grate and all components used to connect it to the finished pool surface and to the individual suction system.
- Field-built sump: a sump formed or fabricated as part of the pool construction rather than supplied as a manufactured sump by the cover/grate manufacturer.
- Unblockable: a SOFA configuration that cannot be completely shadowed by the prescribed 18 in. x 23 in. body-blocking element and that satisfies the applicable flow/force criteria.

Key point: An RDP certification applies to the complete, site-specific SOFA configuration - not merely to a grate, a sump, or a hydraulic calculation in isolation.

2. Core professional responsibility

ANSI/APSP/ICC-16 requires RDP SOFAs to be designed, installed, and certified in conformance with all applicable requirements of the standard by a properly credentialed RDP. The standard also prohibits certification where an RDP SOFA has not been evaluated to all applicable provisions or fails an applicable requirement.

Section 3.9.4 is the central organizing provision for the RDP certification package. It requires site-specific plans acceptable to the AHJ and a written report addressed to the pool owner. The plans and report must fully address the considerations used during certification, all applicable listed sections of the standard, and features particular to the specific site.

Professional responsibility extends through the installed condition. ANSI/PHTA/ICC-7 defines a certified RDP SOFA as one that is designed and certified and whose installation is confirmed by a Registered Design Professional.

3. Design responsibilities

3.1 Use an unblockable sump configuration

RDP SOFAs are limited by ANSI/APSP/ICC-16 to designs using sumps that qualify as unblockable. The RDP
should document the geometry used to establish that the sump/cover configuration cannot be completely
shadowed by the prescribed body-blocking element.

3.2 Define the complete certified configuration

The RDP should define every feature that materially affects the certification. Depending on the design, this will typically include the cover/grate, frame, supports, fasteners and receptacles, sump geometry, suction pipe opening size and orientation, pipe location, mounting orientation, pool surface interface, materials, service access, and any site-specific structural or hydraulic features.

Differences in mounting orientation, suction pipe opening size, or suction pipe opening orientation can constitute different SOFA configurations under the standard. The certification documentation should therefore clearly identify the exact configuration being certified.

3.3 Establish the maximum allowable flow rating

The RDP determines the RDP SOFA flow rating under Section 3.9. For body entrapment, the RDP may use the Section 6 body-entrapment test or the calculation method in Section 3.9.1. The calculation method considers the portion of cover/grate open area that can be shadowed by the body-blocking element, the remaining unblocked area, the flow coefficient of the cover/grate, the prescribed entrapping force, and water density.

- Document all geometry and areas used in the calculation.
- Document the basis of the cover/grate flow coefficient, including test data, representative data, calculation, or other permitted demonstration.
- State the resulting maximum allowable flow in the units needed for the certification and project documentation.
- If a lower design rating is intentionally assigned, state the lower rating and use it consistently in all system checks, plans, instructions, and markings.

3. Design responsibilities (cont.)

3.4 Enforce the 1.5 ft/s velocity limit

In addition to the body-entrapment flow-rating method, Section 3.9.2 limits RDP SOFAs to 1.5 ft/s through any remaining cover/grate aperture not shadowed by the body-blocking element, unless the RDP assigns a lower flow rating. The certified rating must satisfy the more restrictive applicable criterion.

3.5 Design the sump to control flow

Section 3.9.3 requires a sump below or behind the cover/grate, designed by the RDP, and documented to control flow through the open area so the velocity limit is not exceeded. The RDP should establish the controlling sump geometry and flow-path characteristics in the engineering documents rather than leave those features to field discretion.

4. Physical, structural, and entrapment requirements

RDP certification is not solely hydraulic. Section 3.9.4 requires the plans and report to address applicable physical-design, structural-test, fastener, and finger/limb requirements.

Area	RDP certification responsibility
Service life	State installed service life in years for each SOFA component.
Protrusion	Limit installed protrusion to the standard's maximum.
Sharp edges	Eliminate bather-accessible sharp edges.
Accessible openings	Demonstrate compliance with Section 7 finger and limb requirements.
Fasteners	Address permissible fastener types, corrosion resistance, removability, toolrequired removal, receptacle integrity, and serviceability.
Service access	Do not use attachment methods that prevent access to components requiring periodic service.
Metal components	Provide compliant bonding means where the standard makes bonding applicable.
Physical testing	Address Sections 4.2 through 4.8 and 4.10 as applicable, including UV, load/deformation, point load, shear, differential pressure/impact, pull load, and threaded-fastener requirements.

4.1 Finger and limb entrapment

Section 7 applies to all SOFA types. The RDP must evaluate the actual assembled geometry, including openings through the grate and openings created at interfaces with frames, supports, or the finished pool surface. The standard uses an articulated probe and specific criteria for small and large apertures.

4.2 Hair entrapment - important scope distinction

Section 3.9.4 does not list Section 5 hair-entrapment testing among the sections that the RDP certification report must address, and Section 6.1.1.1 permits RDP SOFAs to be certified under Section 3.9 or Section 6. Accordingly, this guidance does not treat the manufactured-SOFA Section 5 hair test as a general RDP-SOFA certification requirement. The RDP should nevertheless review the complete standard and any site-specific conditions before concluding that a test provision is not applicable.

5. Suction-system integration under ANSI/PHTA/ICC-7

The SOFA certification cannot be separated from the actual suction-system operating envelope. ANSI/APSP/ICC-16 requires the SOFA or combination of SOFAs to provide an individual suction-system flow rating greater than the pumping system's maximum system flow rate. ANSI/PHTA/ICC-7 provides the system-level methodology for determining that maximum flow.

- Determine the maximum system flow rate using the applicable PHTA-7 method and control-system type.
- For secured-control public-pool systems, evaluate pumps at highest operating speed and the lowest operating system resistance defined by the RDP.
- Do not credit skimmers, gutters, or overflow systems as available relief when the standard requires evaluation of all possible pump flow through the submerged suction system.
- Ensure the installed SOFA system flow rating is equal to or greater than the maximum system flow rate.
- After construction, verify the calculated maximum flow using the prescribed TDH/pump-curve method or an appropriately installed flow meter.

Commissioning is part of the safety case: the design calculation establishes the expected operating envelope; field verification confirms that the constructed pumping system does not exceed the certified SOFA system rating.

6. Required engineering and certification documentation

6.1 Engineering plans

The RDP must prepare plans acceptable to the AHJ for the specific pool. The plans should clearly define every dimension, material, component, orientation, support, fastener, flow limitation, and installation condition on which certification depends. Where a tolerance could affect compliance, the tolerance should be stated.

6.2 Written certification report to the pool owner

The RDP must provide a written report addressed to the pool owner. The report should identify the exact SOFA and project, state the certified flow rating and service life, summarize the hydraulic and physical compliance basis, identify supporting calculations or test data, document the installation-verification basis, and state operational or maintenance limitations.

Report element	Minimum content
Identification	Project, pool, SOFA location, RDP, date, drawing/revision references.
Configuration	Cover/grate, sump, frame, supports, fasteners, pipe opening, orientation, poolsurface interface.
Unblockable basis	Geometry/body-blocking-element evaluation establishing the required classification.
Flow rating	Section 3.9 calculation or Section 6 test basis and final certified flow rating.
Velocity	Verification of the 1.5 ft/s limit through remaining unshadowed aperture area.
Flow distribution	Documented sump design and flow-path basis.
Physical compliance	Applicable Sections 3.1, 4.2-4.8, 4.10, and Section 7 compliance basis.
Service life	Installed life in years for each component and replacement basis.
System coordination	Maximum system flow and comparison to installed SOFA system flow rating.
Installation	Supervision/confirmation method or installation instructions, plus as-built verification.
Marking/signage	Required markings or permanent equipment-area sign and location.
Owner instructions	Maintenance, service, winterization where applicable, and required safety statements.
Certificates/records	Applicable GCC information and supporting records identified by the standard.
Site-specific issues	Any other condition particular to the pool that affects certification.

7. Installation and field verification

The RDP has two installation paths under Section 9.2.1. If the RDP certifies and supervises installation, separate installation instructions are not required. If the RDP does not supervise installation, the RDP must provide installation instructions applicable to the specific SOFA and incorporating the applicable information required by the standard.

- Verify that the field-built sump, grate, supports, fasteners, pipe opening, orientation, and surrounding pool construction match the certified plans.
- Document deviations before acceptance. A material change to the SOFA structure or flow path requires evaluation and, where applicable, certification of the revised configuration.
- Do not issue final certification solely from intended construction documents when the installed condition has not been confirmed.
- Maintain a field record sufficient to demonstrate what was observed, measured, or otherwise verified.

8. Owner-facing information and life-cycle responsibilities

8.1 Markings or permanent sign

The RDP must either provide the applicable SOFA markings and installation-information label or provide equivalent information on a permanently mounted sign adjacent to the circulation pump(s). If posting adjacent to the pump is not feasible, the sign may be located in the equipment area if it identifies the pump(s) to which the SOFA(s) are connected.

8.2 Maintenance and service instructions

RDPs responsible for a product certified to the standard must provide applicable Section 3.4 maintenance information. This includes service-life replacement, restrictions on unauthorized modification, inspection for damage or tampering, reattachment of loose components, cleaning of fastener receptacles, assembly alignment, fastener practices, integrity evaluation, and repair/removal-from-service criteria.

8.3 Winterization

Where the pool is in a location requiring winterization, the RDP must provide instructions for winterizing the RDP SOFA.

8.4 Safety instructions

The certification package must address the safety-instruction requirements of Sections 9.6 and 9.7, including re-evaluation following flow-increasing system modifications and removal from service when required SOFA components are missing, broken, cracked, or loose.

9. Recommended engineering workflow

1. Confirm RDP licensure/registration for the project jurisdiction and identify the AHJ requirements.
2. Define the suction system, pumps, maximum operating conditions, and SOFA location(s).
3. Develop a site-specific unblockable SOFA configuration and identify all components and interfaces.
4. Complete the Section 3.9 body-entrapment flow-rating evaluation and the 1.5 ft/s velocity check.
5. Document sump geometry and the basis for flow distribution through the unblocked open area.
6. Address applicable physical design, structural, fastener, bonding, and finger/limb requirements.
7. Coordinate the SOFA system rating with the maximum system flow under ANSI/PHTA/ICC-7.
8. Prepare sealed/site-specific plans acceptable to the AHJ and the written certification report.
9. Provide installation instructions unless the RDP will supervise the installation.
10. Provide required markings/signage, service-life information, maintenance, winterization, and safety instructions.
11. Observe/confirm construction of the installed SOFA and resolve deviations from the certified design.
12. Verify the completed system maximum flow by the applicable PHTA-7 commissioning method.
13. Issue final certification only after the installed condition and operating envelope are confirmed.
14. Retain the certification record, calculations, supporting test data, field verification documentation, and owner deliverables.

10. Recommended minimum deliverable set

- Sealed site-specific RDP SOFA engineering drawings.
- RDP SOFA hydraulic calculation or applicable Section 6 test documentation.
- Physical/structural/fastener/finger-limb compliance documentation applicable to the certified assembly.
- Maximum suction-system flow calculation and post-construction verification record.
- Written RDP certification report addressed to the pool owner.
- Installation instructions when installation is not supervised by the certifying RDP.
- Field observation/installation-confirmation record.
- Permanent marking/label or equipment-area signage information.
- Owner maintenance, service, winterization (where applicable), and safety instructions.
- Applicable certificate and recordkeeping information required by Section 9.3 and current law.

11. Practice cautions

Do not certify the grate alone. The SOFA is the complete assembly and the certification is site-specific.

Do not use the 1.5 ft/s criterion as the only certification test. It is one hydraulic limit within a broader certification framework.

Do not treat a generic field-built sump under a manufactured cover as automatically acceptable. Manufactured SOFA installations must conform to the manufacturer's certified sump/configuration requirements unless the complete assembly is being designed and certified as an RDP SOFA.

Do not assume the design-stage maximum flow is the final answer. ANSI/PHTA/ICC-7 requires postconstruction verification of maximum system flow.

Do not issue a final certification without confirming the construction and installation against the certified design.

12. Federal, state, and local applicability

ANSI/APSP/ICC-16 notes that certain provisions of the 2017 standard extend beyond the CPSC's authority under the Virginia Graeme Baker Pool and Spa Safety Act and may be voluntary at the federal level unless adopted by state or local law. This distinction does not change the content of a representation that an RDP SOFA conforms to ANSI/APSP/ICC-16 2017 as a complete standard. Engineers should determine the applicable federal, state, local, AHJ, contractual, and professional-licensure requirements for each project.

13. Professional practice conclusion

RDP SOFA certification should be treated as a complete professional-engineering safety certification process. The RDP is responsible for establishing the site-specific certified configuration, hydraulic rating, applicable physical and entrapment compliance, installation requirements, documentation, owner information, and confirmation of the as-installed condition. The certification is not complete until the actual installation and the system operating envelope have been reconciled with the certified design.

A concise statement of scope: The RDP designs and certifies the complete site-specific SOFA, establishes its allowable flow and safety criteria, defines how it must be constructed and maintained, confirms the installed condition, and documents that the assembly and suction system operate within the certified limits.

Works Cited

- **ANSI/APSP/ICC-16 2017.** American National Standard for Suction Outlet Fitting Assemblies (SOFA) for Use in Pools, Spas, and Hot Tubs. Approved August 18, 2017.

- **ANSI/PHTA/ICC-7 2020.** American National Standard for Suction Entrapment Avoidance in Swimming Pools, Wading Pools, Spas, Hot Tubs, and Catch Basins. Approved November 19, 2020.

Key ANSI/APSP/ICC-16 sections discussed: 1.2.5, 1.3, 3.1, 3.3-3.6, 3.9, 4.2-4.8, 4.10, 6, 7, 8.5, and 9.2-9.7. Key ANSI/PHTA/ICC-7 topics discussed: RDP SOFA certification, maximum system flow, field-built sumps, and post-construction flow verification.

This guidance summarizes and organizes the cited standards for engineering practice. It does not replace the standards, applicable law, or requirements of the Authority Having Jurisdiction (AHJ).