APSP 2013

Workmanship Guidelines and Practices

For Residential Inground Swimming Pools and Spas

APSP

The Association of Pool & Spa Professionals®

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This document was prepared under the auspices of the Builders Council, and reviewed by the Technical Committee, of the Association of Pool & Spa Professionals, for the guidance of the swimming pool/spa industry.

The guidelines in this document supplement the following standards:

ANSI/APSP-3 1999 Standard for Permanently Installed Residential Spas

ANSI/APSP/ICC-5 2011 Standard for Residential Inground Swimming Pools

Other design and installation requirements are listed in the ANSI/APSP standards and publications listed below.

ANSI/APSP-1 2003 Standard for Public Swimming Pools

ANSI/APSP-2 1999 Standard for Public Spas

ANSI/APSP/ICC-4 a 2013 Standard for Aboveground/Onground Residential Swimming Pools

ANSI/APSP/ICC-6 2013 Standard for Residential Portable Spas and Swim Spas

ANSI/APSP-7 2013 Standard for Suction Entrapment Avoidance in Swimming Pools, Wading Pools, Spas, Hot Tubs, and Catch Basins

ANSI/APSP/ICC-8 2005 (R2013) Model Barrier Code for Residential Swimming Pools, Spas and Hot Tubs

ANSI/APSP-9 Standard for Aquatic Recreation Facilities (in progress)

ANSI/APSP-11 2009 Standard for Water Quality in Public Pools and Spas

ANSI/APSP/ICC-14 2011 Standard for Portable Electric Spa Energy Efficiency

ANSI/APSP/ICC-15-a 2013 Standard for Residential Pool and Spa Energy Efficiency

ANSI/APSP-16 2011 Suction Fittings for Use in Swimming Pools, Wading Pools, Spas, and Hot Tubs

APSP 2013 Workmanship Standards for Swimming Pools and Spas

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APSP Workmanship Guidelines and Practices for Residential Inground Swimming Pools and Spas

1 Scope and purpose

1.1 These workmanship guidelines are for dispute resolution for the construction, installation, remodeling, renovation, and warranty repair of inground residential swimming pools and permanently installed spas as required under the contract covering same. The requirements in this document supplement and do not supersede the design and installation requirements of *ANSI/APSP/ICC-5 Standard for Residential Inground Swimming Pools* and *ANSI/APSP-3 Standard for Permanently Installed Residential Spas* in effect at the time of installation. The goal of this document is to provide guidance to city, county, and state agencies having jurisdiction over such disputes.

1.2 The quality of materials or equipment is not covered by this document. Only the impact of the contractor's, installer's, or tradesman's work in relation to the finished product is within the scope of this document.

1.3 Workmanship guidelines within this document may vary due to certain features, designs, and unique regional conditions (such as expansive soil, groundwater conditions, temperature, and waterfront locations (bog and clay), which may require technical input by a professional engineer or architect.

1.4 The structural, circulation system, plumbing, and electrical work shall be consistent with codes in effect within the jurisdiction having authority at the time of installation.

1.5 The builder is responsible to the owner only for those guidelines as they apply to items included in the work as defined herein. However, the builder shall advise the owner in writing of any other deficiencies or unsafe conditions.

1.6 The owner shall promptly notify the builder upon the discovery of any deficiencies falling within these guidelines. Failure to do so may transfer the burden for corrective action from the builder to the owner should such delay in notification be shown to further adversely affect the work.

1.6.1 Following the receipt of a written workmanship complaint, the builder shall respond to the consumer within 14 days, and shall have the right to schedule and promptly perform any remedial work.

1.6.2 If there is a valid complaint that there is a deficiency in the quality of workmanship as defined in this document, the builder has the responsibility to correct the deficiency within a mutually agreed upon time. Unless the contract documents state otherwise, the builder's responsibility within the scope of this document is limited to the action called for herein in response to the owner's complaint given to the builder within the periods specified. The owner shall not impede the builder's right of access to the work site to effect repairs.

1.7 Warranty

1.7.1 Should a specific warranty time period not be stated, then it is intended that for that item a time period of 12 months following substantial completion shall apply.

1.7.2 Warranty time periods shall not be cumulative and shall commence on the date of substantial completion unless otherwise specified.

1.8 Exclusions

- Any defects in or defects caused by materials or work supplied by others;
- Normal wear and tear or normal deterioration;
- Loss or damage not caused by a defect in the construction of the pool/spa by the builder or his employees, agents, or subcontractors, but resulting from accidents or acts of God including but not limited to the following: fire, explosion, smoke, water escape, changes that are not reasonably foreseeable in the level of the underground water table, wind storm, hail, lightning, falling trees, aircraft, vehicles, flood, and earthquake;
- Damage caused by the lack of proper owner maintenance. Such damage may be caused by improper water chemistry, the type and location of existing or owner-installed trees and shrubbery or by the owner failing to maintain positive site drainage away from the work. Excessive entrance of water around the work, which includes not only the pool, itself, but the decking surrounding the pool can cause soil movement and damage. Such damage caused by the owner's changing the grade or not properly maintaining drainage away from the work will not be considered as an eligible claim;
- Damage created by the owner's lack of care in maintaining the water quality and cleaning the pool or spa properly. This includes damage to the pool finish by improper water chemistry or stains to the pool or deck created by the owner's lack of cleaning.

- Any damage to the extent that it is caused or made worse by the following:
  - negligence, improper maintenance, or improper operation by anyone other than the builder;
  - failure of anyone other than the builder to comply with the warranty requirements of manufacturers of appliances, equipment, or fixtures;
  - failure to give notice to the builder of any defect within the time period specified;
  - changes of the grading of the ground by anyone other than the builder;
  - operation of any pool or spa water at temperatures over 104 °F *(40 °C);*
  - changes of any equipment, additions, or deletions by anyone other than the builder.

1.9 A variety of construction practices may be used to obtain these acceptable levels of workmanship. APSP sets these guidelines but cannot ensure conformance to these guidelines in as much as they are voluntary.

1.10 Definitions

builder: The contractor and his employees, agents, or subcontractors, as evidenced in the written contract covering the work.

owner: The purchaser, his agents, or assignees.

osmotic blistering: Small (pea to dime size) liquid-filled bumps that appear on gelcoat surface, or larger (fist size or greater) liquid-filled bumps that can form deeper in the fiberglass laminate structure. Blistering results from water interaction with certain water soluble contaminants found in improperly prepared fiberglass structures or resins.

substantial completion: The date and time when the pool is filled with water and all equipment is in operation.

total dissolved solids (TDS): The measure of the total amount of dissolved matter in water.

work: Those items covered in the contract documents and any amendments thereto.

workmanship: Quality of finished product.

2 Structure

2.1 Performance standard — The pool or spa structure shall be watertight and engineered to withstand anticipated loads and stresses and shall be installed to meet or exceed the local structural requirements. Pool should not leak more than ¼ in. *(6 mm)* per day. Plaster shall be sufficiently thick to hold water (watertight). Water loss over ¼ in. *(6 mm)* per day may be considered normal if any of the following factors are present: exposure to wind, excess evaporation, pool usage, pool and/or spa is heated, waterfalls, or water features that are part of the pool water circulation.

2.1.1 Possible deficiency. Will not hold water.

2.1.2 Builder's responsibility. The builder shall take whatever corrective measures necessary to ensure the structure is watertight.

2.1.3 Owner's responsibility. Keep pool filled to the proper level at all times except for short maintenance periods designated by the builder.

2.2 Performance standard — Out-of-level one-piece fiberglass and vinyl-lined pools/spas. For one-piece fiberglass and vinyl-liner pools/spas, the distance between the actual waterline and the uppermost surface of the structure shall have a tolerance of ±¼ in. *(6 mm)*.

2.2.1 Possible deficiency. Pool/spa installed out-of-level.

2.2.2 Builder's responsibility. The builder shall re-level the structure, re-level the tile, coping, or any combination of these.

2.2.3 Owner's responsibility. After initial filling of the pool, the owner shall notify the builder that the pool is out-of-level.

2.3 Performance standard — Out-of-level concrete pool structure. Structural shell (bond beam) must be within a tolerance of ±1 in. *(25 mm)* before tile application.

2.3.1 Possible deficiency. If the top of the structural shell or bond beam has been formed and poured or shotcreted out-of-level by 2 in. *(51 mm)* or more.

2.3.2 Builder's responsibility. The builder is responsible to lower a high portion of the structure or to raise a low area of the structure in an acceptable structural manner.

2.3.3 Owner's responsibility. None.

2.4 Performance standard — Cracks in concrete shells prior to plaster. Concrete shell shall be free of structural cracks before plaster is applied.

2.4.1 Possible deficiency. Structural cracks causing a failure to the pool shell.

2.4.2 Builder's responsibility. The builder shall take whatever measures necessary to correct cracks. Repairs shall be performed in a timely manner and with materials that produce structural integrity.

2.4.3 Owner's responsibility. None.

3 Circulation

3.1 Performance standard — Circulation and filtration systems furnished and installed shall meet the design requirements specified by local codes, manufacturer's instructions, and the appropriate ANSI/APSP standards.

3.1.1 Possible deficiency. Water is not clear because circulation and filtration equipment provided do not meet the design requirements specified in the ANSI/APSP standards.

3.1.2 Builder's responsibility. The builder shall take corrective steps to have the circulation and filtration systems comply with the appropriate ANSI/APSP standard. The circulation system furnished and installed shall be covered by a written manufacturer's or builder's warranty. The builder shall ensure delivery of the warranty information to the owner, and provide written instructions covering equipment furnished, and verbal assistance on the owner's water samples.

3.1.3 Owner's responsibility. None.

3.2 Performance standard — All water, gas, and waste lines, including lines to or from outside services, shall be of adequate size and shall be installed in accordance with established trade practices and applicable building codes.

3.2.1 Possible deficiency. Water, gas, and waste lines, including lines to and from outside services, do not fully perform the function intended and/or are not installed in accordance with manufacturer's specifications.

3.2.2 Builder's responsibility. The builder shall take corrective steps so that water, gas, and waste lines meet the performance standard and applicable building codes.

3.2.3 Owner's responsibility. None.

3.3 Performance standards— Inlets, skimmers, main drains, etc., shall be provided and installed in accordance with the appropriate ANSI/APSP design standards.

3.3.1 Possible deficiency. Poor surface skimming or circulation.

3.3.2 Builder's responsibility. The builder shall provide the owner with written instructions for pool operations. The builder shall make necessary repairs.

3.3.3 Owner's responsibility. The owner shall acknowledge and follow instructions provided by the builder.

3.4 Performance standard — Circulation components shall be designed, furnished, and installed to ensure that vacuum in the system will not cause damage to them.

3.4.1 Possible deficiency. Circulation components damaged by system vacuum.

3.4.2 Builder's responsibility. Circulation components shall be installed in a manner that allows access for servicing. The builder shall make necessary repairs and replace any components damaged by system vacuum.

3.4.3 Owner's responsibility.

- Keep suction grates clear of debris.
- Keep all valves in the proper open position.

4 Tile

NOTE: The colors of tile and grout have an almost infinite range of variations due to many factors and causes. These colors, when exposed to the environment of their use, will also change over time at varying rates, for a variety of reasons.

4.1 Performance standard — Out-of-level waterline tile. Tile shall be level with a tolerance of ± ¼ in. *(6 mm)*.

4.1.1 Possible deficiency. Tile out-of-level at waterline.

4.1.2 Builder's responsibility. The builder shall bring tile level within tolerance.

4.1.3 Owner's responsibility. None.

4.2 Performance standard — Level of tile joints. Tile joints shall be straight, level, and plumb.

4.2.1 Possible deficiency. Tile joints are uneven.

4.2.2 Builder's responsibility. The builder shall install tile so as to keep all tile joints level with the preceding tiles, except for minor variances inherent in all mosaic tiles and tiles pre-set on netting. Variances should not be visible from more than 10 ft *(3 m)* away when viewed straight on.

4.2.3 Owner's responsibility. None

4.3 Performance standard — Hairline cracks in grout or tile joints. Hairline cracks in grout or tile joints are commonly due to normal shrinkage. Grout shall not become loose and shall provide a solid watertight bond around tile.

4.3.1 Possible deficiency. Cracks appear in grout, or grout becomes loose.

4.3.2 Builder's responsibility. The builder shall replace loose grout or fill cracks in grout.

4.3.3 Owner's responsibility. The owner must maintain drainage away from pool shell and deck. Water intrusion under deck can cause soil to expand. The expanded soil will move deck up and create loose tile and cracks in grout.

4.4 Performance standard — Tile checks and crazes. Tile may check or craze, but shall not become loose.

4.4.1 Possible deficiency. Tile cracks or becomes loose.

4.4.2 Builder's responsibility. The builder shall replace or re-secure tile that has become loose, unless looseness was caused by forces beyond the builder's control.

4.4.3 Owner's responsibility. The owner shall maintain drainage away from the pool structure and deck to reduce the relative movement of saturated soil, and shall protect and maintain tile and grout from freezing.

4.5 Performance standard — Tile color. Tile has many varying shades and patterns that are acceptable and do not adversely affect the appearance.

4.5.1 Possible deficiency. Tile colors do not match.

4.5.2 Builder's responsibility. The builder shall inform the owner that tile may vary in shade, color, and pattern from the sample selected. The builder shall install tile from the same dye lot.

4.5.3 Owner's responsibility. The owner shall acknowledge that tile may vary in shade, color, and pattern from the sample selected.

4.6 Performance standard — Color of tile grout. Tile grout may be white or colored. Grout may match coping or plaster, or may be of another color. Grout shall be protected against bleeding into other grouts or plaster. Crossover of color is not avoidable, but should be minimized by whoever connects to the existing color.

4.6.1 Possible deficiency. Tile grout does not match coping or plaster, and/or one color bleeds into another.

4.6.2 Builder's responsibility. The builder shall inform the owner of possible bleeding of one mortar dye into another. Excessive crossover shall be corrected by cleaning, repairing, or re-grouting.

4.6.3 Owner's responsibility. The owner shall acknowledge that wet dyed mortar will bleed into adjoining mortars without adversely affecting performance.

4.7 Performance standard — Freezing of tile. In areas of potential freezing temperatures, a frost-proof tile should be installed, but the owner may choose a non-frost-proof tile.

4.7.1 Possible deficiency. Ceramic tile cracks, spalls, or pops off due to freezing.

4.7.2 Builder's responsibility. If the owner requests a tile or grout not offered for installation by the builder, the builder shall advise the homeowner that the selected tile or grout is not warranted against freeze damage.

4.7.3 Owner's responsibility. The owner shall acknowledge that freeze damage can occur to non-frost-proof tile and grout, and shall take responsibility for using it.

4.8 Performance standard — Tile stains and scaling. Tile shall be installed to eliminate excessive bleeding from the back. When pool is substantially complete, the tile shall be free of stains or scale on tile surface.

4.8.1 Possible deficiency. Scale builds up on tile.

4.8.2 Builder's responsibility. The builder shall ensure that tile is clean and free of scale, grout, or mortar build-up at the time of completion. The builder shall take necessary measures to prevent seepage into the pool shell and from behind the tile that weeps through tile grout.

4.8.3 Owner's responsibility. The owner must maintain proper water chemistry and proper drainage around pool and away from deck. Scaling is normally caused by water on the tile surface or penetrating from behind through the grout. Proper chemical balance and drainage behind the structure will help reduce scaling.

5 Coping

NOTE: Coping as defined in this section includes many products, such as tile (glazed and unglazed), pre-cast coping stones, bricks of all types, natural stone, limestone, blue stone, flagstone, fieldstone, boulders, slate, and marble. Coping may be aligned to create the structure's perimeter. Checks in grouted joints of coping sections are commonly due to normal shrinkage, and are not defects in workmanship. A cantilevered deck may be installed on the pool structure for support, eliminating the need for coping.

Color of coping. All colors have an almost infinite range of variations due to many factors and causes. Also, colors, when exposed to the environment of their use, will change over time at varying rates for a variety of reasons.

5.1 Performance standard — All coping shall provide a slip resisting surface and shall not become loose or crack. This does not apply to metal or plastic coping for vinyl-lined pool.

5.1.1 Possible deficiency. Stones pop loose. Coping has slick surface. Coping comes loose, or cracks.

5.1.2 Builder's responsibility. The builder shall install coping sections so they remain whole and firmly in place, and are flush with each other. The builder shall protect coping from deck movement and shall provide the proper expansion joint, which will allow the deck

to move (within reason) independent of the edge treatment, so as not to cause damage. The builder shall reset coping that is loose or cracked.

5.1.3 Owner's responsibility. The owner shall ensure that the excess pool water drainage is away from pool and deck.

5.2 Performance standard — Coping shall have clean cuts and be free of sharp edges.

5.2.1 Possible deficiency. Edges are sharp or abrasive that were not designed as such (i.e., "chiseled" or "rock-faced" coping).

5.2.2 Builder's responsibility. The builder shall inform the owner of the inherent characteristics of the chosen edge treatment. The builder shall grind, power sand, or buff edges to make them acceptable.

5.2.3 Owner's responsibility. The owner shall acknowledge the finish characteristics of the chosen product, and that it may be abrasive and have rough or sharp edges after installation.

5.3 Performance standard — Manufactured products such as tile, coping, brick, and some stone products shall be from the same production run (dye lot).

5.3.1 Possible deficiency. Color variation in newly installed product.

5.3.2 Builder's responsibility. The builder shall inform the owner of product characteristics and require manufacturers to ship job deliveries from the same production run (dye lot) when homogenous coloration is needed. The builder shall inform the owner of possible color and shade variations in all colored products, either dyed or natural. Shade variations are acceptable in natural stone products.

5.3.3 Owner's responsibility. The owner shall acknowledge that color and/or shade variations are normal for this type of product. The owner shall maintain and protect finishes. The owner should keep the area free of items that cause staining.

5.4 Performance standard — Manufactured coping or brick shall be installed to inhibit standing water.

5.4.1 Possible deficiency. Coping stones hold water.

5.4.2 Builder's responsibility. The builder shall install coping with a minimum slope away from the pool of ⅛ inch per foot *(10 mm per m)*. The builder shall properly seal grouts and mortars and shall inform the owner that natural rock will vary in surface finish and thickness, and may possibly hold some water.

5.4.3 Owner's responsibility. The owner shall acknowledge that natural rock will vary in surface finish and thickness, and may possibly hold some water.

5.5 Performance standard — Out-of-level coping. Newly constructed coping shall be installed with a tolerance of ±¼ in. *(6 mm)*.

5.5.1 Possible deficiency. Coping not level.

5.5.2 Builder's responsibility. The builder shall bring the level of the coping within tolerance, and shall replace it if leveling requires it. When doing renovation work with decks staying in place, the edge shall be level. The back edge shall be congruent to the deck as much as possible. The builder shall inform the owner that natural rock will vary in surface finish and thickness.

5.5.3 Owner's responsibility. The owner shall acknowledge that natural rock will vary in height and thickness.

5.6 Performance standard — Brick corners. Brick corners shall have uniform cuts and shall be installed congruent to each other, with a tolerance of ± ⅛ inch *(3 mm)* on either side of the joint.

5.6.1 Possible deficiency. Brick corners have poor or non-uniform cuts inside and out.

5.6.2 Builder's responsibility. The builder shall ensure that brick corners are congruent and level within tolerance.

5.6.3 Owner's responsibility. None.

5.7 Performance standard — Uniformity of grout joints. Variances in width are acceptable in radius joints, i.e., brick installed in a curve or circle. The grout joint from the front to the back may vary.

5.7.1 Possible deficiency. Grout joints not uniform in depth or width.

5.7.2 Builder's responsibility. The builder shall have uniform grout joints (depth or width) in manufactured stones with a tolerance of ± 1/16 in. *(2 mm)*. Grout joints may vary in natural stone and with some brick curves. The builder shall ensure the same application is used for cleaning and tooling methods throughout the job.

Builder shall inform owner that the grout joints will have some variation due to irregularities of the stone, masonry, or brick.

5.7.3 Owner's responsibility. The owner shall acknowledge that the grout joints will have some variation due to irregularities of the stone, masonry, or brick.

5.8 Performance standard — Missing grout. Grout shall provide a solid bond to the coping.

5.8.1 Possible deficiency. Grout comes out.

5.8.2 Builder's responsibility.

5.8.2.1 The builder shall re-grout stone one time with no charge to the owner, in a manner that matches the rest of the job; use sponge or tool struck finish.

5.8.2.2 The builder shall inform the owner to avoid direct water pressure on grout for 48 hours while grout is curing.

5.8.3 Owner's responsibility. The owner shall not use strong acids when cleaning grout.

5.9 Performance standard — Grout shrinkage cracks. Grout shrinkage cracks are normal. Hairline cracks in grouted joints of coping sections are commonly due to normal shrinkage and are not defects of workmanship.

5.9.1 Possible deficiency. Grout has shrinkage cracks.

5.9.2 Builder's responsibility. If grout is loose, flaking, or otherwise compromised, the builder shall fill in grout cracks, one time only, at no charge to the owner.

5.9.3 Owner's responsibility. The owner shall protect the grout from abrasive products.

5.10 Performance standard — Coping stains. Coping shall be free from staining as a result of deck pour.

5.10.1 Possible deficiency. Coping gets stained from deck pour.

5.10.2 Builder's responsibility. The builder shall protect the coping from deck splash. The builder shall remove any splash stains.

5.10.3 Owner's responsibility. None.

5.11 Performance standard — Coping chips. There shall be no chips in the coping larger than ⅜ in. *(10 mm)*.

5.11.1 Possible deficiency. Coping is chipped.

5.11.2 Builder's responsibility. The builder shall repair or replace copings where the chips are larger than ⅜ in. *(10 mm)*.

5.11.3 Owner's responsibility. Protect coping from chipping caused by negligence.

6 Decks — Concrete

6.1 Performance standard — Acceptable standing water. Concrete decks shall be sloped so that standing water shall be no deeper than ⅛ in. *(3 mm)*, 20 minutes after water has stopped being added to the deck. Two stacked U.S. quarters can be used to measure the depth (water should not flow over the quarters).

6.1.1 Possible deficiency. Standing water on deck.

6.1.2 Builder's responsibility. The builder shall revise and/or modify the deck work so as to provide the specified drainage.

6.1.3 Owner's responsibility. None.

6.2 Performance standard — Acceptable cracking. Shrinkage and minor movement cracks will occur in concrete deck work without adversely affecting its serviceability. Horizontal and vertical separations shall not exceed a maximum of 1/16 in. *(2 mm)*. Vertical separations shall not exceed a maximum of ¼ in. *(6 mm)* at the joints.

6.2.1 Possible deficiency. Cracks.

6.2.2 Builder's responsibility. The builder may correct excess vertical separation at designed joints by grinding down of the high side up to ¼ in. *(6 mm)* and may fill the excess horizontal separation at these same joints by the use of a polysulfide sealant. Cracks in other locations in excess of the standard may be cut out and replaced. All materials shall reasonably match the existing texture and color. Slabs may also be repositioned to correct the excess movement.

6.2.3 Owner's responsibility. The owner shall maintain proper drainage away from pool decks.

6.3 Performance standard — Consistent pattern and appearance. Concrete decks, including special finishes and toppings shall have a consistent pattern.

6.3.1 Possible deficiency. Irregular appearance and/or finish.

6.3.2 Builder's responsibility. The builder shall ensure that all portions of the deck are visually consistent with each other. The builder shall repair or replace or re-coat portions of the deck that are not consistent with each other.

6.3.3 Owner's responsibility. None.

6.4 Performance standard — Settling, sub-base preparation. Deck shall be installed on properly prepared sub-base.

6.4.1 Possible deficiency. Deck settles or lifts.

6.4.2 Builder's responsibility. The builder shall repair, or remove and replace deck areas that have settled, provided that the owner has maintained proper drainage.

6.4.3 Owner's responsibility. The owner shall provide equal saturation around the pool. The owner shall avoid water intrusion under the deck from:

- overflowing pool;
- improper drainage;
- irrigation systems;
- water from outside the deck area saturating the soil under the deck.

6.5 Performance standard — Color variation. Concrete decks shall be uniform in color. Finished material shall have a consistent color.

6.5.1 Possible deficiency. Deck is not uniform in color; deck is blotchy, stained, or bleached.

6.5.2 Builder's responsibility. The builder shall use same color in mixes and finishes. The builder may acid wash or chlorine wash or re-stain to bring to a consistent color. These procedures may create a change in color.

6.5.3 Owner's responsibility. The owner shall accept responsibility for variations in color created by the environment, or stains due to spills caused by the owner.

6.6 Performance standard — All deck finishes shall be slip resisting.

6.6.1 Possible deficiency. Slippery deck.

6.6.2 Builder's responsibility. The builder shall install slip resisting materials.

6.6.3 Owner's responsibility.

- The owner shall select slip resisting materials;
- The owner shall maintain a clean algae-free surface.

6.7 Performance standard — Steps and risers shall be consistent. All steps shall have a consistent slope for drainage, be level, and have a consistent riser height. Either the first or last step may vary in height to adjoining decks, but must be within the minimum/maximum height requirements specified in ANSI/APSP standards.

6.7.1 Builder's responsibility. Build steps according to local code or standards of the American Concrete Institute (ACI).

6.7.2 Owner's responsibility. None.

6.8 Performance standard — Spalling shall not occur.

6.8.1 Possible deficiency. Spalling occurs, due to improper finishing of deck surface, improper design mix, surface freezing.

6.8.2 Builder's responsibility. Repair or replace affected areas of deck.

6.8.3 Owner's responsibility. None.

6.9 Performance standard — Crack in cantilever nose is a normal condition.

6.9.1 Possible deficiency. Crack in cantilever nose under white cap at control joint above tile.

6.9.2 Builder's responsibility. None.

6.9.3 Owner's responsibility. None.

6.10 Performance standard — All concrete deck work shall be equivalent to any sample or display of that finish displayed to the owner. In the absence of a display sample, the owner and the builder shall rely upon the standards of quality found in similar work in the area.

6.10.1 Possible deficiency. Irregular appearance and/or finish.

6.10.2 Builder's responsibility. Contractor shall provide at least the consistency of workmanship called for in the standard. Colors shall match as closely as reasonably possible.

6.10.3 Owner's responsibility. None.

7 Decks — Wood

7.1 Performance standard — Decking shall be firm and stable.

7.1.1 Possible deficiency. Decking sags, has excessive springiness or motion when in use, or otherwise provides an unstable structure. Finished product does not match submitted plans.

7.1.2 Builder's responsibility. The builder shall take whatever corrective measures necessary to correct the problem and bring deck into compliance with local codes.

7.1.3 Owner's responsibility. None.

7.2 Performance standard — Deck shall be free of loose, rusty, or protruding fastening devices; splintered, sagging or split boards; loose knotholes; and poorly cut boards.

7.2.1 Possible deficiency. Inferior workmanship such as loose or rusty nails, splintered or split boards, numerous loose knotholes.

7.2.2 Builder's responsibility. The builder shall take whatever corrective measures necessary to correct the problem.

7.2.3 Owner's responsibility. None.

8 Deck Equipment

8.1 Performance standard — Deck equipment, including but not limited to, slides, diving boards, hand rails, ladders, etc. furnished as part of the work, shall be securely anchored, firmly connected, properly bonded and grounded electrically (as per *National Electrical Code* and/or any local, state or city codes) and installed as per manufacturer's instructions in a plumb and level manner.

8.1.1 Possible deficiency. Deck equipment such as slides, diving boards, ladders, etc., installed with the pool or spa is either loose, not level, or not plumb.

8.1.2 Builder's responsibility. The builder shall make the necessary changes and/or corrections to installation of the equipment to comply with standards and manufacturer's instructions.

8.1.3 Owner's responsibility. The owner shall periodically tighten loose nuts and bolts.

8.2 Performance standard — Embedded anchor sockets shall not protrude more than ¼ in. *(6 mm)* above the deck.

8.2.1 Possible deficiency. Anchor sockets protrude more than ¼ in. *(6 mm)* above the deck.

8.2.2 Builder's responsibility. The builder shall re-set all sockets to protect against tripping hazard.

8.2.3 Owner's responsibility. None.

8.3 Performance standard — Deck equipment supplied and installed as part of the work shall be securely anchored, mechanically firm as a unit, and installed in a true, level, and aligned fashion.

8.3.1 Possible deficiency. Deck equipment such as slides, diving boards, and ladders installed with the pool and/or spa are loose, not level, or not plumb.

8.3.2 Builder's responsibility. The builder shall make the necessary changes and/or corrections to installation of the equipment to comply with standards.

8.3.3 Owner's responsibility. The owner shall check and tighten loose nuts and bolts.

9 Electrical

NOTE: Potentially hazardous situations shall be corrected immediately.

9.1 Performance standard — All electrical circuits, controls, etc., shall be supplied and installed to meet the requirements of the *National Electrical Code (NEC)* and applicable electrical codes.

9.1.1 Possible deficiency. Electrical boxes, conduits, disconnects, or equipment not level or plumb. Erratic performance.

9.1.2 Builder's responsibility. The builder shall make necessary repairs.

9.1.3 Owner's responsibility. None.

10 Mechanical

10.1 Performance standard — All equipment supplied shall be covered by manufacturer's warranty provided to the owner, prior to or at the time of, substantial completion of the work.

10.1.1 Possible deficiency. Mechanical and/or electrical equipment supplied and installed does not perform correctly.

10.1.2 Builder's responsibility. The builder shall carry out all manufacturer's equipment warranties for the period of time agreed upon.

10.1.3 Owner's responsibility. None.

10.2 Performance standard — The circulation and mechanical system shall be installed so that the piping is horizontal and vertical wherever possible. The circulation system shall be airtight and watertight to a maximum of 1.5 times the normal operating pressure. The circulation system shall be designed and installed to protect it in all normally anticipated climate conditions.

10.2.1 Possible deficiency. Mechanical equipment not level or plumb. Circulation system not installed or not working to the manufacturer's specifications.

10.2.2 Builder's responsibility. The builder shall make necessary repairs. All piping and circulation equipment subject to freezing shall be capable of being drained or evacuated. In mildly freezing climates, the builder shall design the circulation system so that the owner can protect the components and pipes by circulating the water. Builder shall provide complete written and verbal instructions concerning operations, maintenance and climate protection of the pool/spa to the owner at the time of substantial completion.

10.2.3 Owner's responsibility. Owner shall follow builder's instructions to protect components and pipes. The owner shall acknowledge and follow the builder's instructions concerning the method of climate protection designed into the system.

10.3 Performance standard — All mechanical equipment and related components and piping shall be airtight and watertight in the range of 1.5 times the normal operating pressure. The circulation system shall be designed and installed to protect it in all normally anticipated climate conditions.

10.3.1 Possible deficiency. Water leaks from equipment or piping.

10.3.2 Builder's responsibility. The builder shall correct any leakage to ensure normal operation. Builder shall provide complete written and verbal instructions concerning operations, maintenance and climate protection of the pool/spa to the owner at the time of substantial completion.

10.3.3 Owner's responsibility. The owner shall follow instructions from the builder concerning operations, maintenance and climate protection of the pool/spa and shall be responsible to ensure that said methods are properly performed.

10.4 Performance standard — Contractor shall provide freeze protection for the pipes and equipment as follows:

- In mild freezing climates, the builder shall construct the system so that by circulating the water all components and pipes are protected.
- In moderately severe climates, the piping shall be placed below the freezing line and the equipment placed in a heated area.
- As an alternative for severe climates, all piping and equipment subject to freezing shall be capable of being conveniently drained.

10.4.1 Possible deficiency. Water in pipes or equipment have no freeze protection.

10.4.2 Builder's responsibility. The builder shall instruct the owner of the method of freeze protection designed into the system.

10.4.3 Owner's responsibility. The owner shall ensure said method is properly carried out during or in advance of freezing weather.

10.5 Performance standard — Suction lines to the recirculating pump shall not be stepped down in size on the way to the pump, except at equipment connection. Openings from the suction line into the pool or spa shall be covered by suitable grates or screens to prevent large objects from entering, and to protect against suction entrapment.

10.5.1 Possible deficiency. Clogged suction line.

10.5.2 Builder's responsibility. The builder shall make necessary repairs.

10.5.3 Owner's responsibility. Owner shall never operate the system with broken or missing suction grates.

10.6 Performance standard — Pool/spa pumps shall not require an owner to do more than fill certain components with an open garden hose, seal such opening, operate the necessary valves, and turn the system on.

10.6.1 Possible deficiency. Pump will not prime, due to the following reasons:

- Equipment is set too high above water level.
- There is an air leak on the suction side of the pump.

10.6.2 Builder's responsibility. The builder shall design and install the system so as to accomplish the standard.

10.6.3 Owner's responsibility. Protect the suction side of the system from air leaks.

10.7 Performance standard — Pool/spa mechanical and electrical components shall be installed in a manner that allows normal access for ease of servicing.

10.7.1 Possible deficiency. Difficulty in servicing mechanical and electrical components.

10.7.2 Builder's responsibility. The builder shall make necessary repairs.

10.7.3 Owner's responsibility. None.

11 Solar Heaters

11.1 Performance standard — All solar equipment supplies shall be covered by a written manufacturer's warranty. All warranties shall be made available to the owner prior to sale, and provided to the owner at the time of substantial completion of work.

11.1.1 Possible deficiency. System does not perform as specified. Owner may have purchased an undersized system, or located it in a poor location (for reasons such as overall cost, sight lines, Covenants, Conditions, and Restrictions (CC&R), or homeowners association controls), thus reducing its overall performance.

11.1.2 Builder's responsibility. The builder shall take whatever measures necessary to ensure the specified performance. The builder shall inform the owner that undersized equipment and poor equipment location reduce overall performance.

11.1.3 Owner's responsibility. The owner has the right to purchase undersized systems and to locate them in less-than-ideal locations, thus reducing the overall performance. The owner shall acknowledge that undersized systems and poor placement reduce overall performance.

11.2 Performance standard — All collectors, pipes, conduits, etc. shall be secured and adequately braced. Piping and collectors shall follow imaginary horizontal and vertical lines whenever possible.

11.2.1 Possible deficiency. Irregular appearance.

11.2.2 Builder's responsibility. The builder shall align and secure collectors and piping to conform to manufacturer's specifications and workmanship standards.

11.2.3 Owner's responsibility. None.

11.3 Performance standard — Solar collectors, piping, and related system shall be designed and installed so as to provide freeze protection, in climates subject to freezing conditions.

11.3.1 Possible deficiency. Solar collectors and/or system are damaged by freezing.

11.3.2 Builder's responsibility. The builder shall instruct the owner in the method of freeze protection designed into system.

11.3.3 Owner's responsibility. The owner shall protect panels and pipes before periods of freezing by one of the suggested methods provided by the manufacturer or solar installer.

11.4 Performance standard — Solar pool heating systems installed in areas that freeze, must be equipped with a fail-safe diversion valve allowing collectors to drain. This valve must return to a normal open position during a power failure or equipment malfunction.

11.4.1 Possible deficiency. During a power failure, solar collectors are damaged by freezing.

11.4.2 Builder's responsibility. The builder shall take whatever corrective measures necessary to comply with standards, manufacturer's instructions, and warranty provisions.

11.4.3 Owner's responsibility. In areas prone to freezing, the owner shall protect against freeze damage as early in the season as possible.

11.5 Performance standard — Roof must be protected against water penetration around solar components or tie-downs. Properly tested roof sealant shall be used per manufacturer's recommendations. Installations shall not interfere with the integrity of the existing waterproof membrane.

11.5.1 Possible deficiency. Roof leaks due to improper penetration and/or sealant.

11.5.2 Builder's responsibility. The builder shall take whatever steps necessary to ensure a waterproof penetration of the roof structure for the roof's intended lifetime.

11.5.3 Owner's responsibility. The owner shall not alter, repair, or break the seal of components used to seal the penetrated areas.

11.6 Performance standard — Holes made to penetrate the eaves shall be protected by roof jacks (flashing material) so as to protect the roof membrane.

11.6.1 Possible deficiency. Roof leaks where supply and return piping penetrate the eaves.

11.6.2 Builder's responsibility. The builder shall take whatever steps necessary to comply with this standard.

11.6.3 Owner's responsibility. None.

11.7 Performance standard — All solar collectors shall be installed so as to protect the roof against premature deterioration.

11.7.1 Possible deficiency. The roof, under the solar collectors, is showing signs of deterioration.

11.7.2 Builder's responsibility. The builder shall take whatever steps necessary to correct any such deficiency.

11.7.3 Owner's responsibility. None.

11.8 Performance standard — All piping and connecting fittings shall be watertight. All clamps and connectors shall be installed in a manner that allows expansion and contraction, as per the manufacturer's recommendations.

11.8.1 Possible deficiency. Leaks in solar connections.

11.8.2 Builder's responsibility. The builder shall take whatever steps necessary to correct any such deficiency.

11.8.3 Owner's responsibility. The owner shall not walk on, or put any additional stress on, fittings or connections.

11.9 Performance standard — Pump and piping shall be sized to produce the flow required by manufacturer's minimum flow recommendations for collector size and location.

11.9.1 Possible deficiency. Improper sizing of plumbing or pumps, causing inadequate flow.

11.9.2 Builder's responsibility. The builder shall be responsible for proper sizing of re-circulation pump and circulation piping. Builder shall provide complete written and verbal instructions concerning operations, maintenance and climate protection of the pool/spa to the owner at the time of substantial completion.

11.9.3 Owner's responsibility. The owner shall acknowledge the builder's instructions concerning maintenance, and shall maintain the re-circulation system in a clean and non-restricted condition.

11.10 Performance standard — Solar heating system shall drain when the re-circulation system is shut down.

11.10.1 Possible deficiency. System does not drain when shut down.

11.10.2 Builder's responsibility. The builder shall repair components that are restricting or preventing drainage.

11.10.3 Owner's responsibility. The owner shall check the vacuum release valve per the manufacturer's recommendations.

12 Plaster[1]

Plaster has significant regional variations, such as the raw materials of aggregates and cement, water, construction practices and customs, and weather.

- **Smooth:** Having a texture no rougher than very fine sandpaper (220 grit).
- **Maintainable:** The surface shall not encourage the adherence of algae because of excess roughness, and the surface will be compatible with normal pool water chemical treatment.

The minimum acceptable job site plaster mix or preblended manufacturer's material shall consist of a ratio of 1 part type one Portland cement to 2 parts aggregate by weight. Regional differences and experience may allow for other admixtures.

The material shall be mixed an adequate time to homogenize the aggregate, cement, and any admixtures. Admixtures shall not exceed the manufacturer's recommendations. Calcium chloride shall not exceed 2% of the weight of the cement. Calcium chloride (whether liquid, flake, or granular) shall be fully dissolved in water and added to mixer prior to the addition of any cement.

Surface checking or crazing is inherent to some degree in all cement products. This is a normal occurrence and is not considered a deficiency.

12.1 Performance standard — Plaster thickness. Plaster shall be sufficiently thick to hold water (watertight) and sufficiently thick to hold a smooth, maintainable surface.

12.1.1 Possible deficiency. Concrete shell showing through plaster.

12.1.1.1 Possible causes. When plaster cures, the top surface becomes translucent. If the underlying concrete shell is wavy and the plaster is troweled level, the peaks of the concrete shell may show through the plaster. If the underlying concrete shell is level and the plaster is wavy, the concrete shell may show through in the troughs. Other possible causes include: brown coat bed (slag) not trimmed below perimeter tile, or not trimmed off sides of trim tile. Aggregate (dark specs) showing through plaster shall not be considered a deficiency.

12.1.1.2 Solutions. Builder shall inspect the concrete shell prior to plaster for potential problem areas, and correct. Trim excess brown coat flush to tile edges prior to plastering. Remove plaster from deficient areas, trim down concrete if necessary, and patch repair.

12.1.1.3 Responsibility. Builder, shotcrete installer, or plasterer.

12.1.2 Possible deficiency. Unevenness (highs and lows). Pool light casts shadows at night.

12.1.2.1 Possible causes. Plaster is applied and troweled by hand, and will follow the general contour of the concrete shell. Consequently, slight variations and waves may occur, and these variations will be accentuated if the underlying concrete shell is uneven.

If too short a trowel is used to spread material, unevenness of the finished plaster can occur.

Slight variations to the plaster will be magnified by the water, with the light casting shadows across the plaster surface. This is accentuated if the light is placed in the shallow end or in step risers. Variations in plaster viewed by nighttime illumination shall not be considered poor workmanship. Plaster surfaces shall be properly evaluated under normal daylight conditions.

12.1.2.2 Solutions. The owner should be informed of the possibility of shadows caused by light placement. Concrete shell shall be troweled even and level with adequate coverage. Longer shank trowels shall be used to spread material. Pool lights should be set higher in the walls, and placement in step risers should be avoided if possible. The light lens should be rotated so it does not reflect downward, or a blue lens cover should be installed. A lower wattage bulb can be installed in the light to reduce glare and shadows. As a last resort, excess highs in plaster can be power sanded to reduce unevenness, but this will expose the aggregate in the plaster and may cause color variations, particularly in colored plaster pools.

1. This section is adapted from the 7th edition of the *National Plasterers Council Technical Manual* (2011); National Plasterers Council, 2811D Tamiami Trail, Port Charlotte, FL 33952, 1-866-483-4672.

12.1.2.3 Responsibility — Unevenness (highs and lows). Builder, shotcrete installer, or plasterer.

Whenever plaster is removed from an existing pool prior to replastering (i.e., removal of hollow areas or full plaster removal), there will be areas of varying thickness in the new plaster being applied. This may cause the new plaster to set unevenly, and create slight depressions in the new surface at finishing. Variations in plaster viewed by nighttime illumination shall not be considered poor workmanship. Plaster surfaces shall be properly evaluated under normal daylight conditions.

12.1.3 Possible deficiency. Plaster is uneven around trim tile/feature strip, mosaic, or plumbing fitting.

12.1.3.1 Possible causes. Trim tile/feature strip or mosaic set directly on concrete shell, instead of elevated. Tile set unevenly, pitched on an angle, or set too close to edge of step, bench, or seat. Plumbing line, air bar, in-floor cleaners, or light niche not square coming out of concrete shell.

12.1.3.2 Solutions. Plaster to match trim tile/feature strip, mosaic or plumbing fitting. Plaster will not always be even.

On replastered pools, undercut around fittings to allow a sufficient amount of plaster to be feathered flush to existing fittings.

NOTE: When possible, trim tile should be replaced prior to replastering.

12.1.3.3 Responsibility. Builder, tile setter, plumber, plasterer.

12.1.4 Possible deficiency. Insufficient amount of plaster applied.

12.1.4.1 Possible causes. Insufficient material.

12.1.4.2 Solution. Patch or replaster.

12.1.4.3 Responsibility. Plasterer.

12.1.5 Possible deficiency. Excessive moisture in concrete shell groundwater creating leakers/weepers. The result can be rough plaster or discoloration stain.

12.1.5.1 Possible causes. Excess groundwater, high water table, over-watered landscape, or other ground saturation, (i.e., rain) flowing through concrete shell.

12.1.5.2 Solution. Sand and patch repair if necessary. Stains may not be removable.

12.1.5.3 Responsibility. Pool builder, plasterer, and homeowner, (whoever took responsibility to plaster over weeping shell).

Table 1. Industry-recommended water balance levels

Parameter	Minimum	Ideal	Maximum
pH	7.2	7.4–7.6	7.8
Total alkalinity	60 ppm	80–120 ppm	180 ppm
Calcium hardness–pools	150 ppm	200–400 ppm	1000 ppm
Calcium hardness–spas	100 ppm	150–250 ppm	800 ppm

12.1.6 Possible deficiency. Checking, discoloration, streaking, surface spalling, debris in plaster, washouts, rough finish shadowing, caused by weather (rain, wind, heat cold) or environment (fires, etc.). Plaster only during reasonable conditions of weather and environment.

12.1.6.1 Possible causes. Weather and environment (rain, hail, wind, etc.).

12.1.6.2 Solutions. Sand, patch repair, acid wash, replaster.

12.1.6.3 Responsibility. Builder, owner, and plasterer: whoever took responsibility to proceed with work.

12.2 Performance standard — Etching. Plaster etching may occur.

Etching shall be defined as corrosion or eating away of the surface of the plaster. It is evidenced by pitting or other removal of plaster material.

Etching is caused by a chemical action on the surface side of the plaster, from within the plaster mix, or from mechanical action within the plaster mix or from the shell side of the plaster. Etching may not be visible immediately, but may become visible as it becomes more pronounced.

12.2.1 Possible deficiency. Etching from surface (water) side of plaster.

12.2.1.1 Possible causes.

- aggressive water with low alkalinity, low pH, and low calcium hardness;
- corrosive fill water;
- improper water balance. Etching increases over time (See *Table 1 — Industry-recommended water balance levels);*
- improper application of chemicals or sanitizers. Etching increases over time;
- algae growth into surface of plaster.

12.2.1.2 Solutions

- Sand, patch, or repair affected areas. If affected areas are greater than 10% of the total plaster surface, replaster.

- Chemicals shall be applied regularly and properly as per the chemical manufacturer's instructions. Pool/spa water shall be regularly balanced.

12.2.1.3 Responsibility. Startup company, service company, owner.

12.2.2 Possible deficiency. Etching due to in-mix causes.

12.2.2.1 Possible causes.

- cement and aggregate not sufficiently mixed;
- admixtures not sufficiently mixed;
- excess water in mix;
- impurities and foreign objects in mix (bugs, dirt, leaves, etc.).

12.2.2.2 Solutions. Remove and patch repair affected areas. If affected areas are greater than 10% of the total plaster surface, replaster.

12.2.2.3 Responsibility. Plasterer.

12.2.3 Possible deficiency. Etching due to migration of shell side items (between concrete shell and plaster) or caused by the shell not being properly cleaned prior to plastering.

12.2.3.1 Possible causes. Bleeding through of foreign material left on the concrete shell, such as mastic or silicon. Such oil-based materials will bleed to the surface of the plaster and, over time, cause a softening and etching of the plaster.

12.2.3.2 Solutions. Remove plaster and properly clean affected areas before patching/repairing. If affected areas are greater than 10% of the total plaster surface, replaster. Inspect the concrete shell prior to plastering and correct any problems.

12.2.3.3 Responsibility. Builder, plasterer.

12.3 Performance standard — Surface spalling, skinning, or peeling. The integrity of the plaster surface will remain intact (free from surface spalling, skinning, or peeling).

12.3.1 Possible deficiency. Surface spalling.

12.3.1.1 Possible causes. Improper water chemistry, heat, cold, dehydration, sugar or acidic solutions spilled directly on new plaster.

12.3.1.2 Solutions. Sand the surface, remove bad section of plaster. Patch repair, replaster.

12.3.1.3 Responsibility. If any of the above causes occur after plastering, the responsibility shall be the owner's, unless other responsible parties can be identified. The builder shall not be responsible for surface failure caused by external forces, such as water chemistry, acid wash, heat, accident, and draining the pool and leaving it empty for any period of time without notifying plasterer in advance.

12.3.2 Possible deficiency. Surface spalling.

12.3.2.1 Possible causes. Improper finish, improper mix, remixing or overworking of plaster.

12.3.2.2 Solutions. Sand the surface, remove bad section of plaster. Patch repair, replaster.

12.3.2.3 Responsibility. Plasterer.

12.4 Performance Standard — Scaling/precipitation. Plaster shall not be rough or discolored.

Scaling or **precipitation** shall be defined as: A solid material that is forced out of a solution by some chemical reaction and may settle out or adhere to the pool plaster, fittings, lights, or equipment.

Pool water chemistry should be maintained to minimize scaling or precipitation.

12.4.1 Possible deficiency. Rough plaster caused by calcium scale or calcium carbonate precipitates (plaster dust). Both are generally white in color.

12.4.1.1 Possible causes. Not all calcium deposits are avoidable. Possible causes are improper water chemistry, improper water balance at startup, and bad fill water.

If excess calcium deposition occurs:

- pool water not properly balanced and maintained (pH, total alkalinity, calcium hardness and total dissolved solids);
- new plaster not brush vacuumed and brushed enough;
- chemical fall-out due to fully operating pool being covered too long with a pool cover;
- chemical fall-out due to improperly winterized, covered pool;
- pool water not filtered long enough, pool filter too dirty or improperly sized filter;
- new plaster not brushed enough or filter not run long enough to remove calcium carbonate precipitates (plaster dust).

12.4.1.2 Solutions

- Check source water for possible high calcium contribution. Do not use water too high in hardness for filling freshly plastered pools. After the initial fill, if water high in calcium is used to maintain the water level, use filters or chelation/sequestering agents as necessary;
- Properly clean filter and run for sufficient water turnover time;

- Check water chemistry regularly; check water chemistry daily during high usage;
- Have water tested for hardness and TDS as necessary for local water conditions. Have water tested for TDS and hardness monthly during high usage periods. Refer to **Appendix A** of ANSI/APSP standards;
- Drain and refill pool water when proper chemical levels cannot be maintained;
- For newly plastered pools, brush new plaster several times a day, run filter while water is cloudy, consider usage of a sequestering or clarifying agent;
- Drain and sand off calcium build-up. Do a light acid wash, using a solution of 1× muriatic acid to 4× water, or weaker. Do not use undiluted acid.

12.4.1.3 Responsibility. Not all calcium deposition is avoidable. However, depending on cause, the responsibility is as follows:

- If calcium deposits are caused by water chemistry. **Responsibility:** Person(s) responsible for water balance;
- If calcium deposits are caused by fresh fill water. **Responsibility:** Whoever accepts use of tap water to fill/maintain water level in pool.

12.4.2 Possible deficiency. Rough or discolored plaster caused by metal precipitation or electrolysis.

12.4.2.1 Possible causes. Excess metals in water — usually colored on surface of plaster. In water different metals can cause different color stains, such as copper — gray, green, blue, or any combination; iron and dirt — brown; manganese — gray or black; nickel — gray; chromium — gray or black; and silver — gray or black;

Electrolysis (incompatible piping or over-load of ground circuit), metals in source (fill) water, metals in maintenance chemicals, improper water chemistry, high velocity erosion of metal piping, evaporation (resulting in the concentration of dissolved solids in the pool water).

12.4.2.2 Solutions

- Test the source water for possible contributions. If water high in metals is used, use filters or chelating/sequestering agents as necessary to bind and remove metals;
- Check for electrolysis caused by the joining of dissimilar metals in the plumbing of the pool;
- Check for electrolysis caused by the overloading of the grounding system in the residence (thus putting low-level electrical current in the pool);
- Until the plaster is fully cured, avoid the use of chemicals with significant metal components.

12.4.2.3 Responsibility. Not all metal staining is avoidable. However, depending on the cause, the responsibility is as follows:

- electrolysis: Pipe installer/electrical installer;
- water chemistry: Service company;
- fresh fill water: Whoever accepts use of tap water to fill/maintain water level in pool.

12.5 Performance standard — Roughness. Plaster shall be finished smooth. Smooth shall be defined as having a texture no rougher than very fine sand paper (220 grit).

12.5.1 Possible deficiency. Plaster not finished smoothly due to underlying concrete shell.

12.5.1.1 Possible causes. Plaster dries unevenly because concrete shell was not wetted down or properly cured, or because of gunite flash over rebound.

12.5.1.2 Solutions. Wet concrete shell properly and cure as per shotcrete installer's instructions. Remove all rebound.

12.5.1.3 Responsibility. Shotcrete installer, builder, plasterer.

12.5.2 Possible deficiency. Plaster not finished smoothly due to plaster workmanship.

12.5.2.1 Possible causes.

- Plaster is rough because too few finishers were available to properly trowel the pool.
- Plaster is rough in areas where design features make it hard to reach or trowel the plaster properly with available tools.

12.5.2.2 Solutions. Either sand rough areas underwater, or drain and sand.

12.5.2.3 Responsibility. Plasterer.

12.5.3 Possible deficiency. Roughness due to leakers.

12.5.3.1 Possible causes.

- High water table, excess groundwater, overwatered landscape, or other ground saturation (i.e., from rain). Because the water pressure has been released, plumbing pipes will leak water on the new plaster when they are cut flush with the wall.
- Trim tile holding water on steps and benches.

12.5.3.2 Solutions

- Keep ground as dry as possible. Do not overwater landscaping. Advise homeowner not to water on the day before plastering;
- Sponge and remove water from steps and benches;

- Do not allow excess water to stand in pool shell before plastering.

12.5.3.3 Responsibility. Builder, landscaper, homeowner, plasterer.

12.6 Performance standard — Pop-offs. Plaster layers shall not separate or delaminate from the underlying substrate.

12.6.1 Possible deficiency. Bond failure on new pool.

12.6.1.1 Possible causes.

- concrete shell not properly cured, or improper use of gunite rebound;
- leakers, weepers, groundwater pressure;
- foreign material not properly cleaned off concrete shell prior to plastering.

12.6.1.2 Solutions

- Properly clean concrete shell of all foreign materials (mastic, silicone, tile slurry, etc.);
- Patch repair breakout area, or replaster if the breakout area is greater than 10% of the total plaster area.

12.6.1.3 Responsibility

- All sub-trades shall be responsible for the cleaning up of their materials. Prior to plastering, it is the builder's decision or the owner's decision whether to plaster or take corrective action with improper concrete shell and leakers, weepers, or groundwater pressure through shell;
- Builder/shotcrete installer shall be responsible for giving the owner proper curing instructions in writing. The shotcrete installer and the builder shall be responsible to determine that rebound is removed and not improperly used in pool or covered over;
- Prior to plastering, it is the plasterer's responsibility to check the shell for impurities, water intrusion, or hollow spots. Prior to plastering, it is the builder's or the owner's decision whether to plaster or to take corrective action with an improper concrete shell and leakers/weepers, groundwater pressure through shell, etc. Once the plaster has bonded to the concrete shell, the plasterer has no further responsibility.

12.6.2 Possible deficiency. Bond failure on replastered pool. Voids or hollow areas that have not lifted, cracked, or broken loose are not considered a failure.

12.6.2.1 Possible causes.

- Surface was improperly prepared.
- Pool took too long to fill.

12.6.2.2 Solutions. Patch repair breakout areas; replaster if breakout area is greater than 10% of the plaster surface.

Pool shall not be drained during the warranty period without giving prior notice to the plasterer. If pool is drained to acid wash or perform some other service, it should be drained during the cool part of the year.

12.6.2.3 Responsibility

- Owner, if the pool took too long to fill;
- Owner or pool service company, if the pool is drained during the warranty period to acid wash or perform some other service item and is left empty too long;
- Plasterer or person who prepared underlying surface, if new plaster fails to bond to underlying surface.

12.7 Performance standard — Leaks in pool. Plaster shall be sufficiently thick to hold water (watertight). Water loss over ¼ in. *(6 mm)* a day may be considered normal if any of the following factors are present: evaporation; pool usage; pool and/or spa being heated; exposure to wind; waterfalls or water features that are part of the pool water circulation system.

12.7.1 Possible deficiency. Pool losses over ¼ inch *(6 mm)* per day without contributing factors.

12.7.1.1 Possible causes.

- leaks in plumbing lines, hydrostatic valves, or light conduit;
- leaks in skimmer box or skimmer throat where tile meets skimmers;
- leaks around plumbing lines or around light niche;
- leaks through rock tile lines or around boulders;
- leaks in tile line.

12.7.1.2 Solutions

- Cover pool to eliminate evaporation. Then conduct a proper pressure test of plumbing lines. Seal inside of skimmer or where skimmer meets tile;
- Pack and seal around all plumbing lines and light niches;
- Pack and seal before setting boulders or rock tile lines.

12.7.1.3 Responsibility. The responsible person shall be the person whose work is in contact with the leak – the builder or the plasterer.

12.8 Performance standard — Cracks. Plaster shall be sufficiently thick to hold water (watertight).

12.8.1 Possible deficiency. Pool has check cracks or crazing.

12.8.1.1 Possible causes.

- Pool took too long to fill;
- Gunite shell too hot or dry;
- Pool was finished on a hot, dry, or windy day;
- Normal cement shrinkage due to rapid curing.

12.8.1.2 Solutions. Once water is introduced into the pool, the owner shall be responsible to have the pool completely filled as rapidly as possible. Hairline checking and crazing that may appear in plaster are due to normal shrinkage and shall not be considered a deficiency.

12.8.1.3 Responsibility. Owner, builder, plasterer. Once water is introduced into the pool, the owner is responsible to fill pool within 36 hours or some other period of time per the plasterer's recommendations.

12.8.2 Possible deficiency. Major cracks or structural cracks. Plaster has no structural strength. If necessary, obtain engineering evaluation to determine extent of damage and necessary corrective measures.

12.8.2.1 Possible causes.

- Soil movement;
- Failure of pool shell.

12.8.2.2 Solutions. Do not plaster pools with structural cracks showing. Patch repair area.

12.8.2.3 Responsibility. Builder, plasterer.

12.9 Performance standard — Stains/discoloration in plaster. Plaster shall be generally a uniform shade of color, subject to normal cement mottling and shading. Mottling and shading will be more pronounced on a cloudy day. Plaster mottling and shading shall be properly evaluated in normal sunlight.

12.9.1 Possible deficiency. Rust stains.

12.9.1.1 Possible causes. Rust from reinforcing steel or tie wires under plaster.

12.9.1.2 Solutions

- Prior to plastering: Visible steel and tie wires shall be cut off, sealed with cement or rust-inhibiting paint, and patched over;
- After plastering: Plasterer shall cut out steel-tie wire-seal and patch plaster.

12.9.1.3 Responsibility. Plasterer (steel subcontractor, shotcrete installer) builder.

12.9.2 Possible deficiency. Excessive mottling, streaking, or discoloration.

Mottling shall be defined as different coloration of white plaster, similar to the shading difference of cumulus clouds, with no apparent pattern.

12.9.2.1 Possible causes.

- Insufficient mix time to homogenize all materials;
- Addition of admixtures or excess admixtures such as calcium chloride, lime, lubricants, etc.;
- Impurities in the aggregate or cement raw materials;
- Minerals or other impurities in the plaster mix water;
- Improper start up and water balance;
- Poor quality of fill water.

12.9.2.2 Solutions. There are many opinions on this topic, and more research and evaluation are needed.

12.9.2.3 Responsibility. Owner, builder, and plasterer. The causes of mottling, streaking, and discoloration require more research and evaluation.

12.10 Performance standard — Stains or discoloration. Plaster shall be generally a uniform shade of color, subject to normal cement mottling and shading.

12.10.1 Possible deficiency. Isolated spots or stains on plaster.

12.10.1.1 Possible causes.

- Foreign objects on plaster after completion of plastering (leaves, bugs, dirt, footprints, bobby pins, gum, fertilizer, compost, etc.);
- Newly plastered pool was vacuumed with a roller-head vacuum, leaving track marks.

12.10.1.2 Solutions. Light sanding will remove most surface stains, if caught quickly enough. Light sanding and acid washing may be necessary for older stains. For stains or tracks that cannot be removed, patch or replaster.

12.10.1.3 Responsibility. Plasterer, pool owner, service company.

12.10.2 Possible deficiency. Trowel burns (generally in a fan pattern). Shade variations are inherent in all hand-troweled cement surfaces.

12.10.2.1 Possible causes. Because plaster must be hand-troweled to produce a smooth finish, a certain amount of trowel burn is normal. Excessive trowel burns occur when plaster is dry and cannot be lubricated with water because the top surface will not hold water.

12.10.2.2 Solutions

- Buff the plaster with a soft, dry rag after troweling, to remove burn marks;
- After pool is filled, light sanding will remove most marks;
- With the first acid wash, most trowel burns will be removed.

12.10.2.3 Responsibility. Plasterer.

12.10.3 Possible deficiency. Bathtub-ring stain on plaster.

12.10.3.1 Possible causes.

- Water was turned off during initial filling. (Fill water shall not be turned off until the pool is full up to the middle of the skimmer or tile line.)
- Additional hose was put in pool in the shallow end and water was allowed to run down the floor into the deep end. (If additional fill hoses are placed in the pool, the nozzle ends should be wrapped with a clean rag and placed so that the stream of water flows directly into the pool of water, and not onto the plaster above the water level.)
- Existing fill line was used. (Do not use the existing fill line. Plaster should not be wetted down during filling, since this will leave water marks.)

12.10.3.2 Solutions. Some watermarks can be removed with light sanding and an acid wash. Other watermarks cannot be removed.

12.10.3.3 Responsibility. Owner, plasterer, or whoever shut off fill water; whoever added or moved hoses without properly protecting hose ends in contact with plaster.

12.11 Performance standard — Hydration. Plaster shall be a generally uniform shade of color, subject to normal cement mottling and shading.

12.11.1 Possible deficiency. Water entrapment, white plaster graying area is generally a large stain with no uniformity to pattern.

12.11.1.1 Possible causes. Cement gradation too fine, plaster finished, dry hard troweled, water entrapped from underlying substrata (i.e., gunite or existing plaster or replaster), plaster set too rapidly.

12.11.1.2 Solutions. Drain pool, light acid wash to break surface tension, hydrogen peroxide wash.

12.11.1.3 Responsibility. Plaster/cement manufacturer.

13 Painted concrete pools/spas interior finishes

13.1 Performance standard — Color variation. The interior finish shall present a uniform appearance with minimal color and texture variation. The finish shall be free of hairline cracks, checks, crazing, and blisters.

13.1.1 Possible deficiency. Blistering.

13.1.2 Builder's responsibility. Blistering is typically caused by improper surface preparation. The builder shall make certain that pool surface is clean and stable. If a solvent-based coating is being applied, surface must also be dry.

Blistering can also be caused by filling the pool too soon, painting in hot direct sunlight or inclement weather; or applying an incompatible coating.

The builder shall repair, using whatever means necessary to correct the problem. Builder shall provide the owner with paint manufacturer's instructions for after painting.

13.1.3 Owner's responsibility. Owner shall not fill pool too soon after painting, and shall follow paint manufacturer's instructions for after painting.

13.2 Performance standard – There shall be no peeling of paint.

13.2.1 Possible deficiency. Peeling is caused by improper surface preparation, applying an incompatible coating, filling pool too soon, or improper paint application. Before application, paint manufacturer's guidelines shall be read and fully understood.

13.2.2 Builder's responsibility. The builder shall make certain that the pool/spa surface is clean and dry, and shall avoid painting in very hot, direct sunlight or inclement weather. The builder shall repair, using whatever means necessary to correct the problem.

13.2.3 Owner's responsibility. None.

13.3 Performance standard — Paint chalking or powdering. Pool/spa shall be thoroughly cured to prevent chalking or powdering.

13.3.1 Possible deficiency. Pool coating may chalk prematurely if pool is filled too soon, or if water (i.e., rain) gets on the coating before it has thoroughly cured. Most chalking is caused by improper water chemistry, usually low alkalinity and/or high total dissolved solids (TDS) from liquid chlorine use. These conditions cause a fine white powder to form on the pool surface.

13.3.2 Builder's responsibility. The builder shall follow the manufacturer's recommendations on curing and filling the pool with water. The builder shall repair with whatever means necessary.

13.3.3 Owner's responsibility. The owner shall maintain proper water chemistry for a painted pool. Do not fill pool too soon. Follow paint manufacturer's instructions.

13.4 Performance standard — Recommended water chemistry for painted pools/spas. The water in an acrylic painted pool shall be clear.

13.4.1 Possible deficiency. A misconception about pool coatings often causes advanced or excessive chalking, or cloudy water, in pools coated with epoxy or rubber-based paint.

The recommended water chemistry of painted pools differs from that of pools with non-smooth surfaces. For instance, if the total alkalinity is too low, minerals in the water (most often calcium carbonate) can precipitate (fall out of solution). This white precipitate is scale, which feels greasy or oily, like paint.

13.4.2 Builder's responsibility. None.

13.4.3 Owner's, or service company's responsibility. For a pool painted with epoxy or rubber-based paint that is chalking badly, adjust the water chemistry according to the following:

1. Adjust the total alkalinity to between 125 ppm and 150 ppm.
2. Add a sequestering or chelating agent following label directions.
3. Add a clarifier or flocculent to the water. This will bind small free particles together, so they can be trapped by the filter. A filter cartridge in the 5 micron range is recommended. A 30 micron cartridge may not trap these particles.
4. Set the filtering system to operate 16 hours to 20 hours per day for 5 days;
5. Brush the sides of the pool for 5 days;
6. Maintain the calcium hardness level between 175 ppm and 225 ppm.

14 Applied fiberglass pools/spas (fiberglass over plaster or concrete)

14.1 Performance standard – The pool/spa finish shall be free of any hairline cracks, which extend into the laminate.

14.1.1 Possible deficiency. Hairline crack extending into the laminate.

14.1.2 Builder's responsibility. Within 12 months following substantial completion, the builder shall repair with materials that are compatible with original and match the color and texture as closely as possible.

14.1.3 Owner's responsibility. None.

14.2 Performance standard — The finish shall not develop any osmotic blisters.

14.2.1 Possible deficiency. Osmotic blisters in the cosmetic surface or laminate.

14.2.2 Builder's responsibility. The builder shall make needed repairs, using repair materials that are compatible with original, and match the color and texture as closely as possible.

14.2.3 Owner's responsibility. None.

14.3 Performance standard — The pool/spa shall be free of any cracks and shall not leak.

14.3.1 Possible deficiency. Cracked and leaking.

14.3.2 Builder's responsibility. Providing that cracks are not caused by structural failure, the builder shall make needed repairs, using repair materials that are compatible with original and match the color and texture as closely as possible.

14.3.3 Owner's responsibility. None.

14.4 Performance standard – The finish shall not develop surface delamination.

14.4.1 Possible deficiency. Fiberglass pulls away from surface substrate caused by glassing over painted surface and improper preparation. Fiberglass over painted surface must have proper preparation to bond.

14.4.2 Builder's responsibility

- Builder shall cut out and repair delaminated areas;
- Builder shall sandblast or grind surface to remove paint before fiberglass application.

14.4.3 Owner's responsibility. None.

14.5 Performance standard – Surface shall not break down or deteriorate.

14.5.1 Possible deficiency. Surface material breaks down because of the use of improper resins or other ingredients unsuitable for pool environment, or because the water is not maintained in a balanced condition.

14.5.2 Builder's responsibility. The builder shall install fiberglass materials in accordance with the manufacturer's requirements. The builder shall make necessary repairs, using materials that are compatible with original.

14.5.3 Owner's responsibility. Maintain pool water balance as recommended by the manufacturer.

14.6 Performance standard – There shall be a proper seal around fixtures, fittings, lights, and at tile line.

14.6.1 Possible deficiency. Fiberglass pulls away from fittings, lights, or tile line.

14.6.2 Builder's responsibility. The builder shall remove affected area and create a proper seal.

14.6.3 Owner's responsibility. None.

14.7 Performance standard – There shall be no observable air voids (bubbles) in the laminate.

14.7.1 Possible deficiency. Air voids in the laminate due to improper glass compaction during lamination roll out.

14.7.2 Builder's responsibility. The builder shall properly compact glass during roll out and eliminate all visible air voids in the laminate. The builder shall make necessary repairs.

14.7.3 Owner's responsibility. None.

14.8 Performance standard – Observable porosity or pinholes in gelcoat.

14.8.1 Possible deficiency. Porosity in gelcoat or surface finish.

14.8.2 Builder's responsibility. The builder shall use proper application techniques, under proper environmental conditions, using clean air to alleviate porosity or pinholes in the cured laminate. The builder shall make necessary repairs.

14.8.3 Owner's responsibility. None.

14.9 Performance standard – Pool/spa shall not chalk.

14.9.1 Possible deficiency. Chalking (flaky or milky sediment when rubbed). This can be due to incorrect initiator ratio, improper initiator mixing, quality of pigment used in the gelcoat, improper gelcoat thickness, low ambient air temperature during application, or the use of styrene or solvent to dilute gelcoat.

14.9.2 Builder's responsibility. The builder shall re-coat pool using proper resin and application techniques.

14.9.3 Owner's responsibility. Maintain proper water balance. Chalking can be confused with calcium scale formation on the surface. Scaling can be distinguished from chalking by using a hydrochloric acid test. Hydrochloric acid will remove scaling.

14.10 Performance standard – Surface shall not have stains at the time of substantial completion.

14.10.1 Possible deficiency. Excessive amounts of metals in water. In water, different metals can cause different color stains, such as copper — gray, green, blue, or any combination; iron and dirt — brown; manganese — gray or black; nickel — gray; chromium — gray or black; and silver — gray or black.

Other causes of discoloration include:

- Improper placement of chemical feeders;
- Excess water velocity in piping and equipment;
- Improper grounding and bonding of equipment, especially lights.

14.10.2 Builder's responsibility

- The builder shall properly size equipment, and select the proper location of chemical feeders or, in the case of a remodel or renovation, notify the owner of any pre-existing deficiencies.
- The builder shall correct any stains evident at the time of substantial completion.

14.10.3 Owner's responsibility. After completion, the owner shall periodically use a chelating or sequestering product to keep metals in suspension. Owner shall also maintain proper water balance.

14.11 Performance standard – The finish shall not develop black spots due to cobalt leaching.

14.11.1 Possible deficiency. Cobalt leaching (black spots with possible trails and/or blisters) is caused by a reaction of chemicals in the water with excess cobalt promoter in the resin.

14.11.2 Builder's responsibility. The builder shall remove and repair cobalt spots.

14.11.3 Owner's responsibility. Maintain recommended water chemical balance.

14.12 Performance standard – Osmotic blisters in gelcoat.

14.12.1 Possible deficiency. Blistering (small bubbles usually the size of a dime) in the topcoat.

14.12.2 Builder's responsibility. The builder shall remove and repair blistered spots, and reapply gelcoat as required during the warranty period.

14.12.3 Owner's responsibility. None.

14.13 Performance standard – Finish must be applied thick enough to prevent leaking.

14.13.1 Possible deficiency. Measurable water penetration.

14.13.2 Builder's responsibility. The builder shall locate areas where surface density and resin coverage is inadequate, and shall repair/re-coat as required.

14.13.3 Owner's responsibility. None.

14.14 Performance standard – Fiberglass shall be sufficiently thick to hold water (watertight) and of sufficient structural integrity to avoid deflection when delaminated.

14.14.1 Possible deficiency. Unevenness (highs and lows.) Pool light casts shadows at night.

14.14.2 Possible causes. Fiberglass is a hand-applied product that is placed on an existing surface, most often plaster. Plaster finishes follow the general contour of the concrete shell. Consequently, slight variations and waves may occur and will be accentuated if the underlying concrete shell is uneven. Slight variations in the surface will be magnified by the water with the light casting shadows across the fiberglass surface. This is apparent especially if the light is placed in the shallow end or the step risers. Variations in fiberglass viewed by illumination shall not be considered poor workmanship. The fiberglass surface should be evaluated only under normal daylight conditions.

14.14.3 Builder's responsibility. Owners should be notified of the possibility of shadows caused by light placement. Pool lights could be set higher in the walls. Placement in step risers should be avoided if possible. The light lens can be rotated so it does not reflect downward, or a blue lens cover can be installed. A lower wattage bulb can be installed in the light to reduce glare and shadows.

Unevenness (highs and lows) of fiberglass surfaces over plaster pools. In general, whenever plaster is removed from an existing pool (i.e., removal of hollow areas or full plaster removal), the new plaster being applied will have varying thicknesses. This may cause the new plaster on which the fiberglass surface is applied, to set unevenly and create slight impressions in the surface at finishing. Variations in the plaster surface during nighttime illumination shall not be considered poor workmanship.

The fiberglass surface should be evaluated only under normal daylight conditions.

14.15 Performance standard – Fiberglass discoloration.

14.15.1 Possible deficiency. Fiberglass is discolored due to metal precipitation or electrolysis.

14.15.2 Possible causes.

- Excessive amounts of metals in water – usually colored on surface of plaster. Although these colors may vary, common coloration from metals include copper — gray, green, blue, or any combination; iron and dirt — brown; manganese — gray or black; nickel — gray; chromium — gray or black; and silver — gray or black;
- Electrolysis (incompatible piping or overload of ground circuit), metals in source (fill) water, metals in maintenance chemicals, improper water chemistry, high velocity erosion of metal piping, evaporation (resulting in the concentration of dissolved solids in the pool water).

14.15.3 Solutions. Source water should be checked for possible contribution. If water is high in metals, use filters or chelating/sequestering agents as necessary to bind and remove metals. Check for electrolysis caused by the joining of dissimilar metals in the plumbing of the pool. Check for electrolysis caused by overloading of the ground system in the residence (thus putting low-level electrical current in the pool). Until the fiberglass is fully cured, avoid the use of chemicals with significant metal components. Recommend that customer maintain proper levels of a sequestering agent in the water.

14.15.4 Responsibility. Fiberglass installer, owner. Not all metal staining is avoidable. Fiberglass installer shall instruct the owner on proper chemical balance and the need to maintain a proper level of sequestering agent in the water at all times.

14.16 Performance standard – Blistering or delamination of fiberglass.

14.16.1 Possible deficiency. Blistering or delamination of fiberglass. (Voids or hollow areas that have lifted, cracked, or broken loose may not be considered a failure if the fiberglass structure is sound and watertight.)

14.16.2 Possible causes.

- Surface was improperly prepared;
- Pool took too long to fill.

14.16.3 Solutions. Patch repair breakout areas as required. If too extensive (greater than 10% of fiberglass surface), re-fiberglass. Pool should not be drained during warranty period without prior notice to, and approval of, fiberglass installer. If pool is drained to clean or perform some other service, it should be drained during the cool part of the year.

14.16.4 Builder's responsibility. The builder or fiberglass installer shall take whatever corrective measures to ensure compliance with the standard. The builder or fiberglass installer shall inform the owner of the proper procedure for draining the pool.

14.16.5 Owner's responsibility. The owner shall follow the builder's or the fiberglass installer's instructions for draining the pool.

15 Vinyl-lined pools

15.1 Performance standard – At the time of substantial completion,the inground vinyl pool liner shall be properly fitted to the pool and shall have no folds or indentations larger than ¼ in. *(6 mm)*. The structure along with the interior lining shall be watertight.

15.1.1 Possible deficiency. Indentations in excess of ¼ in. *(6 mm)* in floor in an area no larger than 2 ft × 2 ft *(610 × 610 mm)*.

15.1.2 Builder's responsibility. The builder shall ensure that the floor is level and there are no indentations in excess of ¼ in. *(6 mm)* in the bottom of the pool at time of liner installation.

15.1.3 Owner's responsibility. None.

15.2 Performance standard – Liner shall be smooth without excessive wrinkles.

15.2.1 Possible deficiency. Excessive wrinkles in floor and walls.

15.2.2 Builder's responsibility. The builder shall adequately vacuum suction during installation of liner. The builder shall provide liner manufacturer with the exact specification of liner requirements (dimensions, etc.). If small wrinkles occur, use a soft push broom to tap the liner at the bottom of the walls. If the wrinkles are large or there are folds in the liner, shut off the vacuum. After the liner relaxes from the walls and bottom, pull the liner by hand until the wrinkles or folds disappear.

15.2.3 Owner's responsibility. None.

15.3 Performance standard – There shall be no folds in the floor and walls.

15.3.1 Possible deficiency. Folds in liner in floor and walls.

15.3.2 Builder's responsibility. The builder shall install liner squarely into the pool area. The builder will remove folds using appropriate methods.

15.3.3 Owner's responsibility. None.

15.4 Performance standard – Bottom of pool shall be smooth and free of any sharp objects.

15.4.1 Possible deficiency. Pinhole(s) in bottom of liner.

15.4.2 Builder's responsibility. The builder shall ensure bottom of pool/spa is smooth and free of small stones and sharp objects. The builder shall re-pack or re-trowel a sand-bottom pool to bring it back to its original bottom dimensions. On hard surface pools, the builder shall patch rough areas with quality cement material.

15.4.3 Owner's responsibility. None.

15.5 Performance standard – Vinyl liner corners shall be installed to prevent moisture forming behind the corners.

15.5.1 Possible deficiency. Dry rot in corners.

Dry rot shall be defined as failure of the vinyl due to loss of the plasticizers and stabilizers that give vinyl flexibility and temperature stability.

15.5.2 Builder's responsibility. The builder shall put as much material in the corners as possible before starting vacuum. Use liner lock to hold in place.

15.5.3 Owner's responsibility. None.

15.6 Performance standard – The liner shall be securely fastened around the top of the pool.

15.6.1 Possible deficiency. Channel track in bead receivers come loose. (Liner comes loose from fastening around top of the pool).

15.6.2 Builder's responsibility. The builder shall reinsert liner in fastening device and may, at his option, add additional locking pieces to ensure tighter fit.

15.6.3 Owner's responsibility. None.

15.7 Performance standard – There shall be no dry rot of vinyl above the waterline.

15.7.1 Possible deficiency. Dry rot above the waterline.

15.7.2 Builder's responsibility. The builder shall inform homeowner of correct procedure to maintain liner.

15.7.3 Owner's responsibility. The owner shall follow instructions from the builder and manufacturer. Do not use acid-base tile cleaners. Mild soap is recommended.

15.8 Performance standard – The pH shall be maintained between 7.2 and 7.8.

15.8.1 Possible deficiency. Premature fading of vinyl.

15.8.2 Builder's responsibility. The builder shall inform the homeowner of the proper chlorination and pH of the pool. The pH should be between 7.2 and 7.6. Installers should inform pool owners that proper chemical balance will help to prolong the life of the liner.

15.8.3 Owner's responsibility. The owner shall maintain proper pH and chemical balance and follow the manufacturer's recommendations for the proper care and maintenance of the liner.

16 Fiberglass one-piece pool/spa

16.1 Performance standard – The designed waterline, when tiled, shall have a tolerance of ± ¼ in. *(6 mm)*. In the absence of such tile, the designed waterline shall have a maximum construction tolerance of ± ½ in. *(13 mm)*.

16.1.1 Possible deficiency. Pool not level.

16.1.2 Builder's responsibility. The builder shall be responsible for bringing the pool to standard.

16.1.3 Owner's responsibility. None.

16.2 Performance standard – The pool/spa shall be free of any cracks that lead to water leakage.

16.2.1 Possible deficiency. Cracked and leaking pool/spa.

16.2.2 Builder's responsibility. Upon the owner's request within 12 months following substantial completion, the builder shall make needed repairs. The builder shall use repair materials that are compatible with original and match the color and texture as closely as possible.

16.2.3 Owner's responsibility. None.

16.3 Performance standard – Surface shall not have stains.

16.3.1 Possible deficiency – Discolored fiberglass. Discoloration can be caused by the following:

- Excessive amounts of metals in water. In water different metals can cause different color stains, such as copper — gray, green, blue, or any combination; iron and dirt — brown; manganese — gray or black; nickel — gray; chromium — gray or black; and silver — gray or black;
- Improper placement of chemical feeders;
- Excess water velocity in equipment or piping;
- Improper grounding and bonding of equipment, especially lights.

16.3.2 Builder's responsibility. The builder shall properly size equipment. Proper placement of chemical feeder.

16.3.3 Owner's responsibility. The owner shall periodically use a chelating or sequestering agent to keep metal in suspension and maintain proper water balance.

17 Site

17.1 Performance standard – Necessary grades and swales shall be established to ensure proper drainage away from the pool site.

17.1.1 Possible deficiency. Improper drainage of site. Drains, decks, or buildings allowing water to drain under or over decks.

17.1.2 Builder's responsibility. The builder shall establish the proper grades and elevations, and shall advise the owner of proper drainage requirements.

17.1.3 Owner's responsibility. The owner shall maintain such grades and swales after substantial completion.

17.2 Performance standard – Settling shall not interfere with water drainage away from the improvements.

17.2.1 Possible deficiency. Settling of ground around the improvement, utility trenches, or other filled areas.

17.2.2 Builder's responsibility. The builder shall fill excessively settled area one time only during the 12-month period following substantial completion, unless there is a continuing problem due to poor workmanship or improper backfill.

17.2.3 Owner's responsibility. The owner shall be responsible for any grass, shrubs, or other landscaping affected by placement of such fill.

17.3 Performance standard – At time of substantial completion, grades and swales shall have been established to ensure proper drainage away from the improvements. Site drainage is limited to the immediate grades and swales affecting the improvements. No standing or ponding of water shall remain in this immediate area after a rain, except swales that may drain other areas after the rain.

17.3.1 Possible deficiency. Irregular contours in site and/or drainage passages.

17.3.2 Builder's responsibility. The builder shall correct as necessary.

17.3.3 Owner's responsibility. The owner shall maintain such grades and swales after substantial completion.

17.4 Performance standard – All construction debris shall be removed. Site contours shall be graded so that they may be mowed with normal equipment. Rocks and boulders shall be removed or covered with suitable topsoil or, if this is impractical, they shall be so designated in the pre-construction plans.

17.4.1 Possible deficiency. Site cleaning, leveling, trench backfilling not satisfactory.

17.4.2 Builder's responsibility. The builder shall provide a one-time site clean-up and grading prior to the time of substantial completion.

17.4.3 Owner's responsibility. None.

18 Barriers

18.1 Performance standard – Barriers furnished and installed by the builder, which are not an integral part of the structure, shall be designed and built in compliance with local codes.

18.1.1 Possible deficiency. Barriers not built to code.

18.1.2 Builder's responsibility. The builder shall perform all work required to ensure compliance with the appropriate local codes.

18.1.3 Owner's responsibility. The owner shall maintain barriers as installed or constructed by the builder.

APSP 2013

Workmanship Guidelines and Practices

For Residential Inground Pools and Spas

Familiarity with APSP Workmanship Guidelines is highly recommended for anyone who builds, manufactures, sells, or services inground pools and spas.

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