Introduction

Watershape University is the leading education system for the pool, spa, aquatics, and outdoor living industry. The experience and expertise of our instructors has resulted in this Position Statement intended to guide our students and Corporate Engagement team toward better projects.

This Position Statement was assembled with input from leading professionals in the pool and spa industry including individuals that are not members of Watershape University. The contributors share a common goal of improving safety, reducing energy consumption, raising the current standards, and building better quality projects. The positions are not biased toward specific manufacturers or products.

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Format

There are two columns. The first column clearly and concisely states our position. The second column provides commentary and justification for the corresponding position statement.

Position Statement	Commentary
4.1 Structural Loads	
4.1.1 Structural analysis shall include, but not be limited to the following: soils, surcharge loads, slope stability, seismic forces, hydrostatic, hydrodynamic, wind, and storm surge when necessary.	It seems obvious but a surprising number of construction defect cases involve structural failures due to inadequate analysis of the underlying soils.
4.1.2 A soils investigation shall be done per the requirements of International Building Code (IBC) sections 1705.6 and 1803 or the International Residential Code (IRC) section R401.4.	
4.2 Reinforcing Steel	
4.2.1 Reinforcing steel shall have a minimum of 3" clearance to soil and water.	ACI 318 requires 3" clearance when the concrete is cast against and permanently exposed to soil. We recommend the same even if the concrete is formed and then backfilled with soil. We also recommend a 3" clearance against the water since typical cementitious finishes are not waterproof. Additionally, well-built structures may be remodeled which often results in losing up to ½" of the shell when the original plaster is removed.
4.2.2 Reinforcing steel in shotcrete shall have non-contact lap splices and spacing per International Building Code (IBC) sections 1910.4.2 and 1910.4.3, or	Non-contact lap splices prevent shadowing of the shotcrete behind the steel.
4.2.3 Reinforcing steel in shotcrete may have contact lap splices only if the laps are stacked parallel to the direction of the shotcrete (e.g., one bar is behind the other and not stacked side by side).	Shadowing of the shotcrete can be prevented because the cross-sectional width of the bars is no greater than a single bar.
4.3 Concrete	
4.3.1 The minimum compressive strength of the concrete is fc'=4,000 psi with a maximum water-cementitious material ratio (w/cm) of 0.50.	The American Concrete Institute's ACI 318-08 Building Code Requirements for Structural Concrete includes Chapter 4 Durability Requirements. Table 4.3.1 Requirements for Concrete by Exposure Class defines a Category P1 exposure as concrete "in contact with water where low permeability is required." Table 4.2.2 specifies the Requirements for Special Exposure

	Conditions. The 4,000 psi minimum compressive strength has also been affirmed by the American Shotcrete Association in their Position Statement #1.
4.3.2 Where concrete is exposed to freezing and thawing in a moist condition, the minimum is fc'=4,500 psi with a maximum water-cementitious material ratio (w/cm) of 0.45.	ACI 318-08 Table 4.2.2.
4.3.3 For corrosion protection of reinforcement in concrete exposed to chlorides from deicing chemicals, salt, saltwater, brackish water, seawater, or spray from these sources, the minimum is fc'=5,000 psi with a maximum water-cementitious material ratio (w/cm) of 0.40.	ACI 318-08 Table 4.2.2.
4.4 Shotcrete	
4.4.1 Shotcrete includes both wet-mix and dry-mix (gunite).	Defined by International Building Code (IBC) section 1910.1 General: Shotcrete is mortar or concrete that is pneumatically projected at high velocity onto a surface.
4.4.2 Shotcrete shall be done at a high velocity of 350 to 400 feet-per-second.	See the American Shotcrete Association's Position Statement #1 (www.shotcrete.org)
4.4.3 Shotcrete compressive strength shall follow the American Shotcrete Association's Pool and Recreational Shotcrete Committee Position Statement #1.	See the American Shotcrete Association's Pool and Recreational Shotcrete Committee Position Statement #1.
4.4.4 Shotcrete terminology shall follow the American Shotcrete Association's Pool and Recreational Shotcrete Committee Position Statement #2.	See the American Shotcrete Association's Pool and Recreational Shotcrete Committee Position Statement #2.
4.4.5 Shotcrete sustainability benefits shall follow the American Shotcrete Association's Pool and Recreational Shotcrete Committee Position Statement #3 and include the following: 4.4.5.1 Formwork savings of 50 to 100%	See the American Shotcrete Association's Pool and Recreational Shotcrete Committee Position Statement #3.

over conventional cast-in-place construction.
4.4.5.2 Formwork does not have to be designed for internal pressures.
4.4.5.3 Complex shapes require very little – if any – formwork.
4.4.5.4 Labor savings of at least 50% in repair applications.
4.4.5.5 New construction speed savings of 33 to 50%.
4.4.5.6 Better bonding to the substrate enhances durability.
4.4.5.7 Adaptability to repair surfaces that are not cost-effective with other processes.
4.4.5.8 Ability to access restricted space and difficult-to-reach areas, including overhead and underground.

4.4.6 Shotcrete watertightness shall follow the American Shotcrete Association's Pool and Recreational Shotcrete Committee Position Statement #4.

See the American Shotcrete Association's Pool and Recreational Shotcrete Committee Position Statement #4.

4.4.7 Shotcrete contractor and crew qualifications shall follow the American Shotcrete Association's Board of Direction Position Statement #1.

See the American Shotcrete Association's Board of Direction Position Statement #1.

4.4.8 Rebound, trimmings, and loose debris shall be removed from the structure and shall not be used in any manner within the structure or vessel.

Required by International Building Code (IBC) section 1910.6.

4.5 Special Inspections

4.5.1 Special Inspection is inspection of construction requiring the expertise of an *approved special inspector* in order to ensure compliance with the code and the *approved construction documents*. Special Inspections are in addition to the inspections performed by the building official.

IBC 2012 chapter 2 defines special inspection, continuous special inspection, and periodic special inspection.

IBC 2012 section 1704 details the qualifications, report requirements, statement of special inspections, contractor responsibilities, and other requirements.

4.5.2 Continuous Special Inspection is performed by the *special inspector* who is continuously present when and where the work to be inspected is being performed and includes but is not limited to the following requirements:

IBC Section 1705 lists several requirements for special inspection. We have listed key elements that are important for the pool, spa, and water feature industry but this list is not inclusive of all requirements.

ACI 318-11 requires Special Inspection and records per section 1.3.

4.5.2.1 At the time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	IBC 2012 Table 1705.3.7 which also references ASTM C 172, ASTM C 31, ACI 318 sections 5.6 and 5.8, and IBC 2012 section 1910.10.
4.5.2.2 During concrete and shotcrete placement for proper application techniques.	IBC 2012 Table 1705.3.7 which also references ACI 318 sections 5.9 and 5.10, and IBC 2012 sections 1910.6, 1910.7, and 1910.8.
4.5.3 Periodic Special Inspection is performed by the *special inspector* who is intermittently present where the work to be inspected has been or is being performed and includes but is not limited to the following requirements:	
4.5.3.1 For reinforcing steel, including prestressing tendons, and placement.	IBC 2012 Table 1705.3.7 which also references ACI 318 sections 3.5 and 7.1-7.7, and IBC 2012 section 1910.4.
4.5.3.2 To verify the use of the required design mix.	IBC 2012 Table 1705.3.7 which also references ACI 318 chapter 4 and section 5.2-5.4, and IBC 2012 sections 1904.2, 1910.2, and 1910.3.
4.5.3.3 For maintenance of specified curing temperature and techniques.	IBC 2012 Table 1705.3.7 which also references ACI 318 sections 5.11-5.13, and IBC 2012 section 1910.9.
4.5.3.4 To inspect formwork for shape, location and dimensions of the concrete member being formed.	IBC 2012 Table 1705.3.7 which also references ACI 318 section 6.1.1.