GENESIS®
EDUCATE. CERTIFY. CONNECT.

Position Statement #4

Structural Requirements for Pools, Spas, and Water Features

Introduction

GENESIS provides an international forum for continuing education and the establishment of higher standards in watershape design, engineering, and construction. In pursuit of this goal, GENESIS hereby publishes this Position Statement regarding structural requirements.

This Position Statement was assembled with input from leading professionals in the pool and spa industry, including individuals that are not members of GENESIS. 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.

This document is not a consensus standard or building code. It has not gone through the consensus procedures of any recognized standards writing authority. GENESIS has no interest in pursuing the consensus process that would only dilute these positions with inferior concepts based on specific products, technology, maintaining backwards-compatibility, or other conflicts of interest. Use of this document is completely voluntary.

This document is made available in the public domain. GENESIS encourages the free distribution, use, and reference of this document in whole or in part. Individuals or firms involved with the design, engineering, construction, maintenance, and operation of pools, spas, and water features may use this Position Statement to guide their work; however, in no way does this relieve them from compliance with all laws, codes, standards, regulations, ordinances, or other requirements. Individuals and companies involved with the development of standards and codes are encouraged to consider these Position Statements and the associated Commentary. Authorities having jurisdiction may reference this document directly as a building code in whole or in part.

GENESIS reserves the right to add to, delete from, or otherwise modify this document at any time without notice. The positions stated herein represent sound thinking on the date of publication given the current state of technology, experience, and information. GENESIS recognizes that “one size does not fit all” and that there are exceptions to every rule.

In publishing this document, GENESIS disclaims all liability and is not responsible for any loss, damages, or injuries that may result from reliance upon the statements contained herein.

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.

Structural Requirements for Pools, Spas, and Water Features

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-inch clearance to soil and and 1-1/2-inch clearance to pool water in addition to any finishes.	ACI 318 requires 3-inch 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 1-1/2-inch clearance against the water since typical cementitious finishes are not waterproof.
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 0.45.	The American Concrete Institute requires a minimum compressive strength of 4,000 psi for vessels where low permeability is required. ACI 318-19, W2 exposure class, table 19.3.2.1
	The 4,000 psi minimum compressive strength has also been affirmed by the American Shotcrete Association in their Position Statement #1.

Structural Requirements for Pools, Spas, and Water Features

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 318-19 Table 19.3.2.1
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 318-19 Table 19.3.2.1
4.4 Shotcrete	
4.4.1 Shotcrete includes both wet-mix and dry-mix (gunite).	Defined by ACI 318, 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.	American Shotcrete Association
4.4.3 Shotcrete compressive strength at 28 days shall be at least 4,000 psi (fc').	The American Shotcrete Association states that lower strength could only result from significantly reduced material quality or poor application procedures.
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 are listed in the American Shotcrete Association's Pool and Recreational Shotcrete Committee Position Statement #3.	See the American Shotcrete Association's Pool and Recreational Shotcrete Committee Position Statement #3.
4.4.6 Shotcrete watertightness shall mean "impermeable to measurable flow of water except under conditions of high hydrostatic pressure".	Substantially watertight but not absolutely waterproof. See the American Shotcrete Association's Pool and Recreational Shotcrete Committee Position Statement #4. A lack of measurable flow does not preclude dampness.
4.4.7 Shotcrete contractor and crew qualifications shall shall be installed by qualified contractors and crews.	See the American Shotcrete Association's Board of Directors 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 ACI 506R "Guide to Shotcrete"

Structural Requirements for Pools, Spas, and Water Features

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 and must be provided by the owner but acting independent of the contractor when required by the local building official.	IBC 2021, Chapter 17 defines special inspection, continuous special inspection, and periodic special inspection. IBC 2021, Chapter 17 details the qualifications, report requirements, statement of special inspections, contractor responsibilities, and other requirements.