



## LOSS CONTROL BULLETIN

Another loss prevention service from Bollinger, Inc.

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### Pool Design and Construction #109

#### Introduction

While unsafe acts are frequently the cause of accidents involving pool users, pool design and equipment can be a contributing factor in the resulting injuries. Reports compiled by the Consumer Product Safety Commission (CPSC) indicate the following equipment or design features created hazards that were the proximate causes of injuries:

- Perimeter protection
- Depth markings
- Diving area design
- Deck drains and covers
- Pool bottom markings
- Pool coatings
- Electric pool lights, poles, or machinery
- Obstructions on pool and deck surfaces
- Chlorine dispensing equipment
- Drains and suction fittings

National voluntary standards, state, and local codes include specifications that address these design issues. Noncompliance with code requirements or relevant standards may be used in lawsuits as evidence of negligence, or may even be considered negligence per se.

#### Pool Design Standards

The Association of Pool and Spa Professionals (NSPI-1), the Federation Internationale de Natation Amateur (FINA), U.S. Swimming (USS), U.S. Diving (USD), the National Collegiate Athletic Association (NCAA), and American Public Health Association (APHA) publish design, construction, and operating standards for swimming pools and aquatic facilities. These standards also refer to other organizations for specific equipment requirements. The American National Standards Institute (ANSI) recognizes NSPI-1, *Standard for Public Swimming Pools*, as an American National Standard.

The NSPI-1 standard includes specifications on the following aspects of pool design and equipment:

- Materials of Construction
- Structural Design
- Dimensional Design
- Decks and Deck Equipment
- Circulation Systems
- Filters
- Pumps and Motors
- Return Inlets and Suction Outlets
- Surface Skimmer Systems
- Electrical Requirements
- Heaters
- Water Supply
- Waste Water Disposal
- Disinfectant Equipment and Chemical Feeders
- Specific Safety Features
- Dressing Facilities
- Visitor and Spectator Areas
- Food Service
- Chemical Operational Parameter
- Use of Elemental Chlorine

The requirements outlined in NSPI-1 should be considered minimum standards in the absence of more restrictive state or local codes.

## Design Specifications

The following information highlights important design requirements that will reduce the potential for accidents and injuries involving the pool and associated equipment. This summary is not a comprehensive list of all pool design requirements. For more detailed information, please refer to the ANSI/NSPI-1 American National Standard for Public Swimming Pools and applicable local and state codes and ordinances.

### Location and Access Control

Pools should be segregated from other areas of the club. A fence, wall, building, or other enclosure should protect pools. Fences or walls should be at least four feet high and afford no external handholds or footholds. The entrances to the enclosure should be equipped with self-closing, positive self-latching closure mechanisms, located at least 45 inches above the ground and provided with locking hardware.

### Occupancy Capacities

The maximum number of people allowed in the pool area should be limited to number calculated using the criteria outlined in the following table:

	Shallow, Instructional, or Wading Areas	Deep Area (not including the diving area)
Pools with deck area less than the water surface area	15 square feet per user	20 square feet per user
Pools with deck area at least equal to the water surface area	12 square feet per user	15 square feet per user
Pools with deck area at least twice the water surface area	8 square feet per user	10 square feet per user

### Decks

There should be at least six feet of unobstructed deck space surrounding the pool. Pool decks should be sloped away from pools and free of depressions that could accumulate standing water. The surface should be rough concrete or another non-slip surface.

### Wading Pools

If wading pools or spas are present, these structures should be separated from the main pool by at least six feet. Wading pools should be no deeper than 24 inches. The depth at the perimeter should be 18 inches or less. If the wading pool is located adjacent to the deep area of the main pool, a wall or fence at least four feet high should separate the two pool areas.

### Water Depth Requirements

The areas of the pool are defined as follows:

- Beginner's (Wading) Area - portions of the pool with a water depth of three feet or less.
- Shallow Swimming Areas - portions of the pool with a water depth of three feet to less than five feet.
- Deep Swimming Areas - portions of the pool with a water depth in excess of five feet.
- Diving Areas - depth and surface area requirements are determined by the type of diving equipment and the height of the equipment above the water surface. Refer to Loss Control Bulletin #110 for diving area and equipment specifications.

The Beginner's Area may not adjoin the Deep Area of the pool.

Racing pools should have a minimum depth of three feet six inches if starting blocks are used.

### **Floor Slopes and Transition Point Demarcation**

Floor slopes should be constant in each area of the pool and not exceed one foot vertically in twelve feet horizontally. The slope of the floor at the transition between pool areas should not exceed one foot in three feet. The different areas of the pool should be set apart with a rope and float line, depth markers, and a four inch minimum width row of floor tile, a painted line, or similar means of color contrasting on the pool bottom.

If there is a change in slope at the transition between the shallow and deep areas of the pool, the rope and float line should be positioned between one and two feet from the change in slope, on the shallow side of the change.

### **Depth Markings**

The depth of the water should be marked at or above the water surface on the wall (vertical surface) of the pool and on the top of the coping or edge of the deck or walk (horizontal surface) next to the pool. The markings on the pool deck should be within 18 inches of the edge of the water, positioned so they can be read while standing on the deck facing the water, and made of slip resisting material. The markers should be at least 4 inches tall and a contrasting color to the background. Depth markers should be installed at the minimum and maximum water depths and at all points of slope change. Markers should also be installed at intermediate increments of water depth not to exceed 2 feet, and spaced at intervals not greater than twenty-five feet. Markers should be arranged uniformly on all sides of the pool. Depth markings should feature the spelled out unit of measurement, i.e. feet, meters, etc...

### **Pool Entry and Exit**

The pool must have a minimum of two entry and exit points, located so as to serve both ends of the pool. They may consist of ladders, stairs, or recessed treads. All treads must have slip resisting surfaces. In addition, the following criteria for entry/exit points should be met:

- If the deep area of the pool is more than 30 feet wide, both sides of the deep area should have a means of entry/exit.
- A means of entry/exit should be provided at a minimum of every 75 lineal feet of pool wall.
- If the pool has an area with a water depth at the wall of 24 inches or less, such area provides its own natural mode of entry/exit.
- Stairs, ladders and recessed treads should not interfere with racing lanes.
- Stairs, ladders and treads should conform to the criteria outlined in articles 5.3, 5.4, and 5.5 of ANSI/NSPI-1.

### **Pool Surfaces**

All surfaces within the pool intended to provide footing should be slip-resistant. Pool floors and walls should be lightly colored. The colors, patterns, or finishes of the pool interior should not obscure the existence or presence of objects or surfaces within the pool. There should be no protrusions or other obstructions in the swimming area that can cause entrapment or injury. All interior surfaces should have uniform slopes.

### **Handholds**

Suitable handholds should be provided around the perimeter of the pool in areas where the depth exceeds 3 feet 6 inches. At a minimum the handholds should be no more than 4 feet apart, and consist of any one or a combination of the following:

- Coping ledge, or deck along the immediate top edge of the pool that provides a slip resisting surface of at least 4 inches, not more than 12 inches above the waterline;
- Ladders, stairs, or seat ledges; or
- A secured rope or railing placed at not more than 12 inches above the waterline.

### **Lifeguard Chairs**

Pools with surface area greater than 1800 square feet should have at least one elevated lifeguard chair. The pool should have one additional chair for every 3000 square feet or fraction thereof. If the pool has more than one chair and is wider than 45 feet, the chairs should be located on opposite sides of the pool.

## **Diving Structures**

Diving structures used for competitive diving should comply with USD, FINA, or other requirements. Slides should comply with the CPSC *Safety Standard for Pool Slides*. See Loss Control Bulletin 110 for additional information.

## **Electrical Systems**

All electrical wiring and equipment in or adjacent to swimming pools should comply with local electrical safety codes and the *National Electrical Code (NEC)*. The primary requirements for pools are currently located in Article 680, "Swimming Pools, Fountains, and Similar Installations." These requirements include separation distances for electrical conductors; requirements for underwater lighting and audio equipment, grounding requirements for certain electrical equipment; and mandatory bonding of metallic pool structural elements, lighting systems, and electrical equipment associated with pool water circulating systems. Additional information on electric shock hazards in swimming pools is outlined in Loss Control Bulletin 112.

## **Lighting**

All lighting over swimming pools should comply with NEC Article 680 requirements. In addition, all light bulbs should be heavy-duty bulbs, encased in sleeves, or otherwise protected from breakage.

Underwater lighting, if provided, should provide a minimum of 0.5 watts per square foot of pool surface area. The lights should be spaced to provide illumination so that all portions of the pool, including the bottom, may be readily seen without glare.

Area lighting should provide at least 0.6 watts per square foot of deck area. If such lighting is used for night swimming, area and swimming pool lighting combined should provide at least 2 watts per square foot of pool area with 2 foot-candles of illumination.

## **Pool Mechanical Equipment**

Pools should be equipped with water circulation, filtration, and disinfection equipment. This equipment should comply with NSF Standard 50, *Circulation System Components for Swimming Pools, Spas, or Hot Tubs*. All equipment should be installed and operated according to the manufacturer's instructions.

## **Drains**

Pools should have at least two drains located at the bottom of the pool. All drains and suction fittings should be guarded by anti-vortex covers or other means to prevent entrapment. In addition, circulating system designs should conform to U.S. Consumer Products Safety Commission (CPSC) voluntary guidelines for reducing entrapment hazards in pools.

## **Emergency Shutdown**

An emergency shutdown station should be provided. This station should disable all pool circulation, mechanical, chemical feed, and electrical devices.

## **Pool Safety Equipment**

Pool safety equipment, including signs, first aid equipment, and emergency procedures are covered in Loss Control Bulletin #107 – Swimming Pool Operations.

**IMPORTANT NOTICE - The information and suggestions presented by Bollinger Inc. in this Loss Control Bulletin are for your consideration in your loss prevention efforts. They are not intended to be complete or definitive in identifying all hazards associated with your club, preventing workplace accidents, or complying with any safety related, or other, laws or regulations. You are encouraged to alter them to fit the specific hazards of your club and to have your legal counsel review all of your plans and club's policies.**

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