



# Standard Guide for Fences for Residential Outdoor Swimming Pools, Hot Tubs, and Spas<sup>1</sup>

This standard is issued under the fixed designation F 1908; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This guide provides recommended minimum requirements for various types of fences for residential outdoor swimming pools, hot tubs, and spas.

1.2 The values stated in inch-pound units are to be regarded as standard. The values stated in brackets are for information only.

## 2. Referenced Documents

2.1 *ASTM Standards*:<sup>2</sup>

A 392 Specification for Zinc-Coated Steel Chain-Link Fence Fabric

A 491 Specification for Aluminum-Coated Steel Chain-Link Fence Fabric

F 552 Terminology Relating to Chain Link Fencing

F 668 Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric

F 1183 Specification for Aluminum Alloy Chain Link Fence Fabric

F 1345 Specification for Zinc-5 % Aluminum-Mischmetal Alloy-Coated Steel Chain-Link Fence Fabric

2.2 *CPSC Document*:<sup>3</sup>

CPSC Staff Recommendations, Barriers for Residential Swimming Pools, Spas, and Hot Tubs (March 1992)

2.3 *NSPI Document*:<sup>4</sup>

ANSI/NSPI-8 1996 Model Barrier Code for Residential Swimming Pools, Spas and Hot Tubs

2.4 *BOCA Document*:<sup>5</sup>

The BOCA National Building Code/1996—13th Edition

2.5 *SBCCI Document*:<sup>6</sup>

1993 SBCCI Bluebook, Standard Swimming Pool Code

2.6 *ANSI Standards*:<sup>7</sup>

Z535.4 Product Safety Signs and Labels

## 3. Terminology

3.1 See Terminology F 552 for definitions of terms relating to chain link fencing.

3.2 *Definitions of Terms Specific to This Standard*:

3.2.1 *fence, n*—a type of barrier that surrounds and obstructs access to the pool, tub, or spa.

3.2.2 *grade, n*—the finished elevation at any specified point of the ground or pavement outside the pool area.

3.2.3 *hot tub, n*—See *spa*.

3.2.4 *outdoor, adj*—located outside of a completely enclosed building or other structure.

3.2.5 *residential, adj*—situated on the premises of a detached one- or two-family dwelling or a one-family town house not more than three stories in height.

3.2.6 *spa (nonportable), n*—a permanent structure containing water over 24 in. [610 mm] deep, in which the water-heating and water-circulating equipment are not an integral part of the product, intended for recreational bathing.

3.2.7 *spa (portable), n*—a nonpermanent structure containing water over 24 in. [610 mm] deep, in which all controls, water-heating, and water-circulating equipment are an integral part of the product, intended for recreational bathing.

3.2.8 *swimming pool, n*—an in-ground, on-ground, or above-ground structure of a permanent, semi-permanent, or portable fabrication containing water over 24 in. [610 mm] deep and designed and constructed in accordance with local codes, used for bathing, swimming, diving, racing, or other activity.

## 4. Summary of Practice

4.1 This guide is based in part upon recommendations of the United States Consumer Product Safety Commission (CPSC), the American Association of Pediatrics, the National Center for

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> Available from U.S. Consumer Product Safety Commission (CPSC), 4330 East-West Hwy., Bethesda, MD 20814.

<sup>4</sup> Available from National Spa and Pool Institute, 2111 Eisenhower Avenue, Alexandria, VA 22314.

<sup>5</sup> Available from Building Officials and Code Administrators International Inc., 4051 W. Flossmoor Rd., Country Club Hills, IL 60478-5795.

<sup>6</sup> Available from Southern Building Code Congress International, 900 Montclair Rd., Birmingham, AL 35213-1206.

<sup>7</sup> Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

Injury Prevention, and the American Medical Association. It also incorporates certain provisions of the National Spa and Pool Institute (NSPI) Model Barrier Code for Residential Swimming Pools, Spas and Hot Tubs.

**5. Significance and Use**

5.1 This guide sets forth minimum standard requirements for use in local codes and ordinances relating to residential outdoor swimming pools, hot tubs, and spas.

5.2 This guide does not have the effect of law, nor is it intended to supersede local codes and ordinances of a more restrictive nature.

5.3 Studies, as listed in Annex A1, have been referenced as the bases for certain recommendations in this guide and will assist those who intend to provide protection against drownings and near-drownings by restricting access to children under the age of five years in residential swimming pools, spas, and hot tubs. This would include, but not be limited to, state and local governments, model code organizations, building code groups, and consumers. It is understood that the format will vary depending upon the specific use and local conditions.

**6. Requirements**

6.1 *Height*—The top of the fence shall be a minimum of 48 in. [1219 mm] above grade measured on the side of the fence that faces away from the swimming pool. If the fence is mounted on top of an above ground pool, the top of the fence shall be a minimum of 36 in. [914 mm] above the top of the pool structure, provided the top of the pool structure is a minimum of 48 in. [1219 mm] above grade (see 3.2.2 for definition of *grade* specific to this guide).

6.2 *Visibility*—The fence on top of an above ground pool shall be so designed and constructed that it has at least a 65 % open area to allow visibility from a designated supervising area outside the pool area to inside the pool area.

6.3 *Ground Clearance*—The maximum vertical clearance between grade and the bottom of the fence shall be 4 in. [102 mm] measured on the side of the fence that faces away from the swimming pool. Where the top of the pool structure is above grade, such as an above ground pool, the fence may be at ground level or mounted on top of the pool structure. Where the fence is mounted on top of the pool structure, the space between the top of the pool structure and the bottom of the fence shall be no greater than 4 in. [102 mm] in any direction.

6.4 *Solid Barriers* that do not have openings, such as masonry or stone walls, shall not contain indentations or protrusions except for normal construction tolerances and tooled masonry joints. Such indentations shall not be deeper than 0.375 in. [10 mm].

6.5 *Horizontal and Vertical Members*—Where the fence is composed of horizontal and vertical members and if the distance between the tops of the horizontal members is less than 45 in. [1143 mm], the horizontal members shall not extend more than 0.375 in. [10 mm] outside of the enclosure, and the spacing between the vertical members shall not exceed 1 3/4 in. [44 mm] (see Fig. 1). If the distance between the tops of at least two consecutive horizontal members is 45 in. [1143 mm] or more, the spacing between the vertical members shall not

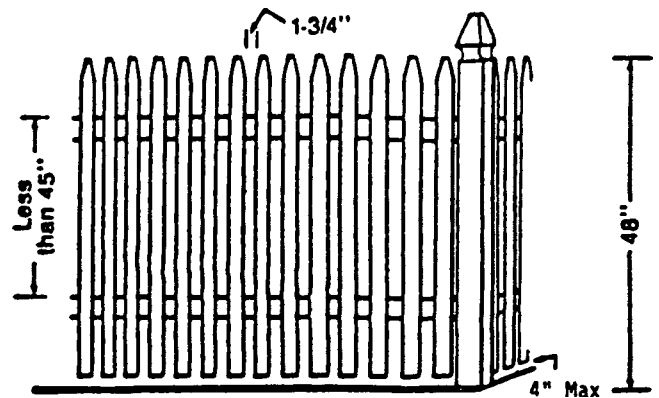


FIG. 1 If Horizontal Members are Less Than 45 in. Apart, Vertical Spacing Shall Not Exceed 1-3/4 in.

exceed 4 in. [102 mm] (see Fig. 2). Where there are decorative cutouts, the spacing within the cutouts shall not exceed 1 3/4 in. [44 mm].

6.6 *Chain Link Fences*—Mesh opening for chain link fences shall be a nominal 1 1/4 in. [32 mm] measured between the parallel sides of the mesh, and a maximum of 1 3/4 in. [44 mm] measured horizontally between the corners of the installed mesh, as illustrated in Fig. 3 (see Note 1), unless the fence is provided with privacy slats (see Note 2) fastened at the top or the bottom, in which case no opening in the mesh shall exceed 1 3/4 in. [44 mm].

NOTE 1—If the tolerance of ± 1/8 in. [3.2 mm] indicated in Specifications A 392, A 491, F 668, F 1183, and F 1345 is rigidly applied to an ordered nominal mesh size of 1 1/4 in. [32 mm] measured between the parallel sides of the mesh, the result could be a dimension exceeding the specified maximum of 1 3/4 in. [44 mm] measured horizontally between the corners of the installed mesh. The degree of tension applied to the fabric during installation could also affect this horizontal dimension. In all cases, the horizontal opening between the corners of the fabric mesh after tensioning shall not exceed 1 3/4 in. [44 mm].

NOTE 2—*Caution Regarding Privacy Slats*—Privacy slats where used shall not violate the requirements of 6.2 regarding visibility.

6.7 *Diagonal Members:*

6.7.1 Where the fence is composed of diagonal members, such as in a lattice fence, any opening created by the diagonal members located less than 48 in. [1219 mm] above grade shall be a maximum of 1 3/4 in. [44 mm] measured in its largest direction.

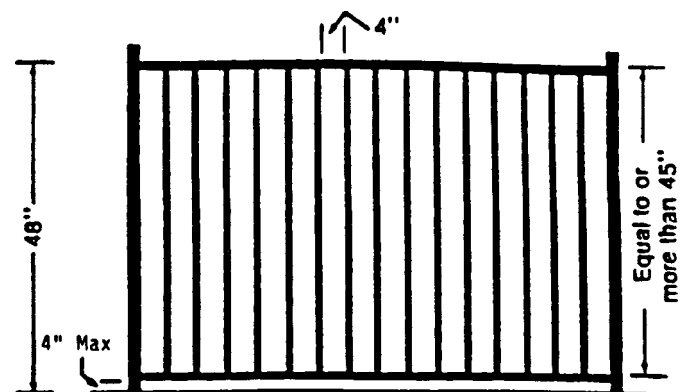


FIG. 2 If Horizontal Members are Equal to or More Than 45 in. Apart, Vertical Spacing Shall Not Exceed 4 in.

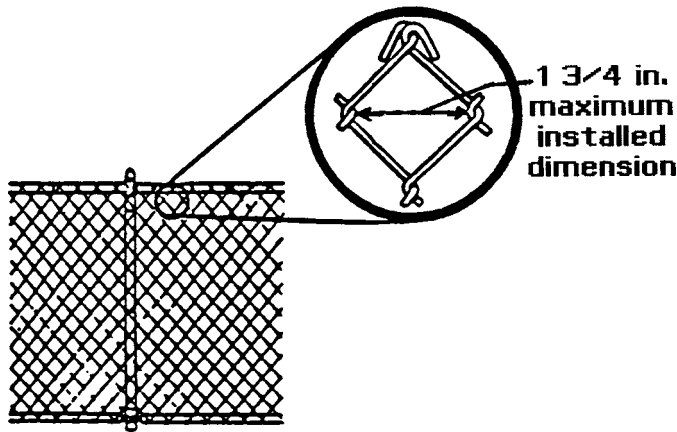


FIG. 3 Nominal 1-¼ in. Square Chain Link Mesh

6.7.2 Diagonal bracing members extending from one side to the opposite side creating a ladder effect on all styles of fences and gates are not permitted where spacing of vertical members in any area between posts exceeds 1¾ in. [44 mm].

6.8 Access Gates:

6.8.1 *Double Leaf* access gates shall comply with the requirements of 6.1-6.6 and shall be equipped with a padlock or other key-operated locking device that must be locked when the gate is not in use.

6.8.2 *Single Leaf* access gates shall open outward away from the pool, shall be self-closing, and shall have a self-latching device. Where the release mechanism of the self-latching device is located less than 54 in. [1372 mm] above grade, the release mechanism shall be located on the pool side of the gate a minimum of 3 in. [76 mm] below the top of the gate and the gate and fence shall have no opening greater than ½ in. [13 mm] within 18 in. [457 mm] of the release mechanism when the gate is in the fully closed position (see Fig. 4).

6.9 Buildings—The fence shall completely surround the pool structure when practical. Where a building or dwelling or portion thereof must be utilized as part of the pool enclosure,

and if the exterior wall or walls of that portion of the building contains doors, windows, or other openings, it shall comply with the following provisions:

6.9.1 *Doors*—Doors in the wall of a building or dwelling that allow direct access through the wall to the pool shall be provided with one of the following:

6.9.1.1 An alarm capable of detecting unauthorized entry through the door into the pool area and which, when activated, emits a sound of sufficient volume to be heard in the building or dwelling. The audible warning shall commence not more than 7 s after the door and/or its screen, if present, are opened and shall sound continuously for a minimum of 30 s. The alarm shall have a minimum sound pressure rating of 85 dB at 10 ft and the sound of the alarm shall be distinctive from other household sounds such as smoke alarms, telephones, and door bells. The alarm shall automatically reset under all conditions. The alarm shall be equipped with manual means such as touch pads or switches to temporarily deactivate the alarm for a single opening from either direction. Such deactivation shall last for no more than 15 s. The deactivation touch pads or switches shall be located at least 54 in. [1372 mm] above the threshold of the door; or

6.9.1.2 A self-latching device on a self-closing door that is either:

- (1) At least 54 in. [1372 mm] above floor level, or
- (2) At any convenient height if the device uses a key, electronic opener, or integral combination lock, so long as it does not negate the function of the door.

6.9.2 *Windows*—Windows in the wall of a building or dwelling that allow direct access through the wall to the pool and are located 48 in. [1219 mm] or higher above floor level, and where there is no foothold in the building or dwelling wall, shall be exempt and considered equivalent protection to the fence. Windows in the wall of a building or dwelling that allow direct access through the wall to the pool and where the lowest opening is at a height of less than 48 in. [102 mm] above floor level, shall comply with one of the following requirements:

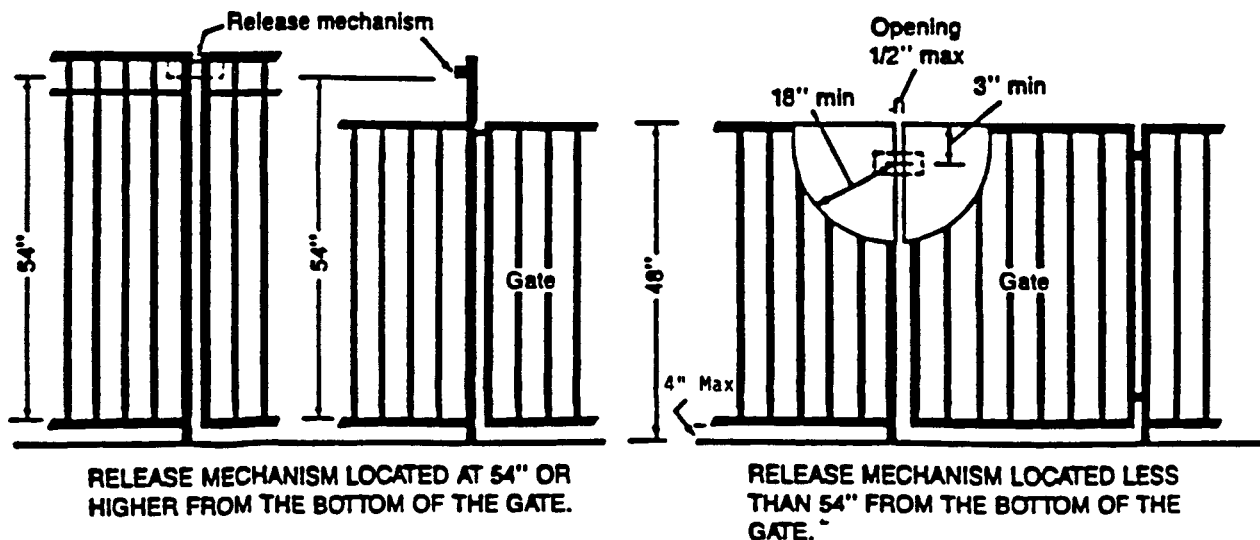


FIG. 4 Latch Release Mechanism

6.9.2.1 Window guards or other means of equal protection shall limit access such that there are no openings exceeding 4 in. [102 mm]; or

6.9.2.2 Ground level windows shall be fixed in such a way that they will not open sufficiently far to create a gap exceeding 4 in. [102 mm]; or

6.9.2.3 The lowest opening panel of a window shall be located not less than 48 in. [1219 mm] above the floor and there shall be no footholds wider than 0.4 in. [10 mm] on the internal wall down to 42 in. [1067 mm] below the lowest opening panel.

#### 6.10 *Above-Ground Pools or On-Ground Pools:*

6.10.1 *Pool Wall*—An above-ground or on-ground pool wall itself may be the barrier if the pool structure is on grade and the wall is at least 48 in. [1219 mm] in height. Other types of barriers can be mounted on the pool structure or can surround the pool at ground level. Where the barrier is mounted on the pool structure, the opening between the top surface of the pool frame and the bottom of the fence shall be no greater than 4 in. [102 mm] in any direction. Where an above-ground or on-ground pool wall is less than 48 in. [1219 mm] above the ground, it is not considered a barrier and therefore a barrier fence in accordance with 6.1-6.8 shall be provided.

6.10.2 *Ladders or Steps*—Where an above-ground or on-ground pool wall is used as a barrier or where the barrier is mounted on the pool structure, and the means of access to the pool is a ladder or steps, then:

6.10.2.1 The ladder or steps shall be capable of being secured, locked, or removed to prevent access; or

6.10.2.2 The ladder or steps shall be surrounded by a barrier fence that meets the requirements of 6.1-6.8.

6.10.3 *Fence Mounted on Top of 48 in. [1219 mm] or Higher Above Ground or On Ground Pool Wall Structure:*

6.10.3.1 Where provided, the top rail of a fence mounted on top of the pool structure or deck of an above-ground or on-ground pool that is in conformance with 6.10.1 shall be a minimum of 36 in. [914 mm] above the deck surface.

6.10.3.2 Where a picket or ornamental type fence is provided, it shall comply with the 45 in. [1143 mm] height requirements of 6.5.

6.10.3.3 *Visibility*—Where fencing is required and/or provided with the pool or deck, it shall comply with the requirements of 6.2.

6.10.4 *Deck*—Where an above-ground or on-ground pool has a deck that abuts or is adjacent to a dwelling and direct access to the deck is through the exterior wall of the dwelling, such access shall be in compliance with 6.9.

6.11 *Grounding*—Continuous runs of metal fencing, installed in the ground within 10 ft of the pool, shall be grounded in compliance with the requirements of local utilities and electrical codes.

## 7. Prohibited Locations

7.1 Fences shall be located so as to prohibit the use of permanent structures, equipment, or similar objects to aid in climbing the fence.

7.2 *Clear Zone*—There shall be a clear zone of at least 48 in. [1219 mm] between the swimming pool barrier and any permanent structures or pool equipment such as pumps, filters, heaters, etc. that can be used as an aid to climb the barrier.

## 8. Maintenance and Inspection

8.1 It is the responsibility of the home owner, occupant, or tenant to maintain the integrity of the fence and to regularly inspect the gates, doors, etc. for proper closing and locking operation, and the alarms for correct operation.

8.2 Keep the area outside the fence free of toys, furniture, or other objects that could be moved by a child and used to climb the fence.

8.3 Signage complying with ANSI Z535.4 to provide warnings about certain risks found in the pool/spa environment (such as: constant adult supervision required, maintain a clear zone around the barrier, keep the gate closed and secured when pool/spa is not in use) shall be placed in the pool area and maintained by the homeowner.

## 9. Keywords

9.1 fence; fences; hot tubs; pools; spas; swimming pools

## ANNEX

### (Mandatory Information)

#### A1. RATIONALE

A1.1 The presence of a fence around a residential swimming pool, spa, or hot tub is only one in many available layers of passive protection against drownings or near-drownings. Such passive protection should never be construed as taking the place of constant adult supervision.

A1.2 About 350 children under 5 years of age drown each year in residential swimming pools, spas, and hot tubs. No other age group is as vulnerable. For the age group 5 to 14,

with twice as many children in the population, there are one-fifth as many drownings in pools.

A1.3 In a study of drowning and near-drowning incidents (1),<sup>8</sup> CPSC found that the majority of the victims lived in or were visiting the residence where the accident happened; less

<sup>8</sup> The boldface numbers in parentheses refer to the list of references at the end of this guide.



than two percent of the accidents occurred when a child trespassed on the property. Most of the victims were either near or in the residence immediately prior to the accident and reached the pool unnoticed.

A1.4 For these reasons, the CPSC staff recommendations and those of NSPI are intended to limit or delay a child under five years of age from gaining unsupervised access to the pool from the house or yard. The recommendations consider anthropometric and developmental characteristics of children under five. A fence should not have footholds and handholds, and spaces should be limited in size and location to preclude a child from climbing over or passing through the fence. Latches on gates should be shielded or out of reach.

A1.5 The following are rationale for the various subsections in Section 6:

A1.5.1 6.1—The minimum 48 in. [1219 mm] fence height above grade is based on the ability of children under five years old to climb fences (2) and on appropriate anthropometric (3, 4) and developmental characteristics (5, 6, 7) of children under age five.

A1.5.2 6.2—This requirement is essential to proper adult supervision of children within the pool area.

A1.5.3 6.3—This requirement is based on the head breadth and chest depth of a 13- to 18-month old (3) and is intended to preclude passing through an opening of a type not otherwise specified in the remaining subsections of Section 6.

A1.5.4 6.4—This requirement is intended to reduce the potential for gaining a foothold.

A1.5.5 6.5—If horizontal members are less than 45 in. [1143 mm] apart, a child may gain both a handhold and a foothold. The 1¾ in. [44 mm] space requirement is based on the foot width of a 13- to 18-month-old (6) and is intended to preclude his gaining a foothold. The 4 in. [102 mm] space requirement is intended to preclude young children from passing through the fence (see 6.3). The 45 in. [102 mm]

horizontal member spacing is intended to prevent young children from using the horizontal members as a ladder.

A1.5.6 6.6—The 1¾ in. [44 mm] maximum horizontal opening in the chain link mesh is based on the foot width for young children and is intended to reduce the potential for gaining a foothold (see Fig. 3). During the research leading to the selections in this standard guide, based upon comparative mesh size climbability studies (8), several differences of opinion on the rationale for this size mesh were noted. At least two organizations, NSPI and SBCCI (see 2.3 and 2.5), have written standards calling for a maximum of 2¼ in. [57 mm] measured between the parallel sides of the mesh, which is the generally accepted standard for residential chain link fence. At least two other organizations, CPSC and BOCA (see 2.2 and 2.4), consider the 1¾ in. [44 mm] maximum horizontal opening the only acceptable standard.

A1.5.7 6.7—This requirement is intended to reduce the potential for gaining a foothold (see 6.5).

A1.5.8 6.8—A single leaf access gate should open outward because, in the event the latch fails to operate, a child who pushes the gate will not gain immediate access to the pool and may even engage the latch. Double leaf access gates are not required to have a self-closing device since such devices are generally prohibitively expensive and often are not available for large gates. Any such gates should be securely locked with a suitable padlock or other device. The 54 in. [1372 mm] height of the release mechanism is intended to keep children under five years old from reaching it based on the reaching height of 3.5- to 4.5-year-old children (4). For release mechanisms on the pool side of the gate, the 3 in. [76 mm] minimum requirement is intended to prevent a child from reaching over to unlatch the gate. The ½ in. [13 mm] maximum requirement is intended to prevent reaching the latch release through the gate or fence.

A1.5.9 6.11—This section was included to ensure against electrical shock hazards from ungrounded or improperly grounded metal fences.

## REFERENCES

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- (2) Nixon, J.W., Pearn, J.H., and Petrie, G.M., "Childproof Safety Barriers," *Australian Pediatric Journal*, Vol 15, 1979, pp. 260–262.
- (3) *Physical Characteristics of Children as Related to Death and Injury for Consumer Product Design and Use*, May 31, 1975, Highway Safety Research Institute, The University of Michigan, Ann Arbor, Michigan.
- (4) *Anthropometry of Infants, Children, and Youths to Age 18 for Product Safety Design*, May 31, 1977, Highway Safety Research Institute, The University of Michigan, Ann Arbor, Michigan.
- (5) Caplan, Frank and Theresa, *The Second Twelve Months of Life*, New York, Bantam Books, 1977.
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- (8) *Swimming Pool Safety: Fence Climbability By Children*, prepared for National Institute of Child Health and Human Development, National Institute of Health, Contract N43-HD-8-2912, by COMSIS Corporation, 8737 Colesville Road, Silver Spring, MD 20910.

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