Core Director: Michael Bell
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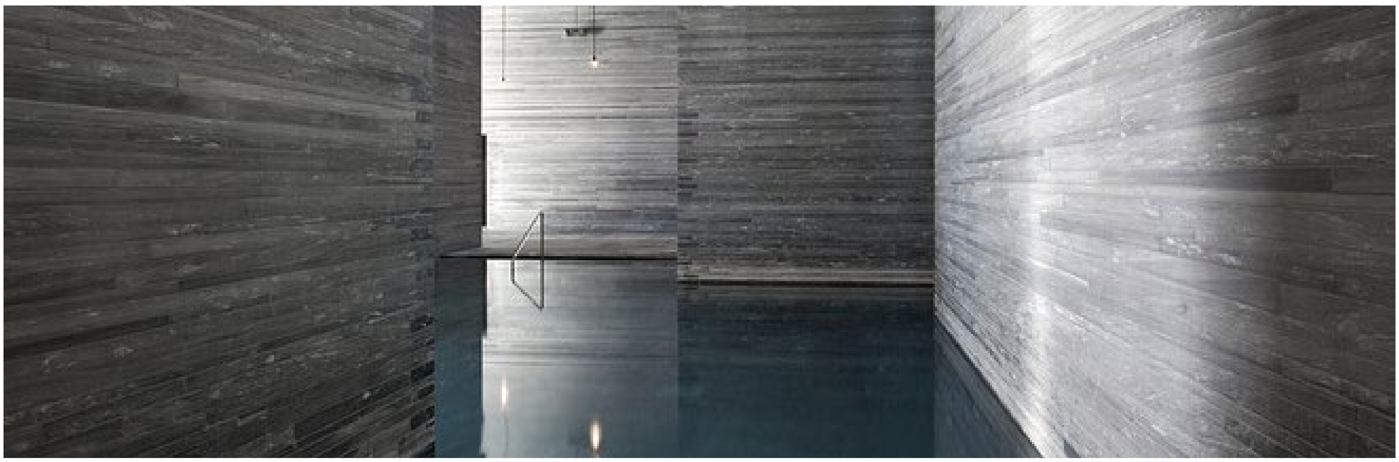
Studio Assistant: Jesse Catalano

TEMPORALIS

BRIEF III: Gymnasium



WATER : LAND : AIR : SKIN

It is a conceit of New York City- the concrete city, the steel metropolis, Batman's Gotham – to think it is a place outside nature, a place where humanity has completely triumphed over the forces of the natural world, where a person can do and be anything without limit or consequence. Yet this conceit is not unique to the city, it is shared by a globalized twenty first century human culture, which posits that through technology and economic development we can escape the shackles that bind us to our earthly selves, including our dependence on the earth's bounty and the confines of our native place." - Eric W Sanderson, Mannahatta, page 13

"..if we were able to run on sunlight and utilize only the energy needed; if form and function would seamlessly merge and every bit was recycled; if we would reward cooperation and rejoice in diversity, if we would attend to things locally and curb our excesses from within, then we would be following some key laws of nature and many difficult problems would simply cease to exist... " - Greenpeace, www.greenpeace, quote extracted from web site, Nov 2012

Maximize Use : Minimize Consumption : Engage Communities

THESIS

Our aim in this project is to produce a building anchored in its urban and geological context, useful for the communities around it, efficient in terms of consumption of mechanical and material resources and able to give pleasure and wellness to a diverse number of users.

The building is a contemporary derivative of the ancient bath house, inspiration can be drawn from any of its predecessors such us; thermae, gymnasium, hamman, misoji, banyas, sauna, hanjeungmak, jimjilbang, sweat lodge, the contemporary spa, gym, recreation center or clubs - all of which are variations of buildings containing bathing facilities with different names in most cultures.

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Our definition of "Gymnasium" is a public institution with four programmatic components:

WATER: A series of rooms with water containers – pools of different sizes – for bathing, exercise, relaxation, play and instruction.

LAND: A series of outdoor and indoor spaces such us gardens, patios, courts, connected to the building for exercise and contemplation of nature and the seasons.

AIR: A series of rooms for exercise, yoga, dance, music, martial arts, gathering, where natural light and air stimulate deep breathing.

SKIN: A female and male set of rooms for changing, showering, and preparing the body for the different temperatures and activities within the building.

This building is intended as a supplement for physical and mental health and general advancement for the adjacent communities.

The site is a through block. Natural light, cross ventilation, passive heating and cooling are encouraged. Public access and circulation through the site should be maintained regardless of the building's use and hours. The building is allowed on the site provided it maintains a pre-existing easement. This easement dictates public use of a sidewalk width (no less than 15 feet) between the streets that bound the site.

The building maximum foot print is 6,800 square feet, maximum floor area 16,000 square feet. The building volume cannot exceed 320,000 cubic feet within. The rest should be allocated to productive urban landscaping. The building and program are considered as part of a public infrastructure that includes public schools, libraries, and health and fitness centers. The Gymnasium building is part of a complete ecosystem that harvests, uses and recycles its waters and energy. The pool will be no larger than 82 x 41 feet, smaller pools are encouraged. This pool size is for teaching how to swim, exercise and relaxation, not for tournaments or speed competitions.

A separate area for female and male changing rooms and lockers is required. These lockers should have access to showers and restrooms. The building should demonstrate an understanding of the life cycle consistent with our findings of the previous Brief I and II.

The water, light and air for this building are considered as one circuit intricately linked. The building aspires to be a polyvalent structural, mechanical and spatial system.

Our client is a combined partnership between the City of New York and Columbia University. Our users are the citizens of New York City that live within a certain radius of the building weather they are Columbia University members or not– the user group is purposely generic, and left open for your/critic definition. Natural light and ventilation are encouraged. Natural light should be maximized as a resource.

COLUMBIA UNIVERSITY **GRADUATE SCHOOL OF ARCHITECTURE PLANNING AND PRESERVATION**
CORE I STUDIO A4101X FALL 2014

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SITE

The maximum total roof footprint (hard surfaces) shall be 6,800 square feet and within the maximum envelope area, outlined.

SCALE 1/16” = 1’

2’ Contours

Maximum Footprint
6,800 SF

A Public Access Easement requires that :

1. Public Access through the site and connecting streets is allowed at all times.
2. At least 60% of the lot remains accessible as park

PROGRAM

These are some verbs to keep in mind when designing the spatial sequence: entering, changing, undressing, cleansing, submerging, soaking, socializing, observing, listening, resting, relaxing, ascending, and descending

It is important that you think in terms of sequence of spaces and from within, rather than objects or forms from an outer point of view.

	PROGRAM ELEMENTS	AREA (SF)
1.	Water Component (various pool sizes / types, such as deep or hot)	4,000
2.	Skin Component (changing rooms, showers, bathrooms) *	1,600
3.	Air Component (various body studios such as dance or yoga)	1,500
4.	Reception Area / Public Access / Café	1,200
5.	Land Component (garden contemplation space)**	TBD
6.	Program X - to be determine by student	1,200
	SUBTOTAL (GROSS PROGRAM SPACE)	*10,000*
	Circulation ~15%***	1,500
	Mechanical ~10%	1,000
	Loss factor ~15%	1,500
	SUBTOTAL (SUPPORT SPACE)	*4,000*
	TOTAL BUILDING GROSS	**14,000**

* Provide accessible toilets at every floor/level - and 2 publically accessible toilets
** At least 60% of the lot should remain accessible as park
*** 2 independent means of egress are required per floor, no scissor stairs allowed. Elevator and escalators do not count as egress

TASKS

- Produce a mass physical and 3D model at 1/16” = 1’-0”
- Design the access of people and services from the public way
- Consider the edge of adjacent streets
- Design only One (1) +/- 16,000 square feet (multiple buildings are not allowed)
- Consider the different users scenarios and schedules, inscribe different paths within the site.

Rule: The building is austere and gets maximum use by allocating different users at different scheduled times, such as, school instruction, after school classes, spa hours, senior fitness, after work exercise routines, recreation on weekends, support group meetings.

DELIVERABLES **(TO BE REFINED BY EACH CRITIC)**

- Format all drawings 24" x 36"
- Include Plans and corresponding section drawings
- Layout can overlap, be horizontal, radial, vertical.
- Label the drawings with your; LAST NAME/GSAPP/CRITIC NAME/FALL 2014/BRIEF III

- Diagrams, perspective views, sketches, etc. as desired.

- Site Plan including context and ground floor plan (1/16" = 1'-0")
- Overall building plans (at 1/8" = 1'-0"). Structural grids should be indicated
- Main floor plan (1/8" or 1/4= 1'-0"). Coordinate these plans with the sections
- Full building sections (1/8 or 1/4" = 1'-0")

- Massing model in context 1/16" = 1'-0"
- Section/Building model 1/8 or 1/4" = 1'-0"

RULES

- The water table is -17' below the ground level, and the max construction depth is minus 17 ft
- The maximum allowable building height is 48 feet
- The maximum footprint of the building is 6,800 sq. ft.
- Only one (1) building is allowed on the entire site.
- All utilities – water, sewer, electrical power, gas- are within the site.

TIMEFRAME

- Deliver final project by December 1st or 2nd – as per your studio schedule

REFERENCES

Space + ADA Planning
- Architectural Graphic Standards (Attached)

Diagramming + Drawing Techniques
- Thom Mayne, Combinatory Urbanism: A Realignment of Complex Behavior and Collective Form
- Simon Unwin, Analysing Architecture
- Kim Seonwook, Construction & Design Manual: Architectural Program and Diagrams 1 & 2
- Vishaan Chakrabarti, A Country of Cities

TEMPORALIS
BRIEF III: PRECEDENT STUDY



TASKS

- In groups of two chose a precedent from the list provided
- Explore the precedent through several rounds of investigations. In the first round, you may trace plan and section drawings to familiarize yourselves with the precedent as you study the physical boundaries that define spaces, their scale, composition and sequencing. You may want to relate the precedent to spaces which dimensions you know, such as Avery Hall.
- Subsequent analytical studies should focus on a more interpretative and qualitative reading of architecture, with the aim of arriving at a drawing set that, while true to scale and proportion, manages to convey the design concept, circulation logic, character and atmospheric qualities of the spaces observed. The process is about specificity and selection, not completeness.

Remember: As the spa/bathing experience centers around a highly personal experience and consciousness of our body in its surroundings, focus your investigation on the differentiation of public versus private spaces, the transitions between them and the sequence or route a visitor might take from entry to pool to exit.

TIMEFRAME

- Deliver by October 10th

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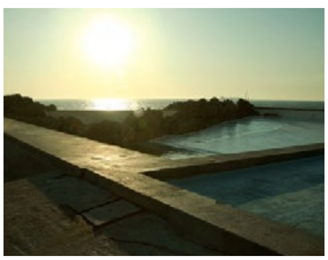
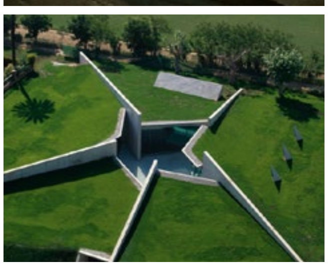
PRECEDENTS

Tod Williams Billie Tsien
Cranbrook Natatorium
Bloomfield Hills, MI, United States
1999

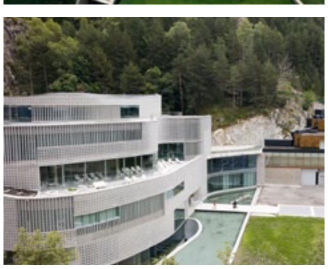
Peter Zumthor
Therme Baths at Vals
Graubunden Canton, Switzerland
1996



Alvaro Siza
Leca Swimming Pools
Leca de Palmeira, Portugal
1966



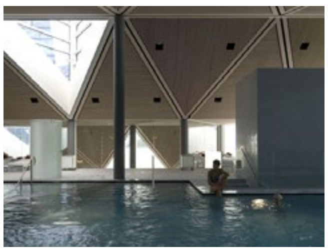
Carlos Ferrater // OAB
Fitness Center
Barcelona, Spain
1996



Moneo Brock Studio
Termas de Tiberio
Panticosa, Spain
2008

Kengo Kuma
Water/Glass House
Atami, Japan
1995

A4 Estudio
Entre Cielos Hotel & Spa
Mendoza, Argentina
2011



Mario Botta
Wellness centre 'Tschuggen Bergoase'
Arosa, Switzerland
2006

Behnisch Architekten
Bad Aibling
Bad Aibling, Germany
2007

JSA Architects
Gleichenberg Thermal Bath
Gleichenberg, Austria
2008

PLOT, (BIG + JDS)
Copenhagen Harbor Bath
Copenhagen, Denmark
2003

Steven Holl
Loisium Alsace
Colmar, France
In Design

GENERAL

The information for determining occupant load shown in the table on this page comes from three model building codes in use in the United States:

1. BOCA National Building Code (BOCA), 1996 edition, with permission of the Building Officials and Code Administrators International, Inc., publisher.
2. Standard Building Code (SBC), 1997 edition, with permission of the Southern Building Code Congress International, Inc., publisher, with all rights reserved.
3. Uniform Building Code (UBC), 1997 edition, with permission of the International Conference of Building Officials, publisher.

Occupant load generally is defined as the maximum capacity of a building or room given as the total number of people present at any one time. For occupant loads, it is generally assumed that all areas of a building will be occupied at the same time, with some exceptions noted in specific codes. For example, the UBC states, "Accessory use areas, which ordinarily are used only by persons who occupy the main areas of an occupancy, shall be provided with exits as though they are completely occupied, but their occupant load need not be included in computing the total occupant load of the building" [UBC Sec. 3302 (a)].

Most codes require that to determine multiple use building or area occupancies, the occupant load (OL) must be based on the use that produces the most occupants. For example, the occupant load for a school multiple use room, which will be used for classroom activities (OL factor 20) as well as assembly space (OL factor 15), is calculated using the 15 sq ft per occupant factor.

If buildings or areas contain two or more separate occupancies, the overall occupant load is determined by computing occupant loads for various areas and adding them together for an aggregate occupant load.

When calculating occupant load for areas with fixed seating in benches or pews, the number of occupants is based on one seat for each 18 in. of bench or pew space. In dining areas with booth seating, the number of seats is based on 24 in. for each seat.

EXITS

All three major codes use occupant loads to determine the size and number of required exits. Based on occupant loads and area uses, it is possible to determine the required number of exits and the arrangement and sizes of exit components.

All three codes (BOCA, SBC, and UBC) consider an exit to be more than merely a door. Although specific definitions vary with each code, exits usually are considered to be continuous and unobstructed means of egress to a public way and may include such building elements as doors, corridors, stairs, balconies, lobbies, exit courts, etc. Elevators are not considered exits. Requirements for arrangement, size, and operation of exits vary; consult applicable codes for specific information.

OCCUPANT LOADS

USE	MAXIMUM FLOOR AREA PER OCCUPANT (SQ FT)		
	BOCA	SBC	UBC[1]
Assembly areas[2]—concentrated use (without fixed seats): auditoriums, bowling alleys[3], churches, dance floors, lodge rooms, reviewing stands, stadiums	7 net	7 net	7
Assembly areas—less concentrated use: conference rooms, dining/drinking areas, exhibit rooms, gymnasiums, lounges, stages[4]	15 net	15 net	15
Assembly areas—standing space	3 net	3 net	3
Business areas[5]	100 gross	100 gross	100
Courtrooms (without fixed seats)	40 net	40 net	40
Day care facilities	—	—	35
Dormitories	—	—	50
Educational			
Classroom areas	20 net	20 net	20
Shops and vocational rooms	50 net	50 net	50
Industrial areas[6]	100 gross	100 gross	200
Institutional[7]			
Children's homes, homes for aged, nursing homes,	—	—	80
sanitariums, hospitals	240 gross	240 gross	240
Inpatient treatment areas	100 gross	100 gross	—
Outpatient areas	120 gross	120 gross	120
Sleeping areas			
Kitchens (commercial)	—	—	200
Libraries			
Reading rooms	50 net	50 net	50
Stack areas	100 gross	100 gross	100
Lobbies (accessory to assembly area)	—	—	7
Locker rooms	—	—	50
Mechanical equipment areas	300 gross	300 gross	300
Mercantile[8]			
Basements	30 gross	30 gross	30
Ground floors	30 gross	30 gross	30
Upper floors	60 gross	60 gross	60
Storage, stockrooms, shipping areas	300 gross	300 gross	300[9]
Parking garages	200 gross	200 gross	200
Residential[10]	200 gross	200 gross	—
Hotels and apartments	—	—	200
Dwellings	—	—	300
Skating rinks[11]		15 net	—
Rink area		—	50
Deck	—	—	15
Storage areas	300 gross	300 gross	300
Swimming pools			
Pool	—	—	50
Deck	—	—	15
All other areas	—	—	100

1. Both BOCA and SBC use net and gross floor areas to determine occupant load. UBC does not differentiate between net and gross areas.
2. Occupant loads for assembly areas with fixed seats are determined by the actual number of installed seats.
3. Occupant load calculations for bowling alleys under BOCA and SBC use 5 persons per alley in addition to the tabular values indicated.
4. Stages are considered assembly areas—less concentrated use (15 sq ft per occupant) in UBC, not separately classified in BOCA or SBC.
5. UBC classifies business areas as office occupancy.
6. UBC classifies industrial areas as manufacturing areas.
7. BOCA and SBC classify areas within institutional occupancies; UBC classifies by occupancy description only.
8. UBC classifies mercantile areas as store retail sales rooms.
9. UBC considers storage and stockroom areas as storage occupancy (300 sq ft per occupant).
10. BOCA and SBC do not separate hotel/apartment and dwelling occupancies.
11. BOCA does not classify skating rinks separately from other assembly areas of less concentrated use (15 sq ft per occupant). SBC does not separate areas within skating rinks.

MINIMUM EXITS BASED ON USAGE

USAGE	2 EXITS MINIMUM REQUIRED WHERE OCCUPANT LOAD IS AT LEAST:
Aged, homes for the	6
Aircraft hangers	10
Auction rooms	30
Assembly areas	50
Bowling alley	50
Children's homes	6
Classrooms	50
Congregate residences	10
Courtrooms	50
Dormitories	10
Dwellings	10
Exercise rooms	50
Health care facilities	
Sleeping rooms	8
Treatment rooms	10
Hotels and apartments	10
Kitchens (commercial)	30
Library reading rooms	50
Locker rooms	30
Manufacturing areas	30
Mechanical equipment rooms	30
Nurseries for children (day care)	7
Offices	30
Parking garages	30
School shops and vocational rooms	50
Skating rinks	50
Storage and stockrooms	30
Stores (retail sales rooms)	
Basements	2 exits minimum
Ground floors	50
Upper floors	50
Swimming pools	50
Warehouses	30
All other	50

ICBO; SBCCI; BOCA
James O. Rose, AIA; University of Wyoming; Laramie, Wyoming
Annica S. Emilsson; Rippeteau Architects, P.C.; Washington, D.C.

GENERAL

Stairways are an essential component in the circulation and egress systems of most buildings. They are also the site of accidents resulting in approximately 4000 deaths and one million injuries requiring hospital treatment annually in the United States. For these reasons, stairway design is strictly controlled by building regulations.

The information on this and the following page on stair design summarizes most common building code and access regulation requirements. Be sure to check local regulations as well.

MINIMUM REQUIREMENTS: Consult the table below on building code stairway requirements to determine dimensional limits for treads, risers, and stair width. Verify that local codes are not more restrictive.

TREAD AND RISER SIZES: Use the stair proportioning graph on the associated AGS stair design page to find the number of risers, riser height, and optimum tread depth.

STAIR WIDTH: In addition to the minimums shown on this page, stair widths must also meet occupant load requirements based on use group and floor area. Consult the local building code.

LANDINGS: Landings at least as wide as the stair itself are required at the top and bottom of the stair and at intermediate points if necessary to ensure that no single flight has a rise greater than 12 ft (3658 mm).

STAIR LAYOUT: A sample stairway plan and section are shown on the following page on stair design. Some tips for stair layout follow:

1. Maintain minimum headroom of 6 ft 8 in. (2032 mm) for non-residential and 6 ft 6 in. (1981 mm) for residential stairs.
2. Avoid flights with fewer than three risers to minimize tripping hazards.
3. The use of door alcoves is recommended to prevent stairway doors from obstructing the egress travel path.
4. For prefabricated stairs, the stairwell enclosure should be oversize by several inches for ease of stair installation and to avoid structural conflicts.

TREAD AND RISER PROPORTIONING

Most interior stairs are designed to the steepest limits permitted by code so as to occupy the least amount of space. However, tread and riser combinations that are less steep may be considered for exterior stairs, grand stairs, or stairs of just a few risers. The most common rule for the comfortable proportioning of stairs in these cases is 2 x riser height + tread depth = 25 in. (635 mm). Consider testing life-size mock-ups of stairs of unusual proportions to verify their ease of use.

HANDRAILS

The accompanying diagrams summarize most handrail requirements for nonresidential stairs. For residential stairs not covered by ADA, most codes permit handrails on only one side of the stair, without top and bottom extensions. In some cases a greater range of heights is also permitted. The ADA recommends (but does not require) additional handrails at lower heights where stairs are used by children.

GUARDRAILS

Guardrails 42 in. (1067 mm) in height are typically required on the open sides of nonresidential stairs. When handrails are used in combination with a guardrail, handrail heights up to 42 in. (1067 mm) are permitted by some building codes. Intermediate rails or balusters must be spaced so that a sphere of either 4 or 6 in. (102 or 152 mm), depending on the code and use group, cannot pass through any part of the guard. Guardrail designs with horizontal rails that are easily climbed are not recommended and, in some cases, are restricted. For residential stairs, guardrails 36 in. (914 mm) in height are usually permitted.

STAIR DETAILS

Treads and risers within a flight must be uniform in size within close tolerances. Treads must be slip resistant. The shape of nosings and risers must meet the requirements shown below. Carpeting or other stair coverings should be applied securely and should not create a nosing radius greater than permitted. Handrails, guardrails, and stairways themselves must meet structural load requirements.

Access regulations in some localities require floor material strips of contrasting color located at the top approach to a stair and at the lowest tread. These markings are intended to aid the visually impaired in identifying the limits of the stair. The application of such markings may be appropriate even where not required, particularly where a high proportion of elderly or visually impaired users are anticipated.

SPECIAL STAIR CONFIGURATIONS

Winders (radiating risers) in stairs normally are permitted only in single-family residences. Minimum tread depth requirements at the inside of the winders may limit the inside radius of the stair. Spiral stairs typically are permitted in single-family residences and for access to mezzanines of limited area in other building types. With certain tread depth restrictions, circular stairways are permitted in most buildings. Alternating tread stairways are permitted for some mezzanines and for access to rooftops. The use of fixed ladders is limited to access to restricted areas, such as rooftops and elevator pits.

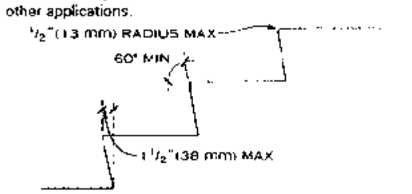
REFERENCES

Metal Stairs Manual. National Association of Architectural Metal Manufacturers, 1992.

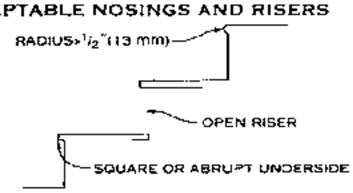
Templer, John. *The Staircase*, 2 vols. Cambridge, Mass.: MIT Press, 1992.

NOTE

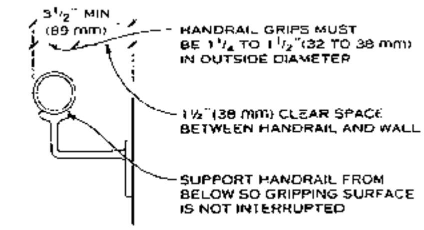
See pages in other *Architectural Graphic Standards* chapters for stair construction details in various materials and for other applications.



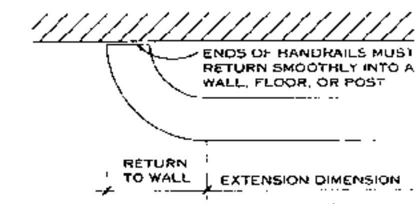
ACCEPTABLE NOSINGS AND RISERS



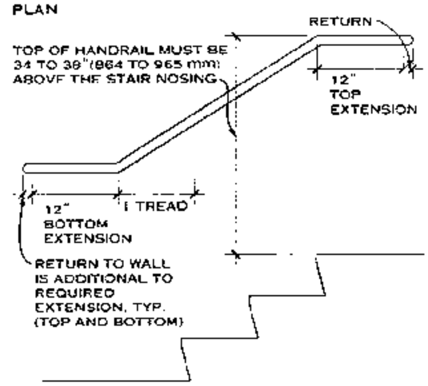
UNACCEPTABLE NOSINGS AND RISERS



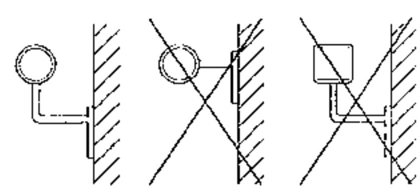
SECTION



PLAN



ELEVATION



NOTES

1. When considering metal pipe rails, do not confuse the nominal size by which pipes are specified with the actual outside diameter of the pipe. The outside diameter is larger than the nominal size.
2. Handrails must be continuous on both sides of a stair. Ends of handrails must extend beyond the stair as shown above.
3. The gripping portion of a handrail must be equivalent to a 1¼ to 1½ in. (32 to 38 mm) diameter round rail.

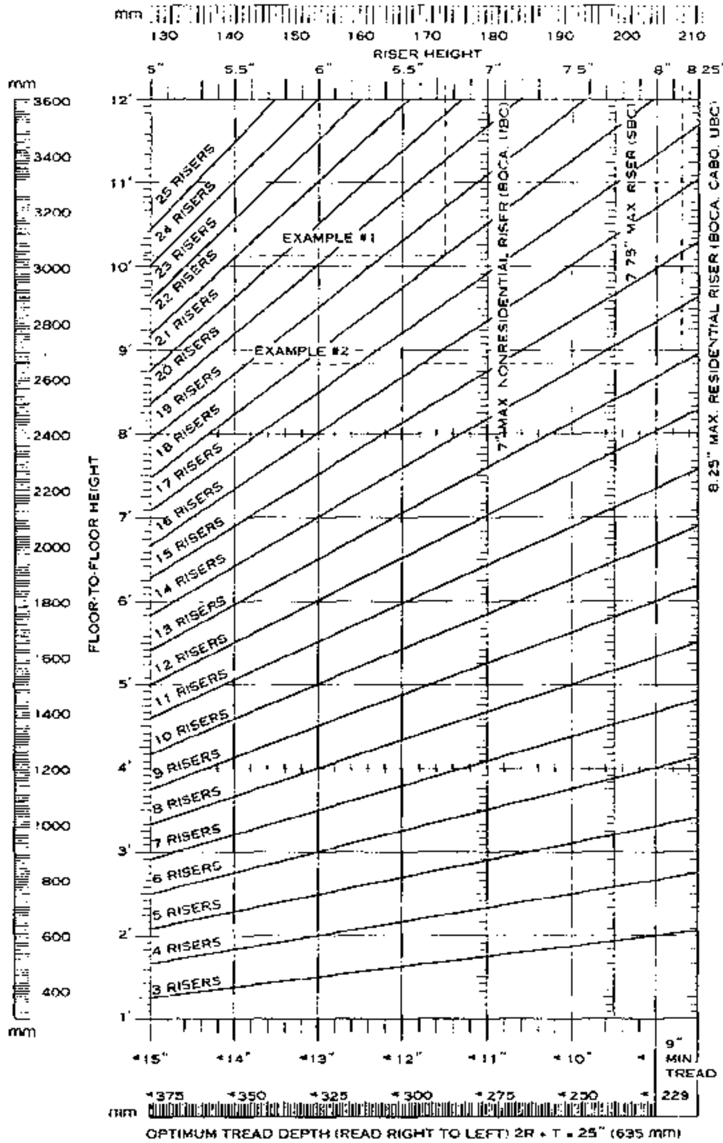
HANDRAIL DETAILS CONFORMING TO ADA AND MOST BUILDING CODES

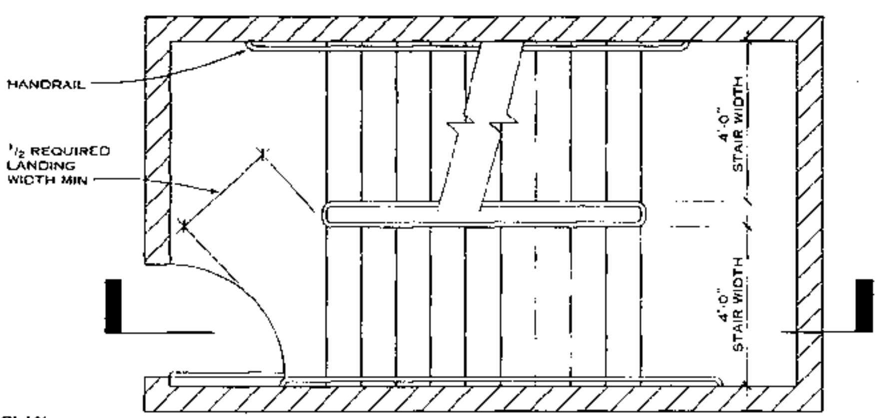
BUILDING CODE STAIRWAY REQUIREMENTS

	BUILDINGS OTHER THAN SINGLE-FAMILY RESIDENCES			SINGLE-FAMILY RESIDENCES		
	MINIMUM TREAD DEPTH	RISER RESTRICTIONS	MINIMUM STAIR WIDTH	MINIMUM TREAD DEPTH	RISER RESTRICTIONS	MINIMUM STAIR WIDTH
1998 ADAAG	11" (279 mm)	No limits	48" (1219 mm) clear between handrails for stairs adjacent to an area of rescue assistance	No limits	No limits	No limits
1996 BOCA National Building Code	11" (279 mm)	7" (178 mm) maximum 4" (102 mm) minimum	44" (1118 mm) 36" (914 mm) for occupancy of 50 or fewer	9" (229 mm)	8 $^1/_4$" (210 mm)	36" (914 mm)
1997 Standard Building Code	9" (229 mm)	7 $^3/_4$" (197 mm) maximum	44" (1118 mm) 36" (914 mm) for occupancy of 50 or fewer in some cases	9" (229 mm)	7 $^3/_4$" (197 mm)	36" (914 mm)
	2R + T must equal 25" (635 mm)					
1997 Uniform Building Code	11" (279 mm)	7" (178 mm) maximum 4" (102 mm) minimum	44" (1118 mm) 36" (914 mm) for occupancy of 49 or fewer 60" (1524 mm) for educational use group with occupancy of 100 or more	9" (229 mm)	8" (203 mm)	36" (914 mm)

Joseph Iano, Architect; Boston, Massachusetts
Edward Allen, AIA; South Natick, Massachusetts
Rippeteau Architects, P.C.; Washington, D.C.

STAIR PROPORTIONING GRAPH





PLAN

SAMPLE STAIRWAY

STAIR DESIGN AND BUILDING CODES

Building codes are updated regularly, so it is best to consu the current copy of the applicable building code (the BOC National Building Code, the Standard Building Code, or t Uniform Building Code) for tread and riser dimensions. I International Building Code will also offer a standard t these dimensions when it is published in 2000.

STAIR DESIGN EXAMPLE 1

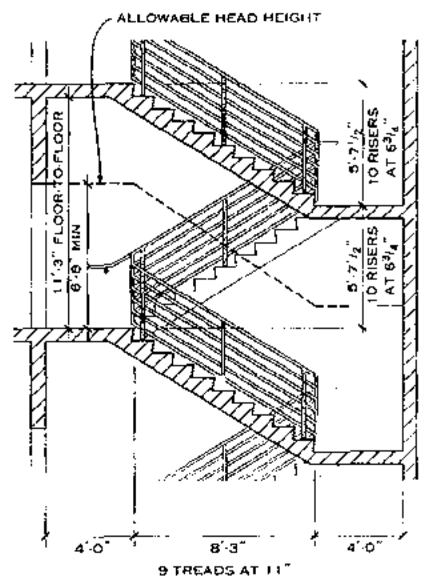
An exit stairway in a theater rises a total of 20 ft 3 in. Th dimension is off the graph shown at left, which means th at least one landing must be insertec in the stai. Sele two flights of 10 ft 1 ½ in. rise each. Looking for the highe possible riser, read across to the 18 riser sloping li (before crossing the 7 in. maximum riser height line), the upward to read a riser height of 6.75 in. Reading downwa to the bottom horizontal axis, the optimum tread dimensio is 11 ½ in. This figure can be rounded down to the leg minimum of 11 in. to make the stair as compact as poss ble.

STAIR DESIGN EXAMPLE 2

A stairway in a single-family house rises 8 ft 10 in, a needs to be as compact as possible according to CAB requirements. Read across to the 13-riser sloping line, the upward to read a riser of 8.15 in

NOTES

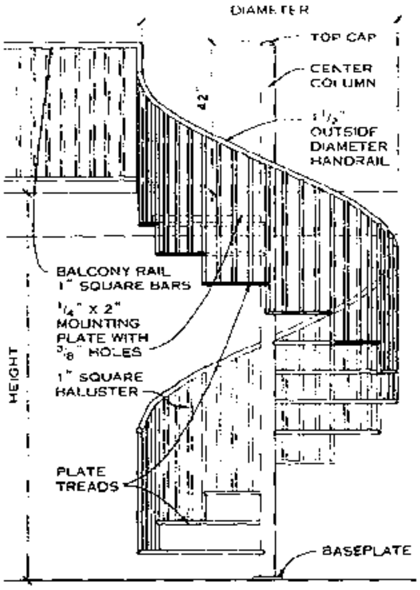
1. Stairs should be laid out in both plan and section. The d mensions shown on this page are samples only.
2. Landings must be at least as wide as the stair
3. No single flight may rise more than 12 ft 0 in. (3658 mm vertically.
4. In each flight, there is one more riser than tread.
5. Handrails may project up to 3 ½ in. (89 mm) into the required stairway width. They must be continuous or th ends must extend beyond the top and bottom of the stair. Stairs serving areas of rescue assistance must have 4 ft clear between handrails.
6. Stairway doors must swing with the direction of egress travel and must not obstruct more than half of the required landing width at any point in the swing. Whe fully open doors must not strike handrails (including extensions) and not project more than 7 in. (178 mm into the travel path.
7. See AGS page on areas of rescue assistance for mor restrictive stair dimensioning requirements.



NOTE

Measure allowable head height at nosings.

Joseph Iano, Architect; Boston, Massachusetts
Edward Allen, AIA; South Natick, Massachusetts
Rippeteau Architects, P.C.; Washington, D.C

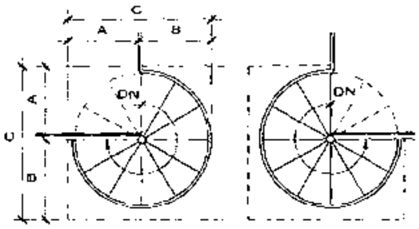


ELEVATION

SPIRAL STAIRS

FRAMING DIMENSIONS (IN.)

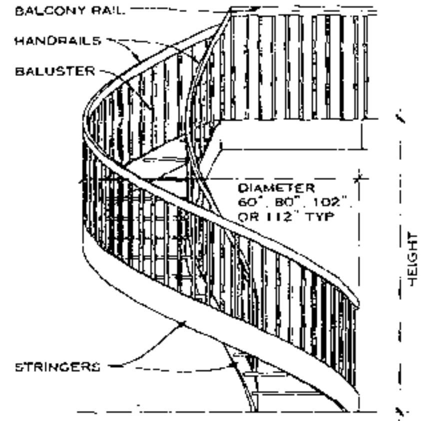
	STAIR DIAMETER								
	40	48	52	60	64	72	76	88	96
A	20	24	26	30	32	36	38	44	48
B	24	28	30	34	36	40	42	48	52
C	44	52	56	64	68	76	80	92	100



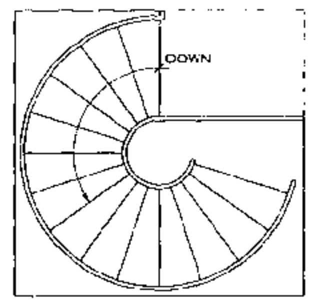
PLAN—RIGHT-HAND UP PLAN—LEFT-HAND UP

NOTES

1. For spiral stairs, larger diameters increase perceived comfort, ease of use, and safety.
2. Tread and platform materials: The most common materials are steel (regular and galvanized), aluminum, and wood. Steel and aluminum can be smooth plate, checker plate, pan type, and bar. A variety of hardwoods can be used, although many manufacturers use steel substructures to support the wood finish surface.
3. Refer to local and national codes for dimension and construction requirements and allowable uses.



ELEVATION



PLAN

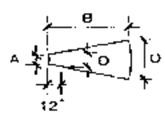
NOTE

Design considerations for circular stairs are similar to those for spiral stairs. A fabricated steel tube serves as a one-piece stringer to which treads are bolted or welded. Risers can be open or closed. Numerous finishes are available, and treads can be made of laminated wood.

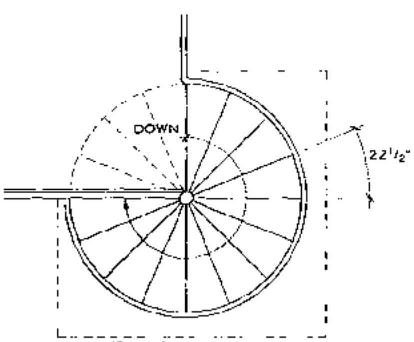
CIRCULAR STAIRS

SPIRAL STAIR DESIGN DIMENSIONS (IN.)

Diameter	40	48	52	60	64	72	76	88	96
Center column	4	4	4	4	4	4	4	6 5/8	6 5/8
Lb/9 ft	205	220	235	250	265	310	325	435	485
Tread detail A	4	4	4	4	4	4	4	6 5/8	6 5/8
Tread detail B	18	22	24	28	32	34	36	42	48
27° tread detail C	9 1/4	11 1/8	12 1/8	13 15/16	14 7/8	16 3/4	17 5/8	20 1/2	22 5/16
27° tread detail D	7 5/8	8	8 1/4	8 3/8	8 1/2	8 5/8	8 3/4	10	10 1/2
30° tread detail C	10 1/2	12 9/16	13 5/8	15 3/4	16 3/4	18 7/8	19 7/8	23	25 1/8
30° tread detail D	8 1/2	8 5/8	8 3/4	8 7/8	9	9 1/4	9 3/8	11 3/8	11 1/2
Landing size	22	26	28	32	34	38	40	46	52



TREAD DETAIL



PLAN—RIGHT-HAND UP

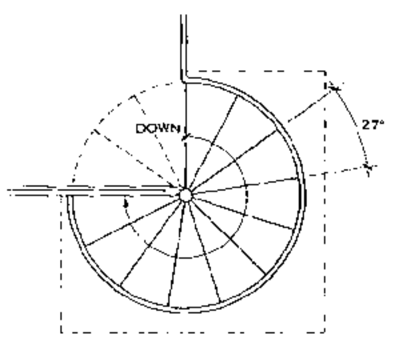
FLOOR-TO-FLOOR TREAD COUNT

FINISH FLOOR HEIGHT (IN.)	NUMBER OF STEPS	CIRCLE DEGREE
84 to 91	12	270°
92 to 98	13	292 1/2°
99 to 105	14	315°
106 to 112	15	337 1/2°
113 to 119	16	360°
120 to 126	17	387 1/2°
127 to 133	18	405°
134 to 140	19	477 1/2°
141 to 147	20	450°
148 to 154	21	472 1/2°

NOTE

16 treads per circle. Riser height: 6½ to 7 in.

22 1/2° TREAD SPIRAL STAIRS



PLAN—RIGHT-HAND UP

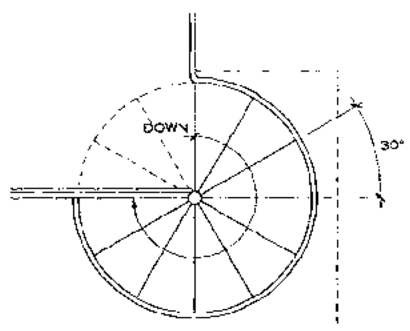
FLOOR-TO-FLOOR TREAD COUNT

FINISH FLOOR HEIGHT (IN.)	NUMBER OF STEPS	CIRCLE DEGREE
90 to 96	11	297°
97 to 104	12	324°
105 to 112	13	351°
113 to 120	14	375°
121 to 128	15	405°
129 to 136	16	432°
137 to 144	17	459°
145 to 152	18	486°
153 to 160	19	513°
161 to 168	20	540°

NOTE

13½ treads per circle. Riser height: 7½ to 8 in.

27° TREAD SPIRAL STAIRS



PLAN—RIGHT-HAND UP

FLOOR-TO-FLOOR TREAD COUNT

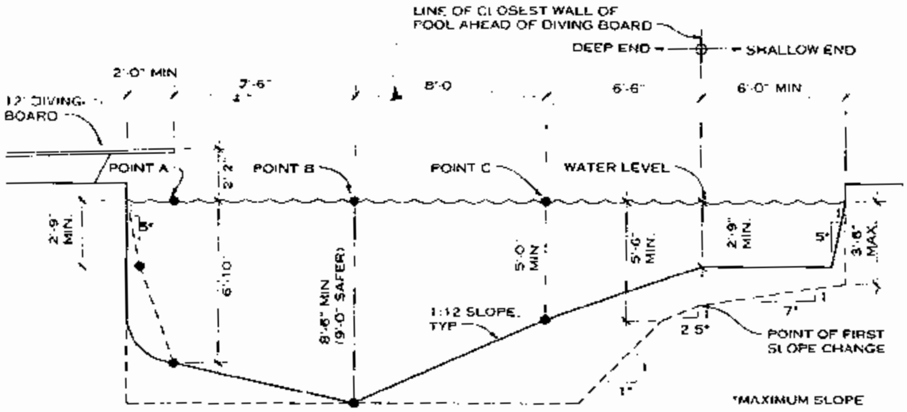
FINISH FLOOR HEIGHT (IN.)	NUMBER OF STEPS	CIRCLE DEGREE
85 to 95	9	270°
96 to 104	10	300°
105 to 114	11	330°
115 to 123	12	360°
124 to 133	13	390°
134 to 142	14	470°
143 to 152	15	450°
153 to 161	16	480°
162 to 171	17	510°
172 to 180	18	540°

NOTE

12 treads per circle. Riser height: 8½ to 9½ in.

30° TREAD SPIRAL STAIRS

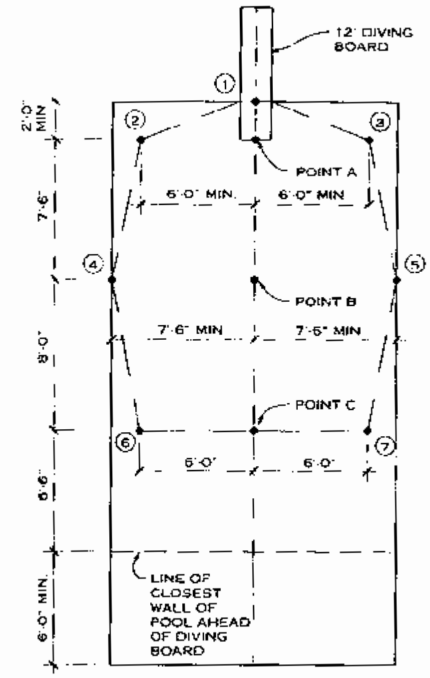
David W. Johnson; Washington, D.C.



NOTE

For a 10-ft board, Point B must be 8 ft 0 in. (8 ft 6 in. is safer).

LONGITUDINAL SECTION AT CENTERLINE (TYPE III POOL)



7-POINT GRID DIMENSION PLAN

PERMITS AND RESTRICTIONS

In most areas, permits are required from building, health, plumbing, and electrical departments and zoning boards. Check for setback restrictions and easements covering power and telephone lines, sewers, and storm drains.

CONSTRUCTION AND SHAPES

Residential pools are generally made of gunite (a mixture of pea stone, sand, cement, fly ash, and water sprayed on a steel reinforcement rod framework), a vinyl liner with a structural wall backup and formed floor (steel or thermoplastic vertical wall sections and lightweight concrete or sand base), or a prefabricated fiberglass shell (used primarily where high water tables and nonfrost penetrating conditions exist). Shapes are virtually unlimited within limitations for safety and minimum dimensions.

FILTERING

Filtration is the mechanical process of removing insoluble matter from swimming pool water. Pool water carrying particulate matter, solids, and debris is passed through filtering media and returned to the pool.

Pool water flows through the filters by pressure or vacuum. As water passes through the filter, particulate matter and solids collect on the surface of the filter medium. The ability to hold and screen fine particles varies according to filter type. Three basic media are used for swimming pool filtration—diatomaceous earth, sand, and cartridge filters.

Filters are sized by dividing the pool volume by the required turnover time (established by the local board of health), then dividing that figure by 60 min/hr, which equals the flow rate in GPM. Divide the flow rate in GPM by the filtration rate (established by the board of health), which is in GPM/sq ft. The result is the required filter area in sq ft.

HEATERS AND PUMPS

Pool heaters have become a necessity for user comfort and maintenance of proper chemical balance. Heater size is determined by the frequency of pool use, the size of the pool, and the average outside air temperature. Use a pool cover to minimize evaporation. A solar cover can add heat to a pool.

The size of a pool pump establishes the limit of the volume of water that can be recirculated. The pump causes water to flow and determines the direction of flow. Pump capacity is measured in GPM for flow and in feet of head for pressure.

In most swimming pools, filtered pool water is returned below the water surface; thus, after the pump has been primed and all air expelled, the pump need only overcome the friction in the piping system and the pressure drop across the filter to maintain consistent circulation.

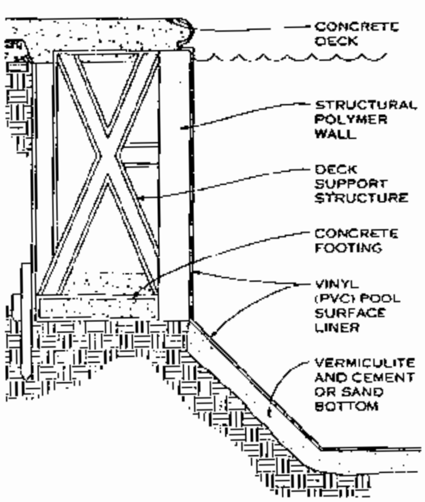
WATER TREATMENT

Pool water must be disinfected and recirculated. Seven principal factors are balanced by basic chemically treated water: total alkalinity, pH balance, calcium hardness, free available disinfectant, total disinfectant, total dissolved solids, temperature.

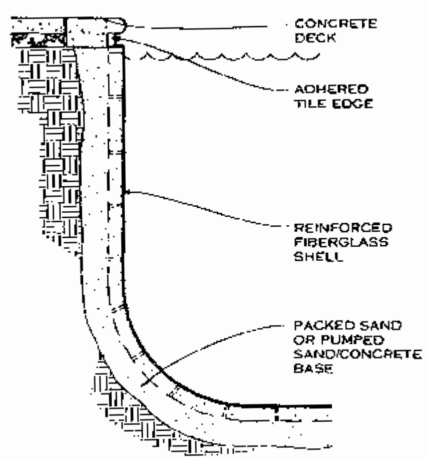
Many alternative combinations of chemicals are available for water treatment, but growing concern over using chemical treatment alone has led to the development of ozone-based systems. Ozone generators are used to disinfect and oxidize the water, making it more easily filtered and decreasing the amount of sanitizer needed.

NOTES

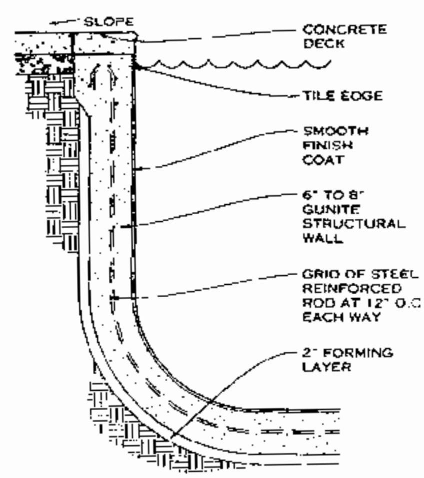
1. The drawings above illustrate the use of a 7-point dimension grid that expresses the minimum desirable dimensions to be used when specifying or designing a rectangular pool for residential use.
2. Width, length, and depth dimensions may apply to residential pools of any shape.
3. The minimum length with diving board and wading area is 32 ft. The average length of a residential pool is 32–40 ft.
4. Standards for residential swimming pools have been published by the National Spa and Pool Institute (1989).



VINYL POOL LINER OVER STRUCTURAL POLYMER WALL

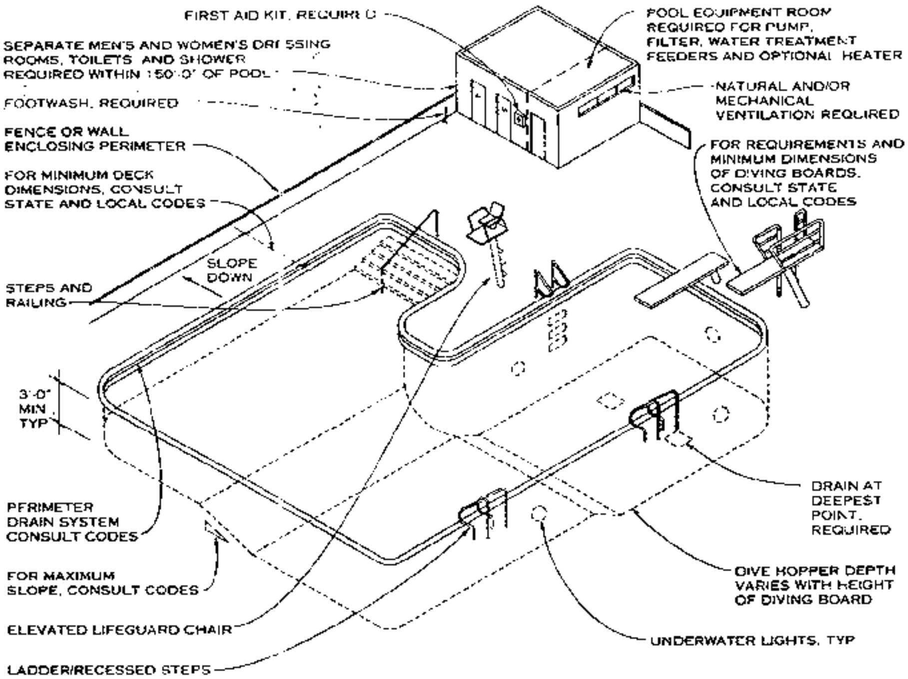


FIBERGLASS SHELL POOL



FORMED CONCRETE (GUNITE) WALL AND DECK

Robert D. Buckley, AIA; robert d. buckley * architect; Kalamazoo, Michigan
D. J. Hunsaker; Counsilman/Hunsaker & Associates; St. Louis, Missouri
National Swimming Pool Foundation; Merrick, New York



NOTES

1. All swimming pools must be equipped with a filtration system for clarifying the water; the system must be an integral part of the circulation system and consist of one or more filter units, either sand, diatomaceous earth, or cartridge type.
2. Every swimming pool must be equipped with a disinfectant feeder as required to keep the microbiological, chemical, and physical characteristics of the pool water within prescribed limits.
3. All swimming pools must have the water depth marked plainly at or above the waterline on the vertical wall where possible and on the edge of the deck next to the pool; depth markers must be 25 ft or less on center.
4. When visitor or spectator areas are provided at swimming pools, there must be an absolute separation between those areas and the pool area. Provide separate toilets for visitors and spectators.
5. Every public pool must have a readily accessible room or area designated and equipped for emergency care.

TYPICAL PUBLIC SWIMMING AND DIVING POOL REQUIREMENTS

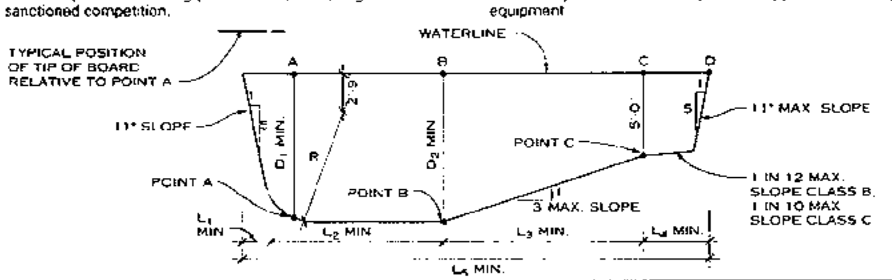
STANDARD DIMENSIONS FOR PUBLIC SWIMMING POOLS IN FT-IN. (M)[1]

POOL TYPE	DIVING EQUIPMENT: MAX. BOARD LENGTH	DIVING EQUIPMENT: MAX. HEIGHT OVER WATER	MINIMUM DIMENSIONS[2]: D_1	D_2	R	L_1	L_2	L_3	L_4	L_5	MINIMUM WIDTH OF POOL AT POINTS: A	B	C
VI	10–0 —	0–26 (2/3)	7–0 (2.13)	8–6 (2.59)	5–6 (1.68)	2–6 (0.76)	8–0 (2.44)	10–6 (3.20)	7–0 (2.13)	28–0 (8.53)	16–0 (4.88)	18–0 (5.49)	18–0 (5.49)
VII	12–0 —	0–30 (3/4)	7–6 (2.29)	9–0 (2.74)	6–0 (1.83)	3–0 (0.91)	9–0 (2.74)	12–0 (3.66)	4–0 (1.22)	28–0 (8.53)	18–0 (5.49)	20–0 (6.10)	20–0 (6.10)
VIII	16–0 —	— (1)	8–6 (2.59)	10–0 (3.05)	7–0 (2.13)	4–0 (1.22)	10–0 (3.05)	15–0 (4.57)	2–0 (0.61)	31–0 (9.45)	20–0 (6.10)	22–0 (6.71)	22–0 (6.71)
IX	16–0 —	— (3)	11–0 (3.35)	12–0 (3.66)	8–6 (2.59)	6–0 (1.83)	10–6 (3.20)	21–0 (6.40)	— —	37–6 (11.43)	22–0 (6.71)	24–0 (7.32)	24–0 (7.32)

Source: National Spa and Pool Institute (NSPI), Alexandria, Virginia

[1]The dimensions given are the currently recommended standards for public swimming pools and are not designed for sanctioned competition.

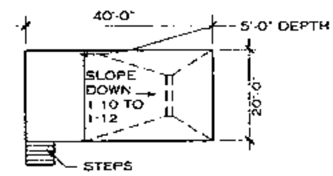
[2]L_2, L_3, and L_4 combined represent the minimum distance from the tip of a board to the pool wall opposite the diving equipment

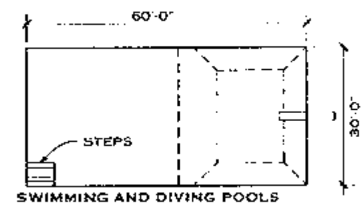


STANDARD DIMENSIONS KEY

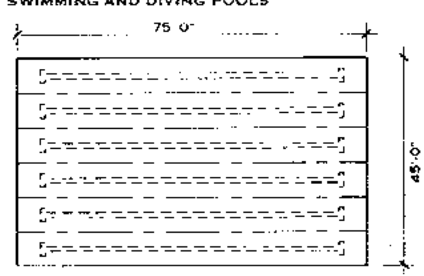
GENERAL NOTES

1. Public pools are those operated and intended for the collective use of unrelated persons, whether or not a fee is charged. Semipublic pools are those intended for use by housing facility occupants and their invited guests. Private residential pools are those located on private property for use by the owner's family and/or invited guests.
2. Special purpose pools are those designed for specific uses and not defined as public, semipublic, or private residential.
3. A spa is defined as a special facility that is not drained, cleaned, or refilled after each individual use and may include hydrojet circulation, hot water, cold water, mineral bath, air induction bubbles, or any combination of these.
4. The water supply serving a public swimming pool and all plumbing fixtures, including drinking fountains, lavatories, toilets, and showers, must meet all applicable requirements for potable water. All portions of the water distribution system serving the swimming pool and auxiliary facilities must be protected against backflow.
5. Swimming pools must be designed and constructed to withstand all anticipated loadings for both empty and full conditions.
6. A hydrostatic relief valve must be provided for in-ground swimming pools in areas with a high water table.
7. Provisions must be made for complete, continuous circulation of water through all areas of the swimming pool.
8. The shape of any swimming pool must not impair swimmer safety or the circulation of water through all areas of the pool.





SWIMMING AND DIVING POOLS



6-LANE LAP POOL

TYPICAL PUBLIC POOL SHAPES

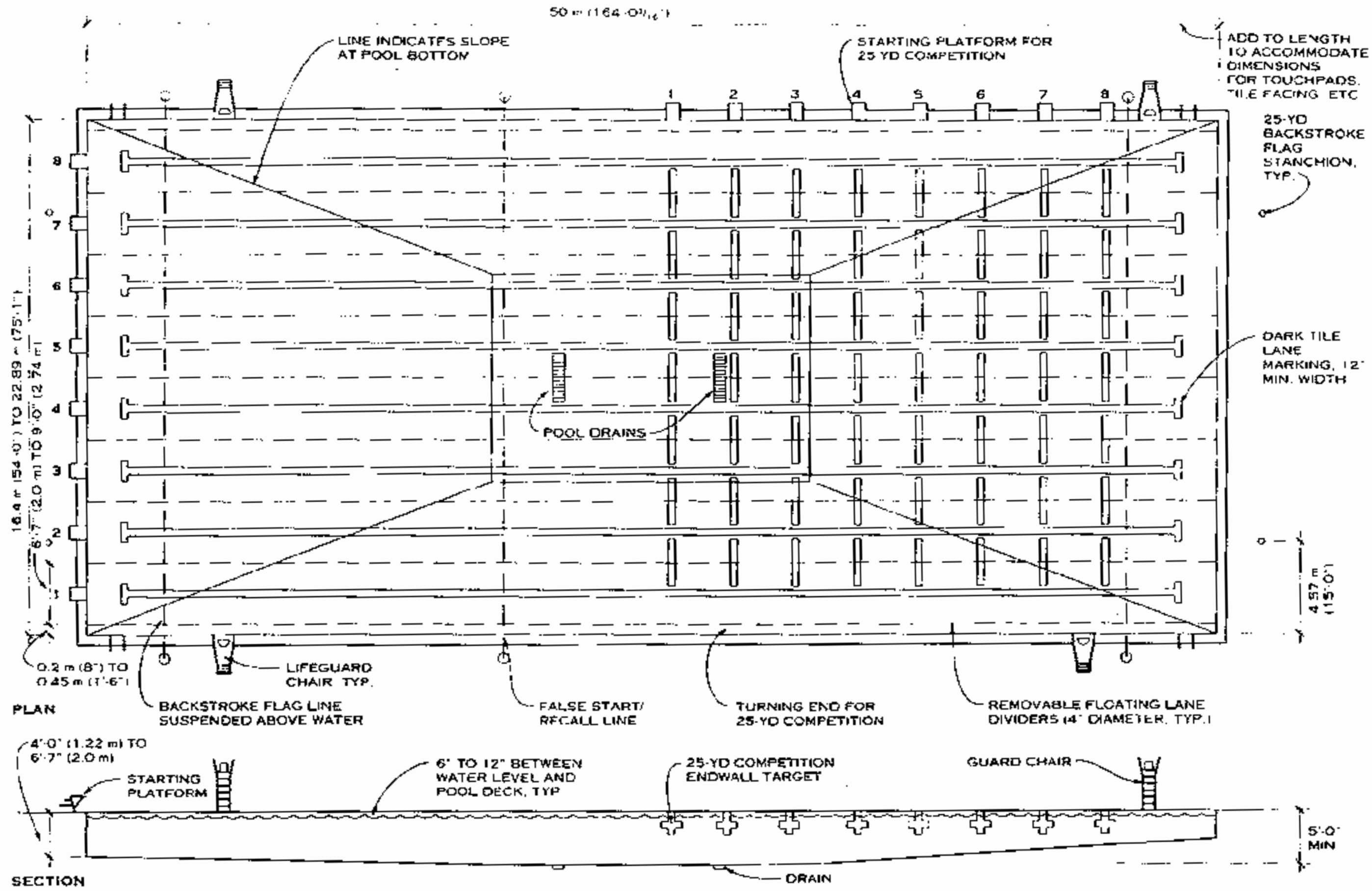
DIVING BOARD DIMENSIONS

There must be a completely unobstructed, clear vertical distance of 13 ft above any diving board, measured from the center of the front end of the board. This area must extend horizontally at least 8 ft behind, 8 ft to each side, and 16 ft ahead of point A (see key).

For diving board placement, observe these minimum distances from the pool edge or adjacent boards:

Deck-level board to pool side:	8 ft
1-meter board to pool side:	10 ft
3-meter board to pool side:	11 ft
1-meter or deck-level board to 3-meter board:	10 ft
1-meter or deck-level board to another 1-meter or deck-level board:	8 ft
3-meter board to another 3-meter board:	10 ft

Robert D. Buckley, AIA; robert d. buckley + architect, Kalamazoo, Michigan
D. J. Hunsaker; Counsilman/Hunsaker & Associates, St. Louis, Missouri
National Swimming Pool Foundation, Merrick, New York



NOTE

A 25-meter pool width will provide 10 lanes for training or competition and accommodate international meets of any distance. An economical alternative for pool length is 70 meters with at least one bulkhead to separate training and competition areas.

50-METER COMPETITION SWIMMING POOL

NOTES ON POOL DESIGN

1. The information on this page is based on current standards and rules for swimming races, competition diving, and other aquatic competitions stipulated by the following aquatic sport organizations:

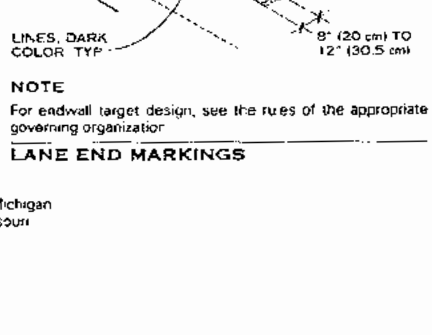
   FINA (Federation Internationale de Natation Amateur) governs international competition, including the Olympic Games.

   US Swimming (United States Swimming, Inc.) governs open and age group levels in the United States.

   US Diving (United States Diving, Inc.) governs open and age group levels in the United States.

   NCAA (National Collegiate Athletic Association) governs all collegiate competition.

   NFHS (National Federation of State High School Associations) governs all high school competition.
2. Because they represent different groups and/or skill levels within a sport, the regulatory organizations do not always agree on the dimensions and features required for a pool facility. In addition to complying with the rules of pertinent organizations, the engineering of a swimming pool must follow the design regulations of any local, state, or federal agency that has jurisdiction over the facility. Sanitary and structural considerations vary almost as much between agencies as competitive guidelines do.
3. Consult the *Official Swimming Pool Design Compendium* (Merrick, N.Y.: National Swimming Pool Foundation, rev. ed. 1997) for specific rules of all the governing bodies.
4. Swimming pool dimensions shall be measured from the inside walls or from the tile or timing devices attached to the walls. Touchpads for automatic timing may be used if they do not shorten the race course beyond minimum specifications. Markings on the finish pad and bulkheads must conform to required markings on the endwalls. Visible numbers identifying lanes must be provided.
5. Endwalls and movable bulkheads serving as endwalls must be parallel and vertical for a distance of 3 ft 6 in. (1.0668 m) below the overflow level of the water. No protrusions are permitted below the surface. Endwalls should be finished with a nonslip surface.



NOTE

For endwall target design, see the rules of the appropriate governing organization.

LANE END MARKINGS

6. All ladders, steps, or stairs must be recessed into side walls or easily removed for competition.
7. Lighting at water level should be 100 footcandles. (FINA standards dictate 600 lux at water level.)
8. Lane markers must be continuous, clearly visible floats that indicate the lateral limits of each lane. They must be attached to and stretched between the endwalls and anchored at surface water level in a recessed receptacle. Solid color floats are recommended within 15 ft 0 in. (4.572 m) of both endwalls in contrast with the center portion of the lane markers.
9. Backstroke flag lines are required for all events in which the backstroke is swum. At least three 12-18 in. long pennants of two or more alternating colors must hang from the line.

NOTES ON POOL DIMENSIONS

1. When a range of dimensions is given, consult the appropriate governing organization (FINA, USS, NCAA, or NFHS) for specific dimensions.
2. Depending on the governing organization, pool size, and competition type, the following information applies for dimensions from the starting platform end of the pool:

   To the backstroke flag line, the dimension ranges from 15 ft 0 in. (4.57 m) to 16 ft 4.

   For 50-m pools, the dimension to the false start/recall stanchion ranges from 42 ft 0 in. (10.973 m) to 65 ft 7 in. (20.0 m).

   For 25-yd and 25-m pools, the dimension to the false start/recall stanchion ranges from 33 ft 1 in. (10.08 m) to 60 ft 1 in. (18.31 m).

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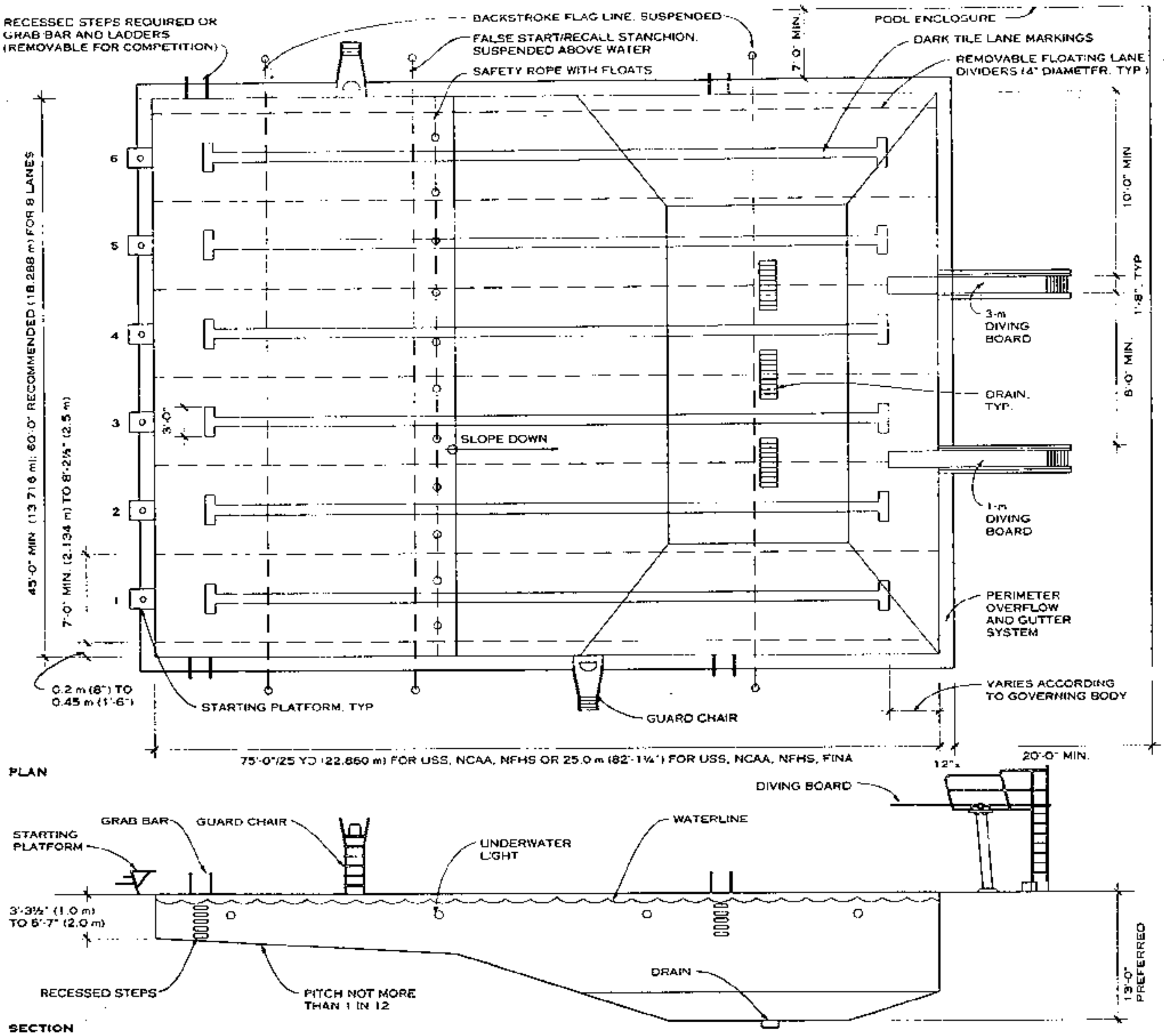
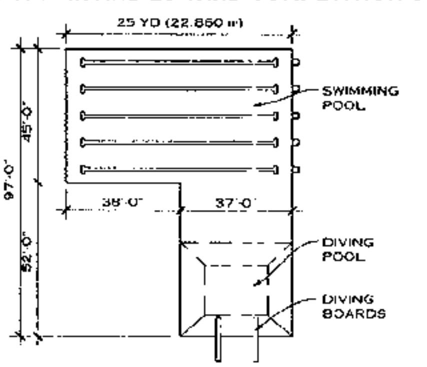
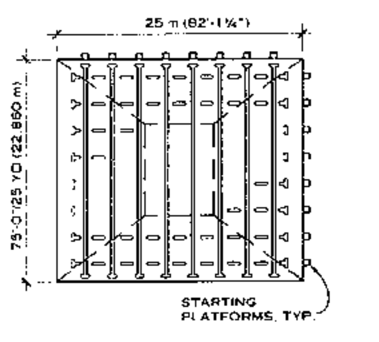
D. J. Hunsaker; Counsilman/Hunsaker & Associates, St. Louis, Missouri
National Swimming Pool Foundation; Merrick, New York



25-METER AND 25-YARD COMPETITION SWIMMING AND DIVING POOL



DIVING POOL ATTACHED TO SWIMMING POOL



COMBINED 25-YD AND 25-M SWIMMING POOL

ALTERNATE POOL LAYOUTS

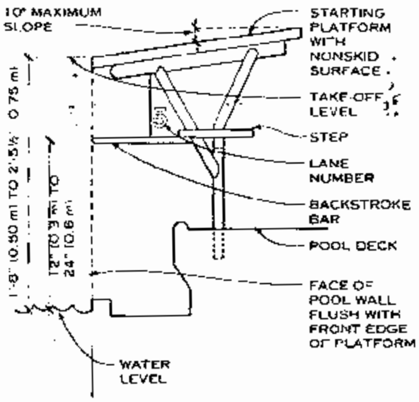
NOTES ON POOL DIMENSIONS

1. When a range of dimensions is given, consult the appropriate governing organization (FINA, USS, NCAA, or NFHS) for specific dimensions.
2. Depending on the governing organization, pool size, and competition type, the following information applies for dimensions from the starting platform end of the pool:

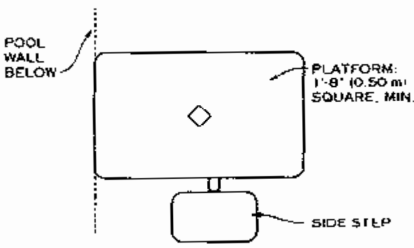
   To the backstroke flag line, the dimension ranges from 15 ft 0 in. (4.57 m) to 16 ft 4¾ in. (5.0 m).

   To the false start/recall stanchion, the dimension ranges from 33 ft 1 in. (10.08 m) to 60 ft 1 in. (18.31 m).

Robert D. Buckley, AIA, robert d. buckley * architect; Kalamazoo, Michigan
D. J. Hunsaker; Counsilman/Hunsaker & Associates; St. Louis, Missouri
National Swimming Pool Foundation; Merrick, New York



SIDE ELEVATION

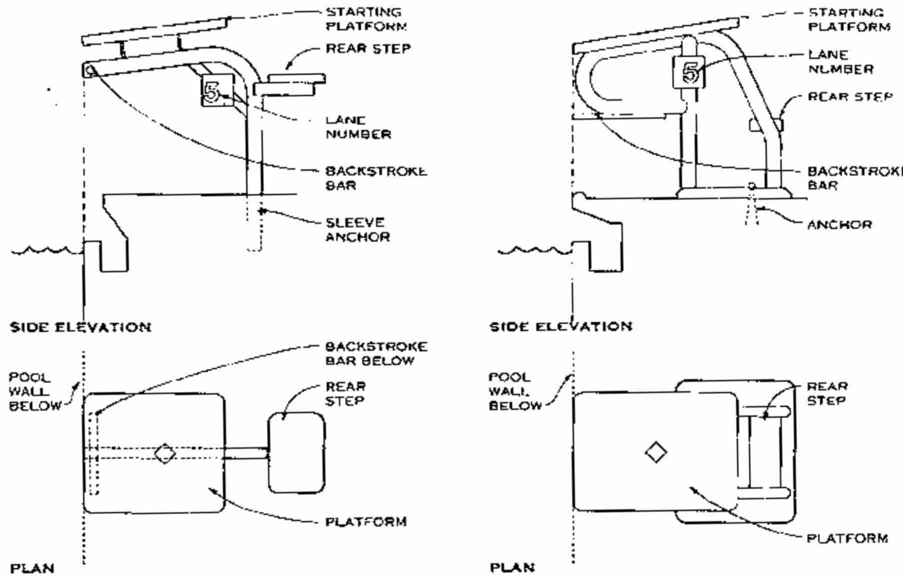


PLAN

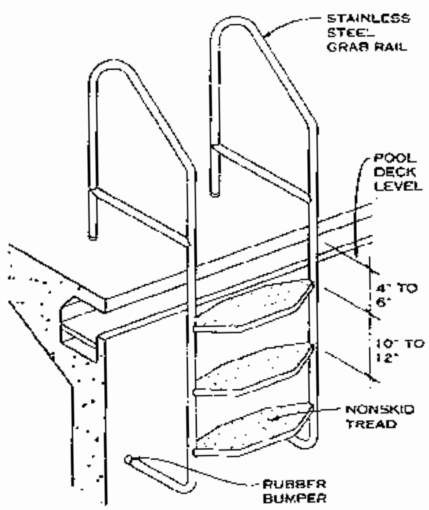
NOTES

1. In pools with a water depth of 3 ft 6 in. to 4 ft at the starting end (measured at the end wall or any point within 12 in. of the end wall), starting platforms shall be no more than 18 in. above the water surface; otherwise, the swimmers must start from the deck or in the water.
2. In pools with a water depth less than 3 ft 6 in. in the starting end, the swimmers must start in the water.

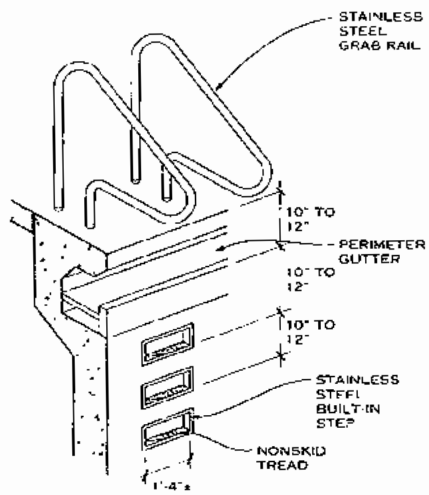
STARTING PLATFORM REQUIREMENTS



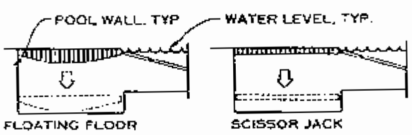
ALTERNATE STARTING PLATFORMS



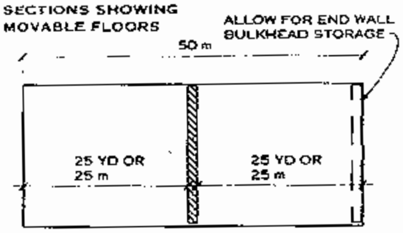
POOL LADDER



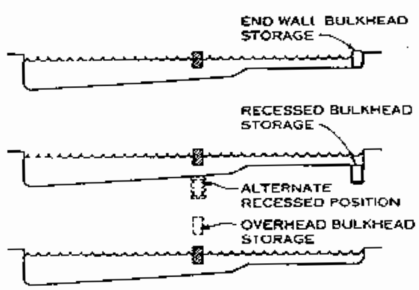
BUILT-IN STEPS WITH GRAB RAILS



SECTIONS SHOWING MOVABLE FLOORS

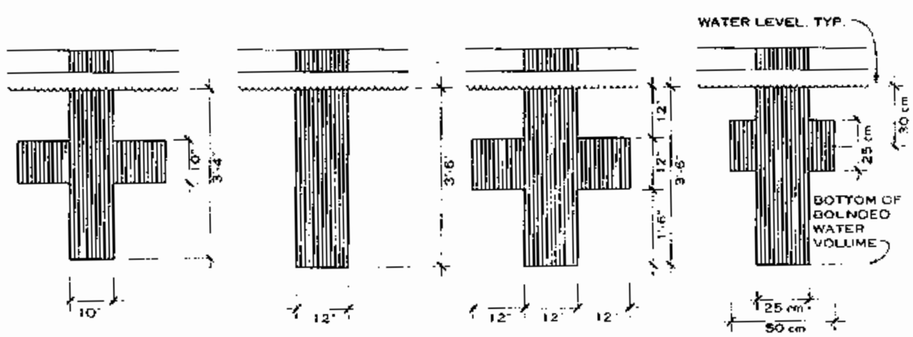


PLAN—BULKHEAD



SECTIONS SHOWING BULKHEAD IN VARIOUS STORAGE POSITIONS

BULKHEADS AND MOVABLE FLOORS



NOTES

For placement and dimensions of touch pads specified by the various governing agencies, refer to the section on electronic starting, timing, and judging devices in National Swimming Pool Foundation, *Official Swimming Pool Design Compendium*, updated 5th ed. (1997).

END WALL TARGETS

Robert D. Buckley, AIA; robert d. buckley * architect, Kalamazoo, Michigan
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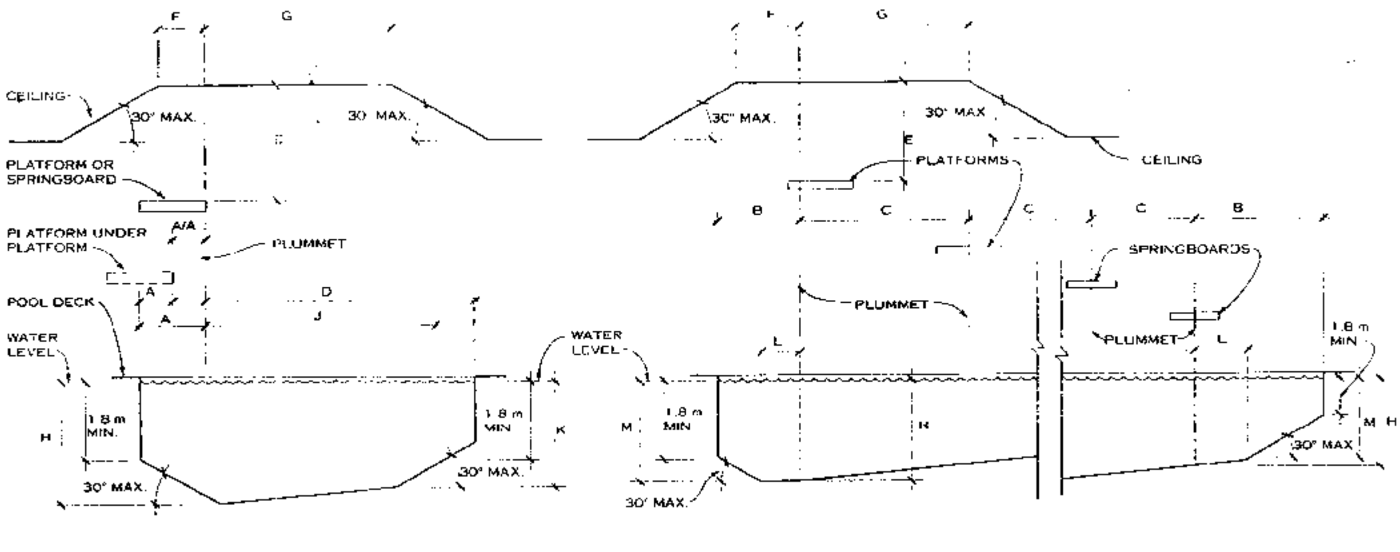

LONGITUDINAL SECTION

TRANSVERSE CROSS-SECTION

DIAGRAM OF RECOMMENDED DIMENSIONS FOR FINA, US DIVING, NCAA, AND NFHS DIVING FACILITIES

DIMENSIONS FOR DIVING FACILITIES

			FINA (IN M)														U.S. DIVING AND NCAA (IN FT-IN.)[1]									
			SPRINGBOARD				PLATFORM										SPRINGBOARD				PLATFORM					
			1 meter		3 meter		1 meter		3 meter		5 meter		7.5 meter		10 meter		1 meter		3 meter		5 meter		7.5 meter		10 meter	
		Length	4.80		4.80		5.00		5.00		6.00		6.00		6.00		16'-0"		16'-0"		20'-0"		20'-0"		20'-0"	
		Width	0.50		0.50		0.60		0.60 min. (1.50 pref)		1.50		1.50		2.00		1'-8"		1'-8"		5'-0"		5'-0"		6'-7"	
		Height	1.00		3.00		0.60-1.00		2.60-3.00		5.00		5.00		10.00		3'-4"		10'-0"		16'-5"		24'-8"		32'-10"	
DESIGN CRITERIA			Horiz.	Vert.	Horiz.	Vert.	Horiz.	Vert.	Horiz.	Vert.	Horiz.	Vert.	Horiz.	Vert.	Horiz.	Vert.	Horiz.	Vert.	Horiz.	Vert.	Horiz.	Vert.	Horiz.	Vert.	Horiz.	Vert.
A	From plummet back to pool wall	Desig.	A-1		A-3		A-1PL		A-3PL		A-5		A-7.5		A-10		A-1		A-3		A-5		A-7.5		A-10	
		Min.	1.50		1.50		0.75		1.25		1.25		1.50		1.50		5-0		5-0		4-2		5-0		5-0	
		Pref.	1.80		1.80		0.75		1.25		1.25		1.50		1.50		6-1		6-1		4-2		5-0		5-0	
A/A	From plummet back to platform (plummet directly below)	Desig.									A/A5/1		A/A7.5/3, 1		A/A10/5, 3, 1						A/A5		A/A7.5		A/A10	
		Min.																			2-6		2-6		2-6	
		Pref.																			4-2		4-2		4-2	
B	From plummet to pool wall at side	Desig.	B-1		B-3		B-1PL		B-3PL		B-5		B-7.5		B-10		B-1		B-3		B-5		B-7.5		B-10	
		Min.	2.50		3.50		2.30		2.80		3.25		4.25		5.25		8-3		11-6		10-8		14-0		17-3	
		Pref.	2.50		3.50		2.30		2.90		3.75		4.50		5.25		8-3		11-6		12-4		14-10		17-3	
C[2]	From plummet to adjacent plummet	Desig.	C1-1		C3-3, 3-1		C1-1PL		C3-3PL, 1PL		C5-3, 5-1		C7.5-5, 3, 1		C10-7.5, 5, 3, 1		C-11		C-331		C-531		C-7.5531		C-10/7.55531	
		Min.	2.00		2.20		1.65		2.00		2.25		2.50		2.75		6-7		7-3		7-5		8-3		9-1	
		Pref.	2.40		2.60		1.95		2.10		2.50		2.50		2.75		7-1		8-3		8-3		8-3		9-1	
D	From plummet to pool wall ahead	Desig.	D-1		D-3		D-1PL		D-3PL		D-5		D-7.5		D-10		D-1		D-3		D-5		D-7.5		D-10	
		Min.	9.00		10.25		8.00		9.50		10.25		11.0		13.50		29-7		33-8		33-8		36-2		44-4	
		Pref.	9.00		10.25		8.00		9.50		10.25		11.0		13.50		29-7		33-8		33-8		36-2		44-4	
E	On plummet, from board to ceiling	Desig.		E-1		E-3		E-1PL		E-3PL		E-5		E-7.5		E-10		E-1		E-3		E-5		E-7.5		E-10
		Min.		5.00		5.00		3.25		3.25		3.25		3.25		4.00		16-5		16-5		10-8		10-8		13-2
		Pref.		5.00		5.00		3.50		3.50		3.50		3.50		5.00		16-5		16-5		11-6		11-6		16-5
F	Clear overhead behind and each side of plummet	Desig.	F-1	E-1	F-3	E-3	F-1PL	E-1PL	F-3PL	E-3PL	F-5	E-5	F-7.5	E-7.5	F-10	E-10	F-1	E-1	F-3	E-3	F-5	E-5	F-7.5	E-7.5	F-10	E-10
		Min.	2.50	5.00	2.50	5.00	2.75	3.25	2.75	3.25	2.75	3.25	2.75	3.25	2.75	4.00	8-3	16-5	8-3	16-5	9-1	10-8	9-1	10-9	9-1	13-2
		Pref.	2.50	5.00	2.50	5.00	2.75	3.50	2.75	3.50	2.75	3.50	2.75	3.50	2.75	5.00	8-3	16-5	8-3	16-5	9-1	11-6	9-1	11-6	9-1	16-5
G	Clear overhead ahead of plummet	Desig.	G-1	E-1	G-3	E-3	G-1PL	E-1PL	G-3PL	E-3PL	G-5	E-5	G-7.5	E-7.5	G-10	E-10	G-1	E-1	G-3	E-3	G-5	E-5	G-7.5	E-7.5	G-10	E-10
		Min.	5.00	5.00	5.00	5.00	5.00	3.25	5.00	3.25	5.00	3.25	5.00	3.25	6.00	4.00	16-5	16-5	16-5	16-5	16-5	10-8	16-5	10-8	19-9	13-2
		Pref.	5.00	5.00	5.00	5.00	5.00	3.50	5.00	3.50	5.00	3.50	5.00	3.50	6.00	5.00	16-5	16-5	16-5	16-5	16-5	11-6	16-5	11-6	19-9	16-5
H	Depth of water at plummet	Desig.		H-1		H-3		H-1PL		H-3PL		H-5		H-7.5		H-10		H-1		H-3		H-5		H-7.5		H-10
		Min.		3.40		3.70		3.20		3.50		3.70		4.10		4.50		11-0		12-0		12-2		13-6		14-10
		Pref.		3.50		3.80		3.30		3.60		3.80		4.50		5.00		11-6		12-6		12-6		14-10		16-5
J/K	Distance and depth ahead of plummet	Desig.	J-1	K-1	J-3	K-3	J-1PL	K-1PL	J-3PL	K-3PL	J-5	K-5	J-7.5	K-7.5	J-10	K-10	J-1	K-1	J-3	K-3	J-5	K-5	J-7.5	K-7.5	J-10	K-10
		Min.	5.00	3.30	6.00	3.60	4.50	3.10	5.50	3.40	6.00	3.60	8.00	4.00	11.00	4.25	16-5	10-10	16-5	11-10	19-9	11-10	26-3	13-2	36-2	14-0
		Pref.	5.00	3.40	6.30	3.70	4.50	3.20	5.50	3.50	6.00	3.70	8.00	4.40	11.00	4.75	16-5	11-2	19-9	12-2	19-9	12-2	26-3	14-6	36-2	15-7
L/M	Distance and depth each side of plummet	Desig.	L-1	M-1	L-3	M-3	L-1PL	M-1PL	L-3PL	M-3PL	L-5	M-5	L-7.5	M-7.5	L-10	M-10	L-1	M-1	L-3	M-3	L-5	M-5	L-7.5	M-7.5	L-10	M-10
		Min.	1.50	3.30	2.00	3.60	1.40	3.10	1.80	3.40	3.00	3.60	3.75	4.00	4.50	4.25	5-0	10-10	6-7	11-10	19-11	11-10	12-4	13-2	14-10	14-0
		Pref.	2.00	3.40	2.50	3.70	1.90	3.20	2.30	3.50	3.50	3.70	4.50	4.40	5.25	4.75	9-11	11-2	8-3	12-2	11-6	12-2	14-10	14-6	17-3	15-7
N	Maximum slope to reduce dimensions beyond full requirements is 30 degrees for both pool depth and ceiling height																									

[1] All dimensions in the US Diving and NCAA section of this chart are rounded up, even when the dimension is only fractionally greater than the next lowest inch

[2] Dimension C (plummet to adjacent plummet) applies to platforms with widths as specified in this chart. If platform widths are increased, dimension C must be increased by half the additional width(s)

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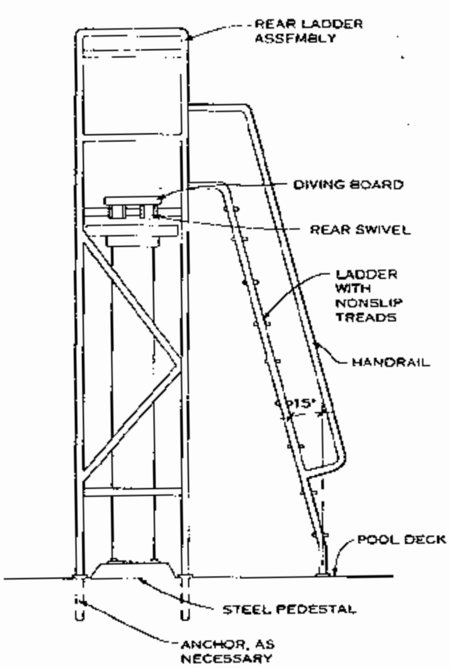
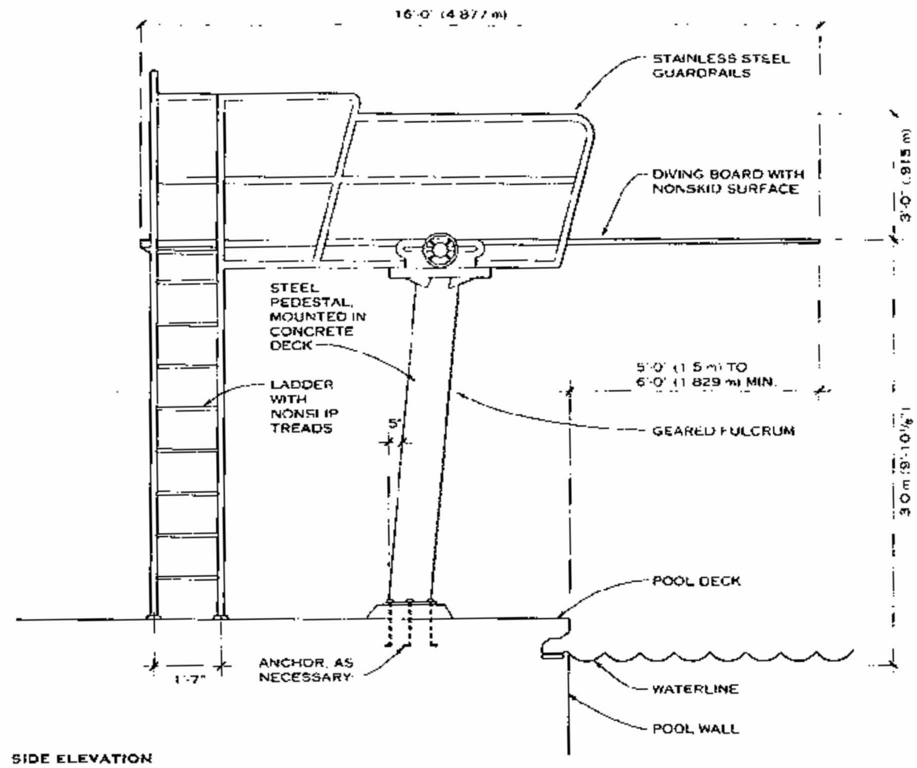
D. J. Hunsaker; Counsilman/Hunsaker & Associates; St. Louis, Missouri
National Swimming Pool Foundation, Merrick, New York

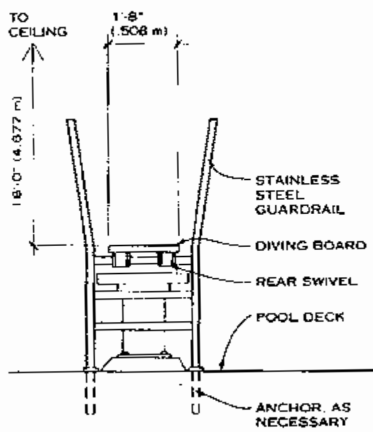


REAR ELEVATION

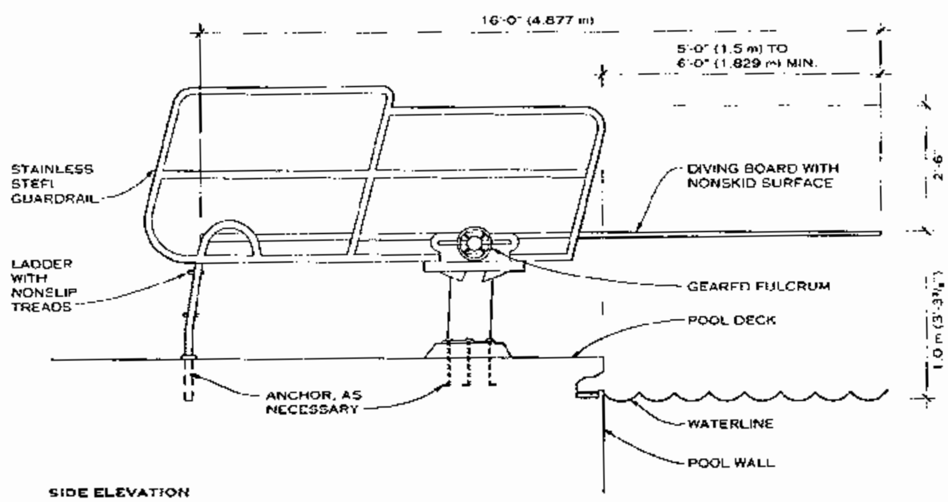


SIDE ELEVATION

3-METER DIVING BOARD



REAR ELEVATION



SIDE ELEVATION

1-METER DIVING BOARD

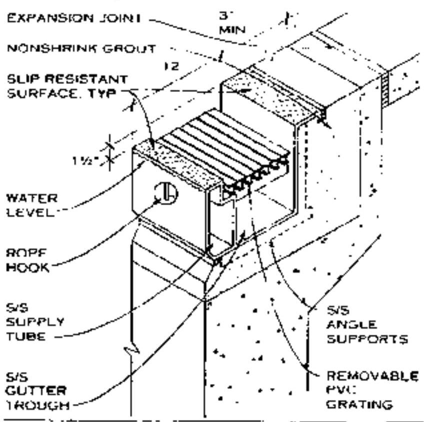
NOTES

1. Both 1- and 3-meter boards are required for amateur, collegiate, and international meets. Consult the *Official Swimming Pool Design Compendium* (Merrick, N.Y.: National Swimming Pool Foundation, rev. ed. 1997) for specific FINA, US Diving, NCAA, and NFHS details and specifications.
2. When a range of dimensions is given, consult the appropriate governing organization for specific dimensions.
3. When selecting a 1- or 3-meter diving tower, pay special attention to the materials it is made of. Differences in wall tubing thickness, anchorage, and fulcrum materials influence the flexibility and spring from the tower.
4. A fulcrum, which can be moved and set at varying positions between 5 ft 6 in. (1.676 m) and 7 ft 6 in. (2.286 m) from the rear of the diving board, is required. The board must remain horizontal with the fulcrum in any position. The range of movement of the fulcrum may be limited under certain conditions. Consult with the appropriate governing body for diving competition regulations.
5. A water agitation system is recommended that produces water surface agitation extending 5 ft (1.524 m) beyond the end of the board with a width of 2 ft (.6096 m).
6. The maximum depth reduction rate of diving pools that do not exceed minimum depth requirements shall be 6.25% for a distance of 20 ft (6.096 m) forward and 6 ft (1.829 m) back and to the sides. Deeper pools may have proportionally steeper depth reduction rates.
7. Three choices are available for diving board supports for 1- and 3-meter boards: a manufactured cantilevered steel stand; a manufactured cast aluminum stand; and a cast-in-place concrete platform with a fulcrum assembly mounted directly to the top of the slab.

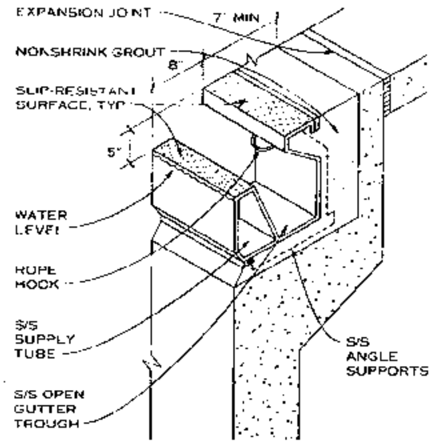
Robert D. Buckley, AIA; robert d. buckley * architect; Kalamazoo, Michigan
D. J. Hunsaker; Counsilman/Hunsaker & Associates, St. Louis, Missouri
National Swimming Pool Foundation; Merrick, New York

NOTE

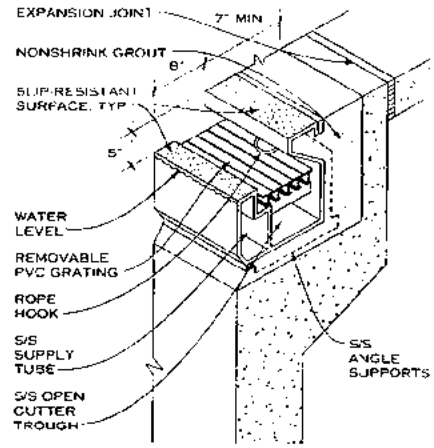
In these drawings, S/S stands for stainless steel.



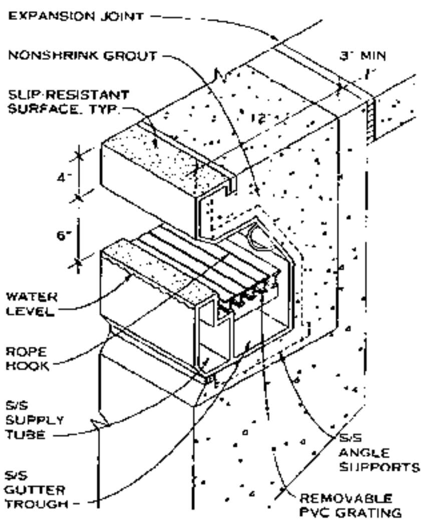
ROLLOUT GUTTER SYSTEM



SEMIRECESSED OPEN GUTTER SYSTEM



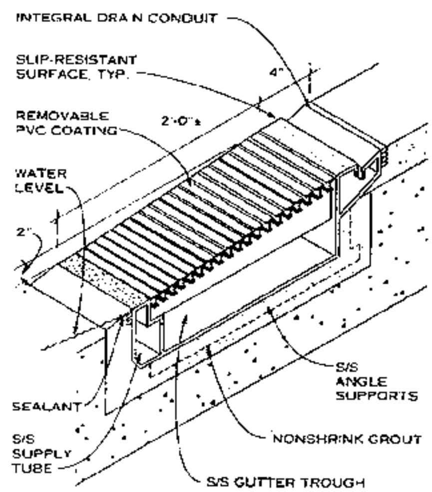
SEMIRECESSED GUTTER SYSTEM



NOTE

In addition to the stainless steel system shown, gutters may be designed as an integral part of the concrete deck edge.

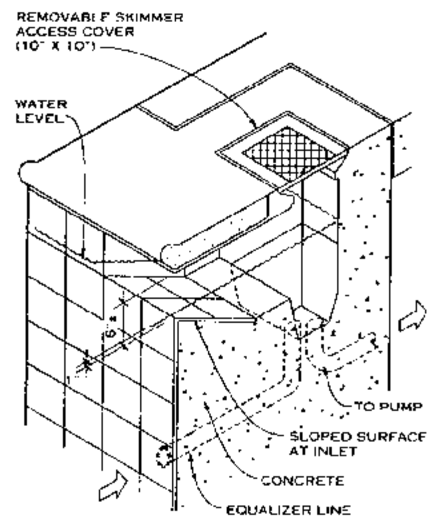
FULLY RECESSED GUTTER SYSTEM



NOTE

The zero depth gutter system is typically used for walk-in or leisure-type pools only, if necessary.

ZERO DEPTH GUTTER SYSTEM



NOTE

Surface skimmers are not recommended for use in competitive pools.

SKIMMER DETAIL

NOTES ON PERIMETER OVERFLOW

1. A perimeter overflow system must be provided on all public swimming pools. The system must be designed and constructed to maintain the water level of the pool at the operating level of the overflow rim or weir device. Applicable codes determine the dimension from the deck to the water level.
2. When used as the only overflow system on a pool, a perimeter overflow system must extend around a minimum of half the swimming pool perimeter. Perimeter overflow systems must be connected to the circulation system with a system surge capacity of not less than 1 gal/sq ft of pool surface.
3. The perimeter overflow system in combination with the upper rim of the pool must constitute a handhold. It must be designed to prevent entrapment of a swimmer's arms, legs, or feet and to permit inspection and cleaning.
4. In some states, the hydraulic capacity of the overflow system must be sufficient to handle 100% of the circulation flow.
5. Rollout and/or zero depth flush perimeter overflow systems are most commonly used in recreational pools and walk-in shallow areas. Competitive pools that have semirecessed gutters along their length to trap wave surge and prevent reflected waves must have fully recessed gutters at the ends or provide a visual barrier that can be seen by competing swimmers.
6. Perimeter overflows are commonly used on public swimming pools. Some state health departments do not approve skimmers on public swimming pools that exceed a certain surface area. Check current state codes or swimming pool regulations to determine limits of use, minimum dimensions, and other factors regarding overflow design.
7. Metal swimming pool systems with built-in perimeter overflow are available. In addition to the overflow channel, the metal liner may contain the return waterline from the filtration system. A metal liner that incorporates a cove between wall and floor is desirable to facilitate cleaning.
8. Deck areas adjoining an overflow system are generally required to slope away from it to separate drains. When a deck is sloped to the pool overflow, provide for diverting the overflow to waste during deck cleaning.
9. A stainless steel perimeter system may combine the supply and return functions of the swimming pool recirculation system around the pool perimeter to optimize surge control and provide water supply, return conduit, and continuous surface skimming.
10. Return water may enter the gutter through a series of skimming weirs spaced around the pool perimeter or by overflow into the gutter. For normal recreational use, the water level is kept at the center of the skimmer face, allowing the pool to act as a surge chamber and absorb water displacement caused by swimmers. For competitive use the water level is raised to the gutter lip. Waves then flow over the lip and are returned through the surge tank without rebound.

SURFACE SKIMMERS

If surface skimmers are used, provide one for each 500 sq ft or fraction thereof of the pool surface. When two or more skimmers are used, they must be located so they maintain effective skimming action over the entire surface of the pool. To obtain the most effective skimming action, locate the skimmers with regard to the prevailing wind and drift, shape of the pool, and water circulation pattern. Use of directional inlet fittings will help ensure a proper circulation pattern.

Skimmers may not be permitted in larger pools; see local health department codes for limitations on public pool use. Skimmers are not recommended for use in competitive pools.

Surface skimmers are available from many swimming pool suppliers. Metal or plastic units come in various capacities. An access cover in the deck provides for removal and cleaning of the strainer. Surface skimmers should comply with the joint National Swimming Pool Institute–National Sanitation Foundation performance standards.

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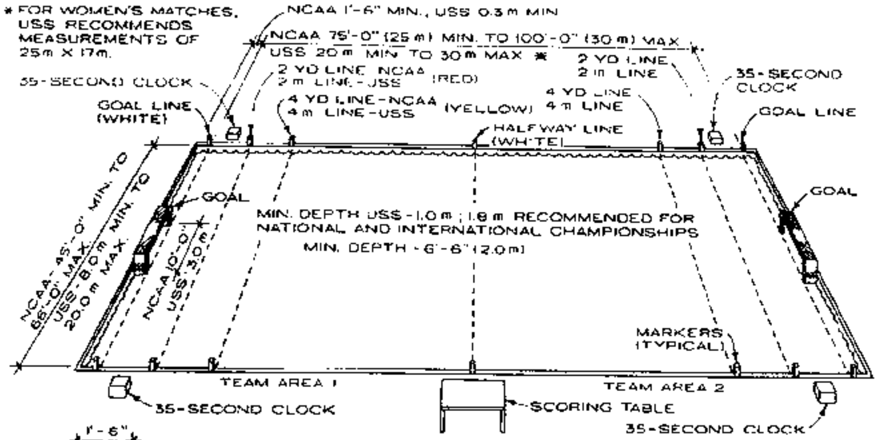
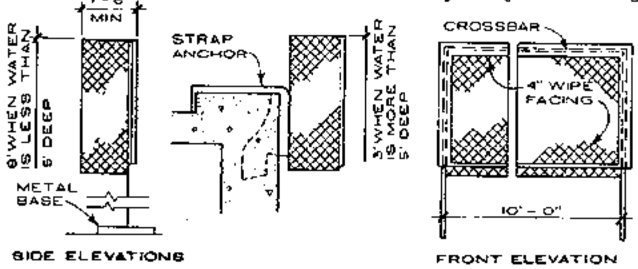
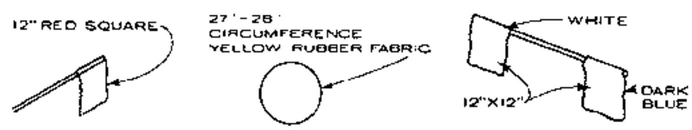
D. J. Hunsaker, Counsilman/Hunsaker & Associates; St. Louis, Missouri
National Swimming Pool Foundation; Merrick, New York







WATER POLO

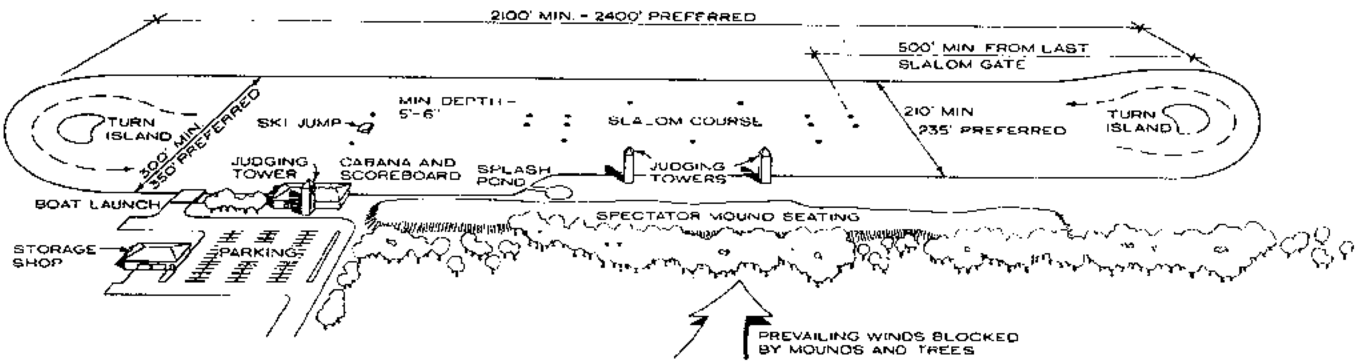
NOTES

1. Distinctive marks must be provided on both sides of field of play indicating goal lines, 2 and 4 yd (or meter) lines, and ½ distance between goal lines. These must be clearly visible from any position within the field of play. Allow sufficient space on walkways so referees may move freely from end to end of field of play. Provide space at goal lines for goal judges.
2. There must be distinctive markers on both ends of the pool to denote the ejection area on the goal line or the ends of the field of play 2 yd (2.0 m) from the corner of the field of play and to the right of the goal at the corner where the goal judge is located.

GOAL REQUIREMENTS

Posts and crossbar, rigid and perpendicular. USS, wood or metal, 3 in. sq, painted white. NCAA, metal 1½ in. diameter, painted yellow or orange. Nets to hang loosely on frame. For USS, the underside of the crossbar must be 0.90 m above water surface when water is 1.50 m or more in depth, and 2.40 m from the bottom of the bath when the depth of the water is less than 1.50 m.

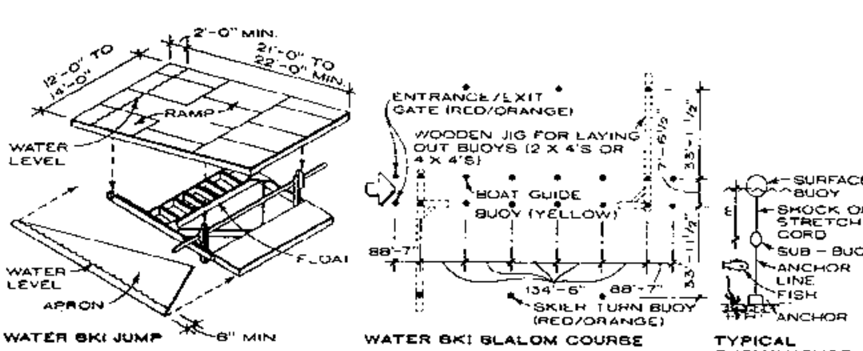
Frames are custom made, with bracing placed where necessary. It is recommended that they be collapsible for easy storage. Anchorage methods depend on pool design, with those above commonly used, or brass couplings may be placed in pool walls to which frame is attached. If pool is longer than required length, one of the goals may be floated and anchored with guy wires.

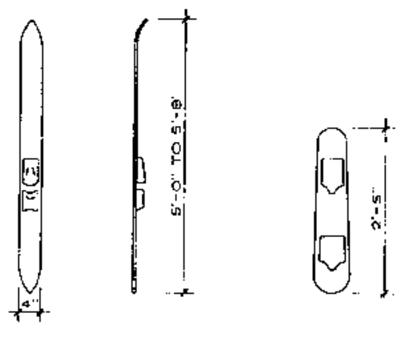


NOTES

1. To decrease turbidity caused by boat wake, an island running down the center of the lake may be built in addition to turn islands. Floating breakwaters may also be used; islands should be riprapped to prevent soil erosion.
2. A gradual (ratio 6 : 1) sandy slope along shorelines lets wave action die without rolling back.

WATER SKI LAKE





WATER SKIING AND JUMPING

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