Lloyd, Joyce L. Planning a multi-purpose swimming facility. M.S. in Physical Education, August 1979. 105 p. (Wayne S. Kaufman).

Swimming pools and auxiliary facilities were investigated with the intention of developing a plan for a structure which would foster a more versatile aquatic program than the average one now being conducted in traditional pools around the country. The results of this study indicated that there were innovative concepts, all of which have not been pursued. It also resulted in the formulation of a particular concept for including shallow water in the pool in a new manner.

PLANNING A MULTI-PURPOSE SWIMMING FACILITY

A Seminar Paper

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In Partial Fulfillment of the Requirements

for the Degree Master of Science

in Physical Education

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CHAPTER I

INTRODUCTION

Background

This study was precipitated by the existence of a beautiful swimming facility located in Neillsville, Wisconsin. The author taught middle school physical education there, starting in 1976. The pool combined a 42 feet by 75 feet one inch shallow area for instructional swimming with a 12 feet deep diving well. The pool was "T" shaped and had both three meter and one meter diving boards with adjustable fulcrums.

Outstanding auxilliary features of said facility were:

1. It had a non-skid tile deck that shed water readily.
2. It had good electrical lighting.
3. The diatomaceous earth filter system was very efficient.
4. The deck area was sufficient for instructional purposes.
5. There was a glassed off area (constructed of heavy unbreakable glass) suitable for spectator seating.
6. The participants main entry was through the shower room.
7. The facility was attractive.

In spite of all the positive features of the afore mentioned pool, the author noted that there were other needs

that the facility did not meet. It is fairly common knowledge that in order to fully implement one aquatic program in a given pool, another often has to suffer.

Statement of Problem

The problem was to design an aesthetically pleasing swimming facility that would adequately accomodate the various aquatic programs that could, and should, be offered there. The facility needed to include the following:

1. The facility should incorporate the highest safety standards possible.
2. The specifications should meet governmental regulations.
3. The pool should include some very shallow water.
4. Easy access to the facilities should be provided for handicapped individuals.
5. The maintenance system should be economical.
6. The materials used for construction should be of very high quality.
7. Preparation should be made for achieving an aesthetically pleasing atmosphere.
8. The cost of construction should be comparable to that of pools serving a similar population.
9. The dressing facilities should be designed to discourage vandalism.
10. There should be storage areas that are easily accessible for aquatic supplies.

Need for the Study

In relation to dimensions and configurations of swimming pools, Bronzan (1974) says that maximum flexibility at a minimum cost should be considered. He says the most popular configurations are rectangular, L-shape, T-shape, Z-shape, H-shape and separate tanks for different aquatic needs. He also tells of pools with moveable bulkheads which allow for numerous size conversions. While these structures provide solutions for some of the aquatic needs; note that they either compromise specifications for other aquatic activities or else they require moveable bulkheads, irregular shapes, or multiple tanks. The need for this study is to determine if there is a single uncomplicated pool configuration that can meet the needs of the various aquatic programs.

Purpose

Some of the problems associated with various types of aquatic facilities can be identified and alleviated from future constructions. This is the purpose of this study. As aquatic facilities and programs are improved, there should be a resultant decrease in water accidents and deaths and an increase in the number of people who can safely enjoy aquatic activities.

Hypothesis

It is hypothesized that it is possible to construct a

swimming facility with a single pool of such design that the needs of many aquatic programs could be met without requiring moveable bulkheads and/or excessive pool length.

Assumptions

1. It is assumed that there is a need for a swimming facility that will meet the needs of more people.

2. It is assumed that if the facility is attractively designed that more people will want to take advantage of it.

Delimitations

1. The facility was to be designed for year round usage regardless of the weather.

2. The facility was to be designed to accomodate both school and community needs.

Limitations

Due to the many areas of expertise involved in designing a swimming facility, the study had the following limitations:

1. The designs for the various aspects of the facility would show only dimensions and locations of pertinent details. Technical drawings indicating location of electrical wiring and plumbing pipes would not be included.

2. Estimation of construction costs would have to be approximated.

3. Since an actual site for construction was unavailable at the time this study was conducted, there could

be no evaluation of the completed facility.

4. The actual population this facility was to serve had to be approximated.

Definition of Terms

Aesthetically pleasing. This would indicate that:

1. The facility needed to depart from the traditional rectangular pool.

2. The facility needed to have accessories that would be attractive as well as functional.

3. Every effort was made to use color, light, and acoustics to advantage.

Aquatic programs. These would include instructional and recreational offerings as follows:

1. Water safety instruction.
2. Life saving classes.
3. Swimming for the handicapped.
4. Lessons for various skill levels.
5. Learn to swim classes.
6. Water adjustment for tiny tots.
7. Synchronized swimming.
8. Competitive swimming.
9. Fitness activities.
10. Beginning diving.
11. Competitive diving.
12. Beginning skin and scuba diving.
13. Modified water polo.

14. Tip dip swimming.

15. Water games.

16. Recreational swimming.

17. Age group swimming.

18. Introduction to canoeing.

Aquatic supplies. These would include supplies for pool maintenance and supplies which were used in conjunction with the various classes taught at the swimming facility.

Governmental regulations. This would include any requirements set up by those government agencies that control who may use a facility.

Multi-purpose. This would indicate that the facility was designed to be used for instructional and recreational programs. It should be able to serve a school and a community.

Safety standards. These would include:

1. Allowing for sufficient head room over diving boards.

2. Having sufficient depths under diving boards and starting blocks.

3. Allowing for sufficient water distance from ends and sides of diving boards.

4. Making provisions for back-stroke lines.

5. Providing non-skid decks.

6. Providing non-skid surfaces on diving boards and starting blocks.

7. Providing means for safe access to the facilities for handicapped people.

8. Providing water of an appropriate depth for small children.

9. Providing for good visability of the total pool area.

10. Having life saving equipment that is readily accessible.

11. Developing a program that encourages and stresses water safety practices.

Similar population. The population should be based on the number of people who use (or are anticipated to use) the swimming facility per unit time. Some predictions could be made by surveying communities of comparable size which have offered similar programs.

Swimming facility. This would be a structure which houses a swimming pool, adjoining storage areas, dressing rooms, maintenance equipment, pool accessories, and which has built-in features to accomodate adding various aquatic programs as needed.

Vandalism. This would apply to those acts often performed by people who are not supervised closely in areas adjoining the swimming pool. Examples are as follows:

1. Splashing water on bulletin board materials.

2. Putting water in soap dispensers.

3. Pulling clothing through air vents to lockers.

4. Unrolling bathroom tissue.
5. Unscrewing screws.
6. Breaking protruding items such as clothes hooks.

CHAPTER II

REVIEW OF RELATED LITERATURE

Designing a swimming pool facility was dependent on many factors. The literature researched included information on the needs of an aquatic facility, the program that should be offered, the needs and specifications of various offerings within the program, the construction of the facility, and the management of the facility.

Needs Assessment

To assess the needs of an aquatic facility, a committee should be formed (Bronzan, 1974). It should include representatives (men and women) from the following areas:

1. Physical education department
2. Interscholastic athletic department
3. Intramural sports program
4. Recreation program
5. Swimming teams
6. Synchronized swimming teams
7. Student recreation and activities groups
8. Other campus or community groups

In addition there should be representatives from the men's water polo team.

Gabrielsen (1972) claimed that no community with 3000 or more people should be without a public swimming pool. He

listed a number of factors that are important for such a community pool:

1. It should be a beautiful facility, blend into the decor of the surrounding area, and be recognized as a distinct asset to the community.

2. It should be a place where parents could bring their children with complete confidence in regard to their safety.

3. There should be a place where parents, without having to get into a suit, could watch the activities of their children.

4. It should be a place with other things to do besides swim.

5. The pool should not become a noise nuisance in any way.

6. It should be a place where participants could improve skills and knowledge in aquatics or enjoy the wholesome benefit of just swimming.

7. The pool should be designed so that the pool water is purer than the water people normally drink.

8. The traffic flow in the pool area should be planned carefully in order to keep congestion to a minimum.

Bronzan (1974, p.161) stated that, "A majority of the aquatic facilities constructed in the past 25 years have failed to meet the demands placed upon them".

Program

Program requirements (Athletic Institute & AAHPER, 1974) should be carefully reviewed by the pool planning committee in order to determine what kinds of facilities are needed. They listed some program possibilities which included the following:

1. Swimming and life saving classes for students (including skin and scuba diving) and classes for faculty children

2. Classes for special populations of various kinds including timid non-swimmers and postoperative cases

3. Practice times for competitive swimming groups, synchronized swimming clubs, and team diving groups

4. Recreational swimming for students and faculty

5. A time for student make-up work following excused absences

6. Small craft classes in boating and canoeing

7. Community programs

8. Assignments for special events such as home interschool meets, water shows and clinics

Gabrielsen's recommendations stressed the needs of the school program (Gabrielsen, 1972) because the council believes that greater problems exist and more help is needed in aquisition of pools for American schools. He says that it has been proven that swimming classes should be scheduled in blocks of classes that meet daily in preference to having a

class once a week. The classes should be split by ability level and where possible student leaders should be trained to assist the regular class instructor. He added that trained personnel are essential to effective teaching of fundamental skills.

Program wise, he listed a number of aquatic activities that should be taught in addition to basic skills. They are as follows: survival swimming, life saving, water safety, small craft techniques, diving, scuba diving, and synchronized swimming. He recommended that there be a water show once a year, that there be opportunities for pre-school children to learn to swim, and that there be special training in scuba diving for rescue workers such as policemen and firemen.

The American Red Cross (1977) noted that there were 36,000,000 handicapped people in the United States according to the United States Department of Health, Education and Welfare. The Red Cross and others (Cordellos, July 1976 and Newman, 1976) encouraged handicapped programs in aquatics. Cordellos, a blind man who learned to water ski and scuba dive, recommended various aquatic activities for the visually impaired. Newman told how even children with spina-bifida (11,000 being born each year) could learn to swim and some of them well enough to perform in a swim show without any aids. The Red Cross claimed that swimming offers opportunities for physiological, psychological, and sociological development.

Bronzan (1974) said that the aquatics facility committee

should identify the various programs that will use the facility. Uses for an aquatic center included (in addition to others previously mentioned): men's and women's synchronized swimming, men's water polo, and special summer programs for disadvantaged youth. He added that it may be impossible to provide each program with ideal facilities thus making it necessary to prioritize the various programs; then if a limited budget was a factor, a low interest program might be eliminated.

In 1974, Cramer outlined standards for aquatic instructors and specialists. Some not previously mentioned were instructor of life guarding, instructor of aquatic facilities management, and instructor of small craft and open water activity.

An unusual aquatic program was recommended by Cureton in 1943. He called it "warfare aquatics". It included a great number of survival skills such as swimming in team combinations carrying heavy objects, obstacle swimming, and learning how to swim under water and look up in order to find openings between oil patches on the water. He pointed out that great numbers of armed service personnel perished due to their inability to swim and/or maintain themselves in the water under various conditions.

Specifications for Various Programs

Rules for competitive swimming covered a number of different areas including what size the pool should be, how

the pool should be constructed, the kinds of markings that should be on the pool, how the lanes should be identified, what the water conditions should be, and what equipment needs to be supplied.

Roberts and Erwin (1978) gave the following pool dimensions:

1. The length of the pool shall be 75 feet (22.860 m) measured from the inside walls.

2. The pool shall be at least 45 feet (13.706 m) but a pool 60 feet (18.288 m) wide would be preferred.

3. The depth of the water shall be a minimum of 3 feet, 6 inches (1.0668 m) in all swimming pools.

Bronzan (1974) recommended that a competitive pool should have eight lanes, each of which should be a minimum of 8 feet wide. He said that the depth of the water should be 6 feet unless the pool was also being used for water polo, and then it should be 7 feet deep. He recommended a 50 meter pool so that it could be used for international competition.

Some of the aspects of pool construction that needed to be considered (Roberts and Erwin, 1978) were:

1. End-walls, or bulkheads serving as end-walls, shall be parallel and vertical about 3 feet, 6 inches (1.0668 m) below the overflow level.

2. There shall be no protrusions or inlets below the water surface except those which are $\frac{1}{2}$ inch (1.27 cm) or less and are the result of a finish-pad being used for an automatic

timing device.

3. End-walls should be finished with a non-slip surface.

4. Ladders, or similar devices, shall be recessed into the side-walls (or be easily removable) for competition.

Pool markings recommended by Roberts and Erwin (1978) were:

1. Pools constructed or refinished after January 1, 1976 shall have white bottom and walls.

2. The middle of each lane shall be indicated by a continuous dark colored line at least 12 inches (.3048 cm) wide. These lines should end 60 inches (1.524 m) from the end-walls. The last 12 inches (.3048 cm) should form a "T" that is 36 inches (.9144 m) wide.

3. Identifying lane numbers should be visible from right to left as the pool is viewed from the starting end.

4. It is recommended that end-walls be at least 2 inches (5.08 cm) above the normal water surface. On deck level pools the top edge shall be marked with a dark contrasting color.

Roberts and Erwin (1978) gave the following rules regarding lanes and water conditions:

1. There shall be clearly visible lane markers indicating the lateral limits of each lane. It is recommended that solid colored floats be used for 15 feet (4.572 m) from the end-wall.

2. The lane markers shall be anchored at the surface level of the water in recessed receptacles.

3. Lane widths shall be a minimum of 7 feet (2.134 m) wide. Since outside markers are recommended, the two lanes next to the side-walls may be wider than the other lanes.

4. Water clarity shall be such that the pool markings may be seen while standing at the midpoint on either side of the pool deck.

5. The physical condition of the water shall be in compliance with local or state health codes.

6. The water temperature for indoor meets should be from 78 degrees (26 degrees C) to 80 degrees (27 degrees C) Fahrenheit.

7. The water level shall be at the overflow rim of the pool.

All necessary equipment that was listed by Roberts and Erwin (1978) was to be provided by the host team or institution. The equipment included starting platforms, a .22 calibre pistol, a recall rope, backstroke flag lines, a visual lap counting system, ballots, timing devices, and a scoring device (Roberts and Erwin, p.8).

Roberts and Erwin (1978) also gave rules relating to the pool board and equipment for diving competition as follows:

1. The end of the board to the anchoring pool wall should be 6 feet (1.829 m).

2. The side of the board to the side of another board should be 8 feet (2.438 m).

3. The side of the board to the side of the pool wall should be 10 feet (3.048 m).

4. The end of the board should be 29 feet (8.839 m) away from the forward pool wall.

5. The ceiling should be 16 feet (4.877 m) over the top of the board.

6. If a diving pool does not exceed the minimum depth requirement, then the maximum depth reduction rate shall be $6\frac{1}{4}$ percent for a distance of 20 feet forward (6.096 m) and 6 feet (1.829 m) back and to the sides. A deeper pool may have a steeper depth reduction rate.

7. The diving board shall be one meter above the surface of the water, as measured from the top of the board. It shall be 16 feet (4.877 m) long and 20 inches (.508 m) wide. It shall be horizontal and the entire top surface shall be of a non-skid material.

8. The board should have a movable fulcrum which can be set at positions between 5 feet, 6 inches and 7 feet, 6 inches (1.676 m and 2.286 m) from the rear of the diving board. The board should be horizontal regardless of the position of the fulcrum.

9. It is recommended that a diving pool should have a water agitation system that agitates the water for 5 feet (1.524 m) beyond the end of the board for a width of 2 feet

(.6096 m).

In regard to water polo, Bronzan (1974) recommended that there be water polo markings on the pool. He said receptacles for goals should be provided on either end of the pool. He said that the depth of the water should be 7 feet.

Gabrielsen (1972) gave additional requirements as follows:

1. The length between the goal lines should be 30 yards.

2. The width should be 20 yards.

3. There should be not less than 18 inches from the goal line to the nearest obstruction.

4. The goal line should be of a contrasting colored tile not less than 18 inches from the end of the pool.

5. There should be 2 yard lines and 4 yard lines (measured from the goal line) in contrasting colored tile.

6. There should be a half distance line of contrasting tile at the center of the playing areas.

7. The cross bar of the goal must be 3 feet above the water surface when the water is more than 5 feet deep.

8. If the water is less than 5 feet the underside of the cross bar is to be 8 feet above the floor of the pool.

9. The goal posts and cross bar should be painted traffic yellow (or orange) and white.

10. There should be 10 feet between the goal posts.

The synchronized swimming program requirements given

by Gabrielsen (1972) were as follows:

1. There should be 2000 to 3000 square feet of water over 6 feet deep.

2. There should be underwater speakers.

3. There should be underwater lights.

4. In order to add interest there should be some kind of stage.

In 1967, Bolton and Goodwin pointed out the value of pool therapy in working with locomotor disabilities and recommended aquatic activity for rheumatism, arthritis, anterior poliomyelitis, and postoperative orthopedic cases. One of the requirements they gave for working with these people is that the water be warm, even as high as 94 to 100 degrees Fahrenheit. They suggested the use of the following apparatus in working with patients: submerged parallel bars, steps with handrails, a submerged plinth with depth adjustment, and working against a water current.

Cordellos (1976), writing from the standpoint of a blind man, gave some helpful suggestions in dealing with the handicapped. He indicated that making a pool safe for a visually impaired person would also make it safer for other people. One of his suggestions was to change the texture of the pool deck surface so that a person could feel when he was getting close to the pool. He said that there should be a minimum of sharp edges or metal objects located around the pool. He recommended that there be a well defined, well

supervised diving area. He explained that the noise factor could be particularly distressing to the blind person. He recommended under water speakers, plus observation windows as being particularly helpful for instructing the blind.

Specifications for water safety dealt primarily with personnel. In order to teach classes, the instructor needed certain qualifications. Completion of a "Water Safety Instructor" course (American Red Cross, 1968) is one of the ways that people have met those requirements. Some water safety tests required a minimum depth of 8 feet or 9 feet and so this should be kept in mind when designing a pool.

In regard to instructional swimming, safety was given as an important factor by the American Red Cross (1968). They listed such questions as:

1. "Is the area safe?"

2. "Has the local board of health approved the water?"

3. "Is the physical arrangement of the area such that it is safe for the user?"

4. "Is safety equipment such as ring buoys and reaching poles, available?"

5. "Are there buoyed lines separating the various swimming areas?"

6. "Is the bottom firm and free from holes and sudden step-offs?" (American Red Cross, p.11)

Another requirement that the Red Cross (1968) gave was that the swimming areas should have enough "teaching faces"

(places where the instructor can stand to see the work of the student). The water temperature requirements given by the Red Cross were 72 to 78 degrees Fahrenheit for all-around usage and 78 to 82 degrees Fahrenheit for teaching beginning swimming. They recommended that the air temperature be 5 to 10 degrees higher than the water when possible.

Construction

Gabrielsen (1972) pointed out that prior to selecting the actual construction site, borings should be carefully defined. The soil mechanics should be investigated and referenced. Changes of stratum, water table, and the character of all formations and rock should be noted. Then expert interpretation of the boring logs should be obtained so that pool construction could satisfy the natural parameters.

According to Bronzan (1974) form-poured concrete was said to be the most widely accepted method for constructing a pool basin. Steel and aluminum are also used and welded together electrically on-site. He said that it is important that the supporting earth be properly prepared and that the highest quality of cement be used. He also advised to allow appropriate time and methods for curing the concrete.

Bronzan (1974) also pointed out that it is necessary to finish pool construction materials. He said steel pools needed to be smoothed and periodically covered with a protective waterproof paint. He added that aluminum pools either needed to be painted or finished with tile. He

advised adding color to the original mixture of concrete if that type of pool was not to be lined with tile. He felt that the cost of tile was justified because the cost and maintenance of other materials would be greater over the life span of the pool. He recommended finishing gutters and coping edges in a contrasting color.

Pearson (April, 1979) claimed that it was no longer necessary to use elemental gas chlorine from a pressurized cylinder to treat swimming pools. He said there was a new process developed that eliminated the danger and other disadvantages of what he called an "outmoded technology". The process he described was an on-site generation of sodium hypocholrite by electrolysis. He said it had been tested and proven by applied, in depth research. Not only was it less dangerous, he claimed it benefitted the swimmers health, was economical, and provided safety benefits for everyone.

Pearson explained the process somewhat as follows: the pool water is pre-conditioned with food salt to 3000 parts per million; the conditioned water is then separated into its basic components by electrolysis as it circulates through one or more pairs of "generating cells"; and then a series of complex chemical reactions take place which produce sodium hypochlorite. A part of the reaction produced free oxygen radicals and other peroxyspecies which were very strong oxidizers in their nascent state. The combination of concentrated hypochlorite and other species sterilizes and

superchlorinates all the water circulating through the generating cell and leaving a strong residual remaining in the pool water. Pearson pointed out that by the time the water circulated through the generating cell two or three times the pool water has been sterilized, superchlorinated, and can still purify any objectionable contamination entering the pool.

In addition to the above benefits, Pearson made additional claims such as: the chemical imbalance is eliminated, the water is more comfortable and does not contain irritating chloramines, there is no need for goggles, dehydration of skin is minimized, and the water is bacteria safe and algae free.

Pearson also listed some financial benefits: hundreds of man hours can be saved per year, there is no need to transport or handle caustic or corrosive chemicals, the generating equipment does not require special skills or training to maintain (just add salt several times per year), the life of associated pool equipment is prolonged, backwash cycles are lengthened, the generator operates compatibly with existing automatic chlorine sensing equipment, and the overall cost is lower over a period of 5 to 10 years.

Bronzan (1974) pointed out that bad placement of lighting could impair the vision of swimmers thus creating a safety hazard. He recommended vapor-proof luminaires with shatter proof lenses or with protective covering devices. He

said there should be 50 foot candles of illumination on deck and spectator areas and 100 foot candles over the pool area. He advised that a method for servicing the lights should be planned (such as a catwalk). He recommended under water lighting to increase the safety of the pool when used for night use. He said that the use of high intensity mercury vapor lamps have been successful but added that the blue color needed to be corrected.

Kaiser and Kinney (1976) reported about Jenks High School in Oklahoma. They used 400 watt metal halide sealed luminaires and claimed that they had excellent penetration to the pool bottom. The high density discharge lamps were manufactured by the Wide-Lite Corporation. They used asymetrical beam patterns to throw light out over the pool.

The lamps were mounted on the pool perimeter which allowed for easy maintenance and relamping. The lamps provided 50 foot candles of light on the pool surface which is less than Bronzan (1974) recommended but equal to what AAHPER and the Athletic Institute (1974) recommended.

In 1972, Gabrielsen gave some information on filtration systems. He pointed out that both pressure and vacuum diatomaceous earth (DE) systems have minimum backwash requirements. With the DE filters, he said, it was necessary to consider settlement basins and high volume sewer connections. He recommended a turn over rate of the pool water once every $3\frac{1}{2}$ to $4\frac{1}{2}$ hours in preference to the minimum 6 to 8 hours

permitted by law. He opposed filtration systems that shut down during "off-peak" hours because they prevented design standards from being effective. He said a more desirable method would be to have two pumps and run one for high demand and the other continuously, alternating the two periodically for equal wear.

Thomas (1972) said that three or four turnovers of pool water were needed per day in order to maintain clear water. He added that DE filters should be operated at a flow rate of not more than $2\frac{1}{2}$ gallons per minute per square foot, with 1 or $1\frac{1}{2}$ gallons per minute being preferred. He explained that the filters had to be properly coated with clean DE before circulating dirty water through them, thus the coating needs to be a continuous process. Advantages he gave were: that they use one third the space of sand filters, they require less backwash water, and they remove smaller particles from the water. A disadvantage, he said was that they require closer supervision.

Dunlop (June 1979) indicated that in the next two or three years solar heat for pools may be mandated. There was even some discussion about the possibility that it might be considered as a Federal tax credit.

Ezersky and Theibert (1976) noted that Los Angeles County had conducted tests on 12 different types of solar heat collectors for probable use in their public pools. In light of the energy crisis, he said that solar energy will be looked

at critically as one of the solutions to heating pools.

Bronzan (1974) stated that pool water should be heated as it leaves the filtering system. The most common heating method, he said, was to use heat-exchanger pipes or coils. The sources of heat he mentioned were electricity and gas. He advised outfitting the system with an automatic thermostat to control the water temperature. He added that the water should not exceed 105 degrees Fahrenheit as it enters the pool.

Additional recommendations given by Bronzan (1974) regarding heating are as follows:

1. The pool deck should have radiant heating allowing for a deck temperature that is 2 to 4 degrees warmer than the air.

2. Radiant overhead heaters for the class assembly-instruction area and the competitive swimmer resting area are advisable.

3. It is desirable to have heated benches for class instruction and for competitive swimmers.

4. The spectator area should have a temperature of 68 to 72 degrees Fahrenheit.

5. Water for swimming instruction should be 76 to 82 degrees Fahrenheit.

6. Water for competitive swimming should be 74 to 76 degrees Fahrenheit.

7. Deck temperature, taken at 3 feet above deck level,

should be 83 to 85 degrees Fahrenheit.

8. The spacing of heat inlets should be such that warmed air is distributed equally so as to avoid the sensation of a draft.

9. Heat should be thermostatically controlled and operated with a built in timer.

10. The heat inlets should be low.

11. There should be separate heating inlets, with air of different temperatures, for deck and spectator areas.

12. The location of the return air ducts should be such that there would be little interchange of air between the deck and spectator areas.

According to Borozne, Morehouse, and Pechar (1977) hose nipple and water faucetts should be placed every 50 feet for maintenance purposes.

Bronzan (1974) said that an invisible wall could be formed between the deck and spectator areas by using a "jet-stream" forced air system that would aid temperature control between the two.

A major concern, according to Bronzan (1974) was the control of humidity. He recommended the dehumidifiers should be placed in the ceiling or in the ventilation system. He advised circulating the air without creating a draft in order to minimize condensation. He pointed out that 40 to 60 per cent humidity is desirable for all areas except the spectator area, which should have a lower level.

The Athletic Institute and AAHPER (1974) gave some factors to consider in regard to electricity. They suggested that provisions be made for the installation of electric scoreboards, a central sound and public address system, places for using audio-visual equipment, and places for using cleaning machines. It was pointed out that care should be taken in the strategic placement of speakers and microphone inputs around the pool area. They reminded that it was unsafe to extend electrical cables around pool decks. They recommended that electrical outlets in the pool area should be placed 3 to 4 feet above deck level on sides and ends of all pool areas. A weatherproof outdoor type, that was grounded for safety was recommended.

A deck, 20 feet wide, around the entire pool basin was recommended by Bronzan (1974). He pointed out some of the advantages of a wide deck were that they are safer, they aid in instruction, they are useful for dry land exercises, and they are useful in administering rehabilitative exercises. He specified that the deck should be made of anti-slip materials such as special tile. He said that excellent results had been obtained with polyurethane surfacing. He added that the decks should be free of obstructions.

Bronzan (1974) explained that the purpose of deck coping was to prevent the deck water from entering the pool. He said it should consist of a non-slip surface and be about 10 inches wide. Commonly, he said, the coping was raised

2 or 3 inches above the deck surface. He pointed out that another method that was often used was to gradually increase the slope of the deck to a height of 2 or 3 inches at the edge nearest the pool. The slope of the deck (either from the pool or toward the coping) should be one eighth to one fourth inch per foot. He specified non-corrosive grates and drain pipes to carry the waste water to the sewer line.

The Athletic Institute and AAHPER (1974) recommended that deck drains should slope away from the pool toward the center of the deck or outside wall. They advised checking state and local sanitary codes for their requirements.

Bronzan (1974) pointed out the necessity of walls and ceilings being made of a material that was impervious to moisture. He said that tile or epoxy finishes were suitable for lower sections of walls. He recommended, that above 6 feet, the walls should be treated with acoustical plaster or acoustical panels made of foam glass. He stated that it would help to prevent condensation if the following recommendations were followed in the construction of walls and ceilings: provide an airspace, install a layer of insulation, and include a vapor seal between the inner and outer walls.

Ebersky and Theibert (1976) told about the geodesic dome concept of construction. It allowed for large open spaces with no supporting pillars or columns. They said that geodesic technology provided an obvious advantage for sports

and athletic competition.

In 1979, Wagner told about a geodesic dome structure in Oklahoma. One of the advantages pointed out in that article was the indirect lighting system which he said "bounces" the light from five pods (suspended above the bleachers) off the insulated ceiling of the dome. He said that the light intensity was uniform and provided excellent illumination. He pointed out that the structure had aesthetic appeal.

Wagner (1979) pointed out that acoustics could be a problem. He advised that the sound system should be properly installed by an expert "acoustician". The Kerr Center in Oklahoma had some trouble but it was alleviated by adjusting the sound system and using acoustical material on the North and South bare walls.

Bronzan (1974) pointed out that floors get about 90 per cent more wear than other parts of a typical building. He claimed that floors influence the effectiveness of the lighting system and play an important role in acoustics. He said that carpet rated highest in the ability to prevent and absorb sound and that polyurethane floors ranked next. In regard to effect on lighting he said that light colors and smooth surfaces were better than dark colors or rough surfaces for reflecting light. He pointed out that floors that required waxing or polishing often accounted for glare.

Other factors that need to be considered in selecting

a floor, Bronzan said, were if it was resistant to contamination, if it was resistant to fire, if it was resistant to slipping, if it could be cleaned easily, if it could be disinfected easily, and if it was free of soil traps. He reminded that all surfaces are more dangerous when they are wet. In the event of falling, he pointed out, that carpet and polyurethane floors had more absorptive qualities than some of the other floors used.

The Athletic Institute and AAHPER gave the following suggestions for lounges and/or lobbies. They said either one should be attractively lighted, have a drinking fountain that is wall mounted and recessed, have a lighted trophy case and bulletin board, have enough space for vending machines (preferably recessed and near electric and water connections) and have a telephone that can accomodate a person in a wheel chair. They recommended using a good aluminum door with a minimum of glass in preference to a full glass door from the standpoint of vandalism. Carpet was listed as being desirable but terrazzo, quarry tile, and patio tile were recommended when there was a chance that there might be cigarette damage to the floor.

The Athletic Institute and AAHPER (1974) stated that one of the most common errors in planning recreational type buildings is the lack of storage space. They said the minimum size of a storage room should be 250 square feet. They pointed out that storage rooms are needed for maintenance

purposes, custodial purposes, and for storing equipment. In regard to maintenance storage rooms, it was recommended that they be located on the ground level and be adjacent to outdoor areas. They said it was necessary for the outside entrance to be burglar proof but at the same time sufficiently large to permit the passage of motorized maintenance equipment.

Within the storage areas, they recommended that there be recessed wall shelving and cabinet storage that was suitable for tools, supplies, and equipment. They added that there should be hot and cold water, a slop sink, a lavatory, and a water closet. They recommended a concrete floor, that was pitched to a central drain and that the junction of the wall and floor should be covered. Each floor level, they added, should have a supply closet equipped with a slop sink and space for mops, pails, brooms, and cleaning supplies.

In order to maintain health standards at secondary and higher education levels, Ebersky and Theibert (1976) said that gym clothing and towels should be laundered daily. They added that the latest commercial equipment makes it feasible for school personnel to operate it. The laundry needed to be placed where it was accessible. They suggested considering chutes, collection centers, elevators and/or ramps as needed.

Ebersky and Theibert (1976) recommended that the laundry room be a plain structure made of concrete or some similar material. Lines for water, gas and electricity needed to be considered. It was suggested that all areas

requiring plumbing facilities might be located in adjacent areas. They said counter tops and tables were desirable for sorting purposes but that it might be a duplication if there is counter space in the equipment room.

AAHPER (1972) cautioned that controls of sound and vibrations of laundry machines are critical. They advised that the selection of the equipment should be made before the lay out of the room, floor, and auxiliary services. The equipment was to be placed so that items could be handled with a minimum of wasted steps and effort. AAHPER (1972) advised that room should be available for servicing the machinery. Other suggestions were that walls should be sound-proofed, walls and ceilings should be impervious to moisture, ventilation outlets or spaces for fans should be planned in the construction phase, doors should be wide enough to allow for equipment passage and acoustical controls should be considered when selecting the type of ceiling. Floors needed to be non-skid and able to withstand heavy wear. Drain covers and door thresholds had to be such that they would not interfere with the moving of rolling equipment.

In 1972 AAHPER said the decision to use ironers and/or pressers was dependent on the types of materials that would be laundered. They added, that with the advent of drip-dry and other synthetic clothing it would be difficult to justify. They told of a folder and stacker that could fold up to 1600 bath towels in an hour. They said that there were

times when rinsing sinks would be required and that they should be equipped with special drains to prevent clogging from mud.

The minimal training room size recommended by Taylor and Novich (1972) was 15 by 20 feet for high schools. They recommended placing the training tables to the front of the training room to discourage excessive traffic. They said that there should be electrical outlets near work tables and therapy equipment. It was advised to keep sensitive electrical instruments by the wall away from the flow of traffic. Training room cabinets were to be located near the taping and treatment tables. Equipment was not to be located in drafty areas. They pointed out that taping tables could be shorter than treatment tables to help save space. Wash-up and whirlpool areas were to be placed near the rear of the room so as to be out of the way of normal traffic.

Bronzan (1974) pointed out that an athletic training room should be available to all students but that controls were needed to prevent overcrowding. He said that the athletic training room and its services should play a major role in the prevention of injury and illness. He added that the area could double as a first aid station.

It could also double as a laboratory area for students interested in the study of athletic training, he noted. Some of the advantages of well-equipped, well-supervised training rooms were: immediate diagnosis and treatment tends to reduce

the severity of the injury, possible legal suits based upon negligence would be reduced, improvement of team performance by reduced time out, and reduction of academic time lost (due to a quicker recovery). He said that the facility should be available to people inside the facility or outside the building.

Bronzan (1974) listed six separate areas which he felt should comprise an ideal athletic training room:

1. Physical therapy
2. Hydrotherapy
3. Electrotherapy
4. Trainer's office
5. Physician's examining room and office
6. The storage room

Then he added that a seventh area should be contiguous; that was the rehabilitative exercise area. He said the athletic training room should be climate controlled and that exhaust fans should be included. He said it was preferable that the room not have any windows. He advised that the office should have two telephones; one on an extension and the other to an outside line (for emergencies). It was also recommended to have a time clock with program signals and some kind of an intercommunication device.

The walls of the training room were to be impervious to moisture five feet above floor level and then treated with moisture-resistant paint or glazed concrete block walls,

Bronzan said. Ceilings were to be of a light color and at least 10 feet high (to allow a person to safely stand on a training table) according to Bronzan. He said electrical outlets should be plentiful and that they should be placed at least 48 inches above floor level. He recommended that varying currents should be supplied and that all electrical switches and outlets should be grounded. All materials used in the training room were to be non-corrosive according to Bronzan.

Bronzan advised in 1974 that there should be one or more classrooms (in addition to academic considerations) and a demonstration laboratory. He said that the design should be controlled by the anticipated needs. He reminded that closed and public television outlets, as well as electrical outlets, should be included for the operation of audio-visual equipment. He advised providing for the ability to quickly and easily darken the room for showing slides and films.

AAHPER (1972) recommended that shower rooms should be directly accessible from the dressing rooms and the swimming pool deck. They said there should be a towelling area adjacent to the shower and that toilet facilities should be convenient to shower rooms. They suggested non-corrosive towel bars or a stainless steel airplane cable to be used in the shower area for towels (to be installed above the splash line). Shower and drying rooms were to have non-skid ceramic tile floor (or equivalent material). They said that floors

should slope toward drains and that low curbs should be used only when necessary to confine the water. They further recommended tiled gutters beneath the shower heads leading to appropriately spaced drains which are covered with non-ferrous metal grates.

The shower room ceilings were to be at least 9 feet high and resistant to moisture, AAHPER (1972) said.

The walls in shower and towelling rooms were to be finished with an easily cleaned material such as ceramic tile or terrazzo wainscot and extend seven feet above the floor in towelling areas, AAHPER (1972) recommended. Epoxy enamels were to be considered for the finish above the wainscot, they said. They added that glazed building blocks be considered for these areas as they provided a similar surface and were less expensive to install.

Other considerations given by AAHPER (1972) were:

1. Hose bibs for cleaning needed to be near the shower and towelling rooms (they said a good location was beneath the lavatories).

2. Shower rooms should not be located by outside walls as it would cause problems with condensation and exhaust (shower room air needs to be exhausted 100 per cent to the outside).

3. Light fixtures need to be vapor proof and installed flush with the ceiling.

4. Shower light switches should be located some

distance from the shower area, and not in the wet area.

5. One shower to four students (peak load) is advisable.

6. Shower heads are an important part of the installation and should be selected carefully in regard to ease and economy of maintenance.

7. Liquid soap from a central supply tank should be provided as well as having recessed soap dishes.

8. Consideration should be given to installing shower heads at various heights.

9. Shower heads should be adjustable in relation to fineness of spray but not as to the direction of spray.

10. Shower heads should be self-cleaning and non-clogging.

11. Plumbing for showers should be in pipe spaces that are convenient for repair and maintenance.

12. Special equipment needs to be installed for handicapped use of shower facilities.

In regard to locker facilities, AAHPER (1972) recommended having lockers assembled at the factory by electric arc welding. It is initially cheaper to have the pieces shipped, they said, and have the lockers assembled on the spot but it is more costly in the long run due to maintenance problems. They said that the most practical type bench to use in the dressing room was a concrete slab mounted on a solid pedestal of concrete block with the dressing

lockers installed on top of that. The 60-inch dressing locker was recommended for greater convenience over the 72-inch locker in women's dressing rooms. They also suggested having rubber-silenced door stops on locker doors. It was recommended that storage baskets have forced-air ventilation. Dressing lockers should include a shelf for books or shoes, they said.

The installation of toilet and lavatory facilities should be concentrated in as few places as possible, AAHPER (1972) said. They added that they should be near other dressing facilities. They said that ceramic tile or hardened concrete were suitable for the floors. They recommended that fixtures be wall hung to facilitate cleaning. Mirrors should not be placed above hand lavatories, they added. Electric hand dryers or paper towels needed to be located conveniently. Women's facilities needed to include sanitary dispensers and disposers. They pointed out that outside doors needed to be baffled to obstruct sight lines. Their recommendations were two water closets, two urinals, and two hand lavatories for the first 30 students in the men's locker room area; while four water closets and two hand lavatories were recommended for the women's locker room area. Fixtures were to increase with every 15-30 additional students.

Other considerations in regard to dressing rooms according to AAHPER (1972) were: ease of access, areas for visiting teams, dressing room for coaches and other faculty

members, a telephone available to both men and women faculty members, and a place for conferences with individual players or coaches. The size they recommended was 20 square feet per person. If the pool was to be used extensively for public recreation, AAHPER recommended that separate dressing and shower rooms should be constructed. A mud removal area should be considered they said for students entering the dressing facility from out of doors. They said the area could be outside the building.

Suitable floors (AAHPER, 1972) were ceramic tile or hardened concrete floors. The latter needed to be treated with an abrasive. Hose bibs were needed for cleaning purposes and should be recessed in the wall near the floor they said. Walls, ceilings and lighting all needed to be resistant to moisture, they pointed out.

AAHPER (1972) made several recommendations in regard to electricity:

1. Electrical outlets should be vapor proof and located about 3 feet above the floor in appropriate places.

2. All switch boxes or terminals need to be grounded.

3. Three prong electric plug inlets should be provided.

4. The lights in the dressing room should be controlled from a central switch box.

5. Emergency auxiliary lights should be on all the time.

Some of the accessories listed by AAHPER (1972) for dressing rooms were: mirrors, single-sheet toilet paper dispensers, recessed drinking fountains, hair dryers, and facilities for the handicapped.

Halse mentioned that colors have a psychological effect on people. He pointed out that blue, for instance, reduces mental excitability but if used indiscriminately causes melancholia. Other effects of color he gave were: green was cooling, yellow was cheery and stimulating, red was exciting and stimulating to the brain, purple was sedative, brown was restful (but was depressing when used alone), white was cheery, and grey suggested cold. He also told of other effects due to color such as an area painted yellow will appear larger than one painted orange or a blue area will appear larger than a black one. Yellows and yellow greens he suggested were good for lightening rooms that otherwise might be dark.

In 1977, Borozne, Morehouse, and Pechar pointed out that it was a folly to design indoor pools with only one type of program in mind. They claimed that the traditional 25-yard, 3 feet, 6 inch to 12 feet deep rectangular pool does not serve the needs of the people it is built for. They also claimed that underwater lighting is very expensive and an unnecessary extra but that if they were installed they should be flush with the wall and grounded properly. They recommend that water in a pool serving the needs of all ages should run

from 18 inches to 5 feet deep.

Borozne et al (1977) pointed out that illegal entry and vandalism were common in public facilities. They said that pools should be designed so that they are isolated from other areas. They pointed out that it needed be easy to leave the pool area in case of an emergency such as a fire.

Some of the types of overflow systems listed (Borozne et al, 1977, p.17) were recessed overflow, a partially recessed overflow, the surface skimmer system, the rimflow system, and the roll-out design. They said that the skimmer system works well but does not prevent pool turbulance. They added that it is necessary to see a clearly defined wall for competitive purposes and that the rimflow system and the roll-out design do not provide for a raised vertical wall. They cautioned that in all cases except the skimmer system to be sure that the overflow leads to a surge tank and that a sufficient rate of recirculation is maintained during peak times.

Some requirements for the filter room (Borozne et al, 1977) were that there should be a 10 feet wide by 12 feet high double exit door leading to an outside access road. There should be an air change four times an hour they said. They added that there should be ground fault protection of motors. They said that the ceiling should be 20 feet high. They pointed out that safety signs should be posted and that eye goggles should be worn when working with chemicals.

Materials used in the filter room should be corrosion resistant.

Management

Borozne et al (1977) said that in order for a pool to be safe it had to be administered properly. Some of the areas of management that they mentioned were: determining safe swimming loads, insuring safe conduct within the pool area, posting of rules and regulations, having pool staff members who are responsible for enforcing regulations, establishing specific daily maintenance procedures, keeping permanent daily records, and providing adequate rescue equipment. They said that an additional safety feature was an intercommunication system.

CHAPTER III

METHODS

Introduction

This facility was designed for a single pool concept that could meet the needs of almost any swimming program that might be taught there. Important aspects of this facility were that it had to meet high safety standards and have aesthetic appeal.

The pool was designed as a part of a total aquatic facility that included offices, dressing areas, training areas, a classroom, storage areas, a spectator area, a lobby, and maintenance areas. However, the plan for the pool was such that the pool itself could be used equally well within a different facility.

Swimming Pool Facility Design Selection

Aspects that needed to be considered in the designing of a pool facility were:

1. Who would be using the facility
2. What programs would be offered to the people using the facility
3. The location and the soil composition of the site where the pool would be constructed
4. The recommendations of people who work in aquatic facilities

5. The recommendations of people who have expertise in related fields such as: architecture, maintenance, pool sanitation, plumbing, lighting, painting, construction, sound technology, interior decorating, equipment selection, and heating (including solar heating).

6. The recommendations from people who participate in various aquatic programs such as synchronized swimming, diving, scuba diving, and competitive swimming.

7. The shape and size of the pool.

8. The kinds and number of auxiliary rooms and/or areas that need to be included.

9. Meeting various state and local codes.

10. What the estimated cost would be and how it could be financed.

The facility was designed for a Midwest Community of approximately 3500 people. In order to justify a pool designed to have sufficient size to accommodate the different aquatic programs; it was necessary to plan to have the pool used on an extensive basis. Therefore, the pool was designed for school use, for community use, and for a demonstration area for pool safety clinics to include many outsiders.

The proposed program was set up in four phases. The first phase consisted of an all out effort to train water safety personnel of all kinds. Phase two was designed to be strong on teaching basic water safety and instructional swimming. The third phase was proposed to consist of

competitive swimming and synchronized swimming. It was planned to start this phase with the younger swimmers and work up. The fourth phase was designed to include the special areas such as water polo, skin diving, scuba diving, combative aquatics, and boating skills.

Throughout all the phases, it was decided that there would be opportunities for people of all ages (within their age groups) and for people of all abilities (including those who may be physically impaired in some way).

The program was also designed to include courses that are closely related to the aquatic area. Classes in cardio-pulmonary resusitation were to be included. Water safety (theory as well as practice) for all levels was to be stressed. First aid training was planned as another offering. Rehabilitative work was another consideration.

The course of study was designed to include all of the following:

1. Swimming and water adjustment for tiny tots
2. Combative aquatics
3. Swimnastics
4. Competitive swimming
5. "Basic Water Safety" (American Red Cross)
6. "Basic Rescue and Water Safety" (American Red Cross)
7. "Advanced Life Saving" (American Red Cross)
8. Techniques in Life Guarding
9. "Water Safety Aide" training (American Red Cross)

10. "Water Safety Instructor" training (American Red Cross)
11. Handicapped swimming
12. Modified water polo
13. Masters swim program
14. Synchronized swimming
15. Learn to swim
16. Tip dip swimming
17. Instructional swimming: all ability levels
18. Intramural swimming
19. Survival Swimming (American Red Cross - offers two levels)
20. Diving classes
21. Beginning boating and/or canoeing skills
22. Recreational swimming
23. Water games
24. Skin diving
25. Scuba diving
26. Scuba diving for rescue training
27. CPR training
28. First aid training
29. "Medical Self Help" classes
30. Water shows

The program was set up with definite priorities in mind. The number one priority was to be the stressing and teaching of safety in a safety designed facility. Second,

and closely related to the first priority, was the need for instructional swimming. The third priority was to meet other needs that people have such as fitness, recreation, socializing, performing, and learning new skills.

It was decided that the classes for school and community would be offered in time blocks. The program was planned to be kept varied and interesting instead of always having the same things day after day.

The pool site was considered to be an important aspect of designing the aquatic facility for a number of reasons:

1. The soil conditions had to allow for proper drainage.

2. The soil composition had to be such that it would compact sufficiently to house the structure.

3. The facility needed to fit in with the surrounding structures.

4. The water table needed to be low enough so as not to interfere with the excavation.

5. If the solar heat option was to be used, adequate open space had to be available.

Some of the recommendations of people who were involved with aquatic facilities in some aspect were:

1. Use embedded drums at the opposite end of the pool from where the starting blocks are for storing lane lines used for competitive swimming.

2. Have a hinged back on your one meter diving board

so that it may be hinged back during competitive swimming and during water polo games.

3. Incorporate a laundry as a financial advantage (it saves money).

4. Have the air compressor for inflating air cylinders for scuba diving on a different floor and isolated from the public. The area should be well-ventilated (this can be accomplished by using a fan).

5. Consider using laundry chutes for soiled clothing if your laundry is located on a sub-level.

6. Have instructor's and coach's lockers built in with the building construction.

7. Excavate on the sub-level for future expansion (square footage is lower in cost at that level).

8. Be sure to have deck level access to the swimming pool in case of emergencies (such as needing service from an ambulance) or in order to service large equipment.

9. Avoid using deck level ventilators by a swimming pool.

10. If your spectator area is not on deck level, you need a way to get from one to the other in case of an emergency.

11. Incorporate a gutter system which will not be injurious to competitive swimmers making past "flip" turns.

12. Avoid use of asbestos on walls and ceilings.

13. Consider the use of air circulating lockers.

14. Be sure to provide waste receptacles in appropriate areas.

15. Be sure to get your community people involved in planning.

16. Establish a file on information from various sources (Manufacturers information, ideas from visiting facilities, and ideas from investigation of modern design concepts of facilities.

17. Consider the need for such things as a public address system, emergency lighting, electronic timers, score boards, electrical signal system, and ticket distribution.

18. Consider going metric.

19. Consider new innovations such as air supported structures, geodesic domes, and solar heat.

20. Consider using electric coils for radiant deck heating.

The size and shape of the pool was dependent on a number of factors. For instance, how many people were anticipated to use the pool at any one time? What dimensions were necessary for a competitive pool? What dimensions were needed for playing water polo? What ages and abilities of people needed to be taken into consideration? What were some of the advantages and disadvantages of pool shapes and sizes currently being used? How much of a slope was needed on the bottom of the pool and still maintain safety? Was there a need for some intermediate depths of water or was it

advisable to go directly from shallow water to a deep diving well? Were there any blind areas in the pool that would make it difficult for a life guard to watch that area? Did programs for handicapped people dictate an alteration in the size or shape of the pool?

The kinds of auxiliary rooms and facilities that were needed were dependent on the prevailing philosophy of the administration and staff. If they felt that the related areas of water safety, first aid (including CPR training) and rehabilitation were important, then the adjoining facilities needed to reflect that. If it was important to have some school facilities under lock and key when the pool was open to the public, then the plans had to be made accordingly. It was felt that cost was also a determining factor but that it should be weighed against the advantages that a larger pool might afford, especially in the area of safety.

It was decided that meeting state and local codes as well as financing the project could best be handled by special committees set up to investigate those aspects and how they related to the design of the swimming pool facility.

Procedures

Initially it was decided to look at some of the shapes of existing swimming pools (see Figure 1).

The traditional rectangular shape provided for a short competitive course utilizing the length of the pool. A diving board or boards were placed at the deep end of the pool. The

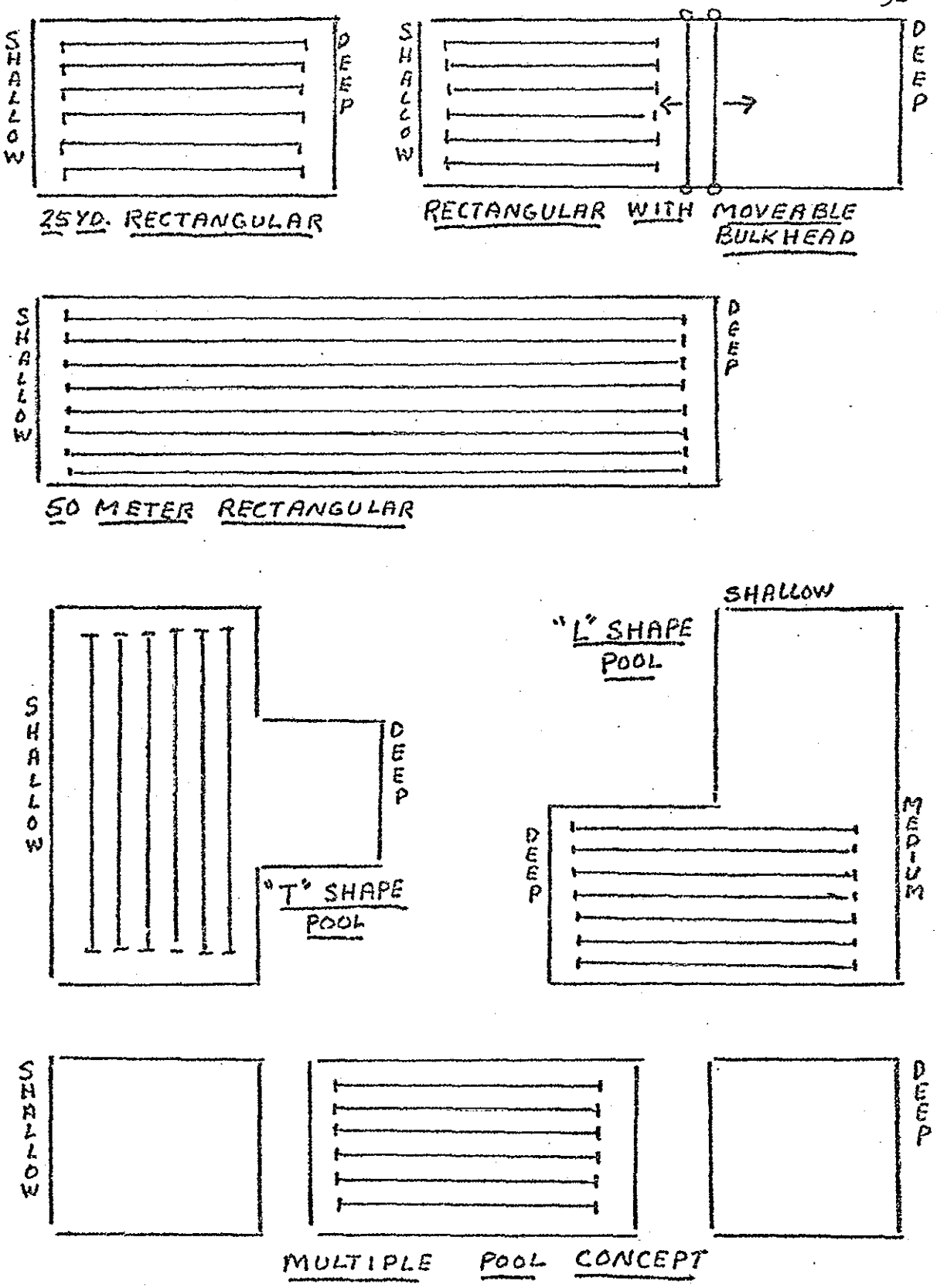

Figure 1
Traditional Pool Shapes

shallow water was at the opposite end of the pool. If there was some very shallow water at the shallow end for instructional swimming for small children then it interfered with the required depth needed under the starting blocks for competitive swimmers. If the starting blocks were placed at the deep end there was still a problem of safely executing some of the competitive turns. It also created an inequitable situation for playing water polo as one team could stand on the bottom of the pool and the other could not. It was sufficient for synchronized swimming because the routines could be devised so that stunts and entries requiring deep water could occur during those portions of a routine when the swimmers were in deep water.

The "H" shaped pool provided a number of possibilities for lengths to accomodate competitive swimming and water polo. It also allowed for shallow water for instructional swimming and deep water for diving. The main disadvantage of this pool would be some of the blind spots that were created by its unique shape.

The "L" shaped pool allowed for shallow, intermediate, and deep depths of water. It also provided a good area for competitive swimming. In relation to water polo the water depth on one end still left the other team at a disadvantage. There was only one blind corner, so guarding was easier than for the "H" shaped pool.

The 50-meter rectangular shaped pool allowed for

international competition but was not always suitable for short course competition (25 yards). It had some of the same problems regarding the shallow end that the traditional rectangular pool had. It did afford sufficient deep water for participation in water polo.

Rectangular pools that had moveable bulkheads contributed to the solution of problems relating to pool length. The bulkhead could be moved to separate the diving pool from the rest of the pool, or to provide a competitive swimming course of proper length and depth, or to provide a pool of adequate length and depth for water polo. Due to the wall effect and the space under the bulkhead some guarding problems were presented.

The "T" shaped pool allowed for a short competitive course and a deep diving well. The major portion of the "T" provided an excellent area for instructional swimming. In one case where the pool was designed to be used for the public and the instruction of smaller children, it resulted in two lanes of the competitive course being less than the required minimum depth (Roberts and Erwin, 1978) of 3½ feet. The other disadvantage of this pool was that there was no intermediate depth of water for teaching water safety skills.

One of the solutions to some of the problems encountered in designing a swimming facility was the use of multiple pools. Aside from the cost factor and needing a guard for each pool, this did meet the needs for the different

aquatic programs. There could be a shallow instructional pool which did not interfere with the depths needed for competitive swimming or water polo. There could even be a separate diving well that would increase the safety of the facility even further.

After investigating the various shapes, the one that met the most criteria was the multiple pool concept of providing three separate pools:

1. An instructional pool of 2 to 5 feet deep water with a minimum of 15 feet wide (the distance from shore or safety within which a majority of drownings are said to occur) by 25 meters (the shortest distance of the second pool).

2. A pool of 7 feet to 9 feet deep water that is 25 meters (for competitive swimming) by 30 yards (for water polo).

3. A diving well that is 15 feet deep and a minimum of 30 feet wide by 36 feet long.

It was decided, after looking at the above arrangement that the game of water polo did not warrant the extra amount of space and water that would need to be provided. It was further decided that a modified game could be played within the confines of the competitive pool. This cut the 30 yards (90 feet) down to 68 feet for the second pool.

The next step was to ascertain if there were single pool shapes that could meet as many criteria as the multiple pool concept and it was decided that there were some

non-traditional shapes which might have merit (see Figure 2).

The musical note shape allowed for shallow water adjacent to the competitive swimming lanes. It also allowed for a deep diving well in the circular portion of the pool. It was not as desirable for water polo as some other designs.

The hexagon had a lot of versatility in that two different lengths of competitive swimming courses could be offered (logically 25 meters and 25 yards). It had a good area for modified water polo. It had a deep area for diving with the boards out of the way of the competitive swimming lanes and the water polo area.

The "waterfront" pool had a lot of shallow water for instructional purposes. It had eight competitive swimming lanes. It included a deep area for diving. It had a circularly curved front which added aesthetic appeal.

After comparing the non-traditional shapes with the multiple use pool concept it was decided that the "waterfront" pool could match all of the advantages of the multiple pool complex except that the water polo area would have some shallow water. The shallow water would be on one side, rather than one end, and it would be equal for both teams. It would not allow for regulation water polo but it would allow for greater class participation when all class members were not equal in skill. It was felt that this could actually be an advantage.

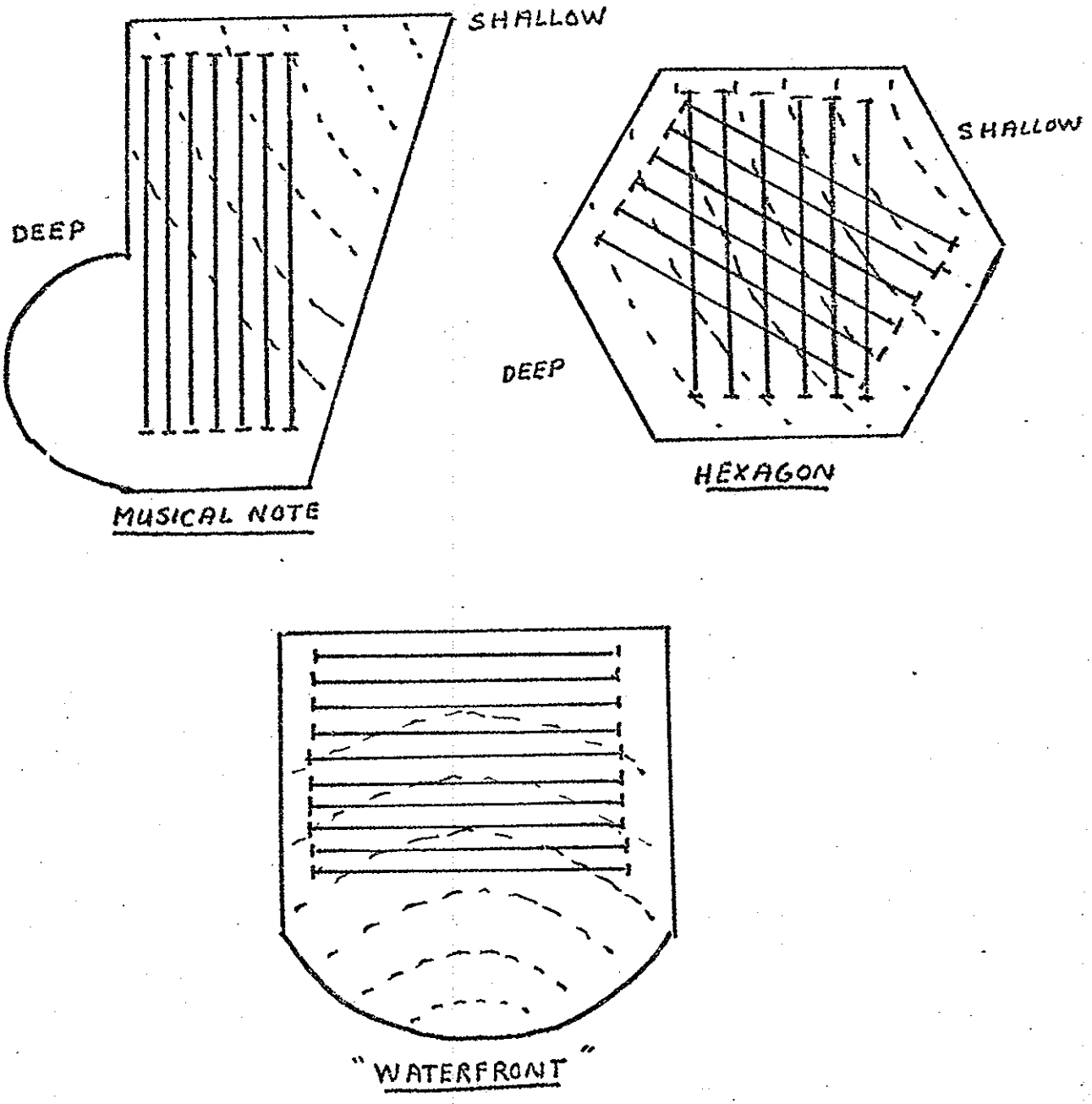

Figure 2
Concepts for Pool Shapes

Another advantage of the "waterfront pool" (as well as the other non-traditional shapes shown) was the curved contour of the pool bottom. In many cases a stranded swimmer would be able to stand in the middle of the pool. In the case of the "waterfront" pool the curve also allowed for a deeper water depth by the starting blocks and at the end walls for making competitive turns.

Once the shape of the pool had been decided it was necessary to start a scale drawing. The scale drawing was then used to plot the pool contours, the depths of various portions of the pool, a safe slope for shallow water swimmers or waders, and placement for receptacles that would secure the various types of pool equipment.

Since one of the priorities of the pool was that of safety it was decided to use Bronzan's (1974) recommendation to use a 1:15 slope for the water from 2 feet to 6 feet. It was also decided to use his recommendation to have a depth of 15 feet under the three meter diving board. This was accomplished by incorporating a diving well of 15 feet within the deep portion of the pool. Bronzan's recommendation for eight competitive swimming lanes, 8 feet wide, was also followed.

Roberts and Erwin (1978) said that there should be lane markers on the outside portion of the two outer lanes. Two feet of extra width were allowed in these two lanes for that reason. It also gives the competitors in those lanes a

fairer chance.

Figuring the curve of the "waterfront" pool was accomplished by drawing a series of curves and then determining which of the curves would allow for proper water depths throughout the pool. It was hoped to keep the pool under 100 feet of length at the maximum distance of the curve from the opposite end wall for cleaning reasons and for visibility reasons.

In addition to selecting a pool shape and determining if the proposed needs could be met by that part of the facility it was necessary to make plans for the adjoining areas that were considered to be a part of the total facility.

Procedures

Many hours were spent making scale drawings of the swimming pool and the adjoining rooms associated with the swimming pool. Parts of the facility were arranged and then rearranged in an attempt to provide for the programs that needed to be offered, to foster a high level of safety, and to incorporate many advantageous ideas and recommendations that had been gathered from literature, from people, and from observations of other facilities (firsthand or in pictures). Figure 3 shows the pool shape and size decided upon. Figure 4 shows the proposed rooms to be constructed at deck level with the pool.

From there it was decided to list the features that would be included in the facility part by part and/or room

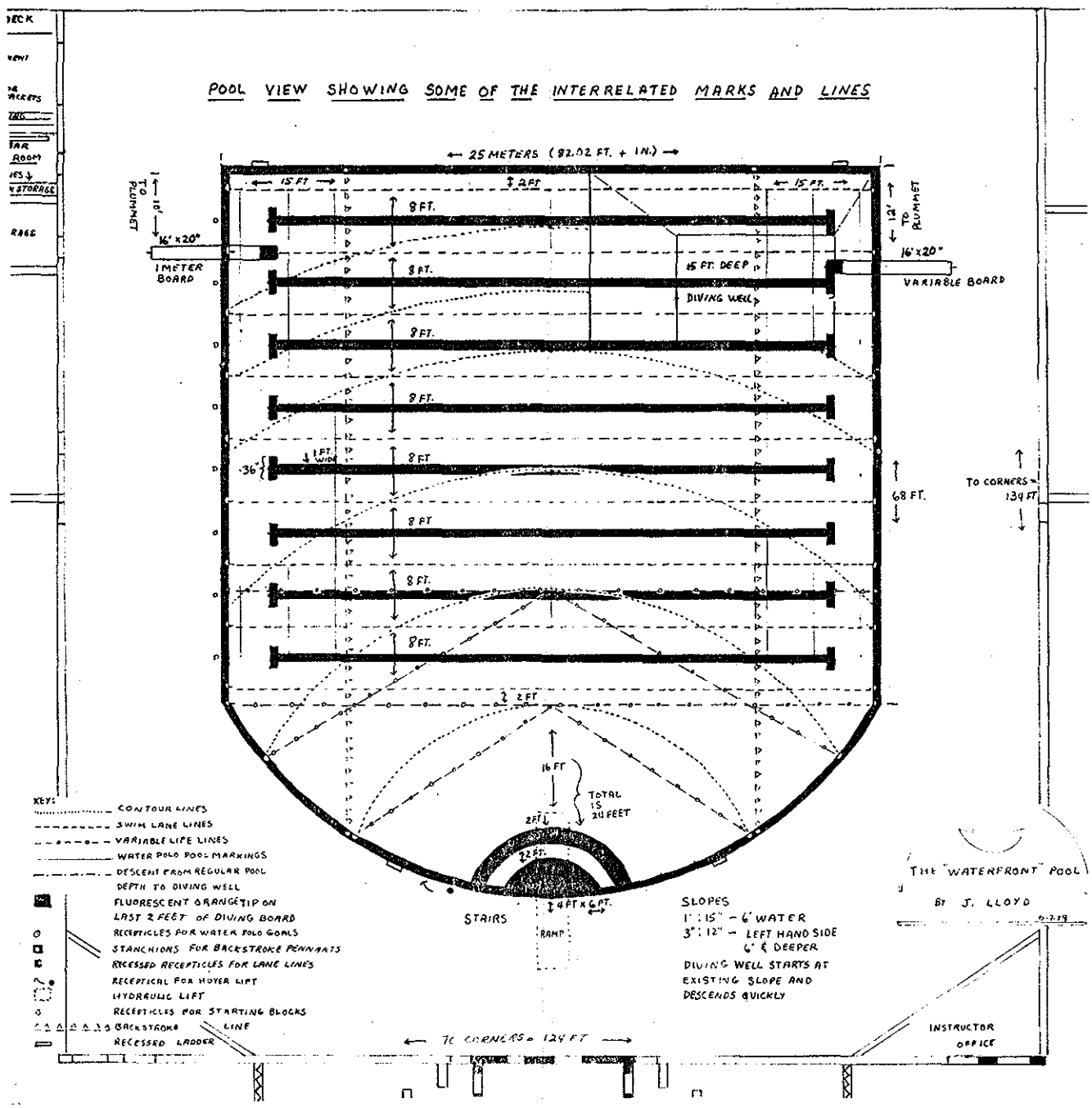

Figure 3
The "Waterfront" Pool

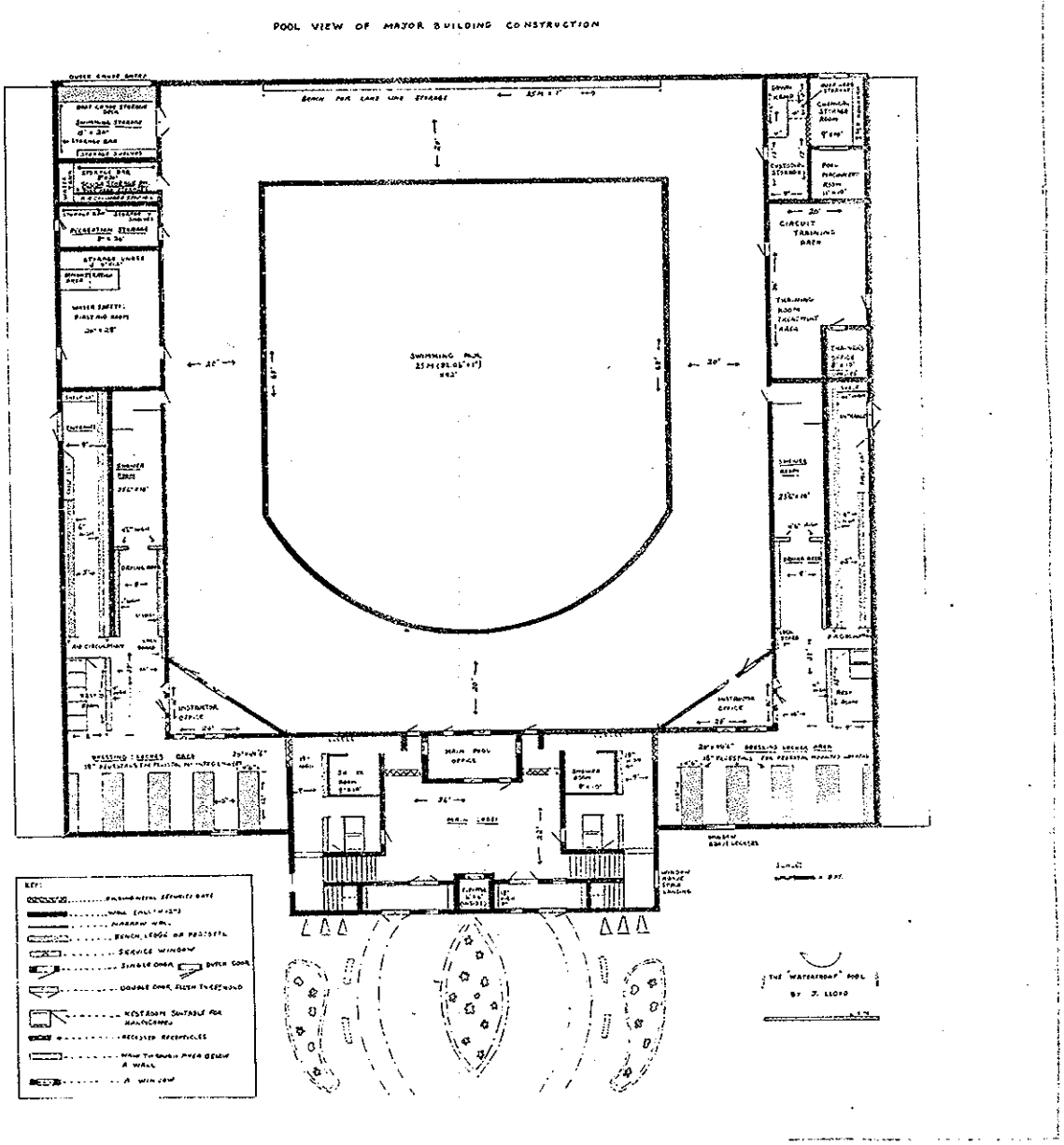

Figure 4
Auxiliary Rooms Adjoining Pool

by room.

The competitive swimming pool of the "waterfront" pool was to have eight lanes that were 8 feet wide and 25 meters long with automatic scoring incorporated. If automatic scoring was not feasible for financial reasons, then an extra inch would be allowed in the length of the pool to allow for the use of timing pads. Other features effecting this part of the pool were selected as follows:

1. The competitive part of the pool would have a white bottom and three white sides and/or endwalls, preferably finished with ceramic tile.

2. Outside lane lines would be provided in the two outer lanes.

3. Pool markings would adhere to the rules listed by Roberts and Erwin (1978).

4. All receptacles for securing lane lines would be recessed so that there were no protrusions on the pool wall.

5. Starting blocks would be designed in units of two (see Figure 5) with the step up between the two blocks. The top front edge of the blocks will be 30 inches from the water.

6. The pool would have a recessed gutter with 3 inches above the gutter marked in dark blue.

7. Any water less than four feet in the swimming lanes would be located in the center of the lanes and not where it could interfere with competitive starts and turns.

8. Recessed ladders would be placed on sidewalls of

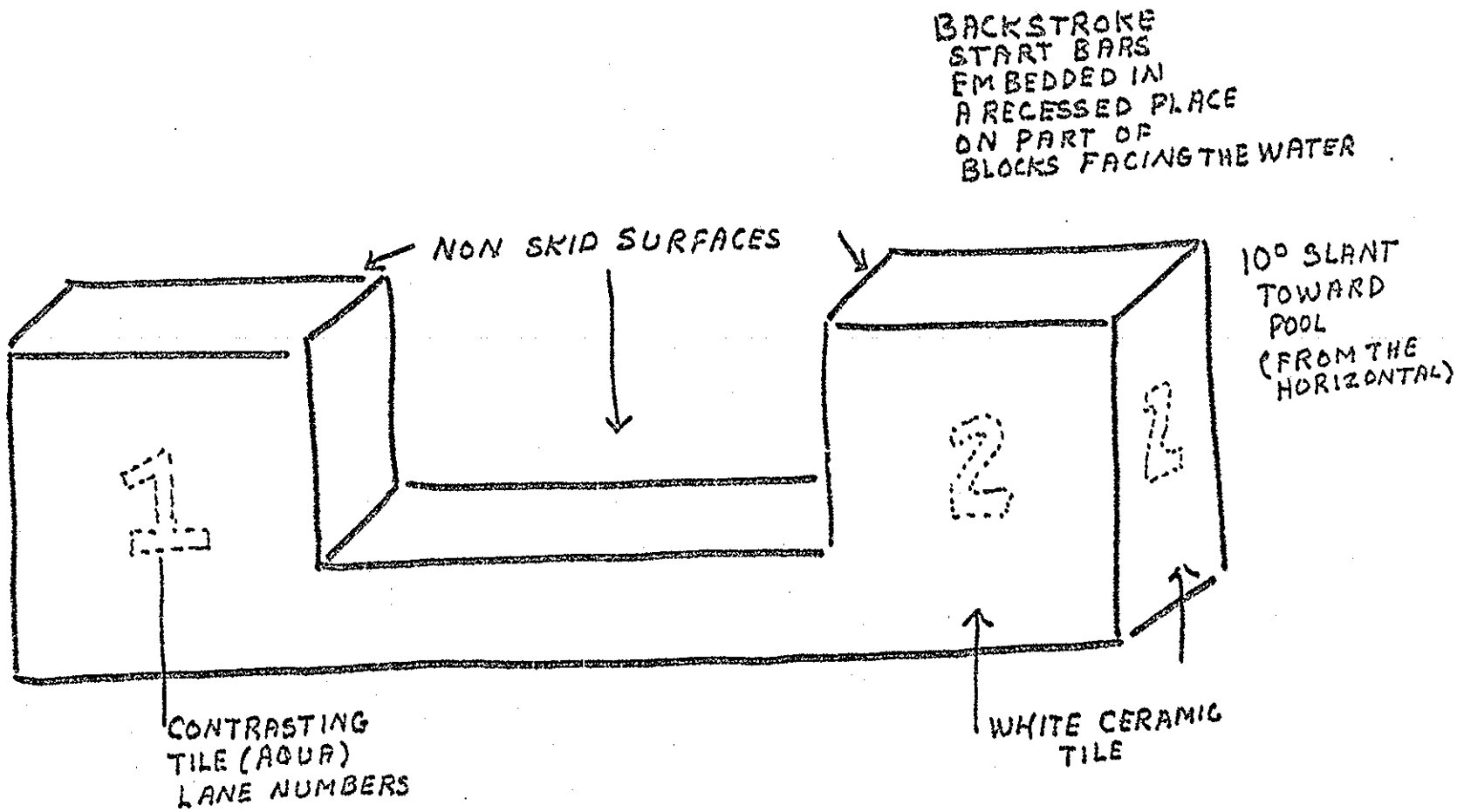

Figure 5
Dual Starting Blocks

the pool, out of the way of competitive swimmers.

9. Receptacles for backstroke line stanchions would be included 15 feet from the end-walls on either side of the pool.

10. The one meter board would have a hinge back design so that it could be removed from the competitive swimming area.

11. The storage for the lane lines would be in embedded drums at the opposite end of the pool from the starting blocks (see Figure 6).

12. Since diving is a competitive event at swim meets the diving boards would have movable fulcrums allowing for a 24 inch variation.

13. A built in water fall in a special life guard chair would double for a water agitation system for diving. (see Figure 7)

14. There were no water inlets (or other hardware) placed on the end-walls to interfere with competitive turns.

15. The built in bench for sitting on was warmed by radiant heat (infrared lamps above bench for heating were optional).

The water polo area of the pool was to closely coincide with the area used for the competitive pool. The width from the lane marker on the outside of lane eight to the bottom lane line in lane one coincided with the width needed for a water polo game. The other lines needed would

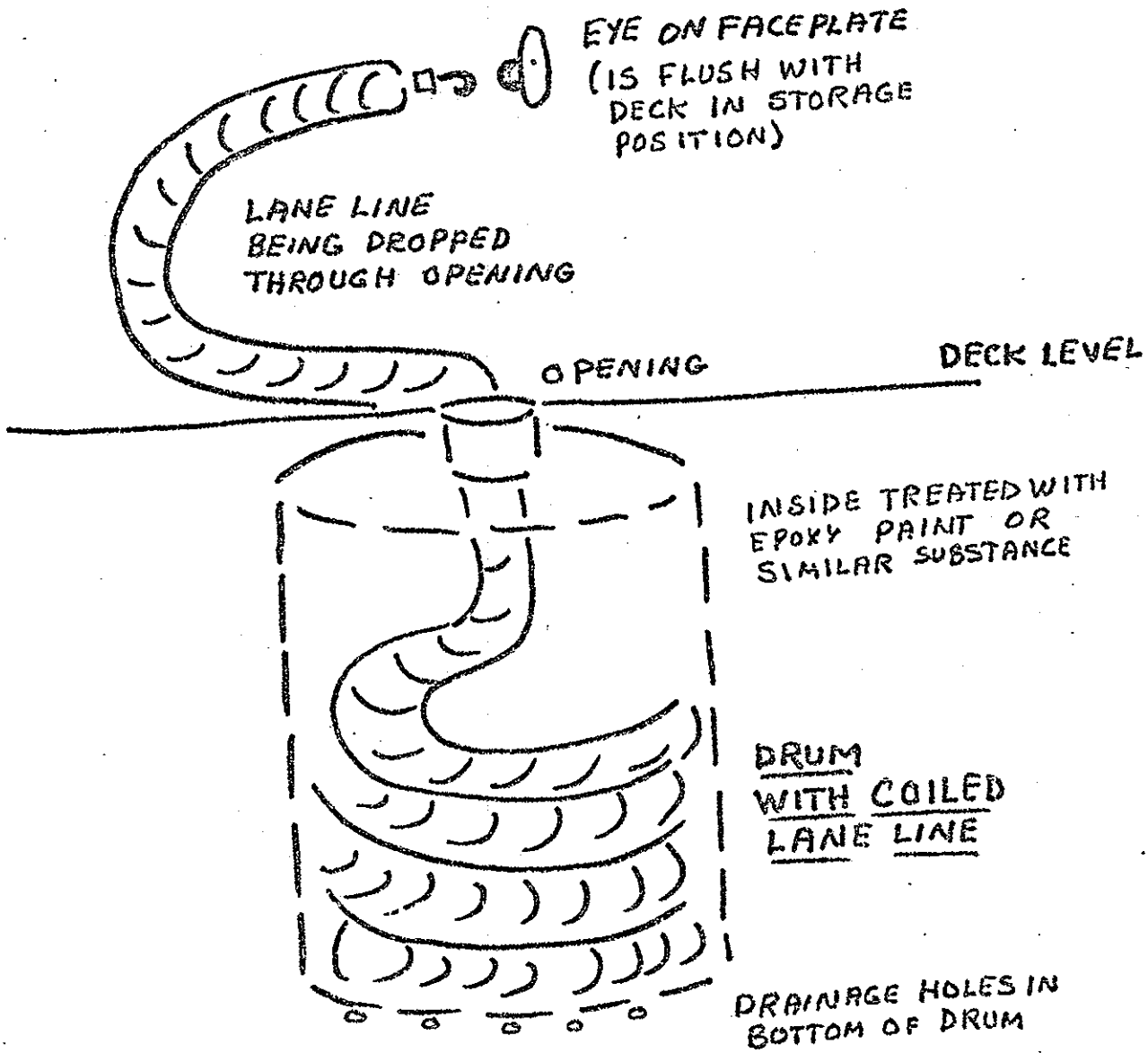

Figure 6
Drum Diagram for Lane Line Storage

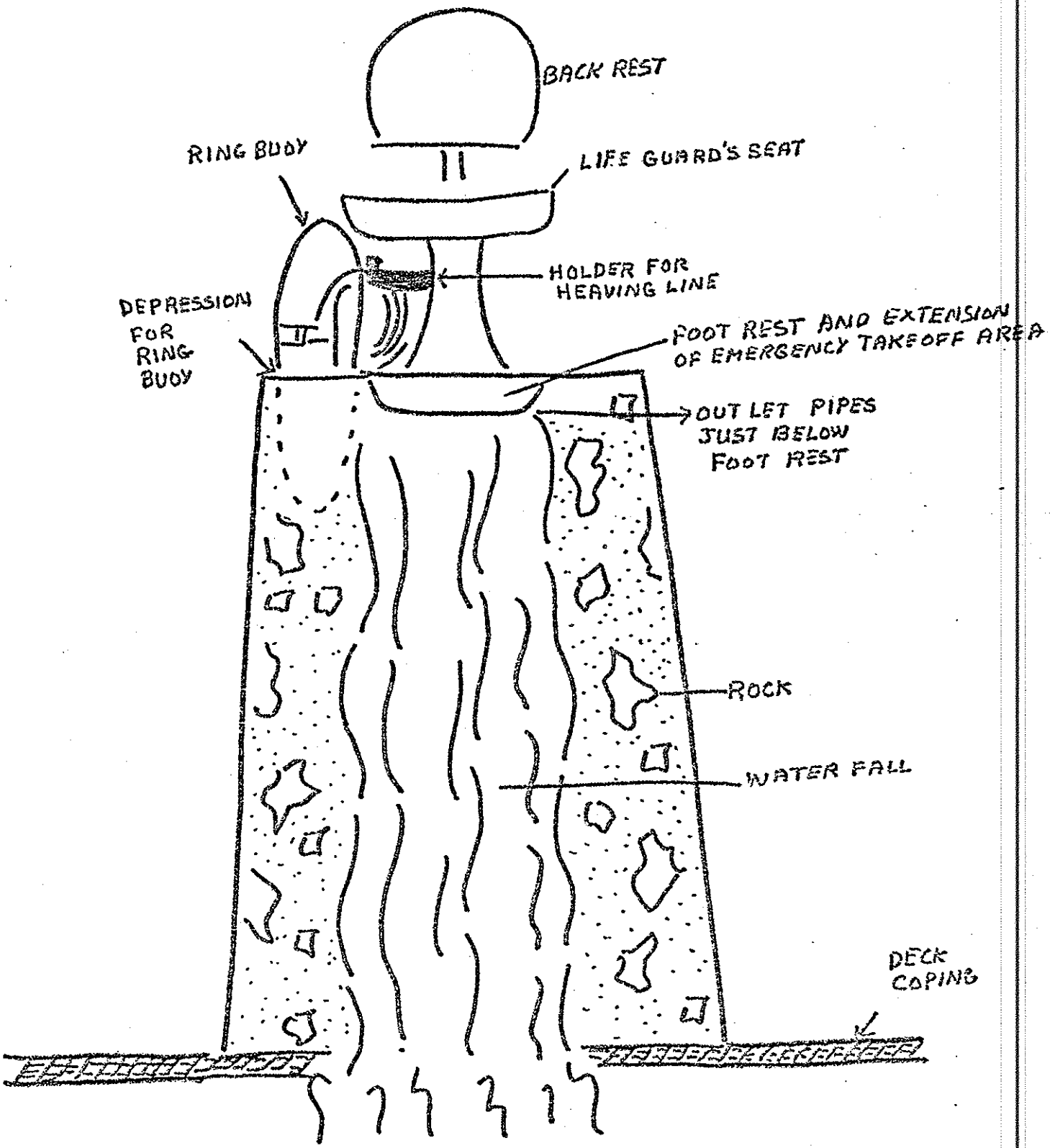

Figure 7
Waterfall Life Guard Tower

be marked with 2 inch tile lines of a contrasting color other than black. There were built in receptacles to secure the ten foot goals, which could be removed when not in use. The hinge back design on the one meter board made the board removable from the playing area.

Most portions of the pool walls by the deep water were constructed vertically to facilitate synchronized swimming entries of a vertical nature. There was adequate deep water planned for synchronized swimming. The mural wall made a built in back drop. The wide deck allowed for other props to be used or for short introductory parts of a routine to be performed on deck. An underwater speaker was installed. Four underwater lights were mounted about 6 feet down on the deep wall. There was an underwater observation window.

Several features of the pool were designed with people from special populations in mind. They were as follows:

1. A 20 foot long ramp starting from a deck depression and ending in water 2 feet deep.

2. Hand rails on either side of the ramp, either one of which could also be used from the shallow stairs area.

3. Wide shallow stairs decending into the shallow water of the pool.

4. Two to 3 feet depth of water.

5. A Hoyer lift.

6. A difference in deck texture on the coping part of the pool from the deck itself (tentatively made from either

a rubber "dek tile" or a non-skid polyurethane floor).

7. An underwater speaker was included.

8. An underwater observation window was included.

9. The decks had radiant heating.

Features that were included with water safety in mind were as follows:

1. Diving boards had fluorescent orange tips the last 2 feet over the water (Masin, January 1979).

2. "No diving" signs were marked on the pool perimeter where the water was shallow.

3. Water depths were marked all the way around the pool on the coping.

4. The pool room walls on either side of the pool were painted aqua on the bottom of the wall up to a height corresponding with the depth of the pool water immediately across from that portion of the wall (see Figure 8).

5. The deck was covered with a non-slip material with some shock resistance (preferably Dek tile by Uni Royal) should a person still fall.

6. There were non-skid stairs leading to the diving boards.

7. Fire extinguishers were available in appropriate areas.

8. The starting blocks were finished with a non-skid material.

9. The deck was slanted toward non-corrosive drains

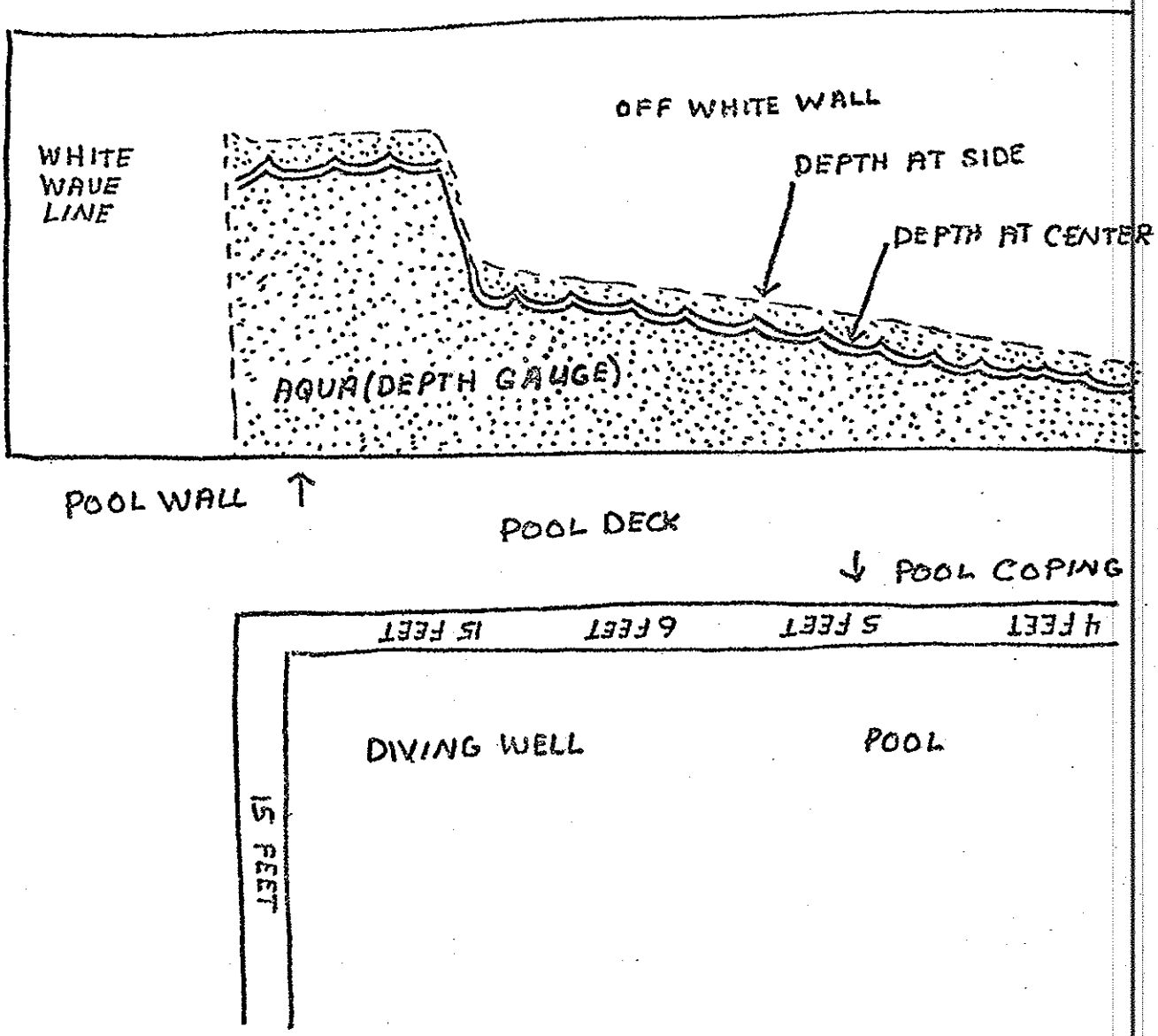

Figure 8
Water Depth Gauge on Wall

to quickly clear the deck of water.

10. Ladders on the side of the pool were completely recessed.

11. There was an alarm system that was put in effect when the pool was "closed".

12. Shallow water that was not in the competitive area was color coded for depth.

13. One permanent life guard chair and two portable life guard chairs were provided.

14. Pool rules were posted in accordance with Wisconsin state law H72.03, section 5 (See Appendix A).

15. Sanitation was maintained with a chlorinating device (utilizing salt water) and was administered with automatic equipment (properly maintained and checked daily).

16. Many depths of water were included in order to teach different life saving skills in a progressive manner.

17. The ramp used for handicapped persons was designed to double for a beach type rescue approach.

18. The railings to the ramp were able to double for a situation where a throwing assist had to be made over something.

19. Life guard chairs and walls were equipped with life saving equipment equal to or exceeding what was listed in the Wisconsin state law H72.03, part 4 (See Appendix A).

20. Deck level exits were provided that were suitable for emergency exit.

21. Fixtures located on the pool wall (such as hose bibs, drinking fountain, etc.) were recessed into the wall.

22. An automatic pool cleaning system was installed.

23. Diving boards were placed appropriate distances from walls, shallower water, and each other.

24. A battery operated light was enclosed on the left hand side of the "waterfall" life guard chair.

Features that were included to benefit instructional swimming were:

1. Four tailed life lines for sectioning pool for "stations".

2. Lots of shallow water.

3. Decks that are 20 feet wide with radiant heating.

4. Blackboard and bulletin board on wall at shallow end.

5. Stairs for confidence activities for younger swimmers.

6. A variable diving board, if that option is used.

7. Moveable life guard chairs for closer supervision in various areas of the pool.

8. Rails on handicapped ramp can be used by instructor to demonstrate scissor kick (or drown proofing kick).

The pool was designed with a basin that had a slope of 1:15 going from a 2 foot depth to a 6 foot depth. The diving well extended down to a 15 foot depth from the existing bottom while the side opposite the diving well had a slope

of 3:12 from the 6 foot water and deeper. In the deep area the bottom curved upward on the final foot next to the wall. There were four drains (indirect action) located in the deeper parts of the pool but none were placed under the diving boards. Most of the water inlets were placed on the shallow side walls so that the water tended to be warmer and the water tended to circulate toward the drains.

Artificial lighting consisted of indirect lighting from ten 400-watt metal halide luminaires located above the pool deck. The minimum amount of illumination at any point on the surface of the water was 50 foot candles. The bottom of the pool could be seen from the sides of the pool.

There was a circular stair case extending from deck level to the upper balcony. It was gated from above and designed to be used for emergency access to the deck level.

The wall adjacent to the deep end of the wall was to be a large mural wall designed to add to the aesthetic quality of the facility. The design was to be picked from a community wide contest. (It was cheaper to pay prizes for outstanding mural ideas than hire an artist). Pictures from runners up could be used in the smaller clamp in type pictures used on wall by starting blocks when competitive swimming is out of season. (See Figure 9)

It was proposed that a large free form record board be located on the wall opposite the starting blocks. (See Figure 10)

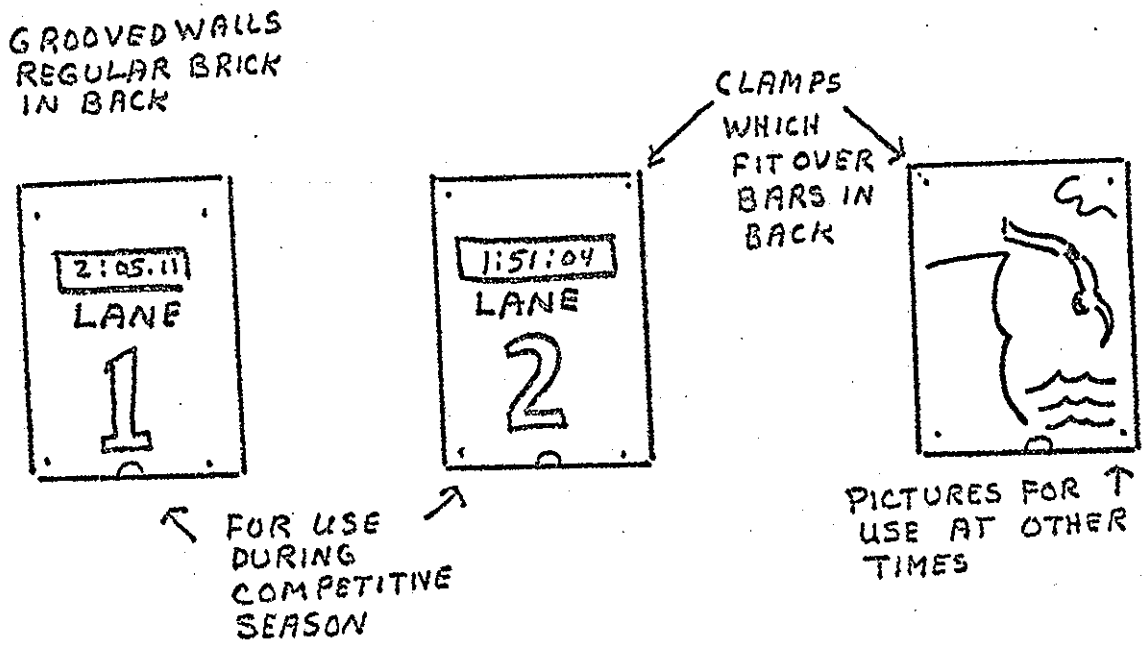

Figure 9
Clamp In or Out Wall Pictures or Lane Times

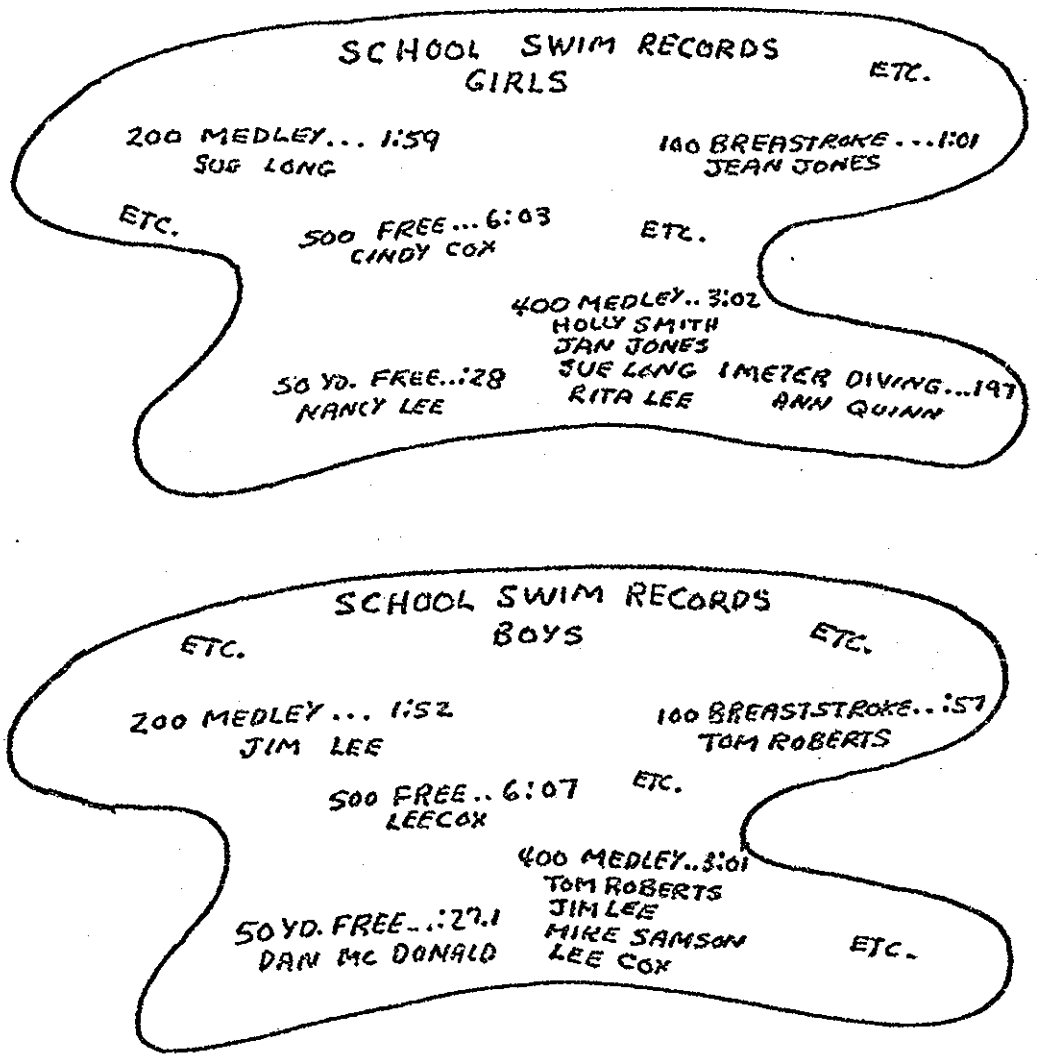

Figure 10

Free Form Record Board

The heating system decided on was a solar energy system that used both air and water. The unit was located to the south of the building and did not show due to the geodesic dome that was used on the building. It was located close to the building to minimize the length of the pipes carrying the heat.

The building itself was constructed of white (pre-colored) pre-stressed double T concrete sections about 20 feet high. The entry area extended in front of the part of the building which supported the geodesic dome. Though the roof over the entry slanted downward the facial part of the entry had a decided upward slope (see Figure 11). The rockwork on the facial pillars included some feldspar and some unbreakable eye shaped mirrors.

The facility was proposed to be a part of a "noise complex" of a school. It should contain physical education facilities, shops, and band and chorus rooms.

Inner walls of the building were to be of concrete block and glazed wherever there was a need for walls that needed to be impervious to moisture. Split concrete blocks would need to be placed on upper parts of pool walls to reduce noise.

The pool deck level maintenance room housed a chemical storage area (mainly for diatomaceous earth), an elevator or ramp, a custodial area (for cleaning supplies and such), and a pool machinery room for filters and automatic equipment.

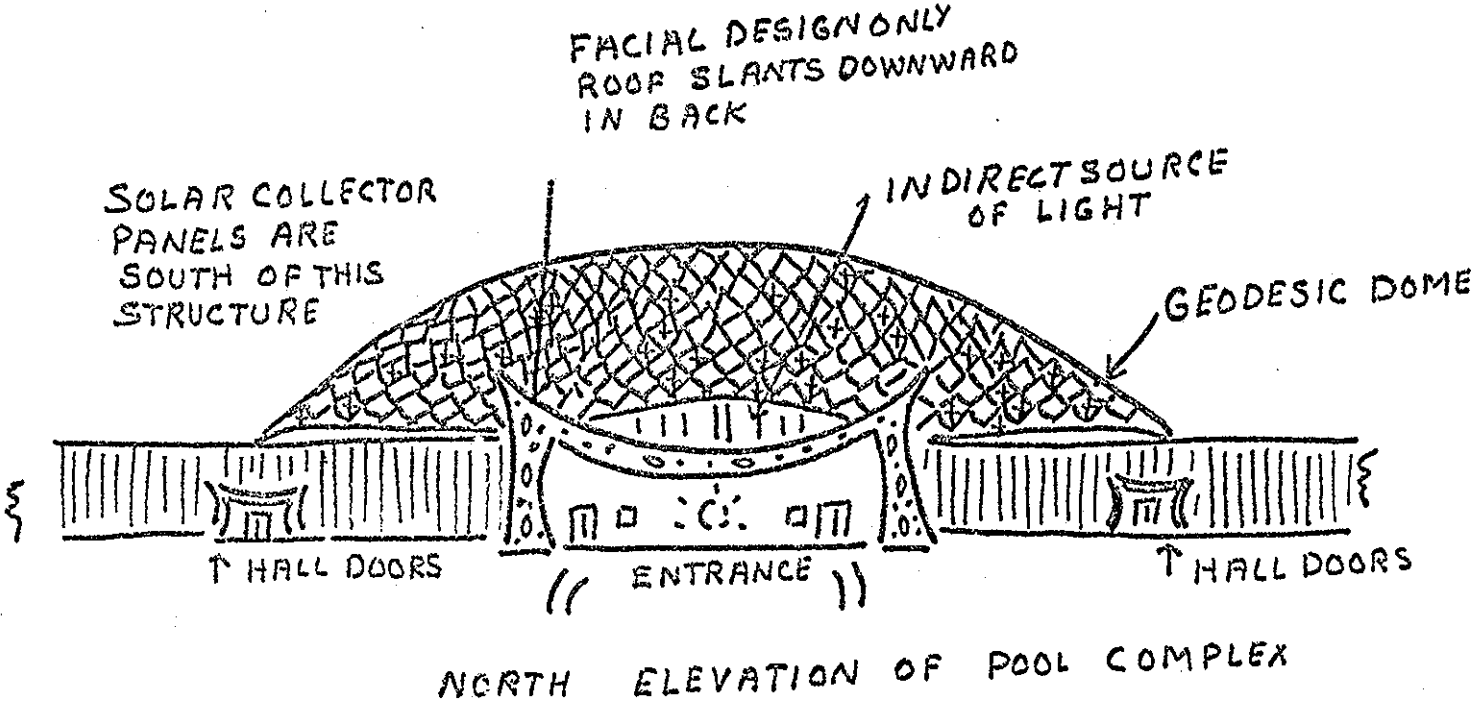

Figure 11
Proposed Building Design

Pipes were color coded. Warning signs and/or directions were permanently placed on walls. Other equipment (such as heat storage units and water tanks) would be housed at the basement level.

The training room was designed as a combination training room and weight room. The weight machines would be placed circuit style and would be available for use of swimmers, people who needed them for rehabilitative work under a trainer, and for youngsters who were taking weight training instruction. One section of the room was planned for use by a trainer. This area could double as a first aid station and be shared by a nurse and a part-time trainer.

The lockers were designed with air circulated storage lockers separate from the dressing lockers and forming a sight barrier from the halls. The dressing lockers were placed on top of a slab covered pedestal creating built in benches. This arrangement saved space and made it easier to clean around the benches.

The dressing room rest rooms each contained one water closet arrangement suitable for handicapped usuage. The shower room also contained one shower head which could be operated by a person in a wheel chair. All bathroom fixtures were to be wall hung to facilitate cleaning. It was recommended that floors be covered with ceramic tile. All floors were to be curved toward walls to make cleaning simpler. This was true where floors were joined to pedestals

in the locker area also. Electrical outlets in locker rooms needed to be placed 3 feet above the floor. Shower switches needed to be placed away from the showers. Showers were placed at varied heights in banks serviceable from the inside. A recessed drinking fountain was to be included in each dressing area. Four to six hair dryers were to be placed in each dressing room. Mirrors were to be placed in dressing rooms, but not over lavatories.

There was to be a lock board for securing locks of individuals not needing a storage locker. The locker room was expected to double for physical education classes and athletics as well as for swimming classes.

The instructor's offices were to be triangular in shape and have a good view of the dressing rooms and the pool. The pool view was to be provided with one way shatter proof glass. The instructor's offices were to double as cage areas for dispensing and collecting towels and clothing. They were to rely heavily on a downstair's laundry. Soiled clothing would be deposited from cage area to a chute leading downstairs where it would be serviced and returned for additional usuage in a cart brought up in the elevator. Lockers and an instructor and/or coach shower would be built in the area.

The laundry room was designed to include three 100 pound dryers, one 50 pound washing machine, one water extractor, and two 400 pound washing machines with room left

for expansion. Consideration would be given to using solar heat if possible. There was a large sorting area and a sewing machine for minor repairs. While all gym clothing would be of a non-iron variety, limited ironing facilities might be included to accomodate caring for modern dance costumes, for instance.

The public entry was planned as a separate unit with adjoining dressing facilities. The floor of the lobby area was terrazzo so that it would not be damaged when spectators went down stairs to smoke. There was an exhaust fan for ridding the building of smoke. Two vending machines (with proper hook ups) were planned for hungry swimmers waiting for their parents. There was a limited amount of seating built in. There were two stairwells leading from the lobby to the spectator area. There was an elevator (used for bringing clean laundry upstairs) that could accomodate handicapped persons who wished to go upstairs. On either side of the elevator was a vestibule type entry to help exclude undesirable weather.

There was a spectator area upstairs formed by reverse bleachers which rolled backward from the wall (formed by the bleachers) facing the pool. When the bleachers were not in use the area formed an additional teaching station. The regular railing had a top rail that was set inward toward the spectator area to discourage sitting on, or climbing on the railing. When the spectator area was being used there was a

jet air stream system which kept the pool area warmth separate from the cooler spectator area.

The office serving the public was also designed to house a PA system and a sound system with speakers in the pool area, under water, and in the spectator area. Each area should have a cut off switch so that sound would be transmitted only to the desired areas. The check-out system for the public office would use large numbered mesh bags with pins of the same number for identification purposes. This office was also to serve as a swim meet announcing area, a place for an emergency pass through (a service window) phone, a place for an emergency first aid kit, and other first aid equipment as needed.

Downstairs there was a walkway, all the way around the pool for servicing the facility. There was also a stairway leading to an underwater viewing area. Other downstairs areas were excavated for future expansion. Under the scuba storage room there was an area closed off with cement walls and a sturdy lockable door. The area had a fan for ventilation and housed an air compressor for filling scuba tanks.

The water-safety:first aid room was designed as a combination classroom-demonstration area. It had a built in demonstration cabinet 12 feet long. It housed a ResusciAnne and other first-aid equipment to be used in that area. Outlets for video-taping and showing various kinds of visual materials were included. There was a rheostatic light control.

Part of the demonstration area was carpeted for demonstrating with people. One wall was designed as a viewing screen. Stackable chairs and lap boards were used so that the area could be used as a practice area for first aid skills.

The storage area was broken into three main parts: the swimming storage area, the scuba storage area, and the recreational storage area. The main storage area had a carpeted drainable canoe deck for storing one or more canoes or similar small craft. It had a lockable outer entry for removing the canoe (or canoes) without having to carry them through the pool area. On the opposite wall there were shelves of various heights. On one wall was a horizontal drying bar. Other equipment was stored in large lockable heavy wire equipment carriers.

The scuba storage area had a drying bar for hanging wet suits. It had a carpeted drainable area on which the scuba tanks could be stored in an upright position without any danger of falling. Above the tank storage area were numerous shelves for storing regulators and such. At one end was a water tank for filling the cylinders with air from the air compressor housed below.

The recreational storage room would be for storage use for public programs. While many items used in school classes could be used by the recreation department, it was felt that the equipment should be checked out and returned when they were finished with it.

CHAPTER IV

RESULTS AND DISCUSSION

Introduction

The study ended up covering a lot more material than was originally intended. The information regarding the auxiliary facilities was however, of great interest to the author as was the information regarding the many phases of planning a swimming pool.

Results

The results have been shown by the plans on the preceding pages. Hopefully at some future date the "waterfront" pool will be a reality rather than just a blue print.

Discussion: Implications

The research and investigation in this area indicated that ideas in the area of planning swimming facilities have by no means been exhausted. There were a lot of problems solved by this study but there were still some left unsolved.

Ideas were shown on how to include aesthetic qualities in the facility. Things that the author felt contributed to that aspect of pool planning were: the mural wall, a sound system, a curved pool wall, a free form record board, using alternative style starting blocks, using other wall pictures, a "waterfall" life guard chair, a terrazzo floor in the lobby,

the stone pillar facial detail in front of the entry, whitening of the pre-stressed concrete double T's, and the geodesic dome roof.

There were some safety tips that were of value. The orange tip on the end of the diving board to make it more visable was one safety feature. The use of a rubber "dek-tile" was a concept that was new to the author. The many recommendations made by Bronzan (1974) exceeded the safety requirements set forth by other authorities.

The study revealed that a public pool did not have to be rectangular, square, or have all sides in straight lines. It was also a good way to compare the advantages and disadvantages of other pools.

Of the concepts studied, the one that showed the most merit (in meeting the author's goals) was the multiple pool concept.

The pool resulting from the study also has other possibilities. If a school could not finance that large a pool they could construct a "waterfront" pool with only six competitive lanes, 7 feet wide each. The slope could follow lesser recommendations of 1:12 up to the five foot depth and then 3:12 in the deeper portion. The 3 meter or variable board could be eliminated. One or two 1 meter boards could still be included. Part of the decks could be cut to 10 feet but the deck where the ramp is and the deck where the starting blocks are located should remain at 20 feet.

CHAPTER V

CONCLUSIONS

Summary

Inasmuch as most swimming pools sacrifice one program to promote another, an investigation of pool facilities was made to determine if there was a pool that could fulfill the needs of a greater variety of programs. The result was a new concept in the design of a public swimming facility. The new concept was accomplished by curving one wall of the pool, where water that was too shallow for competitive turns and starts could be located. In addition it was determined that by contouring the pool in a semi-circular fashion, additional shallow water space could be utilized and still not interfere with competitive turns and starts. The contour concept also allowed for deeper water under diving boards than was located in the central part of the pool.

Conclusions

The project appeared to have merit in solving some traditional problems that are unique to swimming facilities. The plans are ready for the architect as soon as someone interested in financing the facility discovers that such a plan exists.

As a result of this study the author claimed that there was still a lot to be accomplished in the area of planning

pools that meet the needs of people and foster aesthetic values at the same time.

Recommendations

Further studies should be made to uncover more new concepts. The resulting studies should investigate the areas included in this study one by one.

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APPENDIX A

Chapter H 72

SAFETY, MAINTENANCE AND OPERATION OF PUBLIC SWIMMING POOLS

H 72.01	Scope of rules	H 72.06	Seasonal closing
H 72.02	Definitions	H 72.07	Closing criteria
H 72.03	Supervision and safety	H 72.08	Sampling
H 72.04	Maintenance and operation	H 72.09	Variance
H 72.05	Seasonal opening	H 72.10	License

Note: Chapter H 72 as it existed on August 31, 1978, was repealed and a new Chapter H 72 was created effective September 1, 1978.

H 72.01 Scope of rules. (1) GENERAL. This code provides the owner, operator and manager of man-made pools with minimum rules that are to be followed in the proper care, maintenance and supervision of pools.

(2) APPLICABILITY. The provisions of these rules shall apply to the owner or operator, patrons, lifeguard or responsible supervisors of any public swimming pool.

History: Cr. Register, August, 1978, No. 272, eff. 9-1-78.

H 72.02 Definitions. (1) Department means the department of health and social services.

(2) Approved means acceptable to the department based on its determination.

(3) Deck means the approved walking surface around the pool.

(4) Immediate pool area means the area within the pool enclosure, the area immediately adjacent to the pool enclosure and other areas in which necessary pool appurtenances are located.

(5) Lifeguard means a person holding a current advanced lifesaving or water safety instructor certificate from the American Red Cross, National YMCA or equivalent.

(6) Maintained means the keeping of the grounds, buildings, service systems (heating, plumbing, recirculation, electrical, filters, etc.), furniture and all other equipment in good repair.

(7) Patron means a user of the pool area.

(8) Pool means the structure, basin, chamber or tank, used for one of a variety of purposes: combination pools for swimming and diving, diving pools, exercise pools, swimming pools, wading pools, limited purpose pools and whirlpools, as defined in section H 71.03 (8), Wis. Adm. Code.

(9) Pool area means the surface within the pool enclosure.

(10) Public swimming pool means an outdoor or indoor pool that is entirely man-made so defined in section H 71.03 (8), Wis. Adm. Code, excepting those serving less than 3 individual residential quarters such as homes or apartments. Public pools include those serving or installed for the state or any political subdivision thereof, including school districts; those serving or installed at motels, hotels, resorts, camps, clubs,

associations, housing developments, schools; religious, charitable or youth organizations; institutions or similar establishments. Included are buildings, equipments and appurtenances, irrespective of whether or not a fee is charged for the use thereof.

(11) Responsible supervisor means a person designated by the owner who can act quickly to effect rescues, maintain order and enforce pool use regulations.

(12) Unauthorized access means a person entering a restricted area without permission of the owner or designated representative.

History: Cr. Register, August, 1978, No. 272, eff. 9-1-78.

H 72.03 Supervision and safety. (1) SUPERVISION. Every public pool shall be under the supervision of a responsible supervisor or lifeguard. This person shall require careful observance of sanitary and safety regulations.

(2) LIFEGUARDS. (a) *Where and number required.* Lifeguards shall be provided during scheduled and posted hours for pool use at all pools having a surface area in excess of 2,000 square feet. The number of lifeguards shall be in accord with the number of elevated lifeguard chairs required by chapter H 71, Wis. Adm. Code. Where the maximum patron loading exceeds 450, 3 additional lifeguards are required.

(b) *Permissible reduction.* When portions of a pool are not in use, such areas may be roped off and restricted from use. The number of lifeguards may then be reduced in accord with actual patron loading.

The following table is to be used to determine the number of lifeguards required:

Actual Patron Loading	*Lifeguards Required*
1 - 67	1
68 - 104	1
105 - 200	2
201 - 325	2
326 - 450	3

For pools having a patron loading in excess of 450 patrons, a reduction of one lifeguard is permitted for each additional reduction of 500 patrons or major fraction thereof.

Note: In chapter H 71, Wis. Adm. Code, patron loading is related to pool surface area on the basis of 24 square feet per patron in a diving area and 10 square feet in the shallow portion.

(c) *Instructional use.* When a pool or portion thereof is used for instructional purposes, the instructor-student maximum ratio shall be 1 to 30.

Note: Under certain conditions, a lifeguard may be desirable.

(d) *Closed hours.* During closed hours, a sign shall be posted stating that the pool and the pool deck area are closed.

(3) LIFEGUARD IDENTIFICATION AND ASSIGNMENT. Lifeguards shall wear suits that are conspicuously marked "Lifeguard" or be otherwise readily identifiable. Lifeguards assigned to the supervision of the pool shall not

be assigned duties that distract their attention from observation of persons in the pool area, or prevent their immediate assistance to persons in distress.

(4) SAFETY EQUIPMENT. The following safety equipment shall be provided and be maintained.

(a) *Rescue equipment.* At least one ring buoy of the U.S. coast guard approved type, attached to a one-quarter inch diameter line not less than one and one-half times the maximum width of the pool or 50 feet in length, whichever is less, or a Red Cross approved rescue tube with not less than 6 feet of line attached shall be provided in each pool area. When more than one lifeguard chair is provided, each shall be equipped with a ring buoy or rescue tube. The equipment shall be maintained.

Note: At outdoor pools under 30 feet in width a shepherd's crook may be substituted for the ring buoy or rescue tube. Similarly a reaching pole, 8 to 10 feet in length, may be used at indoor pools under 30 feet in width.

(b) *First aid equipment.* An approved 24-unit first aid kit, 2 durable blankets and one spine board shall be available at each pool area.

(c) *Safety rope.* The safety rope, where required, shall remain in place except during supervised special purpose use.

(d) *Communications.* The telephone or other emergency type communication system shall be maintained. A current list of emergency numbers shall be available.

(e) *Safety and alarm equipment.* All safety equipment and emergency alarms, if provided, shall be readily accessible and be maintained.

(f) *Noise.* Noise within the pool area shall be controlled so that all patrons can hear emergency instructions.

(5) POOL RULES. (a) *Location and maintenance.* All pool use rule signs shall be located at conspicuous places and be legible.

(b) *Content.* The posted rules shall include: "Persons with infections not permitted"; "No food, drink, gum or tobacco permitted in pool or on deck"; "Shower before entering and after use of toilet facilities"; "No running or rough play"; and "No pets allowed."

(c) *Additional rules.* Whenever additional rules are needed to protect the health and safety of patrons, the management shall post and enforce such rules.

(6) SLIDES. Slides shall be carefully supervised and used properly.

(7) CHEMICALS. (a) *Labeling.* All chemicals shall have approved labels containing directions for use.

(b) *Storage.* All chemicals shall be stored in the original covered container in a clean, dry and well ventilated locked area away from flammables and heat sources. Only authorized personnel shall have access to the storage area.

(c) *Mixing.* Chemicals shall be independently mixed and applied.

(8) SECURITY. All gates and doors into the pool enclosure shall be checked daily for proper operation. They shall be locked when the pool is not in use.

History: Cr. Register, August, 1978, No. 272, eff. 9-1-78.

H 72.04 Maintenance and operation. (1) POOL AND POOL AREA. (a) *General.* Every pool shall be kept free of sediment, lint, hair and other debris by regular brushing or vacuum cleaning. The walls and bottom of the pool and the deck shall be kept free from dirt and discoloration. Cracks or other defects in the walls, floor or deck shall be repaired. Whirlpools and wading pools shall be cleaned at least once each day. Routine cleaning shall be performed during closed hours. Floor areas subject to bacterial growth shall be sanitized as needed.

(b) *Temperature.* Air temperature at an indoor pool except for whirlpools or therapeutic pools shall be between 4° and 8° F., higher than the water temperature. Indoor pool water temperature shall be between 72° and 80° F., except whirlpool or therapeutic (limited purpose) pool water temperature shall not exceed 105° F.

Note: Prolonged immersion in a whirlpool should be avoided.

(c) *Floors, ceilings and walls.* Walls, ceilings, floors and equipment shall be repainted when necessary. Structural hangers for ceilings shall be inspected for deterioration at least annually and repaired or replaced as needed. Replacement tile, paint or other approved floor surfacing shall be of a nonslip finish.

(d) *Spectator area.* Inspect seats on a regular basis for structural defects and repair as needed. Railings or other restraints to separate spectators from pool patrons shall be maintained.

(e) *Solid waste.* When food, beverage or other items that generate solid wastes are permitted, flytight receptacles shall be provided and be maintained. They shall be constructed of plastic, metal or other approved material. Solid wastes shall be disposed of in a sanitary manner as needed.

(f) *Lockers.* Locker interiors shall be regularly inspected. They shall be cleaned as needed.

(g) *Pool and deck equipment.* All pool and deck equipment shall be maintained.

(2) RECIRCULATION SYSTEM. (a) *General.* The recirculation system consisting of filters, pumps, strainers, screens, disinfectant feeders, slurry or dry feeders and other appurtenances shall be operated continuously except for seasonal closing or during periods of necessary maintenance.

(b) *Skimmers and gutters.* Skimmers, skimmer weirs and overflows shall be inspected daily and cleaned, repaired or replaced as needed. Strainer baskets for skimmers shall be cleaned at least daily. Water shall be added as needed to keep the pool water level at the overflow, as consistently as possible. For other than reverse flow gutter pools, at least 75% or the recirculation flow shall be over the weir during normal operation. For skimmer type pools, at least 80% of the recirculation flow shall be through the skimmers.

(c) *Surge tank.* The surge tank shall be operated between its designed water levels.

(d) *Water supply.* A minimum air-gap of 2 pipe diameters or 6 inches, whichever is less, shall exist between the potable water supply inlet and the overflow point of any pool, makeup tank, surge tank, solution or slurry tanks unless another approved backflow-backsiphonage prevention device is provided. Pool water pretreatment equipment shall be maintained and operated in accord with manufacturer's instructions.

(e) *Pump strainers and screens.* Strainers and baskets or screens shall be continuously in use and be inspected and cleaned as needed. Clean spare strainer baskets or screens shall be available.

(f) *Circulation pumps.* The design recirculation rate shall be maintained at all times except during maintenance operations. The manufacturer's lubrication instructions shall be followed. Pump alignment shall be set and maintained as recommended by the manufacturer. The impeller rotation shall be checked and the impeller inspected whenever the pump motor is repaired. The pump shall not be throttled on the suction side during normal operation.

(g) *Piping and appurtenances.* 1. Flowmeters. Flowmeter accuracy should be checked periodically. They shall be maintained.

2. Valves. Valves shall be occasionally operated through their entire operating range. All valves shall be maintained. Connecting control tubing for automatic rate-of-flow control valves shall be cleaned periodically.

3. Inlets. Inlet flow rates and direction shall be determined periodically. Direction of discharge shall be arranged for most effective water movement.

4. Gauges. Gauges shall be maintained with the lines to the gauges bled and cleaned periodically.

5. Coding. Pipe color coding, direction-of-flow indicators and valve tags, if initially provided, shall be maintained.

(h) *Filters.* 1. Sand. a. Rapid rate sand filters shall be backwashed when the pressure differential is greater than 7 pounds per square inch or as recommended by the manufacturer, whichever is less.

b. High-rate sand filters shall be backwashed when the pressured differential is greater than 11 pounds per square inch or as recommended by the manufacturer, whichever is less.

c. The filter shell and appurtenances shall be maintained.

d. Filter media shall be cleaned or replaced when the initial pressure loss after backwashing exceeds 3 pounds per square inch.

e. Filter backwash water shall discharge to a storm sewer, if available, or to the ground surface at an approved location, except that from whirlpools shall discharge to a sanitary sewer. Discharge shall be through an air-gap.

2. Diatomaceous earth. a. Pressure diatomaceous earth filters shall be backwashed when the pressure differential is greater than 7 pounds per square inch or as recommended by the manufacturer, whichever is less.

b. Vacuum diatomaceous earth filters shall be backwashed when the vacuum gauge reading increases to greater than 7 pounds per square inch following precoating or as recommended by the manufacturer, whichever is less.

c. Septums shall be removed and cleaned or repaired when they no longer provide effective filtration or create a friction loss preventing maintenance of the required recirculation rate.

d. Diatomaceous earth waste water separation units, where required, shall be maintained.

e. The filter shell and appurtenances shall be maintained.

f. Filter wash water shall discharge to a sanitary sewer, if available, or to the ground surface at an approved location. Discharge shall be through an air-gap.

3. Cartridge. a. Cartridge type filters shall be removed and cleaned when the pressure differential is greater than 11 pounds per square inch or as recommended by the manufacture, whichever is less.

b. All waste water and solids resulting from cartridge cleaning shall be discharged to a sanitary sewer or disposed of on the owner's property in a manner not creating a health hazard or nuisance.

c. Cartridges shall be replaced when plugged or damaged.

d. At least 10% of one complete set of cartridges shall be available on the premises at all times.

(3) CHEMICAL FEEDERS. (a) *General.* All feeders shall be operated and maintained for maximum efficiency within the operating range. Manufacturer's recommendations for maintenance shall be followed. All feeders shall be of the positive displacement type and shall be interwired with the recirculating pump electrical circuit or discharge proportional to flow.

(b) *Operation.* 1. Gas chlorinators. Repairs to gas chlorinators shall only be made by adequately trained personnel. The operator shall determine the appropriate emergency personnel to contact in the event of an emergency and have the telephone numbers conspicuously posted.

Note: Emergency personnel most frequently contacted are the staff of the local fire department.

a. Chlorine cylinders shall be stored indoors in an area having approximately the same air temperature as the chlorine room and sheltered from a direct source of heat or sunlight. Cylinders shall be in an upright position and shall be chained or strapped to a rigid support. Cylinders shall not be moved unless the protection cap is secured over the valve. Empty cylinders shall be so tagged and the cylinder valve closed.

b. Cylinders in use shall not be separated from the gas ejector by a wall or other barrier.

c. The chlorinator and gas cylinders shall be checked daily for leaks using ammonium hydroxide. That chemical shall be kept in a plastic container.

d. Smoking is prohibited in the chlorinator room.

e. A gas mask, approved by the appropriate federal agency for use in a chlorine atmosphere, shall be kept outside the chlorine room in an unlocked cabinet. The gas mask canister shall be replaced regularly in accord with the manufacturer's recommendations. A permanent record shall be kept of mask usage.

2. Slurry feeders. The lowest effective concentration of solution should be used. In no case shall the concentration exceed 5%. Diatomite slurry feeder head and lines shall be flushed as necessary to insure proper and continuous operation. Water from the discharge side of the recirculation pump should be used. If connection is to a potable water supply line, it shall be equipped with an approved backflow-backsiphonage prevention device. Diatomite slurry tank agitators shall run continuously.

Note: If automatic flushing equipment is provided, it is preferred that flushing occurs once every 15 minutes for a duration of one minute.

3. Solution feeders. Liquid chemicals may be fed full strength or diluted. If calcium hypochlorite, or other chemicals that form residue are used, a two tank system is required. One tank shall be used for mixing the solution and settling the precipitate. The clear liquid shall be decanted or siphoned into the storage tank. Mixing and storage tanks shall be so labeled. A cover with a screened vent shall be provided on all solution tanks. The installation shall be maintained to prevent backflow of water into the tanks and to prevent the chemicals from being siphoned out of the tanks into the pool or recirculation system. When pool water tests indicate the need, chemical feed rates shall be adjusted to maintain the desired chemical concentrations and pH.

4. Dry feeders. Dry feeders shall be inspected daily for proper operation.

5. Automatic feed control and analyzer systems. The automatic system shall be maintained as recommended by the manufacturer.

(4) WATER CHEMISTRY. (a) *Disinfection.* All pools, when in use, shall be continuously disinfected by a chemical and/or process which meets all of the following requirements:

1. Registered. Is registered with the United States Environmental Protection Agency as a disinfectant and the product label is registered with the Wisconsin Department of Agriculture.

2. Field measurement. Has a chemical residual which can be easily and accurately measured by a field test procedure.

3. Compatability. Is compatable for use with other chemicals normally used in the pool water treatment, or is clearly identified as having a use limitation.

4. Toxicity. Does not impart toxic properties to the water when used according to directions.

5. Safety. Does not create an undue safety hazard when handled, stored and/or used according to directions.

(b) *Chlorine.* The unstabilized free available residual chlorine, as measured by the neutral orthotolodine, D.P.D., leuco-crystal violet tests or similar department approved test method, of at least the following

concentrations, depending upon the pH of the water, shall be maintained.

pH	Minimum free available residual chlorine - mg/1 (not stabilized with cyanuric acid)
7.2 through 7.5	0.40
7.6	0.50
7.7	0.60
7.8	0.70
7.9	0.80
8.0	1.00

(c) *Cyanuric acid or isocyanurate compounds.* 1. General. When cyanuric acid is used to stabilize the free available residual chlorine, or where one of the chlorinated isocyanurate compounds is used as the disinfecting chemical, the concentration of cyanuric acid in the water should be at least 30 milligrams per liter but shall not exceed 100 milligrams per liter and the free available residual chlorine, as measured by the neutral orthotolodine, D.P.D., leuco-crystal violet tests or similar department approved test method of at least the following concentrations, depending upon the pH of the water, shall be maintained.

pH	Minimum free available residual chlorine mg/1
7.2 through 7.5	1.00
7.6	1.25
7.7	1.50
7.8	1.75
7.9	2.00
8.0	2.50

2. Restriction. Cyanuric acid and isocyanurate compounds shall only be used in outdoor pool water.

(d) *Alkalinity.* The total alkalinity shall be maintained between 70 and 150 milligrams per liter. Hydroxide alkalinity shall never be present.

(e) *Test kits.* Test kits as approved by the department shall be maintained.

1. Provision. A test kit shall be provided for the determination of total alkalinity and the content of all chemicals added to the pool water.

2. Reagents. Testing reagents should be ordered in small quantities and shall be properly stored. Phenol red, when used, shall be replaced at least every six months. All reagents shall be stored in their original labeled containers.

3. Personal preparation. Persons using test kits shall wash their hands before and after conducting tests.

(5) WATER HEATERS. (a) *General.* Water heaters and heat exchangers shall be maintained.

(b) *Restriction.* Pool water heaters or heat exchangers for outdoor pools utilizing electrical resistance or fossil fuel shall not be operated from September 15 to the following May 15th.

(6) ELECTRICAL. (a) *General.* The electrical installation at all public pools shall comply with the appropriate section of the Wisconsin Administrative Code and any applicable local codes.

(b) *Maintenance.* Defects in the electrical system including underwater lights, overhead lights and their respective lenses shall be immediately repaired. Underwater lights shall be inspected annually and each time the pool is drained.

Note: Ground fault interruptors should be installed and maintained on all pools constructed prior to 1971.

(7) HEATING AND VENTILATING. (a) *General.* Heating, ventilating and exhaust equipment shall be maintained and operated to provide air movement as required by applicable sections of the Wis. Adm. Code. Temporary ventilation facilities shall be used when work is done in unventilated areas such as settling basins or surge tanks.

(b) *Condensation control.* Action shall be taken to prevent any excessive condensation problems in indoor pool enclosures.

(8) DRESSING, SHOWER AND TOILET FACILITIES. Dressing, shower and toilet facilities shall be maintained in a sanitary condition. Adequate sanitation supplies shall be on hand at all times. Showers shall be maintained to provide 3 to 5 gallons of water per minute per shower.

(9) MAINTENANCE RECORDS AND SCHEDULE. (a) *Reports.* Daily reports of pool operation shall be kept by the owner or operator. Data shall be recorded on forms provided by the department. The monthly reports shall be submitted to the appropriate departmental regional office not later than the tenth of the following month.

(b) *Files.* The owner or operator shall maintain an accessible file on the premises, containing information such as manufacturer's pump performance curves, manual of instruction on filter operation, manufacturer's recommendations on operation and maintenance of all equipment, instructions and other pertinent information on pool operation and maintenance. The file shall include a copy of chapter H 72, Wis. Adm. Code. Departmental correspondence and formal plan approval shall be available but need not be filed on the premises.

History: Cr. Register, August, 1978, No. 272, eff. 9-1-78.

H 72.05 Seasonal opening. As a minimum, the following actions shall be taken by the pool manager or operator before an outdoor pool is used after winter closing.

(1) POOL BASIN AND DECK. Drain the pool to within one foot above the high groundwater level or drain completely, if groundwater is not present. Remove all debris. Examine pool walls, bottom, decks and repair all cracks and chips. Clean the pool walls and bottom thoroughly. Flush all pool piping. Remove any peeled paint and repaint the pool white or a light color. Refill the swimming pool after the paint is dry as indicated by the manufacturer. Remount diving boards, ladders and other deck equipment.

Note: WARNING—It is essential that the depth to high groundwater be known. Such information should be available from the designer and/or contractor.

(2) RECIRCULATION SYSTEM. Reinstall all equipment and piping that was removed. Operate all valves to assure that they move freely. Repair

or lubricate as necessary. Clean the hair and lint strainer basket. Place the recirculation system in operation and backwash the filter thoroughly. Place the filter in operation.

(3) OTHER. Inspect all feeders and place them in operation. Inspect all gauges and flowmeters and repair or replace them if necessary.

(4) WATER QUALITY. Test the pH and alkalinity of the water and the disinfectant content. Adjust, if necessary, to be within the proper ranges.

History: Cr. Register, August, 1978, No. 272, eff. 9-1-78.

H 72.06 Seasonal closing. As a minimum, the following actions shall be taken by the pool manager or operator if a pool is closed at the end of the swimming season:

(1) POOL DRAINED. The pool may be completely drained if the high groundwater level is below the pool. See note following H 72.05 (1). Open drain valve and allow all of the water to drain from the pool and leave valve open. If the pool water is drained into a sump and then pumped, partially open valves so the pumping rate about equals the draining rate. Continuously observe the operation and adjust valves if necessary. The automatic hydrostatic relief valve shall be inspected and repaired or replaced if necessary.

(2) POOL NOT DRAINED. Pump or drain water to a level at least 6 inches below the wall inlet fittings. All piping that is subject to freezing shall be drained or otherwise protected from freezing and be plugged.

Note: Provisions should be made to decrease or prevent direct freezing pressures on pool walls by placing logs, drums, etc. in the pool water.

(3) CLEANUP. Remove all debris within the pool and pool enclosure.

(4) FILTERS. (a) *Sand.* Close water supply line. Remove filter tank drain plugs. Open all valves on filter. Remove manhole covers on pressure filters and examine the filter sand. Remove and replace any encrusted sand. Examine filter shell thoroughly and repair, paint or replace if necessary.

(b) *Diatomaceous earth.* Close water supply line. Remove filter drain plugs. Open all valves on filter. Remove the cover of pressure filters and remove filter septums. Examine filter septums and clean according to manufacturer's recommendations. Repair or replace filter septums and fabric as necessary. Examine the filter tank thoroughly and repair, paint or replace if necessary.

(c) *Cartridge.* Close water supply line. Remove filter drain plugs. Open all valves on filter. Remove cover of filters and remove the cartridges. Examine the cartridges and clean according to manufacturer's recommendations. Replace cartridges as necessary. Examine the filter tank thoroughly and repair, paint or replace if necessary. Order extra cartridges for next season's use.

(5) RECIRCULATION PUMPS. Turn off the pump switch and open the circuit breaker to the pump circuit. Open all valves around the pump. Remove the lid, strainer and drain plug from the strainer pot. Drain the pump impeller casing. Clean and lubricate the pump in accordance with the manufacturer's recommendations. Protect outdoor pumps with a waterproof covering.

(6) CHLORINATORS. (a) *Gas.* Drain the water from all chlorinator parts and associated piping. Make certain the ejector is drained. Store all gas masks in a warm, dry area. All chlorine gas cylinders, empty or full, should be returned to the supplier.

(b) *Hypochlorinators.* Remove all liquid from the hoses and diaphragm. Clean out all calcium carbonate, calcium hydroxide or other deposits on the check valves, hoses and diaphragm. Add oil and grease in accordance with manufacturer's recommendations. Remove and store in a warm dry location.

(7) OTHER CHEMICAL FEEDERS. Drain water from all parts and associated piping. Clean and grease unprotected metal parts. Repair or replace all defective parts. Remove and store in a warm dry area.

(8) CHEMICALS. Dispose of or store all chemicals in accordance with manufacturer's recommendations.

(9) SKIMMERS. Drain and cover all skimmers.

(10) OTHER APPURTENANCES. Examine, paint, service, lubricate, repair or replace all equipment as necessary and store properly.

(11) POTABLE WATER SUPPLY SYSTEM. (a) *Piping.* Drain all water lines to the toilets, urinals, lavatories, drinking fountains, chemical feeders, showers, hosebibbs, pool water makeup, chlorinators and chemical feed system in buildings that are unheated.

(b) *Tanks and fixtures.* Drain all flush tanks on the toilets and urinals, the hot water boiler, water storage and pre-treatment tanks, mixing tanks and chemical solution tanks in buildings that are unheated. Add antifreeze to undrainable fixture traps in unheated areas. Remove outdoor drinking fountains and store them in a warm dry area or cover them.

(12) SWIM SUITS AND TOWELS. Clean suits and towels thoroughly and store in a sanitary manner.

(13) UNDERWATER LIGHTS. Bring light fixtures up on the pool deck and cover them. Examine niches for signs of leakage and repair as necessary.

(14) HEATERS. Turn off the fuel supply or, where necessary, shut off the electrical circuit breaker to the pool heater circuit. Drain the water from the heater and clean the heater tubes according to manufacturer's recommendations.

History: Cr. Register, August, 1978, No. 272, eff. 9-1-78.

H 72.07 Closing criteria. (1) GENERAL. Whenever any of the following conditions are not met at a public pool, it shall be immediately closed and not reopened until proof of correction is evident.

(a) *Health or safety hazards.* When condition(s) at a pool or bathhouse create an immediate danger to health or safety as determined by the department, appropriate local officials or the person in charge of the pool or bathhouse operation.

(b) *Microbiological quality.* When more than 15% of the samples covering any considerable period of time equal or exceed the bacteriological analyses obtained as follows:

1. Plate method. Contain more than 200 colonies per one milliliter of water, as determined by the standard agar plate count (24 hours at 35°C.)

2. Tube method. Show positive test (confirmed test) for coliform organisms in any five 10-milliliter portions of a sample when the multiple fermentation tube method is used; or more than 1 coliform organism per 50 milliliters when the membrane filter test is used.

3. Staphylococcal group. Whenever examinations are made of bacteria of the staphylococcal group, not more than 50 organisms per 100 milliliters of water should be present.

Note: Samples collected for microbiological examination are to be collected while the pool is in use with the residual disinfectant deactivated, and be examined in accordance with the procedures described in the latest edition of *Standard Methods for the Examination of Water and Wastewater*, (APHA, AWWA and WPCF).

(c) *Other quality conditions.* 1. Clarity. When the pool water clarity is such that a black disc, 6 inches in diameter, is not readily visible when placed on a white field at the deepest point of the pool.

2. Inadequate disinfection. See H 72.04 (4).

3. Temperature. When the air temperature is below 65°F. for outdoor pools, and water temperature is below 72°F. for indoor pools.

4. Hazardous weather. When the presence of or the sighting of potential hazardous weather conditions exist. The subsequent opening of the pool shall be approved by the responsible supervisor, lifeguard, operator or owner. If concensus of the owner and his lifeguard cannot be reached, the decision of the lifeguard shall prevail.

(2) WRITTEN ORDER. When a written order to close a pool is issued by the department or appropriate local official, that order shall be conspicuously posted at the pool site by the owner or his designated operator. When the condition (s) causing the issuance of a closing order have been considered corrected, the owner or operator shall notify the department. The pool shall not be reopened until so authorized in writing by the department or local official.

History: Cr. Register, August, 1978, No. 272, eff. 9-1-78.

H 72.08 Sampling. (1) BACTERIOLOGICAL. (a) *Frequency.* At least one sample of pool water per month during the operating season and preferably one sample per week shall be collected for bacteriological analysis. The sample shall be analyzed at the state laboratory of hygiene or other certified laboratory.

(b) *Results.* Should a sample be unsafe as specified in section H 72.07 (1) (b), daily samples shall be collected until a safe analysis is reported. The cause of the unsafe sample should be determined and disinfectant feed rate shall be adjusted upward to achieve more effective bacterial kill. See section H 72.04 (4).

(2) CHEMICAL. Such samples as needed to maintain chemical content or pH in the ranges specified in section H 72.04 (4) shall be collected and analyzed by the operator.

History: Cr. Register, August, 1978, No. 272, eff. 9-1-78.

H 72.09 Variance. The department may approve safety, operation and maintenance rules for pools that are different from those contained in this chapter for experimental or trial purposes. Such purposes shall comply with the purpose and intent of this chapter. The department may require that sufficient evidence or proof be submitted to substantiate any claims that may be made regarding the sufficiency of any proposed alternative.

History: Cr. Register, August, 1978, No. 272, eff. 9-1-78.

H 72.10 License. (1) REQUIREMENT. Before being opened for public use each public swimming pool as defined in section H 72.02 (10), Wis. Adm. Code, shall be licensed by the department or a local governmental entity. Application for licensure by the department shall be made on forms provided by the department.

(2) EXEMPTION. Two or more pools on a property having a single recirculation and filtration system are considered one unit (pool).

(3) STATE FEES. The departmental annual fiscal year license fee shall be nonreturnable, nontransferrable and nonprorated as specified in section 140.05 (17) Wis. Stats.

(4) RESTRICTION. The department shall not assess license fees for public swimming pools if the appropriate local governmental entity (where physically located) enacts an ordinance or promulgates regulations causing payment of an annual local license fee and further providing the following conditions are met by ordinance or regulation enactment and/or activity.

(a) Chapters H 71 and H 72, Wis. Adm. Code, or similar regulations which are at least as stringent as those chapters in all respects be adopted.

(b) A means for suspension or revocation of the local license be provided.

(c) At least one sanitary survey (inspection) per year be conducted.

(d) Copies of all applicable ordinances or regulations and the name and address of the responsible inspecting official be submitted to the department.

(e) A listing of all public swimming pools in its jurisdiction and subject to its regulatory and inspection program be submitted annually during the month of April to the department.

(f) Local governmental entity staff, within 30 days after completing a sanitary survey, submit a copy of that report to the department on forms provided at cost by the department.

(5) LOCAL FEES. Local license fees shall be assessed by the appropriate governmental entity. However, should a local governmental entity own and operate a public swimming pool and conduct a regulatory and inspection program in accord with this section (H 72.10, Wis. Adm, Code), the fees required by Section 140.05 (21), Wis. Stats. shall be considered assessed and paid.

Note: Because of the variety of operating procedures used by local governmental entities, one department, committee, section or other organizational unit may own a facility(s) and staff of another organizational unit may conduct the regulatory and inspection program. In

such cases a fee may actually be assessed. Such action is based on local ordinance or resolution content.

(6) SUPERVISION. The department shall have the right to separately or jointly conduct sanitary surveys and review all records of local activities at reasonable times and upon reasonable notice. Copies of reports on sanitary surveys conducted by department staff shall be transmitted to the appropriate local authority within 30 days.

(7) ENFORCEMENT. (a) Should the department determine that the local regulation and inspection program does not meet the provisions of these regulations, it shall notify the governing body and the responsible inspecting official or agency of the local governmental entity. The local governmental entity shall then revise its regulation and inspection program to comply with these regulations within 60 days. If after that 60 days, the department determines that the local regulation and inspection program has not been revised to comply with these regulations, public swimming pools in that local governmental entity shall be assessed the state license fee for the appropriate state fiscal year to avoid concurrent local and state license fees; and upon expiration of the local license the department shall assume licensure, regulatory and inspection responsibilities.

(b) Should the department determine that a satisfactory program is not being conducted by the local governmental entity because of the lack of a qualified inspector, the department shall after the 60 day period offer that or any other local official an examination designed for statewide use and relating to all facets of public swimming pool design and operation. The examination shall be jointly prepared by qualified state and local governmental entity representatives. Should the employee (inspector) achieve a grade of at least 70 on a scale of 100 he or she shall be deemed qualified.

(8) LOCAL-STATE LICENSE. If local governmental entities conduct an inspection and regulation program in compliance with these regulations, public swimming pools licensed in their jurisdiction shall be deemed licensed by the state under s. 140.05 (17) Stats.

History: Cr. Register, August, 1978, No. 272, eff. 9-1-78.

APPENDIX B

Swimming Pool Supply Companies
(Who sent out current catalogues
to aid in study)

1. Adolph Kiefer
   Box BB
   Northfield, Illinois 60093

2. Central Pool Supply
   8211 N. Hale Ave.
   Peoria, Illinois 61614

3. Dacor Corporation
   161 Northfield Rd.
   Northfield, Illinois 60093

4. Halogen
   4653 W. Laurence Ave.
   Chicago, Illinois 60630

5. Ocean Pool Supply Co., Inc.
   Huntington Station
   New York 11746

6. Swim Shop, The
   1400 8th Ave. South
   Nashville, Tennessee 37203

7. Swim Time Swimming Pool Supplies
   Post Office Box 158

8. U.S. Divers
   3323 West Warner Ave.
   Santa Ana, California 92702