# “WHAT YOU SHOULD KNOW BEFORE YOU BUILD”

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Organized activities have been popularized by fitness lap swimming, aquanastics, skill enhancement classes and masters’ swimming teams. All of these activities have added to the core aquatic programs of swimming lessons and age-group swim teams. An awareness of these changing dynamics is essential for a director or key staff member who faces the responsibility of guiding the community’s development of a successful aquatic center. While outdoor centers still outnumber indoor facilities, the gap is probably closing because of a desire to provide year-round programming, especially if the aquatic center is part of a multiple activity community center.

With so many directions to go, how does the design and construction process begin?

**Needs Analysis Phase**

The first major task is to identify the aquatic needs of the community and to prioritize those needs based upon the most benefits to the community. At this stage there are usually organized groups that promote a new aquatic facility. Frequently the parents in the local age-group swimming club are at the forefront of enthusiasts. Additional focus groups may be swim instructors and other organizations.

The most important constituent group is usually not represented. It is unstructured recreational users. This group consists of families with small children, seniors looking for a pleasant way to exercise, teenagers who want to socialize and anyone who finds the open recreational swim time an opportunity for pleasure through activity in the water. *This group needs to be represented during your needs analysis.* If no spokesperson steps forward, it is up to the aquatic professional to identify the needs of the

general public and to see that features which will be popular among the community members are included in the project. By doing this, the director will increase the success of the facility.

In addition to a task force of citizens, other techniques can effectively bring out the real needs and priorities of the community. Public meetings provide a forum in which citizens can describe their respective interests. These meetings are most effective when a professional aquatic facility planner participates and provides an overview of what is being done elsewhere in the United States or the world. Such an overview, aided by a slide or video presentation can raise the educational level of the attendees and provide a new basis for discussion, which will enhance the analysis of the community's real needs.

Staff meetings can develop an interaction that is very productive when the planning consultant can understand the priorities and policies of the recreation professionals. Workshops give the owner's steering committee an opportunity to recommend ideas in a creative environment.

Another important factor in creating a successful sports building is the participation of elected officials. The city mayor or council members can provide vision and direction that is sometimes awkward for a staff member. Without the active support of community leaders, a project can be doomed. One thing to remember is that aquatic centers rarely are converted to another activity.

Therefore, it is important to get it right the first time.

**Design Program Phase**

Once you have identified the needs of the community, you must develop a design program of spaces.

This is a list of all of the spaces that will be included in the aquatic center, with a specified area in square feet for each space. All spaces must be accounted for, including walls and circulation spaces. Professional services are usually needed for this task, mostly to avoid omissions.

Terminology begins to be critical at this stage. For clarity, the following definitions should be used:

*Aquatic center—a* building made up of many rooms, one of which is a natatorium, and outdoor support elements including parking, lawn areas, utility services, topography, landscaping and directional orientation.

*Natatorium—a* room or enclosed space inside of which is one or more swimming pools.

*Swimming pool—a* tank that contains recirculated water which is processed for human immersion during a wide range of activities.

Once the steering committee has agreed to the design program of spaces, cost estimates are assigned to the spaces and/or construction systems and components. These numbers must also take into account site conditions and variables such as soil conditions, sewer capacity, electrical power, topography and the proposed building's relationship to contiguous land uses and street systems. An allowance must also be included in all estimates throughout the process for loose equipment or what is often called furnishings, fixtures and equipment.

Once you have developed a preliminary construction estimate you must add to it an estimate of the development costs associated with the project such as professional design fees, soil analysis, legal fees, funding administration and the time required of the owner's staff in the administration of the project. The construction cost estimate plus the development cost estimate results in the project cost estimate. Understanding these three numbers is essential for anyone who is an administrator or an active participant on the steering committee.

Estimating the probable costs of a project is perhaps the most crucial task in the process. Budget constraints usually exist due to a compromise between the "wish list" of building features desired by the users and the practical limit of the available capital funds. When the capital funds are raised for a project (a bond issue, for example), accurate estimating of costs is a task that will affect the project's quality and possibly its overall success. For example, if a project estimate is much more than ten percent above the project budget, the project may have to be redesigned. This extra step will be costly for the design team: the delay in bidding the project will usually add to the cost through steady inflation; the project may subsequently be bid in a less competitive market; most importantly, the quality and functionality of the building may be compromised because of the change in focus by the owner and architect in the rush to meet budget requirements and deadlines.

This is a point in time when many buildings are wounded for the rest of their lives. Very often the anxiety associated with the fear of receiving bids over budget creates an erroneous justification in the minds of the project architect and sometimes the owner's representatives that original standards no longer apply and anything is justified to bring the project in on budget. Such compromises often include building components and systems, materials and finishes, fixtures and equipment. The irony of hasty compromise is that less costly components can be satisfactory if they are developed from the beginning of the project in an orderly process. However, when they are thrown into the breech in a hurried effort to reduce costs at the eleventh hour, design errors frequently occur.

Because of the need to avoid unfortunate compromises, it is very important to plan carefully in the design program stage and to be conservative during the estimating stages. Because it is so important to know where the project is relative to budget at all times, you should schedule re-estimates at various stages of the design process, i.e., design programming, schematics, design development, 50 percent of contract (construction) documents, and at 90-100 percent completion of contract documents.

At the completion of design programming, a complete facility has been described in narrative form. At this point you should estimate the operating cost. Against these numbers, estimate the revenue stream to help the owner evaluate the cash flow the facility will generate. By comparing the two, the owner's representatives can predict whether the facility will operate at a positive cash flow, a negative cash flow or a zero (break even) cash flow.

There can be pitfalls in cost estimating because of the way expenses are allocated, the user fee rates established by the policy makers, subsidized programs that may be assigned to the building and the efficiency level of the management team operating the facility. Because of these pitfalls, it is very important for the owner's representatives to accurately understand what it is going to cost to operate the facility. If the capital funding agreements include revenue bonds or certificates of participation, you will have to generate an income stream that will meet interest payments or fee payments to the third-party investors.

Once you have confirmed the project cost, you must move on to the source of financing. This source may be a capital fund drive, the state legislature (university and college), a bond issue, certificates of participation, a capital expansion budget, donations, a build/lease back or a combination of the above.

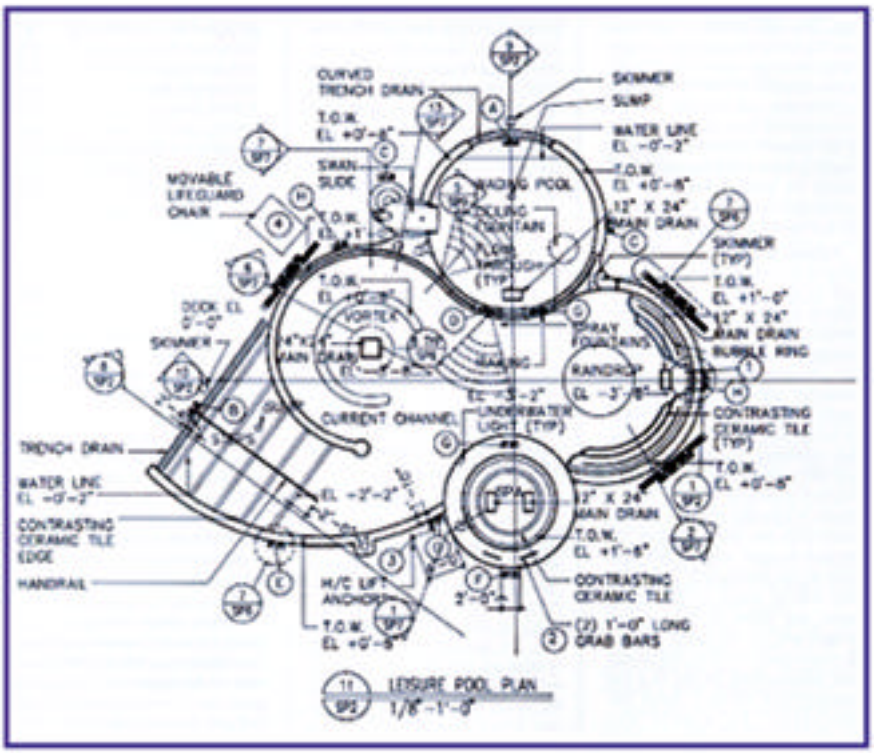
After you have identified the source of funding and received a commitment, the next step is to select an architectural team. There is a protocol which you should follow in this phase of the project. The first step is to develop a request for qualifications which is a formal communication in letter form sent to a number of architectural firms, as well as a formal newspaper advertisement. The respective firms will determine whether they wish to be considered for such a project. If they do, they will submit by a specified date a package which will reflect specifics about their selected team, as well as past history and experience with projects of all types including, presumably, those similar to the proposed project.

Review these submittals and select a limited number for an interview (short list). Schedule the interview of the respective architectural teams for a specific period of time and give the firms a format for

their presentation—usually 60 percent to 75 percent for a formal presentation and 40 percent to 25 percent for answering questions by the interview committee.

The interview process should follow a certain format and the interview committee should be experienced or at least prepared for a methodical evaluation of the different teams. The important issue is to create a discipline whereby all teams are given the same opportunity and benefit relative to presentation time and question and- answer opportunities. In addition to the interview, research the background and experience of the respective teams with former clients. The final step is to select the architectural team and to sign agreements between the owner and the architectural firm that will lead the team throughout the project. This firm is usually identified as the project architect or architect of record. At this point an owner's steering committee should be formed which is made up of individuals representing the users, the administration, the staff and the owner's project manager. Together this group must be qualified to make decisions as the process moves forward.

Much of the work has been done when the design program was developed prior to determining funding needs. At this time the owner and the architect will confirm the surface area needs and requirements developed in the design program stage. The project architect reviews and confirms or changes the construction cost estimate.




## Schematic Phase

The first step of the actual design process, i.e., lines on papers, is the schematic phase. At this point the design architect will develop different schemes for the owner's representatives to consider. The process frequently involves workshop sessions where the owner's representatives, including staff and possibly a representative of different user groups, will assist the designer in creating schemes. This phase usually takes weeks or even months. A number of versions are developed through the use of sketches, drawings, computer-driven visualization sessions and so forth. All of this effort is based upon the details described in the design program.

## Owner's Review

At this stage, the design team will present their recommended scheme, which is based upon the design program and the discussions with the owner's steering committee. The owner's representation, which may include individuals who are not on the steering committee but who have specific knowledge, should study the schematic drawings and determine if the plan meets the owner's needs. To do this it is best to make a checklist prior to the review. This checklist will enable the owner's representative to see what is *not* in the drawings. Most people can see a mistake but often don't recognize an omission.

Once the owner's review committee and the design team has reached a consensus and preliminary

estimates show that the project as this stage is within budget, the design team moves on to design development.

## Design Development

This stage is the point in the process where the features that were defined in the schematic phase are developed into workable systems of architectural design with structural, electrical and mechanical engineering.

Understandably, many adjustments will occur as the constructability of the project is planned. It is at this phase that primary building systems are developed which will include solutions to questions such as: How will the building be supported, both below grade and above grade? How will the pool(s) be constructed? What temperatures will be maintained in the water, in the air and on the walls and ceilings? How will the heating, ventilation, air conditioning and dehumidification be engineered so that the operation of these systems will be energy-efficient? What kind of lighting will be provided and at what light levels? What is the capacity of the sewer system for backwash and pump down discharge? What reverberation time is desired?

Here the design team develops the outline specifications by the respective members of the design team. These documents explain the type of materials, finishes, fixtures, systems and components that will be used, plus the methods and techniques that will be used to construct the building.

With the outline specifications and the refined drawings of the building, i.e., plan, sections and elevations, the design team will develop a new estimate of probable cost. If this estimate is within budget, the design development package is presented to the owner's review committee and any other owner representatives designated.

The owner must review and accept the architect's design development drawings. As in the review process of the schematics, the owner's representatives should make a checklist that will include all the features in the natatorium and support spaces. If there is to be any change in the design development phase, including the outline specifications, it should be discussed and resolved at this time.

## Construction Documents Phase (Contract Documents)

Once the owner's steering committee approves the design development package, authorization is also given to proceed with contract documents which are the final plans and specifications for the construction process. These documents are prepared by the architect, the engineers and other consultants. Their purpose is to communicate the specific way the building will be assembled with regard to quantity of components and quality of materials. This great volume of information is used three times. The first use is by the various contractors to calculate bids which are submitted in an effort to be selected by the owner. The second use is as part of the contract document between the contractor(s) and the owner. The third use is to provide the details for planning and executing the work in a timely and efficient manner.

All plans and specifications are not alike. Some architects minimize details and depend on the successful contractor to provide shop drawings describing the way the selected contractor will construct the building. The rationale for this approach is that the contractor should have flexibility in determining how the building will be assembled. The more conventional approach is for the architect's plans and specifications to be quite specific, with small details carefully drawn and explicit written descriptions of the components, equipment and materials that will be included in the building.

It is helpful for the steering committee to review the construction drawings at 50 percent completion if the reviewer is capable of reading blueprints. If a reviewer is uncomfortable with drawings and spe-

cifications, such a review may be of little benefit to the design team. If the owner's representatives are inexperienced in reading blueprints but want to understand what the project status is, the architect will explain the documents. This explanation will be made in such a way that the lay people on the committee will understand the "work to date" and will then be able to discuss the work that is still to be completed.

**Bidding Phase**

The bidding phase begins when the owner, usually with the assistance of the architect, advertises for bids in newspapers and other media. A specified bid date is given with the requirement that all bids must be submitted to the owner by a certain time. After that time, no bids will be accepted. The bids are then opened at deadline or, in some cases, at a later date.

In projects funded with public money, the bidder with the lowest proposed contract amount for constructing the building according to the plans and specifications is identified. The owner's legal representatives then negotiate the contract for constructing the building. This contractor is usually called the "general contractor." In some locales, jurisdictional rules dictate that there will be several prime contractors with different trades, i.e., mechanical, plumbing and electrical.

**Construction Administration Phase**

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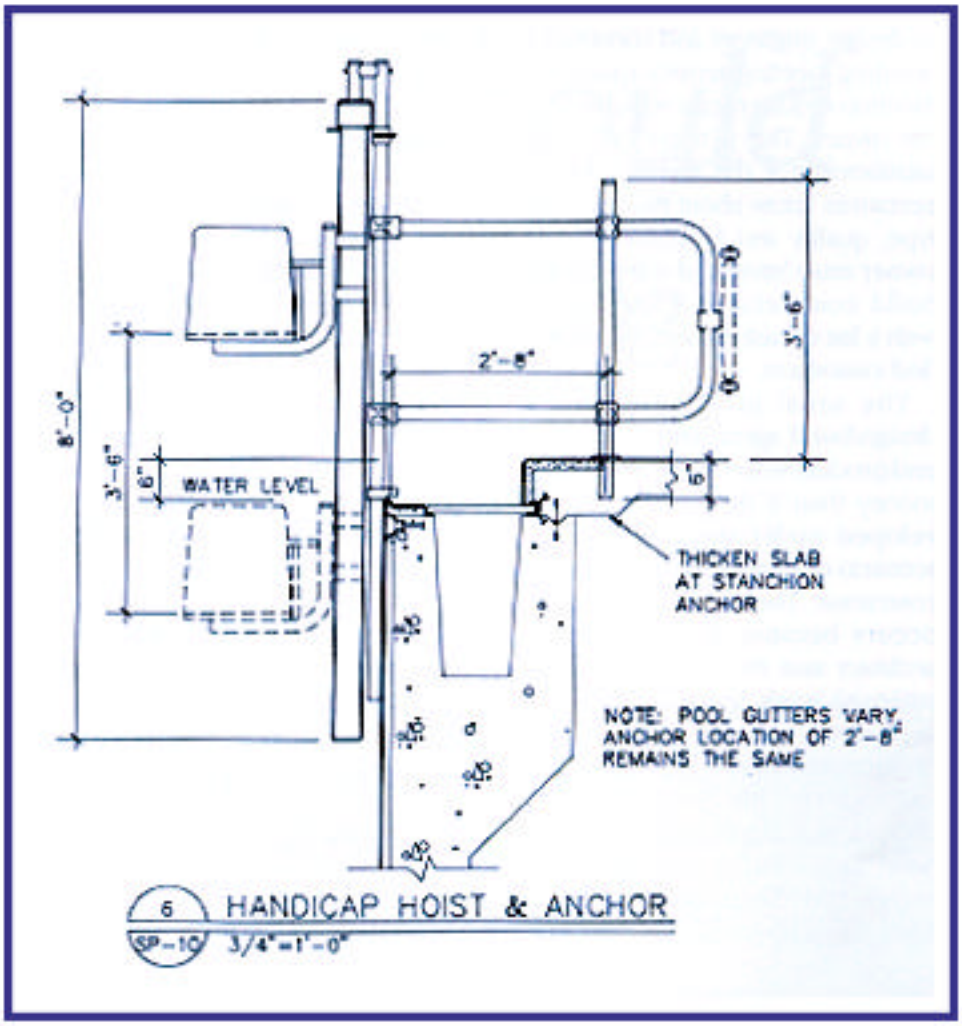
Once the contract has been signed, the general contractor will begin construction starting with big machines moving a lot of dirt. During construction many tasks move forward simultaneously, such as ordering those components that require a long lead time, preparing the site, substituting some products, and so forth. Subsequently the contractor and his or her subcontractors will submit shop drawings and product information for review and approval. This is the process whereby the general contractor identifies the specific products that the subcontractors propose to install in the building. Usually these "submittals" agree with the plans and specifications prepared by the architect. If so, the architect will approve the documents and return them to the general contractor while retaining a copy for the architect's job file. If the submittals do not agree, they are rejected and the general contractor submits more information until it is accepted by the architect.

During the construction phase, the progress will be monitored either on an intermittent basis by the architect or on a daily basis by a clerk of the works who may be employed by the architect or the owner. The purpose is to oversee the work being done so that the owner's interests are not compromised. These positions are also used to approve stages of work and recommend authorization for payment to the contractor(s). As stated above, the employer of the person monitoring the work process may be the architect or the owner, depending upon the scope of services in the architect's contract with the owner.

The construction phase can follow a different protocol through the use of a construction management company. This entity signs a contract with the owner to execute the contract documents for a "not to exceed" amount of total construction costs. The contract management company (or G.M.) is paid a professional fee for its work. The CM. company negotiates the contracts for the owner with individual contractors as if the G.M. was the general contractor. If the total cost of the project is less than the "not to exceed" amount, the savings goes to the owner.




The use of construction management companies has increased over the past 15 years for a number of reasons. General contracting companies with proven experience in contract administration can be hired for their management expertise for a project the company would not bid because of current work loads or because the company has all of its bonding capacity committed to other projects under construction. The owner believes that the G.M. can build a project more efficiently and at a lower cost (even with its fee included) because the G.M. can work with subcontractors to develop means, methods and systems that are less expensive to construct than they would be in a conventional protocol with a general contractor. A major part of the process is to increase competition among possible subcontractors. In addition, the G.M. will frequently execute "value engineering" which gives the G.M. more flexibility in constructing the building as compared to a general contractor who is legally bound to construct the building according to the contract documents.

The G.M. process can be very effective for a project that is on a "fast track" with an abnormally short time frame and an early completion date. In this instance, construction begins on the early construction tasks before the building is completely designed by the architect. The project is bid in phases or "bid packages." The experienced professional construction manager can coordinate the more complex phasing and manage the interfacing of the sequential stages. Like all players in the process, past experience with similar projects can be a very important factor. Some owners do not care for the G.M. protocol because they believe that in their past projects the quality of the building was downgraded. The loss of control is also a criticism by some architects.

There are pluses and minuses with both the general contractor and the construction management approaches. Under the conventional protocol, i.e., bid process with a general contractor, the owner has a price before construction begins, and one company is responsible for the workmanship, the completion date and the physical function of the building. With a construction management company, the final cost is not known until after the project is completed (although a maximum cost is guaranteed by the G.M.). The architect who designs the building can lose substantial control over the construction of the building, and in some cases quality of construction and cost of operation is sacrificed to keep the construction cost below the G.M. '5 guaranteed cost to the owner. In this regard the G.M. is executing a degree of design/build protocol.

In a design/build scenario, the owner enters into a contract with a design/build contractor who agrees to design, engineer and construct a building meeting general space and function requirements stipulated by the owner. This process can work satisfactorily if the owner's representatives know about the building type, quality and function that the owner must have, and if the design build contractor is experienced with a list of past projects with satisfied customers.

The usual justification for a design/build agreement is that the end product will cost the owner less money than if the building is developed under the conventional scenario of an architect and general contractor. The lower cost usually occurs because the owner, the architect and the contractor (constructor) work together from the beginning of the project with the contractor controlling both the architect and the owner to bring about a building that is within the budget that was agreed to by the owner and the design/build contractor. In addition, the lower cost of the design/build project frequently occurs because the standards for construction are lower and material and systems are less expensive than is usually found in a comparable building designed by an architect with like experience.

Like all protocols, the design/build scenario has a place in the field of construction. It normally works best with buildings that are not extremely complicated and in which quality and technical standards are not exceptionally high. In many cases such a building will meet the needs of the owner quite well. In others it may not, especially from the standpoint of long-term maintenance costs. The maintenance issue is especially important because of the aggressive atmosphere in a natatorium.

The construction process is very complicated for an aquatic center, as thousands of pieces of material are assembled, modified, constructed and put into operation. The timeframe for an outdoor aquatic center will require four to five months of good construction weather, whereas an indoor complex will usually require between 14 and 18 months, depending upon geographical location and weather conditions.

## Conclusion

It is essential that aquatic professionals become educated about the design and construction process that occurs when an aquatic building is created. Such construction requires leadership on behalf of the owner. A successful response to building needs can be a career opportunity; the success of the project will reflect on the key people representing the owner. Educated leadership by the recreation director can be the most influential factor. 0

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