Ontario Recreation Facilities Association

Building Community Since 1947

GUIDELINES FOR RECREATION FACILITY PLANNING, DESIGN & CONSTRUCTION

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Acknowledgement

This document is a legacy project that was originally developed by ORFA Past-President, John Archibald (circa 1999) based on his experiences of being thrust into a position of responsibility on several significant recreation facility construction projects. John realized that other members may be presented with these opportunities and challenges and believed that a resource that provided some basic guidance on what to expect, would be helpful. Too often, facility managers are given these types of responsibilities under the "other duties as assigned" section of a job description. If the design team expects a facility manager to accept these responsibilities, there must be an evaluation of the existing workload to determine whether what is expected is reasonable. In addition, some form of professional development to assist the facility manager in being properly prepared to undertake a role in these types of projects must be given, well in advance of starting the project. This document remains open for review and all members are invited to share their experiences in facility construction so that future generations are better prepared to take on these responsibilities. We hope that this resource assists all who have an active role in recreation facility design and construction.

MODULE ONE

Design, Construction and Operations 101

1.0 Deciding to Build a Recreation Facility

"The Least Expensive and Best-Informed Consultant is a Practitioner"

The purpose of this document is to provide general guidance on the various steps required to plan, design and construct a functional recreation facility. It is written from a practitioner's viewpoint, for the people who will inherit the final design and construction for the next 50+ years. The information provides an introduction to common processes used in the design and construction of recreation facilities. Often, internal staff are drawn into the process unprepared. In some instances, volunteers offer to be part of the project. This information will assist everyone in better understanding the complexities of undertaking this kind of investment.

If the planning team does not include an actual practitioner who has sufficient experience in operating the type of building being considered, the probability and risk of designing and constructing a poorly functioning facility is significantly increased. Regardless of the experience of the architectural design team, if they have never actually worked in a recreation facility, you are in a relationship of 'blind faith'.

This resource is a collection of standard operating practices and steps needed, to move from a concept to opening. The information includes the experiences of both industry practitioners involved with construction and frontline recreation staff responsible for the care and control of a variety of recreational buildings post construction. The guide discusses the relationship, and often disconnection, between those who have a vision of what a recreation facility will look like and how this vision is designed and constructed, versus the actual functionality of the final product and ability to operate and maintain the building for its entire lifecycle. By listening to the advice provided in these resources, those taking on the challenge of new construction can prevent repeating past mistakes. A functional facility will result in cost savings throughout the entire life of the investment.

1.1 The Risk of Chasing Funding

Don't be blinded by funding opportunities. Different levels of government will provide initiatives to support recreation development that will seem attractive to those undertaking these types of projects. This situation can lead to 'over design', as community leaders wish to ensure their communities receive the most attractive facility possible. This funding is often limited to the actual construction and will not be there in the long-term to support operations and upkeep. Focusing on the building purpose will require good leadership.

1.2 Assembling the Right Design Team

The first step to designing and building a vibrant, functional community recreation facility is selecting a competent, credible, and reputable architect. An architect helps clients achieve their goals. However, there are obligations for both the architect and the client who is hiring the architect. The selection of a team (to represent the "client") and understand the concept and responsibilities of all parties during the entire design and construction process, is critical.

The architect and the consulting team should be very cognizant of all sustainable measures. This goal can be met by ensuring that the building has a high intensity of improved mechanical systems, includes native plantings that do not require much irrigation, or uses building materials with a low or neutral carbon footprint.

It is essential that the client appoint a knowledgeable and experienced person to be their key representative. This person must be part of all aspects of the design and construction phases. The concept of the facility's functions and needs must be conveyed to the architect who, in turn, translates these needs into three-dimensional designs that support the client's vision. The project leader needs to be surrounded by a team that offers specific skill sets that are separate from the professional design team. These individuals will provide some 'sober second thought" to the practicality of the design.

If the owner expects existing staff to play a key role in the project, then it is essential to conduct a review of current duties and provide the necessary staff support so there is no interruption in service, or that staff do not become overwhelmed with the additional responsibility.

1.3 Avoid the Bait and Switch

Architectural firms are a for-profit business. Often, a firm will assemble a group of highly respected professionals to present to the client's selection team. However, once awarded the contract, the work is delegated to less qualified or experienced individuals. If the project submission does not provide details, clarify who will be performing the work if the firm is selected. Build the individual names into the contractual agreement, identifying consequences for breach of contract. Ask if the people present will actually be doing the design or overseeing the design.

1.4 Avoid Meeting Minimum Construction and Design Standards

Minimum is defined as "*the least or smallest amount or quantity possible, attainable, or required*". Construction teams that adopt a goal of exceeding "minimum" compliance construction and design standards to the Building Code and other associated mandatory obligations, will be investing in the long-term operational health of the infrastructure.

1.5 Invite Local Guest Experts

The design team often benefits from the input of key officials from Public Health, Fire Safety, EMS, Forestry and other local governing agencies. They are experts in their field and will often provide suggestions that can significantly improve design and operations.

1.6 Have a Long-Term Vision

The construction of a recreation facility requires the ability to look into the future. The current data being used for the projection of the lifecycle of a recreation facility is 35-years, reduced from 50-years in the 1980's. This does not suggest that the building will need to be decommissioned in 35 years but rather, a significant capital investment will be required to extend the life of the facility, such as installing new technologies, complying with current Building Code changes, and investing in capital items such as roofing, windows, and doors. Recreation facilities are buildings that often must change with user needs or demands. Designing buildings that can adapt is a difficult but important part of the long-term planning process. Consider how many recreation facilities have installed solar panels. Older buildings could not always take advantage of this opportunity as the original roof design was not able to accept the stress. The pandemic exposed the lack of proper HVAC systems to ensure safe air flow. Trying to mix new technology in an old building is not always seamless.

Technology is advancing at such a rapid pace that often, once purchased and installed, the item is outdated, and sourcing parts becomes a challenge. As a precaution, invest in a good inventory of replacement parts from an established supplier as part of the construction.

1.7 Make Every Decision Based on the Projected Level of Maintenance

Every final design decision should end with these questions:

- How easy will this decision be to maintain?
- What are the projected staffing costs associated with maintaining the decision?
- Is this the most durable product available and what is the projected lifecycle?
- Can this decision be managed in-house, or will an outside contractor be required?
- Are special tools or equipment required to efficiently maintain the decision?
- Is there specialty training involved with maintaining the decision?

1.8 Identify Facility Staff Skill Sets

As the project unfolds, one of the most important sidebar activities of the design team is to identify the required skill sets that management must have to efficiently operate, supervise, and maintain the asset. One of the challenges impacting the recreation industry today, is senior administrative staff's ability to find individuals who have both a strong post-secondary education background and the depth of practical experience in operating or managing a recreation operation. Each recreation facility is its own unique environment. Operational principles may be applicable; however, the complexity and variables of each design will require individual skill sets for those who operate and manage these significant investments. Failing to invest in the staffing of a recreation facility adequately is one of the most common mistakes made in many new constructions. Too often, the owners are financially fatigued after construction and seek opportunities to reduce financial pressures caused by the construction.

The second matter that impacts staffing decisions is the fact that when the building is new, fewer resources are required to maintain the investment. As the structure is used and ages it requires more attention, and this is often a gap that is hard to close. In addition, recreation facilities often have cycles regarding staffing need and demand. Buildings may be extremely busy during peak periods and then drop off significantly. Keeping a complement of well-trained staff requires a facility manager who understands the operation from a business perspective. Be clear, not everyone can manage a recreation operation.

1.9 Think Accessibility

Every team member needs to embrace the fact that if they are granted the gift of old age, they will require access to public facilities that are not only designed for ease of access but also given accommodation for emergency egress. Progressive design teams will consider having an accessibility sub-committee of persons with all forms of recognized disabilities beyond mobility restrictions. Hearing, sight, and mental capacity limits are just some of the recognized disabilities that persons struggle with. By having opinions and guidance by persons who have firsthand knowledge of accessibility challenges, the construction team will avoid negative press or frustration from users. The team must respect accessibility laws and have a knowledge of best practices. Purchases associated with accessibility may be tax exempt or funded and should be researched.

1.10 Do Not Covet Your Neigbours Recreation Facility but Do Learn from Their Mistakes

The overbuilding of recreation infrastructure is a chronic mistake of many communities. Trying to 'out build' another community's investment will likely result in an unfunded liability for future generations of taxpayers. 'Build smart' must be the underlying philosophy of any investment. Look at other construction works, but do not become blinded by their beauty. Instead, gather all facility staff, at least 1-year post construction, and ask them what they like, what they do not like and what they would add or do differently.

1.11 Energy Efficient Design

Constructing energy efficient public infrastructure is an essential design objective. This must be matched with staff who understand the design features, how to manage the systems and can adapt to changes within the industry over the entire lifecycle of the facility. Every professional who designs public buildings will include energy reduction measures. As with any purchase, the challenge will be sourcing the highest quality of product or device, that is simple to use and maintain, and there is access to replacement parts and/or service support. Smart buildings only work if they are under the care and control of smart people. Both must receive the same investment.

Energy consumption costs will often exceed or equal the staffing costs in most recreation facilities. Energy invoicing must be paid while staffing levels are set at the will of the owner. Finding a balance will ensure proper, safe, and efficient operations.

Regardless of the selected energy type at the time of construction, the management team will experience price fluctuations throughout the life of the building.

Ensure that the selected professional design team has experienced recreation facility energy designers, for the long-term efficient operation of the building.

Ice facilities that will be operating in warm weather conditions will require more investment at the time of design and construction. Proper insulation will be critical. Roof and wall designs that reflect radiant heat are essential.

Electrical costs are often based on actual use and peak period demand. The energy management plan should address both charges.

All equipment should be assessed on its ability to be adjusted to meet facility operational demand. Any device that can be operated based on occupancy should be explored. Devices that can be managed based on facility schedule or use should also be researched.

Tools that can track facility energy use data are critical, so that facility managers know where to focus reduction strategies throughout the life of the building.

Recreation facilities use a variety of electrical motors, pumps and other devices that can be purchased as low or energy consumption devices.

Recreation facility lighting systems have evolved significantly over the years. The challenge will be purchasing a system that will not be considered outdated soon after construction is complete.

Beyond energy savings, equipment that can be slowed or turned off when not in use will require less maintenance and have an extended life expectancy.

Consider installing equipment such as vending machines that do not remain lit when the building is unoccupied or controlling equipment or devices where consumption may seem small but when controlled and calculated over their lifetime, the savings can be significant.

Heating of domestic, ice resurfacing or pool water is another high energy consumption item to be controlled.

Secondary refrigerant temperature set-back controls will have a quick return on investment while assisting in maintaining ice quality.

A properly designed and constructed ice sheet pad, where staff maintain proper ice thickness to reduce demand on the refrigeration system, is considered attainable energy management.

Dumping resurfacer ice into a pit or outside the facility consumes significant energy. Proper design can greatly reduce these building expenses.

Other proven energy reduction controls include:

- Ensure that the volume of flood water placed in the ice resurfacer does not exceed 100 gallons.
- Insulate all hot water tanks.
- Insulate all service hot water lines.
- Maintain HVAC filters to improve effectiveness of the system.
- Check and turn off all unnecessary equipment associated with seasonal changeover (i.e. air conditioning pumps and fans in winter).
- Regularly test and maintain all heating equipment to ensure a high standard of efficiency.
- Replace existing shower heads with low flow units to reduce both water and energy consumption.
- Install push button shower controllers to eliminate the waste of hot water when units are left running.
- Install photocells on outdoor security and parking area lighting systems to minimize use and energy consumption.

1.12 Think ROI Not Unfunded Liability

It is essential to understand the potential 'return on investment' or ROI. Pre-construction studies will suggest that the "spin-off" economics of a recreation facility will be significant. Remember that "spin off economics" do not pay the facility's operational bills. Designing a user fee system that realistically recoups the actual operational costs of the facility is essential to ensure an adequate return on investment is being generated. There are several companies in Ontario that operate recreation facilities as a business. They should be researched so that those making decisions for future generations of taxpayers clearly understand what is involved in calculating a ROI. Failing to design a building that can generate adequate financial resources to contribute to its operation will result in facility management trying to operate without sufficient human and/or financial resources, which will significantly reduce both the recreational experience of the user and the projected life expectancy of the facility. Poor investment in proper operations creates unfunded liabilities that will need to be addressed by individuals who often had no hand in the original project.

1.13 Design, Construction and Operational Partnerships

Pending the size of the facility, population and expected use of a recreation facility, a community may enter into a development partnership. Often referred to as 3-P partnerships as they are a relationship between public, private and provincial entities. The community (public) desires a state-of-the-art recreational complex but does not have the financial appetite to solely invest in the project. The province's contribution is based on a long-term projected return on investment of tourism spin-off dollars. Private investment is profit driven based on performance. The province will not seek involvement beyond the original concept. Once the benefits are

presented and the province agrees to invest, they will most often step away from the fine details. The relationship between the public and private investment team members, at all levels of the project, will be difficult at times, unless both have the same vision.

Recreation departments have also partnered with school boards in the provision of recreation services. These types of relationships require careful thought and planning as the perception that both organizations have the same investor (taxpayer) can be overshadowed by those who actually have care and control of the infrastructure.

Clearly defining both the use agreement and financial relationship, including the capital and operating investment, is essential. Location will dictate ownership and the original architects of the agreement will be replaced, leaving new partners with fresh ideas. History suggests that many agreements with school boards have soured with time. A caution is given to these types of relationships.

1.14 Recreation Facility Municipal Tax Exemption

Under the Municipal Act recreation facilities are exempt from paying municipal tax. The facility is considered an asset of the people and as such, if the facility was taxed, the people would be taxing themselves. 3-P partnerships require an evaluation of this exemption to ensure that the private investment is fair and equitable. As part of the budget process, the design team should research what tax reductions may be offered based on recreation exemptions.

1.15 Think Functionality Over Beautification

It is important to not get blinded by the cosmetics of a recreation facility. Architects need to balance the look of the building with its functionality. Too often the focus has been on the look of the building with the mechanical and operational needs being second in the process. Natural light is an important part of human satisfaction; however, towers of glass will need to be maintained for the life of the building. Roof slopes may add to the visual appeal in the warm weather months, but snow loads become a facility manager's challenge if the slope leads to entrances, egresses, or parking areas. Investments in cosmetics often take priority over building performance. The priority must always be functionality balanced with the purpose of the construction.

Be prepared to invest significantly in items that may never be seen by users. It is a wise investment to purchase the highest quality of materials for electrical, plumbing, and insulation installations that will be buried in ceilings and walls. In addition, when required, purchasing quality HVAC and dehumidification systems is essential to the operational ability of the facility.

The pandemic quickly identified that not all construction materials are equal. The cleaning, sanitizing and disinfection of public areas will continue to be a legacy expectation of public health departments and the public who use the buildings. Researching what materials will meet the long-term objectives of public health, while also reducing staff time to perform this work, is critical planning.

1.16 Facility Construction Should Include Building Relationships

The marketplace is a competitive landscape that offers all kinds of opportunities. New facility construction needs to include an evaluation of the submitted cost for equipment, products and services that is based on a fair cost analysis, truly reflective of the request. The opening and recording of prices as part of the bid process must be delivered with the caveat that the project team is not bound or committed to accept the lowest submitted bid. A true cost comparison of products and services being offered must be conducted prior to any decision on awarding of contracts. Entering into relationships with companies or service providers who are unavailable post construction, is poor planning.

Not every contractor can construct a recreation facility. Most can pour concrete but installing an ice pad or pool bowl is a specialty skill set, if not performed correctly there will be an ongoing operational challenge. Be prepared to discuss construction needs with local contractors who believe they should have equal access to the project. To ensure that the most experienced contractors are sourced, the design team will need to create clear experience requirements for these

unique types of installations. The investment in selecting the right service providers is one of the most critical components to the project. If successful, the return on investment will be significant over the life of the construction.

1.17 The Functional Program

The client must develop a comprehensive written functional program, stating the specific functions of the building, listing all spaces required and detailing the purpose of all spaces, including mechanical and electrical requirements and necessary features for each room. The architect will use the functional program throughout the entire design process as a reference, to guide all design actions and decisions and achieve the type of facility that will benefit the community.

1.18 Design Phases 101

Designing a recreation facility is not a simple process. It will consume many hours as different visions and features are discussed, researched, and tabled. The design team requires strong leadership, supported by a variety of team members who have proven skill sets. In every process there is non-acceptance by some stakeholders. Therefore, it is critical to create a team environment that allows for due process on key design issues. Fact checking professional design recommendations with industry leaders is diligent planning.

The design stage has three (3) steps:

1. The first phase is developing the schematic design where the architect looks at how the building can be assembled. The schematic gives a general understanding of the site, suitability, function, and operations of the building.
2. The second phase is when the architect begins introducing more detail to the schematic designs as they gain an understanding of the building and its operations.
3. The third phase involves finalizing the design, preparing working drawings and specifications. This phase involves the most time and is very labour intensive for the architect.

Once the design stage is complete and accepted, the client must consider the type of contracting method that will best meet the needs of the project.

1.19 Types of Contracting Relationships/Methods

Design-Build Method

Clients may reduce costs by as much as 20% using a design-build method compared to other build methods. A design build option needs to be balanced with the community's ability to support this option. The client must have the internal expertise on staff to be successful using this approach.

In the design-build method there are four stages:

1. The client negotiates a fee with the design consultant for preliminary drawings.
2. Preliminary sketches are produced, and the contractor submits a tender for the job. Usually, the tender guarantees a maximum price for a design/build project.
3. The contract is awarded, and a final detailed design is then completed.
4. Contractor completes the job.

1.20 Avoid Construction Change Orders and Build in Contingency Expense Funds

Changes in a design-build contract relationship can be very expensive. The owner has little control over the process once the contract is awarded. Often submitted price quotations include the ability of those involved to determine the level of skill and understanding of the client's construction team. Problems can arise if the contractor guarantees a maximum price prior to the final detailed designs being completed. As a consequence, a contractor may cut corners during construction. For example, the design consultant makes decisions based on quality, including long-term performance, durability, and lower maintenance objectives. The contractor, left unchecked, may opt for minimum standards that won't necessarily offer the best result because they are bound to keep within the guaranteed maximum price of the project. The more prepared and researched the client's team is, the fewer change orders and less additional costs there will be.

But in any construction project there will always be some change orders so funds should be set aside to cover these and other unexpected costs. This is called contingency expenses. It is recommended to budget 15-20 % of the total project costs for contingencies. The success of any project and the team who controlled the design, planning and

construction, can always be measured by the final contingency expense line.

1.21 Traditional, Stipulated or Lump Sum

This is the most common method used in Ontario in contracting the construction of recreation facilities – this process has a long history and is well understood. In this design-bid-build method, the contractor gives a fixed price for the construction of the building, excluding change orders. The owner has input throughout the process. This method provides the most accountability to the taxpayer/investor.

1.22 Construction or Project Management

In this process, there is no general contractor, but a construction/project manager who usually works under contract to the client for a fixed fee, which is independent of the construction costs. The construction/project manager issues trade contract tenders. Therefore, the total cost of the project is not fixed at the outset, as the entire project is not tendered at once. This process can be faster than a traditional lump sum process and, depending on the skill of the construction/project manager, may be less expensive.

The project manager (PM), whether an experienced architect, contractor, or facility staff member, must have construction, recreation facility operations and management experience, along with a strong comprehension of HVAC and mechanical design and function. The PM should also have a good working knowledge of the Ontario Building Code (OBC). The OBC is a current collection of regulatory building responsibilities including the Fire Code, Electrical Code and Plumbing Code. Pending the design of the facility, having a strong understanding of the CSA B-52 Mechanical Refrigeration Code, Regulation 565 Public Pools and Splash Pads, and environmental laws would also be beneficial. The PM must have project management experience.

1.23 The Devil is in the Contractual Details

Whatever process is selected, contracts must be clearly worded and specific in detail to avoid misunderstandings. All service providers are profit oriented and will strive to maximize their return on investment. The legal implications of not issuing clear documents for services can be substantial and increase final construction costs dramatically.

As financial issues become apparent in this phase, it is important for the client to remember that project and construction costs are two separate cost centers. The project cost will be the cost of construction plus additional amounts for fees, project management, furniture, equipment, etc. The total project cost is typically about 20 per cent more than the construction cost. The construction cost is the cost of the building and its built-in components only.

1.24 Construction Health and Safety

Budgeting for construction health and safety management is strongly recommended. Currently, in Ontario, any project exceeding $50,000 must be registered with the Ministry of Labour, Immigration, Training and Skills Development. This registration will invite Ministry Inspectors to the location to ensure compliance with all health and safety matters. Breaches to health and safety laws in a construction setting are expensive and may result in incarceration. Having and maintaining a strong health and safety culture must form the foundation to the project.

In addition, it's essential to ensure that the highest level of health and safety design is incorporated into the project. For example - installing connection points for working at height, proper access ladders for suspended equipment that will require regular maintenance, ensuring proper electrical safety devices are in place - are only some of the construction items that need to be considered at all stages of the project.

1.25 Field Services

Once construction begins, the architect will provide administrative support and field services – periodically observing the construction process and making sure everything conforms to the design specifications and contract documents. Architects with expectations of perfection are unrealistic. Unforeseen problems with the conditions of the site, the performance of a contractor influencing the work of another, design changes and the inability to complete work within expected timeframes are common problems that may arise during the construction process. (Observation: Architects will only provide the services that they have been contracted for - in some cases, overseeing the project directly is not included; however, they will

consult with the on-site representative for the client, and assist in settling disputes).

1.26 Sport Architects

For some clients, an architect who specializes in sports facilities may be the best approach. It is strongly recommended that the client pre-qualify the architect, general contractor and PM based on the construction method being used. Sport architects have specialized expertise (such as ventilation for an ice arena, aquatic facility, or best gymnasium floor surface) that a general architect may not have. Although architecture, as a profession, has not traditionally specialized, if the building is sufficiently demanding (as recreation facilities sometimes are), specialization may be required. Specialists will understand appropriate building responses (such as the biomechanics of sport surfaces) and the strengths and weaknesses of specific solutions.

When a project becomes a successful reality, the community, contractors, and architect have worked together with clear communication and a common vision of the building's purpose. To achieve this success, the client must be very clear from the beginning, in describing their needs. Then, the result is a facility of the best design and construction that meets the needs of the client and patrons.

1.27 Rick Hansen Foundation Accessibility Certification (RHFAC)

Weaved throughout this resource is a reminder of accessibility requirements. Highly accomplished and immediately recognized para-Olympian Rick Hansen has invested his experiences and challenges as a disabled person, to create a certification process for architects, general contractors, engineers, urban planners, design-builders, or anyone interested in accessibility in the built environment, to ensure that future construction projects are universally accessible. Selecting a firm that has obtained the RHFAC Professional designation will ensure that the team brings a strong knowledge and the practical skills needed to design a facility that meets or exceeds the current rating system for a building's overall accessibility.

1.28 The Planning Process

Every community can benefit from a customized parks and recreation master plan. These plans are generally broad and strategic and align with and complement other municipal plans such as an Official Plan, Development Charges Study, Transportation Master Plan, Strategic Plan, Economic Development Plan, or Arts and Heritage Plan.

There are many benefits in having a parks and recreation master plan. A comprehensive plan will:

- Place the municipality in a more favourable position when outside financial funding is sought, whether public or private.
- Provide a framework and guidance for decision-making that assists staff, the community, and Council.
- Identify future financial, staffing, and lifecycle requirements, and potential land acquisitions or partnerships.
- Prioritize major recreation initiatives, facilities, and projects that will benefit the entire community.
- Provide a rationale and criteria by which future recreation requests or demands can be assessed.

Once a master plan is completed it is necessary to regularly review and update the plan, keeping it current and relevant. Implementation of the recreation master plan requires on-going community engagement, a regular review of the plan, flexibility, attainment of funding and possible pursuit of partnerships.

A master plan, which is broad in scope and long in tenure (10-year timeframe), is sometimes followed by more specific needs and/or feasibility assessments that pertain to a specific facility (ies). If the master plan recommends more analysis, prior to an investment, these in-depth studies are generally undertaken.

A *needs assessment* – defines the current and future needs and desires of a community. The report typically includes a demographic profile, population growth projections, stakeholder consultations, comparative or best practice reviews from other similar-sized communities, trends analysis, and detailed user analysis. The assessment is generally tailored to a specific facility such as a sports complex, theatre or outdoor sports complex. [This assessment may not be necessary if a recent master plan has already justified the need.]

A *feasibility assessment* – usually includes a needs assessment but will also include a recommended program, a full financial analysis (both capital and operating), funding sources and recommend a preferred site, if not already identified. This detailed analysis allows decision-makers to make a more informed decision.

The diagram below illustrates how a project moves from a master plan to construction.

Recreation Master Plan

A project is identified in a strategic plan or parks and recreation master plan or brought forward (with a rationale) by a community group

Needs Assessment

- Analysis of the identified need
- Current supply
- Trends
- Demographics
- Projected population growth
- Public/ stakeholder support

Feasibility Assessment

- Determination of viability/ benefits:
- Facility program
- Capital and operating costs
- Impacts on existing facilities
- Potential partnership(s)
- Funding

Development/ Construction

- Detailed design
- Vendor procurement
- Detailed operational plan/ budget
- Fundraising
- Partnership development/ agreement
- Construction

A park master plan can be a somewhat different process and shouldn't be confused with a broader recreation master plan. A park master plan is often a reference to a comprehensive park concept plan for a large park or a network of parks in a new development, including district, community, or neighbourhood parks.

1.29 Approaches to Planning

Planning for recreation facilities involves much more than applying recommended standards; one size does not fit all. What is effective for one community may not work in another. The planning approach will vary depending on the size and stage of development of the community, its history, available resources (financial, human), philosophy, political climate and sophistication of the authority doing the planning.

Regardless of the approach taken, the recreation planning process will benefit from the early adoption of some common principles such as:

- Public recreation should be coordinated with other community recreation opportunities to avoid duplication and encourage collaboration and innovation.
- Public recreation services should be integrated with other public services.
- Facilities should be somewhat adaptable/flexible to meet future needs.
- Facilities and programs should be financially feasible at all stages of development. Operation and maintenance costs place an additional financial burden on a municipality as more facilities require more staff.
- Citizens should be involved throughout the planning process.

- Recreation, facility, and parks staff should be involved in the planning process from design through to construction.
- Planning should be a continuous process, involving a regular review of the recommendations.
- Local plans should align with regional and provincial plans.

The U.S. National Parks and Recreation Association gives an accurate summary: "*Master plans allow a local government to assess current and future recreational needs, evaluate feasible options, develop a strategic action plan, and budget for long-term or phased-in development and improvements. Master plans lay out an organizational framework for improving parks and recreation facilities, programs, and services to better serve the public. The master plan shapes the delivery of local government parks and recreation services, programs, and activities in a manner that is consistent with a local government's comprehensive plan and policy agenda.*"

1.30 Common Elements of Recreation Planning

Although approaches to planning recreation facilities may vary, the components of the process are fairly consistent. Headings and the sequence of the tasks may differ, but the general intent of each step has common acceptance.

The following seven steps are involved in recreation planning:

1. Review of background documents

A municipality generally has numerous documents related to parks and recreation – from an Official Plan to Economic Development Reports to Committee minutes and beyond. A review of all relevant background information will:

- Ensure that the plan is aligned with other municipal policies, priorities, and plans.
- Identify constraints and opportunities and any issues that must be considered.
- Identify existing policies, their application, and the need to update.
- Avoid duplication of studies or reports already completed.
- Identify available financial resources by reviewing capital and operating budgets.
- Determine potential grant/ funding opportunities.
- Understand the political context, as expressed by councilors, community leaders, and civic officials.
- Provide a chronology of past recreation milestones – programs, facilities, and parks.
- Determine any trends over time.
- Collect comparative community data including budgets of other similar facilities, if required.

2. Inventory analysis

The ability to undertake a recreational infrastructure inventory has been greatly expanded with the recent investment in asset management software. However, as a caution, too much information can cloud and confuse efforts. Before collecting data it's worthwhile to determine why the information is necessary and how it will be used.

Some basic inventories are:

- Organizational inventory should include a list of recreation organizations that exist in the community, both non-profit and private, their purpose, membership, year that they were created, current and future needs.
- Existing public and private recreation facility inventory should include type, ownership, location, size, parking capacity, year that the facility was built, usage patterns, and user profile (if available). This information will highlight the type and location of amenities throughout the community. The facility inventory often involves some site visits.
- Land use overview and inventory should identify existing land uses (residential, commercial, institutional, agricultural, and more), future growth areas, development boundaries, physiography, and unique natural features or protected areas. This information is usually captured in the municipality's Official Plan, watershed plans, development plans and other related documents.
- Inventory of areas that have potential recreation opportunities should identify land within the municipality that may have possibilities for future facilities, parks, or

trails. This inventory could include vacant land, conservation lands, amenities commonly used for other purposes such as schools, institutions, rooftops, and areas not presently accessible to the public such as hydro rights-of-way, abandoned railway corridors, private clubs, or industrial facilities. The areas that have some future potential should be mapped to indicate their location in relation to the population, current and proposed new facilities.

3. Projected demands and needs

Once information has been compiled outlining existing conditions, then current and future needs can be assessed. A combination of the following techniques will assist in understanding the future needs and demands for recreation services and amenities.

Demographic profile should, at a minimum, provide age, education, employment, housing, and income data as this will assist in determining disposable income and recreation patterns and preferences. This information is generally available through the federal census or the municipal planning department. This information should also include the anticipated annual population growth and areas of growth.

Program analysis will assess program participation over time. As an example, in the past 5 years has hockey registration increased or decreased? What is driving the change? Consider program attendance, program evaluations that have been done, or feedback forms collected. Review the organizational inventory and the needs identified by interest groups, service clubs, or neighbourhood associations.

Assessment of existing recreation facilities will determine the extent to which current facilities are being used. Are existing facilities used to their full capacity or is there space to meet the future needs of users? The evaluation will depend on information obtained from all sources and should indicate the needs that are not being met as well as suggest reasons for deficiencies.

Trends analysis should look at provincial and/or national data that tracks recreation participation patterns over time. Consider population health trends (rising obesity levels), popular activities (pickleball), social trends (volunteerism), demographic changes (aging population), and the implications of these trends for local recreation services.

Comparative analysis garners information from other municipalities such as facility ratios (e.g. 1 ice pad per 12,000 people), or policy references, or best practices. Recreation departments, undertaking a master plan for the first time may find this comparative information helpful. However, the facility or park ratio should be considered a guide, not a firm standard. Also, as a caution, ensure the comparison is 'apples to apples' not 'apples to oranges'.

4. Vision, values, and strategic directions

Early in the planning process the recreation authority will benefit from reaching an understanding or consensus regarding its vision and values. The vision is broad, aspirational, and future oriented. The values reflect what the community treasures or holds most important. In due course, as the master plan evolves, strategic directions will be developed that align with the vision and values. Some plans focus on goals and objectives. Regardless of the terminology, the intent is to agree on where you want to be and how to get there.

As an example, and these will vary with the municipality, a community could value:

- Its volunteers and associations that provide a broad range of leisure services.
- An inclusive, affordable, and accessible recreation delivery system.
- Its pristine river, parks, and trail system.
- Quality, safe, well-maintained recreation and cultural facilities that meet the needs of its residents.
- A fiscally responsible, sustainable, and well-managed parks and recreation delivery system.

Strategic directions are high-level directions that will guide the development of more specific recommendations. Below is an example of both a strategic direction and several aligned recommendations:

Foster a healthy lifestyle through both structured and unstructured activities that improve the physical, mental or social wellbeing of residents

- Expand the number, location, and promotion of drop-in recreation activities throughout the community.
- Work with other service providers to meet the needs of 'older adults'.
- Offer more family recreation opportunities at the neighbourhood level.

The recommendations should reflect the results of the earlier research e.g., demographic profile, trends analysis, community organizational profile, comparative analysis, etc.

5. Development of alternate strategies

A variety of techniques can be used to develop or confirm alternative strategies or options to reach the vision and strategic directions. Three of these methods are:

- Staff consultations and focus sessions – conduct preliminary interviews with staff and possibly Parks and Recreation Committee Chairs. Undertake brainstorming sessions with a full complement of staff to explore potential strategies for the future and the implications of each.
- Community forums or focus sessions - present all relevant information, including financial limitations, and explore potential strategies for the future. Engage all recreation staff, full-time and part-time programmers and facility operators along with volunteers, representatives from interest and community groups, and service clubs.
- Questionnaires and surveys – conduct a community survey that garners feedback on the proposed strategic directions and key recommendations. Today's survey technologies allow for quick and easy participation. However, the design of these tools requires careful consideration under skilled and experienced individuals who understand these platforms.

6. Draft a preferred strategy

Based on all the input and research collected, the consultants or project team will begin to draft the master plan which may include any or all of the following areas:

Recreation Services and Delivery System: identify any new programs/ services or partnerships that should be introduced or explored in the short and long-term; note any implications for staffing, resources and/or governance. The plan may consider services to various age groups (seniors/ youth); or interest areas – culture, sport, social activities; or include policies or parameters of service such as accessibility, affordability, communication, or volunteer support.

Recreation Facilities: recommend any upgrades or improvements to existing recreation facilities; address any operational or maintenance concerns; provide a rationale or community-specific standard for facility provision; identify any new recreation facilities or further research to determine the feasibility of these amenities.

Parks and Open Space System: recommend park plans or enhancements; identify potential uses(s) for vacant or under-utilized land; address a trail system and priorities for development/ improvements; provide an overview of the park network and possible land acquisition strategies (if required); and address any potential park policies/ practices/ programming; align recommendations with a parks master plan (if it exists).

Implementation Strategy: identify timelines, financial estimates, roles and responsibilities, potential partnerships, and performance measures.

This 'Draft Master Plan' is prepared, based on the preceding steps and the following:

- Alignment with collective vision, values, and strategic directions.
- Ability to meet the community's preferences and needs.
- Feasibility of resources – financial, human, and natural.
- Best practices within the parks and recreation sector.

The Draft Plan should be reviewed and completed with assistance and direction from the professional staff, community leaders, and a recreation planning committee (if applicable, including both elected and non-elected representatives).

7. The Final Master Plan

The final master plan should include an executive summary, vision, values, key directions, specific recommendations, guidelines and policies, an implementation schedule, and performance measures. The recommendations are phased in over the duration of the plan, and often expressed as short-, medium- and long-term goals. However, the schedule should be flexible enough to be responsive to changing priorities and financial conditions. As previously noted, the work plan should be regularly reviewed and adjust as required.

The final master plan will generally be 'received' by the appropriate Committee and Council as a plan or guide for future decisions. These plans can also be 'approved' but are not always approved given the strategic and flexible nature of the plan itself.

1.31 Architect / Consultant Selection Goals

Of all the responsibilities of the design team, the selection of the architect is one of the most important. To select the best possible architectural team for the project the client will need to ensure the team has regard for budget estimations, proven expertise and experience related to similar projects, experienced staff, and the availability of each staff member to invest in the project.

1.32 Architect/Consultant RFP Selection Guidelines

The client generally develops a 'Request for Proposal' (RFP) and solicits proposals from firms capable of providing the requisite work. The response to the RFP, from the architectural team, should:

- Provide detailed information on the level of service the firm can provide and at what fee.
- Include details about the architect/ consultant's experience in the respective field.
- Provide information on who the firm has worked for in the past, what work they completed, the time frame the work was completed in, and references.

The proposals submitted in response to the RFP set out what the architect/ consultant will do for the client and at what cost. Consider the following steps to select a qualified architect or consultant.

Architect/Consultant Selection Process

- Develop a Request for Proposal
- Advertise the RFP
- Pre-Qualify Architect/Consultant
- Tender Call
- Review Detailed Proposals
- Short List
- Reference Check and Project Visits
- Interview
- Final Selection Process
- Fee Negotiation

The Ontario Association of Architects (OAA) provides suggested guidelines to be used in selecting an architectural firm. Highlights include how to develop a "short list" of potential firms and what to look for during the selection process (similar project experience, firm staff experiences).

The OAA recommends only interviewing architects who have been short-listed to ensure that all architects have had equal opportunity to prepare presentations. Schedule approximately 45 minutes for each presentation, and 15 minutes between interviews. It is important to allow ample time for both the presentation and for the question-and-answer period, and also for the selection team to discuss the presentation privately before beginning the next interview.

Schedule all interviews on the same day or consecutive days to ensure consistent interview scoring while the information is fresh. The evaluation and weighting criteria for interview scoring system should be communicated to all architects in advance. The criteria are often set out in the RFP.

While it is appropriate to question architects about their approach to the design of a specific project, avoid asking for, or expect specific advice on an actual design solution during the interview. Appropriate and responsive designs require a great deal of interaction between the client and architect, considerably more than is possible during the selection phase. Preconceived design solutions brought to the table, by either the architect or owner, rarely address the true needs of the owner's program. Considerable time and effort may be subsequently expended trying to salvage those preconceived ideas and make them fit the program. This impedes the progress and prevents the

exploration of more responsive solutions to identified design issues.

The interview provides an opportunity to explore issues such as design innovation and cost control and how these can be applied to your project.

Some clients may wish to explore how the architects plan to develop an appropriate level of compensation for their professional services. However, compensation concerns should be resolved through detailed negotiations with the architect who is finally selected, *after* there is a comprehensive and mutual understanding of the actual scope of services. All architects should be advised of the selection decision date. It is ideal if the decision can be made and announced on the same date as the interviews, after the committee has had time to evaluate all short-listed architects. Remember that the architects may be involved in a selection process for other projects to which they may be asked to commit to and as such may pass on the opportunity to work on the project.

1.33 Sample: Scoring Interviews

Invest the time to create an interview and score sheet. Architects invited to interview for the captioned project should be prepared to address the following areas during the course of their interview. Each answer should be scored by each team member.

1. Related project experience
2. Ability and capacity to perform the work
3. Key personnel and/or sub-consultants assigned to this project
4. Grasp of the project requirements
5. Methods to be used to fulfill the required services, including the design phase
6. Management approach for technical requirements (cost controls, design/construction phase involvement)
7. Ability to meet the project schedule
8. Examples of the architect's experience and methods used for budgeting and financial controls
9. Fees and compensation
10. Other applicable considerations e.g., innovative design, specialization applicable to this project, design achievements.

Before sharing the broad rating system t to short-listed architects, assign 'weights' to each of the criteria, indicating relative importance. During the interview, team members should be prepared to rate each architect on a scale of 1-5 with 5 being the highest, in each of the criteria. Enter the number under "Rating". At the completion of the interview, multiply the rating by the predetermined weight for each criterion and enter the total. Add all totals to establish the grand total. The person in charge will combine all of the totals for those participating in the interview session. An example to the process is the pre-assigned weights being established with a maximum of 10 points for each of the specific design knowledge:

Sample: Rating Scale for Expressions of Interest

1.	Related project experience	10%
2.	Key personnel (time on project)	10%
3.	Arena design knowledge & Community Hall design knowledge	20%
4.	Accessibility knowledge	10%
5.	Local Community/Town/ Regional knowledge	15%
6.	Cost Control	10%
7.	Use of in-house consultants & outside sources	5 %
8.	Time Schedule	10%
9.	General Impressions	5 %
10.	New initiatives/or ideas	5 %
11.	Total	/100%

1. Related Project/Arena Design Experience:

- Consider experience in the design of your project type e.g. an arena, community hall, community centre, aquatic or park facility.
- Consider project experience that is similar to your situation e.g., rural/urban community
- More recent projects should be rated higher than projects from the 1970's as technology has changed significantly. Differentiate projects listed as feasibility studies or proposals, versus full project design and construction.
- Confirm that personnel who worked on those previous projects are being proposed for your initiative. How much time will they be involved in your project?

- Confirm their knowledge and experience working with government agencies.

2. Ability and Capacity of the Team to Perform Work Considerations:

- Completeness of the team - are all areas covered?
- Are consultants and sub-consultants going to be available to deal effectively with any issues in a timely manner?
- Does the architect have a working relationship with the proposed consultants?
- Approach to quality of design package e.g., % completed for tender, and % complete at close of tender --- to minimize claims for extras.
- Drawings to be done in CAD to facilitate changes during design and construction?

3. Ability To Work in a Smaller Community– Considerations

- In a small community where the facility will be the major focus there will be significant community input, financial donations and donated material and equipment that will need to be accommodated, and possibly a large steering committee to work with.
- The firm will need to be receptive to input from committee members, staff, user groups and the public and have the time and ability to acknowledge, consider and incorporate the needs identified.

4. Timeline Suitability Considerations:

- The desired time frame for the project has been indicated to the proponents. For example, the state of the existing facility has a bearing on the desire to have the ice facility operational within 10 months without compromising the end product or cost of project.
- Firms have been asked to indicate how they are planning to achieve the completion of the project within the specified timeline.
- What is architect's critical Path Method (CPM)?
- What is proposed re: regular meeting and reporting to the Committee??

5. Ability To Deliver on Budget Considerations:

- The budget for this project has been established and approved by Council. Of interest is how the firms have performed on previous projects in meeting the project budget including references to confirm past budget performance. Have past projects been on budget?
- Are project management and construction consultants being proposed and what is their record?
- How does the firm propose to address extras required through construction?
- With donated items being included, has the firm addressed how these donated materials or items will be accommodated?

6. Approaches to Pre-Design Considerations:

- A significant part of the project development is compilation of the program information that will include input from committee, staff, user groups and the general public. How will the firm assemble and analyze this information prior to the schematic design phase.

7. Key Personnel Considerations:

- The project can run smoothly when the right design team is selected.
- Focus on the experience of key project personnel, such as the Project Manager, Architectural Design Team, Mechanical, Electrical, Structural Engineers, Refrigeration Team, Landscape Design and Cost Consultants.
- Will the assigned individuals remain for the entire project?
- How available will these key individuals be and what's their time commitment to the projects.
- How many other jobs is the firm working on during the project time frame?

8. Ability To Communicate Considerations:

- This project will involve a number of meetings and presentations and the ability

to communicate clearly and concisely will be of utmost importance.
- The ability to communicate will be evident in the presentation.
- Is the design team able to work with staff?

9. Working Knowledge of the Area Considerations:

- Having previous experience in working with the various regional/local/ provincial agencies, such as regional government, Conservation Authorities, ministries etc., will aid the project development in achieving necessary approvals in a timely manner.
- Is the firm familiar or do they have previous experience with your local building and planning departments?
- Does the firm have experience working with local interest or community groups, etc.

10. Overall Impression Considerations:

- What was the overall feeling regarding the proposal or in the interview?
- Is the team suitable for this particular project?
- Did the firm provide any new suggestions, initiatives or ideas?
- Did the team impress you with other jobs they have completed?

1.34 Contractual Arrangement Options

There are three (3) main entities in a building project: the client, the consultants (architects and engineers), and the contractor. In the traditional approach, the client enters into separate agreements with both the contractor and consultants to construct a defined building, at a predetermined price. This is known as the Stipulated Sum Contract (commonly known as the Lump Sum Contract) or Traditional Method.

Given the increasing length of time to obtain approvals, the high cost of financing, and the complexity of buildings, alternate forms of contractual agreements have been created. Each form has its pros and cons; also, each is best suited to certain conditions.

The level of the client's in-house expertise, the amount of control he/she wishes to exercise, the degree of public accountability, and the rigidity of the construction budget and schedule are some of the factors to consider when selecting the type of agreement to enter into. In fact, the selected contract may also affect maintenance and operations criteria.

The Traditional Method Agreements (Stipulated Sum, Cost Plus, and Management Contractual) allow the client to have a high level of input and control over the project. The Design-Build Method sacrifices control and quality for cost and budget considerations.

Public accountability is best served in a Traditional Method Stipulated Sum Agreement but undermined in the Cost-Plus Agreement. The latter is favoured in cases in which there are many unknowns and changes are anticipated in the construction process.

The selection of the contractual arrangement is an important decision. Everything from concept to commissioning forms part of this decision. There are many variables to consider.

1.35 Pre-Qualification of Contractors

In the interest of time and money, it is best to pre-qualify contractors for the project. It is also important to clearly understand the tendering process and legalities of contract law as the client is responsible to award the construction contracts.

With pre-qualification only qualified contractors will receive contract documents and bid on the project. The pre-qualification process is prepared by the client and should include experience within the last five-year period, related experience to your project and construction of recreation facilities, key personnel, fee rate, health and safety record, references, and insurance information. The client should not pre- qualify more than seven (7) firms and should have a minimum of four (4) to foster a competitive bid submission process. Contact the local Construction Association for assistance and to receive a list of potential firms.

1.36 Common Methods of Contractual Agreement

1. Traditional Method or Consultant/Contractor Method - Stipulated Sum

- This is the traditional form of contractual agreement, with the client entering into a contract with the general contractor or builder.
- The architect, engineers, and other consultants design and administer the project on behalf of the client.
- The general contractor, however, administers the actual construction of the work. Competitive bids for the completion of the project are called from general contractors, who are provided detailed, completed final drawings and specifications.
- The general contractor, in turn, obtains prices from various sub-trades in order to compile an all-inclusive price.
- A winning bid is selected to construct the project.

2. Traditional Build or Consultant/Contractor Method

- This method is most commonly used in constructing municipal facilities.
- The architect is usually the prime consultant and works closely with the owner/or owner representatives.
- The prime assists in the design of the facility and ensures that the project is tendered by experienced contractors.
- The architect employs the sub-consultants such as structural/ mechanical/ electrical engineers, refrigeration engineers and landscape architects or technologists. These professionals all work together as a team in the best interest of the client. The project is then designed, detailed, costed, approved and then tendered.
- This method is more time consuming; however, it gives the owner more flexibility in the design as the architect is involved at the early stages and remains in control with the owner, throughout the project.

Advantages

i. The design team, consisting of the architect and engineers, are retained by the client and are in close communication and responsive to him/her.
ii. This is a tried and proven arrangement in which the responsibilities of all parties are well defined.
iii. Sequential phasing of design, tendering, and construction demands attention to detail. All design details are completed before subsequent phases commence. This phasing ensures the greatest client input and quality control.
iv. As the scope of work is well defined, public tenders may be issued and the lowest bid easily identified. This ensures public accountability.
v. The Traditional Method (Stipulated Sum) ensures the best possible price at the time of tender and holds the contractor's price to a well-defined result.
vi. Capital commitment is known in advance.
vii. Competitive process keeps prices low and demands efficiency in time management on the part of the contractor.

Disadvantages

i. Construction cannot begin until design development and construction documents are complete, and tenders are called. Design and construction cannot overlap unless subsequent tenders are called.
ii. Client revisions can be implemented in both the tendering and the construction phases but at a cost, through the cost-plus contract.
iii. The progress payment procedure may slow down cash flow to the contractor and indirectly to the subs during the construction phase, which may lead to potential delays and other costs to the client.

Discussion

i. If the quality of the bid package is high and if contract administration during the construction phase is tight, construction extras can be minimized.

ii. The general contractor is not party to the design development and as a result their knowledge and experience is not utilized.
iii. Rather than calculating the units of materials and hours of labour after the fact, as in the Cost-Plus Contract, the contractor is required to calculate these costs beforehand. This exposes the builder to financial risk, which may jeopardize the project mid-stream. It is important to investigate the general's and sub's financial position and obtain sufficient bonds.
iv. This type of contract is usually conducive to an on time, on budget, and low construction extras, and requires a strong project team.

3. Cost Plus

The contractor is paid on the basis of actual cost of materials and labour, plus a fee to cover his/her overhead and profit. While these unit costs, including the mark up, may be determined beforehand and included in the contract, the client faces a significant risk of increased financial exposure. An upset price may be included in the contract; however, this makes for difficult and litigious contract administration.

Advantages

i. This is a viable solution for a construction program with many unknowns or where it is not necessary or practical to document the exact scope and method of work.
ii. All problems need not have predetermined solutions; rather, the solutions may evolve.
iii. Construction and design can overlap and therefore construction may be completed faster than in the Traditional Method (Stipulated Sum Arrangement).
iv. The general contractor's knowledge can be utilized during the design stage.
v. Changes to the work are easily implemented and the project can be stopped and re-started more easily than under other contract forms. Changes can even be implemented on site.
vi. Cost Plus permits a situation where time and resources can be used to exact the highest quality of workmanship.
vii. There is a clear basis for assessing the progress claims of the contractor and sub-trades.

Disadvantages

i. Unless a guaranteed maximum is agreed to in advance, there is no commitment by the contractor re: total price and time frame.
ii. It is difficult to determine a fair guaranteed maximum price. The basis for adjusting the guaranteed maximum should be included in the contract to provide for changes in scope of work.
iii. This method requires close control by the client, consultants, and the architect in order to verify extras and progress claims.
iv. Public accountability of funds can be difficult.
v. Unless there are incentive clauses in the contract, there is little financial motivation for the contractor to be efficient. The project can easily run over budget and behind schedule.
vi. If the contractor is party to the contract, the added cost of incentives may become a built-in bonus for the successful contractor, especially if there is a guaranteed maximum.
vii. It is possible that the client may pay for the contractor's errors.
viii. Control of overtime cost claims by the consultants, as well as cost of delay claims by the contractor, may be difficult.

Discussion

i. As the final cost of the project is rather nebulous, this form of contract permits little public accountability and is not common in the public sector.
ii. A variable of the Cost-Plus Contract is the Unit Price Contract. Each variable in the contract has a defined price (the unit price) and multiplying the unit price by the quantity of units arrives at the total price. This method is suitable for certain types of less complex or repetitive buildings and is more common for renovation projects. This form of contract is also best suited to certain clients who are involved with numerous structures of a defined type.

iii. This is an extremely flexible form of contract but at the expense of maintaining a predetermined budget. One way to deal with this is to include an incentive clause in the contract, which will encourage the contractor's efficiency and accountability.

4. Management Contract (Project or Construction Manager)

By this form of contractual arrangement, a project or construction manager is appointed by the client. The manager may manage the entire project from conception to commissioning (Project Management) or may manage only the construction phase (Construction Management). In both cases, the manager will, in fact, act as the general contractor obtaining bids from the subs and administering the project.

Project Manager

- The project manager (PM) usually works on a fee basis, as a percentage of the construction costs.
- The project manager hires the architects, engineers, and general contractor. The PM has full control of all aspects of design and construction including the building and professional services.
- The PM tenders the sub-trades - structural steel/ masonry/ concrete work.
- The PM compiles and completes project contracts with subs and consultants.

Advantages

i. Shortens the tender process because the Project Management team is involved with the owner from the initial concept of the project and the construction costs are negotiated while a "fast-track" method of construction is under way.
ii. Provides for effective communications.
iii. If the client has low expertise in the design phase, a reputable PM will be invaluable, allowing the client to take a hands-off approach. This approach is similar to design-build but offers the potential for more client control.
iv. Allows for flexibility during design and construction, to overcome the unexpected.
v. Provides for efficient use of expertise in all phases of work.
vi. Construction may begin before completion of the final design for the project.
vii. Work can be tendered sequentially, allowing flexibility in controlling costs.
viii. Ensures disclosure of all sub-contractors' prices to the client. Also, trades may be selected on an individual basis.
ix. Possible savings in carrying costs may be realized if subtrades are paid directly after their contract is fulfilled.
x. If the PM is diligent, the construction extras may be minimized.

Disadvantages

i. There is a limited pool of qualified people with experience in managing these types of projects.
ii. The client is seldom willing to give the manager total responsibility and conflicts may result.
iii. There is an additional potential for conflict of interest between the PM and the subs, and between the PM and consultants.
iv. This approach necessitates mutual respect for each other's abilities.

Discussion

i. The Management Contract usually involves overlap between the design and construction phases. Construction work is tendered in sequential packages by means of competitive bidding as the relative tender documents are completed.
ii. The PM may be compensated on a lump sum or salary basis. For large complex projects, both a project and a construction manager may be hired separately.
iii. Under other contractual arrangements, a single general contractor may not be able to assemble a strong team. In theory this may be achieved under a managed contract. This same argument has parallels in the design development, cost control and administrative aspects of the project.
iv. The PM needs to balance the various interests while given sufficient authority; in other words - "walk a fine line."

v. Architects, engineers, and general contractors are experienced in managing their own responsibilities in most projects. To involve a separate project and/or construction manager is usually appropriate in the case of large, complex projects.
vi. If the client has little expertise in design, he/she may hire a reputable manager and take a hands-off approach, opting to provide input when needed/required.

5. Design-Build

This form of contractual agreement is popular for building types that are characterized as simple and repetitive in nature. Under this form of agreement, the client, with the help of consultants, develops a comprehensive set of performance requirements (conceptual drawings and specifications). This package is then tendered. The successful design builders will then further develop the detailed design documents for construction. The professionals completing the construction and performing the field reviews are retained or employed by the design builder. The client would employ a General Contractor who would be in charge of the project.

- The general contractor would be contracted to construct the facility for an agreed upon maximum fee.
- This fee would include all consultants and charges and the contractor would have to work within the limits of the contract price.
- Some people in the industry feel that the flexibility and design requirements of the owner are compromised as the control of the project is in the hands of the contractor and not the owner.

Advantages

i. Design-Build is particularly suitable for standard and repetitive projects.
ii. The client is free from administrative work after the conceptual design stage and the awarding of the design-build contract.
iii. The total initial project cost commitment is known in advance.
iv. It's extremely competitive as the design builder manages all aspects of cost control, including detailed design, construction and the construction schedule.
v. This method provides a good framework for rapid decision making and implementation.
vi. Construction can begin before all design work is complete.
vii. Once the clients' requirements have been formulated, the design builder is responsible for all errors.
viii. The procedure favours established firms with experience, financial stability, and bonding capacity.
ix. The client will have a good idea of what to expect from the design builder by examining similar and previously executed projects.
x. In most cases, the client will receive several proposals with different approaches from which to choose.

Disadvantages

i. Not suited to complex or unique building types.
ii. The client must develop a well-defined set of performance requirements for the design, such as spatial relationships, circulation, performance specs, schematic drawings, materials, workmanship etc.
iii. Over emphasis on capital cost versus other considerations as a criterion in building, such as maintenance, operational or life-cycle costs.
iv. The detailed design professionals (architects and engineers) are retained or employed by the design-builder and thus, their role in representing the interests of the client, may be suspect.
v. The role of the client's consultants (architect and engineers), if any, is restricted and the design-builder may not acknowledge it. The client's consultant's design philosophy may conflict with those of the design-builder and a compromise may be needed.
vi. Final design professionals are not in close contact with the client.
vii. The cost of preparing a contract proposal is high and discourages many competent builders.
viii. The objective comparison of proposals becomes difficult because of different approaches by different design-builders.

ix. It is difficult to reject low but unsatisfactory proposals.
x. The design and construction technique could be repeated, resulting in a nondescript building.
xi. High cost of construction extras may be incurred if the client's performance criteria are not well defined or if the client wishes to implement changes to the project subsequent to contract issue.

Discussion

i. Success of the project depends greatly on well-defined performance requirements/ specifications.
ii. The client is dealing with a single entity. This does not necessarily mean that the individual components of that entity are the best available.
iii. The package contractor is sometimes able to get better and more consistent performance from trades because of an ongoing relationship with them. However, this may not hold true, especially in a depressed economy, as competitive trades may be excluded.
iv. Low client involvement is required, and the project may "slip away" from the client.

1.37 Remedying Construction Defects Can Be Difficult

The existence of construction defects that represent a departure from sound building methods can result in extraordinary maintenance and repair costs, loss of business, and a compromised experience for occupants. These defects are not always readily apparent for many years after completion of the project. The builders and contractors responsible for the construction of buildings bear liability for any defective conditions that occur under their watch. However, owners can only recover costs for repairs and lost revenue if claims are pursued in a timely manner and if related evidence is preserved. If a claim for construction defects is not made within a specific timeframe, or defective conditions are not properly documented during related repairs, this remedy opportunity is lost.

Time limits for claims for construction defects vary but typically fall into several categories. One is commonly referred to as a "statute of limitation." These claims are triggered by the "discovery" of the applicable defect and serve to "start the clock" on the owner's claim period. The actual claim period will depend on the province where your building is located.

Development/construction contracts may contain provisions that serve to reduce the otherwise applicable statutes of limitation and repose, thereby reducing (sometimes significantly), an owner's rights related to the pursuit of a construction defect claim. Courts have consistently held that sophisticated parties (builders, developers and building owners) are free to contract with one another, even where the results of that contract significantly interfere with, or reduce, the parties' respective rights pursuant to otherwise applicable law. As such, the legal stakes can be very high, even prior to ground being broken.

Construction defects can be especially problematic in the recreation industry as the inconvenience and disruption associated with necessary repairs may lead to a bad experience for users interrupted by repair activities. In turn, this situation may result in a significant loss of revenue and a tarnishing of the reputation of an otherwise attractive and well-run operation.

It is vital that construction defects be identified as early as possible and that a claim be pursued in a timely manner, so that those responsible for the defects (and their insurance carriers) will be held accountable for the mistakes. Training staff to carefully observe and make detailed records of their observations, is critical to legal success. This is a complex field and owners should work with legal counsel and design professionals specializing in construction defect matters, in order to protect their financial interests and to ensure that unknown construction issues do not derail an otherwise successful venture.

1.38 Avoid Sub-Contractor Design Gaps

The design team should add a disclaimer to all construction (?) RFPs for professional services that states, "The providers of professional services to this project have been selected based on their proven experience and professionalism. In this spirit, it is expected that each service provider shall identify

any items that may have been missed in the design stage that may be considered best practice, or enhanced safety to the design and/or operation of equipment prior to work commencing." Throughout the process, it is recommended that the design team continually ask if there is anything that is being overlooked in the planning stages of construction.

1.39 Do Not Rush to Take Occupancy

Often, a recreation facility will have different parts of the construction completed at different points in time. The excitement of having a new facility at times pushes decision makers to have access before the building is in fact complete. Although occupancy may be approved, having users and contractors on site at the same time creates operational issues for both contractors and facility management. Once the owner accepts occupancy, they accept the facility's condition. The construction contract may call for a complete housekeeping of the building before being turned over to the owner. A push for occupancy may leave this task incomplete, requiring facility management to deal with the cleaning of the building. If there is a desire to open the construction in phases, build it into the contract. If not built into the contract, do not change the original occupancy terms and conditions.

1.40 Conclusion

This Module introduced a variety of concepts in design, construction, and ownership relationships. This section showcased the complexity and flexibility of recreation facility construction from conception to operations. Draw comfort knowing that no two facilities have ever been built the same way and not one has been built perfectly. The next Module will offer some important information that will assist you in being the first to be on time, on budget and without flaws.

MODULE TWO

General Design and Construction Considerations

2.0 Introduction

This Module will focus on key points of design and construction that are critical to the success of all types of recreation facility projects. Many of these decisions will influence ongoing operational, maintenance and staffing costs. The information is often based on past frontline experiences that resulted in long term operational issues and expense, created by poor design and construction decisions.

Determining facility's purpose, as discussed in Module 1, is critical. As suggested, designing recreation infrastructure that can meet existing and future needs is a difficult but important focus. Although we may not be able to predict future use, we can design a facility that has "good bones" that can provide some flexibility for service provision.

The desire to construct "multi-purpose" designs is a positive approach to meet the diverse needs of users. However, combining air handling, accessibility, and other key design features to properly service each facility feature will require additional investments in planning detail.

Will the building be used as part of a community's emergency response plans? If the structure is expected to house evacuated or displaced persons, or act as a cooling/warming centre, then the facility should be designed for this use.

A written statement that explains and clearly states the purpose and activities intended in the final construction is essential. With agreement on the purpose, the facility can be operational and functional. All users should understand the importance and limitations of the function of the building.

2.1 Location, Location, Location

As with many other real estate selections, location of a recreation facility is an important decision. The ability to walk to the building reduces environmental impact. However, residential homes in close proximity may require consideration of the impact of noxious or toxic chemical release used in cooling, heating, or other equipment in a recreation design.

As previously discussed in Module 1, access to public transit should be given serious consideration as part of the planning process. Once the type of facility and its key operations and functions have been decided, the matter of relating the intended uses to the design is now the responsibility of the architect or contractor. Many assume that their lack of knowledge of architectural design should absolve them from any responsibility in the design stage. A qualified architect will insist upon a close liaison with the owner and its staff to produce the best possible

product. Facility staff should have input into the design as they have the knowledge and expertise related to the operational requirements of the building. This is not to suggest that every detail of the design must be approved in the initial stages, but at each logical stage of development the owner must be given an opportunity to discuss the details and the implications of the design. The following should be discussed during this phase:

- The overall site plan and the relationship to the adjacent site and facilities.
- The actual building layout as to overall size and dimensions showing relationship of entrances and exits to the parking lot and public transportation.

2.2 Research Local Zoning By-Laws

Ensure that any existing zoning by-laws are adhered to, or any regulations pertaining to type, size or height of the building, amount of parking, and so on, have been approved by the appropriate municipal officials. Often proper and attractive design features will overcome many of the objections to such a large facility being placed in certain areas. Proper zoning regulations should prevent conflicts in this matter, as zoning is intended to promote the highest and best land use of the various sections of the municipality. The following factors should be considered:

- Parking lot – surfacing, lighting and drainage
- Snow dumping area (ice from ice surface and parking lot plowing)
- Utilities (sewers, retention ponds, water, electricity, natural gas etc. outside the building)
- Landscaping of the property
- Extra and miscellaneous items.

2.3 The Building Code and Regulations

The architect, contractor and owner have an obligation to ensure that all local municipal building, fire and health regulations are adhered to. This is a customary procedure in any building construction project and is intended to protect the safety and health of the citizens, users and staff using the facility. These regulations vary depending upon the size of the community, number of seats, and intended uses of the facility. For example, if an arena is to be used for trade fairs or home shows, then this will affect the type and number of sprinkler heads required, proximity to other structures, water outlets for fire protection, and so on. These regulations could affect the type of materials, fixtures and costs required, and may have a considerable bearing on the final overall construction costs.

2.4 Think Light Pollution, Noise and Foul Balls

The lighting of sports fields, parking lots and security areas needs to be designed so that it's not intrusive to nearby residential homes. Consider the noise generated by significant events such as tournaments, mid-way operations or fireworks. Be sure that rogue balls from sports fields don't escape into residential yards, rooftops or parking lots.

2.5 Other Design Considerations

To facilitate a proper design, the committee must provide clear direction to the following questions.

- What is the basic purpose of the facility?
- Will it be used mainly for spectator sports, or participation sports, or a combination?
- Will the facility be used for summer activities, as well as winter sports?
- Will the community want ice installed during the summer months, for hockey and skating schools?
- What will be the primary recreation amenity - ice sheet(s), community center, playing fields, swimming pool, auditorium, other?
- Will the arena building be expected to provide for activities that require a stage and auditorium seating, seasonally or year-round?
- What population will be served? What distances will people travel? How will the arena relate to existing recreation facilities?
- What sites are available? Are all the facts needed for site selection gathered e.g., land cost, drainage, utilities, and zoning regulations, adjacent parking, etc.?
- What financial resources are available?
- Will it be necessary to build in phases?
- How will the arena be managed once the building is complete?
- What staff will be available for maintenance and programming?

- Is the new facility in a residential or an industrial area?
- What are the impacts of traffic and noise?
- Does the facility structure and landscape have to blend in with existing buildings?

2.6 Type of Structure

The type of structure to be built will be one of the first discussion points. This decision will reflect the anticipated activities and programs for the arena. While this might appear obvious, there will be major differences in sizes of dressing rooms, seating, heating, and so on, depending on the type of program in minor or senior hockey, whether events other than hockey will be promoted, and seasonal use. Will lacrosse, in-line hockey, ball hockey or skateboarding be considered as summer activities? There is also a fundamental decision that must be determined at this stage: is the arena to be a commercial 'revenue-first' operation or used for public recreation purposes with profit as a secondary consideration. Is the arena to be subsidized by the municipality, break even, or is it to make a profit? Are debenture charges to be paid out of gross revenues or charged against the current municipal tax levy? Is the community interested in public/private partnerships? The answers to these questions may significantly impact the actual architectural design and layout and should be thoroughly discussed and decided upon at the very outset of the planning process.

2.7 Pre–Construction Site Investigation

As part of the Planning Act, developers are required to surrender a portion of the development lands to a municipality for recreational purposes. These lands are usually the most difficult areas to be developed based on soil type and/or the presence of water. Picking the right site for any recreation facility is essential as the investment in soil removal or water control measures can be expensive and will not be seen by the public. It is critical that soil tests be completed to determine the type of ground the facility will be constructed on and the presence and depth of the water table below the surface. Water levels can impact pool basins and ice rink sub-floor performance or shift foundations, possibly resulting in large post-construction capital investment. Try to choose a site that has the least amount of water in the ground beneath and invest in preventive measures to keep the sub-foundation well drained.

2.8 Building on a High-Water Table

If the selected site has an identified high water table challenge, the design and construction of an elevated floor is a possible solution. There are known installations where ice sheets are built beside rivers or lakes and the ice surface is supported on concrete piers, a few feet above the water level.

2.9 Water Run-Off Patterns

Water must be prevented from entering the subsoil under the ice surface. Facilities surrounded by hills and/or water/snow coming off the roof structure, will need to be properly controlled. Public safety of snow load release and water that may freeze in entrance ways or egress locations, causing doors not to properly function, need careful considerations. This drainage is accomplished in many cases by means of weeping tiles around the building, which are led off into a drainage system, away from the building foundation. Final building site design should incorporate the protection of these systems Staff must also be informed of all below surface designs to protect them from damage by digging or heavy equipment, both during and after construction.

2.10 Drainage and Sewage Design

The drainage tiles under the facility must drain away to a lower system. Poor installations where the weeping tiles were connected to a storm sewer system have resulted in fluid back-up into a facility during extreme weather events. Septic tanks and tile beds must not be located where they can drain into the soil under the facility.

2.11 Soil Composition

As indicated, soil composition is critical. Any possible areas of clay or non-porous material must be removed so that there is no potential to hold water under the facility. Best practice is having all material completely porous for a minimum of four feet. If the material within the four feet is non-porous, the surface of this material must be graded and drained; the water collected, run off, and disposed of. For a proper installation, the existing clay, or similar material, is removed to a depth of at least four feet and the top of the remaining clay is terraced into drainage tiles that are connected to the drainage system, leading the water away from the building. Three feet of coarse gravel, or crushed stone, is placed above the tiles. Finally, sharp sand is

used for the top 10" or so, which, when rolled, provides a level surface to lay the insulation.

2.12 Avoid Ice Sheet Capillary Effect Design

The underside of an ice sheet is cold. This attracts moisture in much the same way a glass container does when it is removed from the refrigerator and placed at normal room temperature. Because of this capillary action on the surface, any moisture below will eventually become ice itself. A combination of several construction methods is required to address this problem, including ensuring that minimal moisture is permitted to remain in, or enter into, the soil under the ice. Stop the cold of the ice pad from descending into the soil beneath, by either using insulation and/or heating through pipes or conduit. Alternatively, install the ice surface so that it is raised above ground level, thereby eliminating the freezing action entirely.

2.13 Ice Sheet Sub-Soil Insulation and Heating System

It's essential to have proper levels of insulation below an ice rink refrigeration piping system. Under-floor insulation that is supported by a soil heating system is critical to building performance in cold weather geographical locations. While this infrastructure is again hidden from sight, when done correctly, it will have a significant and ongoing return on investment to the operations. Seeking the most appropriate professional design information and support is recommended.

2.14 Natural Drainage Factors

The drainage of the overall site, including the parking lot and adjacent amenities, has been neglected in the construction of many arenas. Often there are no local regulations or by- laws pertaining to surface run-off. It is strongly recommended that a storm water management study be completed. In the end, every precaution should be taken to ensure that both the arena site and the adjacent grounds receive sufficient drainage treatment. Standard site feasibility assessments require two approaches.

- *Soil testing of the building site* to determine the soil conditions and sub-drainage. The findings indicate the type of footings or structural support that will be required and will also determine any source of underground water that could lead to future problems.
- *Surface drainage* given the existing grade of the overall site. Any necessary changes in grade are to be indicated on the site plan, along with necessary storm sewers and catch basins. This precaution could prevent costly flooding problems, especially during the spring season.

2.15 Utilities and Services

The proximity of utilities and services (water, electricity, storm and sewer lines, telephone, natural gas lines, cable TV, etc.) may be a determining factor in the final site selection. Water and electricity must be available near the intended arena location. Bringing services to the building can be expensive if the source is not located within a reasonable distance. It is common for a recreation construction project to accept the costs of installing an on-site transformer to supply electrical power to the building.

A drilled well in a rural area may prove to be a low-cost feature. The cost of municipal water and sewer can also influence the design selections of the refrigeration equipment. If water costs are high, alternate options may be possible, to reduce operating costs.

If a septic system is required, it is essential to ensure that the effluent is properly dissipated. Also ensure that no rock outcrops, or a similar condition, exist that would create costly excavation problems.

2.16 Direction of the Structure

For natural ice or outdoor artificial ice surfaces, climatic factors will dictate the orientation of the ice surface on the site. The direction of the sun and prevailing winds must be considered. In a modern, well-insulated facility, these factors are not as critical. The building can be situated to accommodate access to parking and general aesthetics.

Special consideration should be made for smaller, low-cost arenas that have limited or no seating along the south side of the building. A corridor or concourse between the rink boards and the exterior south wall will reduce radiation of the sun, thereby preventing soft spots or water pooling against the boards. This can also be overcome by planting a row of coniferous (evergreen) trees four or five feet from

the building. In areas with considerable snowfall, the snow can also act as an insulating medium, but one should not depend on snow to alleviate the problem.

The major entrance and foyer may need to be located to avoid strong prevalent winds. If possible, try to locate the building exits in a north-south direction. This will limit potential problems due to freezing and thawing along southern exposed areas and entrances, especially during the early and late seasonal weather periods.

2.17 Basic Roof Designs

Recreational facilities are often rectangular in shape, and can have a rounded, flat, or hip roof, or at times a modification, or a combination of these three basic types. Designing a roof with limited perforations will mitigate leakage. Roofing material selection should be carefully researched with a final decision based on at least a 25-year lifecycle. The roof should be as maintenance free as possible with limited exposed fasteners. Many roofing systems are being challenged by the increasing number of extreme weather events. Roofing crossbeams and purloins should be a finished steel structure. Common roofing materials include a rubber membrane, and/or stone, asphalt, or tar treatment. Researching the benefits of installing roofing insulation that is above Building Code requirements, is strongly recommended. There are many types of insulation products available in the marketplace with new products being developed. Some recreation facilities have opted for a living roof design where the final installation includes a membrane that supports vegetation growth.

2.18 Main/ Public Entrance Design

Controlling entry is important in all recreation facilities. Ease of access for users struggling with equipment bags or other large bulky items is common and should be given consideration. The main entrance can be located at one end of the building or in a central location. In smaller, low-capacity arenas, the main entrance is usually placed at one end of the building, mainly as a lower cost factor. The entrance must be accessible to all users. The main entrance is usually a common link to the dressing rooms. It is recommended that walkways, hallways, or main lobby entrances be twelve (12) feet wide for a hallway and twenty (20) feet wide for a lobby, to allow for ease of movement. Double door access leading to the dressing rooms and exits is strongly recommended as a minimum.

Skylights are commonly used to upgrade the daytime lighting and are also used to conserve energy costs within these areas. The main entrance should have a vestibule type entrance to assist in the loss of heat during cold seasons. The main doors should have wheelchair accessibility with push button doors or automatic sliders, with the push button located low enough for someone in a wheelchair to operate, as per the Building Code. A slope over the main entrance door is not recommended, as it is a liability with snow building up on the slope and an avalanche of snow falling down on patrons. It is recommended that the roof be sloped away from the front doors whenever possible.

The main entrance should be heated to maintain a safe walkway and entry to the facility. The control panel for the heat sensor should be within a reasonable distance of the front doors for easy management control. The ideal situation is to have the heat sensor tied into the energy management control system. Depending upon the intended capacity and type of activities, an entrance foyer should be sized to hold a minimum of 2% to 5% of the overall capacity of the facility. The larger the foyer, the more it will be appreciated by the patrons. In the case of a low seating capacity, a reasonably sized foyer can be utilized as a control point.

2.19 The Main Entry Sets the Tone of Respect

It is important to understand the importance of the first impression by those who enter a recreation facility. The warmth, colours and design should welcome and foster a feeling of respect for the facility that will follow the user through their entire visit. Designing comfort zones that are warm and inviting where a user has comfortable furniture, media access and other design features that foster social connection, are common. Moving away from an institutional design is recommended for structures that are viewed as community gathering locations.

2.20 Facility Door Design

Selecting and properly installing high quality doors and frames will often result in these features lasting

the full lifecycle of the building. Doors that fail to perform as designed, given weather temperature changes, is an indicator of incorrect door type selection and/or poor installation. Doors not only let patrons in, but they also let people safely out during evacuations. Selecting low-maintenance, high durability door hardware is as critical as door selection. Consider that the main entrance doors will open and close millions of times during the entire life of the structure.

2.21 Facility Locking Systems Design

Selecting a building locking design requires research so that the equipment matches the projected use. The objective is to select a locking system that is repairable or can be changed by facility staff on demand. There are systems that allow facility management complete and immediate control of all locked areas by changing a key core cylinder and replacing key access.

All panic hardware should contain universal lock cylinders as well. Multi-door entrances should have the option of removable centre posts.

2.22 Emergency Egress Design

Fire regulations require that all exit doors be clearly marked by a red exit light that is always lit. These doors are provided with hardware allowing the door to be opened outwards in an emergency. Exit doors should be unusually wide, allowing up to 4 people to exit simultaneously. These exit doors are of great assistance in facilitating crowd dispersal, especially if well located in relationship to the outside parking areas. The use of exits should be checked against local fire regulations.

2.23 Service Entrance Design

The service entrances should be designed to accommodate the delivery of items for normal operation. Besides ample room for trucks and large vehicles such as buses, there should also be sufficient area provided to receive material for special shows or events. There are many examples of large service doors opening into a corridor that is too small to maneuver a large truck.

2.24 Vestibule Design

In many front-entrance arenas, the area above the front foyer has been used for a medium size auditorium, and/or meeting and activity rooms. This multi-purpose space has created additional revenue for the recreation facility. In new, larger facilities this area has become open space, overlooking the main entrance. This open concept design has some merit, but also creates a costly, high maintenance, low-income space.

2.25 Controlling Roof Icing Design

Any ice build-up on a recreation facility is an indicator of poor roof design. A lack of insulation, poor vapour barrier or inadequate ventilation are the primary contributors to these types of issues. The cause can be singular or a combination of all these issues. Eaves troughing can help eliminate the problem of water running to outside doorways and freezing, creating a risk management situation. Some facilities have installed an electrical heating cable in the bottom of the trough, as well as the down pipe, to prevent the build-up of ice. The down pipe should be installed directly into the storm sewer system, eliminating possible flooding of the entrance doors and walkways.

2.26 Parking Lot Design

Paved parking is not a luxury but rather a maintenance reduction necessity. Paved parking that is properly maintained keeps dirt from entering the facility. Dirt that enters the facility destroys flooring, creates dust that will impact cleaning needs, and affects HVAC performance. The amount of parking spaces required will, to a large degree, depend upon the type and number of activities and events that occur in the arena. Other related activities or facilities that take advantage of a common parking area should also be considered. To provide an unusually large parking space for events that draw large crowds only occasionally is, of course, unrealistic. However, the site must provide sufficient or reasonable space for normal activities with some measure of anticipated special event demands. Other factors influencing parking demands are cost of land, related recreation facilities, public transportation, adjacent parking facilities for use at peak or overflow periods (such as shopping centers, public parking areas, etc.). Parking lot design must consider facility ventilation so that emissions are not drawn into the building. A well-lit and secure staff parking area should be considered. Also, consider the installation of electrical vehicle charging stations and designing the facility to be bicycle friendly. In regions that have snow accumulation, the need for

snow removal and possibly storage, should form part of the planning and design discussions. Recreation facilities often open early but are not deemed a priority in snow removal schedules. This causes liability issues as well as excessive snow buildup problems. Snow removal is a significant cost of doing business that should be planned for.

2.27 General Rules for Vehicular Parking

- allow one parking space for every four patrons (for normal attendance)
- allow 400-450 sq. ft. per vehicle for each parking space, which provides parking for over 100 cars per acre.

Check with your municipality regarding local parking regulations. EMS routes need to be defined and reviewed by by-law prior to signage being installed.

2.28 Landscaping Design

Unfortunately, landscaping of a recreation facility is often treated as a consideration only if there are a few spare dollars remaining after the building is completed and someone thinks that a sidewalk or some grass might improve the main entrance. Rarely is the overall appearance considered in terms of aesthetic qualities of the total site. When landscaping has been considered, along with the siting of the building, appearance and quality of building materials, easy access to the entrance and exits, and appropriate landscape materials used, then a favorable overall quality can be achieved. Attendance and local public support, provided there are reasonable attractions, cannot be excluded from the subject of overall landscape and site quality.

Facility landscaping is not merely the growing of grass and the placement of a few shrubs and trees at the entrance to the building. Landscaping is the enhancement of the total area by strategically placing landscape materials that may include turf, plant materials, paving, exterior lighting, parking, benches and fencing, etc., all in conjunction with, and complimentary to, the arena itself. The building and the overall site should be treated as a single design, relating the arena to parking, access, utilities, and final landscape improvements. Too often the grounds and the building are treated as separate entries when in fact, they are integral parts of the overall property and immediate surroundings.

The exit areas should have ample exit space to prevent the use of turf, which can result in a run-down and neglected appearance. Professionally designed, a minimum amount of turf and plant materials can complement the hard surface areas to create an attractive site. The design should be considered in relation to other community recreation areas and facilities. A properly and well-designed site can add immensely to the overall appearance. Consideration must also be given for winter snow removal and storage.

2.29 Building Glass Design

Glass is often a dominant feature of design, which produces a positive architectural appearance but no consideration of the cost to maintain these areas that have no revenue generation opportunity. Unless the client is prepared to accept the ongoing cost of cleaning and replacement of the glass it should be avoided. If selected, ensure glare does not impact users. Some designs with glass have created player vision issues as well as impacted the ability of lifeguards to observe swimmers. This impact will change with each season. The use of windows and/or skylights over an ice rink is not recommended as this may cause problems maintaining or installing a sheet of ice. During warmer days of operation, the sun can wreak havoc with the ice surface and ambient air temperatures.

There are many types of glass in the marketplace. Understanding the benefits and limitations of each type will need to be researched. It is recommended that all systems designed to allow natural light in have common dimensions. Custom units are expensive to replace. Placement of each unit should consider the potential for vandalism. Some designs where the installation was in proximity to exterior rock landscaping, soon realized that the low maintenance of this type of design created other issues. Anywhere that natural light can be safely introduced into common areas should be explored to support energy efficiency of the design.

There is debate over the benefit of allowing natural ventilation by selecting windows that can open. The challenge then becomes designing an HVAC system that can accommodate this approach.

2.30 Interior Wall Design

Interior walls of a recreation facility will take a lot of abuse and potentially vandalism. Creating a culture

of 'facility respect' at the time of opening will serve the operation well over its life. Walls are most often concrete block with vertical concrete pillars as the major roof-bearing structure, or can be wood, sheet metal, brick, or a combination of materials. Walls should be finished in a material that will take abuse by users while being easy to maintain. In the entranceways of some facilities, concrete architectural block is being used as an upgrade to replace the traditional monotony of concrete block.

2.31 Exterior Wall Design

If concrete blocks are laid in an inset pattern, precaution should be exercised, so that the protrusions are not sufficient to allow a wall to be climbed. A 1/4" inset will provide the desired wall patterns and prevent climbing on the wall. Landscaping should be installed to protect from vehicle damage, or prevention of the insulation and vapour barrier being displaced, creating a thermal bridge effect, heat loss or moisture penetration.

2.32 Furniture Design

All selected furniture must not only blend into the colour and building design, but it must also be durable and easy to clean and disinfect. Any furniture that will be stored between use requires adequate storage and the ability of furniture carts to move seamlessly between locations. Struggling to get through doors or around corners to move furniture must be considered during the planning process.

2.33 HVAC and Dehumidification System Design

There are many advancing designs that function well in a recreation facility. A shift from referring to air exchange as "ventilation" to "ventilation and air filtration" was highlighted during the pandemic as building owners focused efforts to control spread of the virus in facilities, beyond keeping surfaces clean and occupants socially distanced. Research offered evidence that proper ventilation and air filtration were critical components in controlling the spread of the illness. Many public facilities upgraded the appropriate processes and equipment, adopted ASHRAE strategies, and invested in remedies such as UV-C technology, to protect the health of all who used or worked in recreation facilities. Good indoor air quality is building priority that requires research and adequate investment at the time of design and construction.

Commercial HVAC systems contain interconnected systems that provide heating, ventilation, and cooling to individual floors, and/ or other areas within the structure.

There are four (4) common types of HVAC systems.

1. Split systems
2. Hybrid systems
3. Duct-free systems
4. Packaged heating and air systems.

Commercial HVAC systems may include heat pumps that extract heat from the air or water for heating purposes. Factors that need to be considered are quality of air, temperature of air, velocity of air flow, direction of air flow in the air-conditioned space and relative humidity. Factors that affect HVAC design include heat load calculations which include:

- Heat gained from the walls: The walls of the room gain heat from the sun by way of conduction.
- Heat gained from the roof and partitions: If the roof is exposed directly to the sun, it absorbs maximum heat.

Three (3) of the most commonly used systems for commercial buildings are:

1. Variable-air-volume (VAV) systems with a packaged rooftop unit.
2. Chiller, cooling tower and boiler systems.
3. Water-source heat pump systems with a cooling tower and boiler.

Design factors include:

- Will there be an air conditioning system?
- The size of the system and the available space
- Ducts and ventilation
- Cooling and heating loads
- Energy efficiency
- Cost-effectiveness
- Ease of maintenance and service
- Accessibility to parts
- Health and safety requirements.

The three (3) most important elements when designing an ice rink facility are the envelope, ice sheet and air dehumidification. Key focus should be placed on:

- Designing a tight building enclosure.
- The vapour barrier goes on the outside of insulation regardless of building location.
- Low-e (emissivity) ceilings will help reduce heat load on the ice sheet.
- Avoid window installation on the west side of the building where solar load is greatest.
- Provide people with access through a vestibule with airlock to reduce infiltration.
- Consider location and access of the resurfacing machine to minimize outdoor air leakage.

Calculating the dehumidification load and outside air (OA) quantity is the first step in sizing the HVAC system for an ice rink. The ice sheet typically provides the entire cooling requirement; the HVAC system's primary function in an ice rink is to dehumidify. The OA is the largest dehumidification load for the rink. Outside air is brought into the space to dilute contaminants and maintain IAQ requirements. It is most effective to dehumidify or treat the OA before it enters the building and to use dew point sensor control, not relative humidity control. In addition, by incorporating CO and CO2 sensors or an occupied/unoccupied mode time clock, the facility will be able to reduce and monitor the amount of OA being delivered to the space. Since ice rinks require a large OA quantity and the differential between space condition and OA condition can be extreme, energy recovery is often a good enhancement to the dehumidifier. An enthalpy wheel can be added to dehumidification equipment to lower the work required by the active desiccant dehumidification portion of the equipment and provide substantially lower operating costs. Once the equipment has been selected, it needs to be positioned and ductwork sized and arranged. Air distribution is generally routed around the rink, but care should be taken so that supply air does not discharge on to the ice surface as sublimation or melting of the ice is possible. High supply that is parallel to the floor has worked well, with the return at floor level and close to the unit. Units mounted inside require condensation control for the specific ductwork system to avoid moisture problems. The outside air duct should be positively drained and insulated to minimize and control condensation inside the ductwork in the summer. Reactivation ductwork for desiccant systems should be treated the same as outside air ductwork. A reoccurring mistake in facilities with multiple ice sheets is to utilize common return ductwork from all ice sheets. Supply and return ductwork should be designed so that individual ice sheets can be isolated when they are taken offline for nonuse periods or maintenance. High return conditions will overload the capacity of the dehumidification equipment if return from an offline sheet is allowed to recirculate through the dehumidifier.

Frequently air is blown into locker rooms from the rink, or exhaust fans are used to migrate air from the rink to the locker rooms. "Rink air" is very expensive to produce and it is not encouraged to release that cool, low dewpoint air for distribution to other areas of the arena. It is more cost efficient to install smaller, separate systems to condition the locker rooms and other common areas. The building load differs greatly depending on the type of occupancy and the number of people in any specific area or time. For example, after game larger groups of people typically crowd the locker room with increased metabolisms and raised temperatures. This type of swing occupancy in a space needs a dedicated system to efficiently provide healthy IAQ for occupants. If designed properly, the system will contribute to the total building energy savings by shutting off exhaust fans when the space is not occupied, to minimize operating costs.

Air flow and temperature comfort in an aquatic environment is critical. A swimming experience should be comfortable, healthy and have good air quality. When designing an aquatic facility, the relative humidity, air temperature, pool water temperature, pool activity levels, air distribution, outdoor air, exhaust air and pool water treatment are all key aspects that must be addressed to provide a good environment. While 50-60% relative humidity levels are ideal for bather comfort and health they can lead to condensation problems and serious damage to the building structure. If the building structure itself has not been properly

designed for this higher humidity application catastrophic results may occur.

An aquatic facility is one of the most difficult facilities to design because there are so many critical considerations that, if overlooked, can develop into problems with the building structure or complaints from the occupants. The designer must take a complete system approach, from basic engineering issues to the more subtle details in the air distribution. Experience and a complete understanding of the design issues help the designer satisfy:

- Comfort and health
- Humidity control
- Indoor air quality
- Condensation control

The pandemic exposed air flow design issues such as circulation and air filtration, in many public facilities. New designs must improve air heating, cooling, and circulation design. The architect should refer to current ASHRAE design recommendations. The design team must embrace the fact that HVAC investment in a new facility is no place to try and reduce construction.

2.34 Public Washroom Design

Washrooms in recreation facilities are undergoing significant change to reflect demographics, ease of access, and improved hygiene through cleaning, disinfection, and sanitization. More than 50% of all facility visitors will use these areas during their visit so there is a significant benefit in properly investing in the design and construction of these high traffic spaces. As a priority, design these areas to reduce vandalism or other damage and select materials that are durable and easy to clean and sanitize.

Whenever possible, design the entry to these areas with no doors. This reduces touchpoints for the transfer of germs and bacteria while reducing maintenance costs.

The minimum number of washroom fixtures are calculated based on maximum user loads as set out in the Building Code. Exceeding minimum requirements is recommended to ensure comfort and accessibility during peak periods.

Toilets should be wall hung for a better visual appearance and to ease cleaning. The toilet seat must be open as required under public health regulations and toilets are usually white to show unwanted dirt.

Accessible and easy to enter toilet areas that can accommodate a wheelchair or other mobility devices must be included in the design. Separate washrooms to accommodate persons with disabilities is another option. Giving the construction sub-committee of persons with disabilities the task of providing design feedback should be considered.

Washroom partitions should be a very durable plastic, approximately 1-inch thick. These partitions will last years and withstand all types of vandalism. Locks and hinges should be selected for durability and low maintenance. Keep an inventory of replacement parts and pieces, to ensure the facility maintains its original design and appearance.

Upright urinals are best in the men's room as the trough, or horizontal floor type, has not proven satisfactory or hygienic. The shift to waterless urinals has been slow as they are in fact water saving devices but do require special attention to maintain.

Sinks should be selected for ease of cleaning. Touch free faucets and soap dispensers are common in most facilities. There is no legal requirement to provide hot water to public sinks as cold water and soap has the same hygiene affect. Hot or tepid water is a customer service comfort decision.

Counter tops should be avoided to reduce cleaning and maintenance. If selected, they should be one-piece and a durable material such as hard marble/stone finish. Some counter tops and sinks can come as one piece, which are attractive and easy to maintain.

Pending the design of the entire facility, some designs include the availability for outdoor access to indoor public washrooms, especially when a multi-use facility has a nearby sports field. Having access to existing washrooms is both a convenience to the user and a cost savings to the client as separate outdoor facilities will not be required.

2.35 Changeroom, Checkroom and Locker Design

Changerooms are areas where users will remove street clothes and dress for the intended recreational activity. There will be different levels of dress and family interaction to be considered. Pending the design and projected use of the facility, the need to control personal items during events will need to be considered. Lockers that allow for the storage of personal items while using a fitness area, aquatic centre, or ice-skating session is a reasonable investment to be considered. If properly designed, the storage area may present a revenue generating opportunity.

The number of changerooms needed will be based on the projected use of the facility. Buildings that plan to offer competition events or tournaments should have changeroom capacity that will allow for adequate team accommodation. Cleaning between events, the size of player and equipment will all need to be considered. The size of some hockey bags often matches the size of the player who is dragging it. Some teams will be player only while other teams will have parent or guardian support to dress for the activity.

Consider the current and future demographics of players. At times females may need separate changerooms. The design must also accommodate users with special needs. All rooms should be designed to current disability standards.

Each dressing room should have a minimum of two floor drains, one in the dressing room and the other in the washroom area; both drains should be 6" in diameter. It is recommended that a floor drain be installed just outside the shower entrance. Proper installation should ensure that the drain is in fact the lowest part of the floor.

A single pad arena should have no less than six (6) dressing rooms with eight (8) being preferred. These rooms should be no less than 20' x 20' exclusive of the shower and washroom area. A chalk or white board should be installed in a location that is accessible to the coach and the players. All dressing rooms should include a metal stick rack.

2.36 Reduced Maintenance Changeroom Design

When designing the changerooms nothing should be attached to the floor and all walls, floors and features should be water friendly. Some advanced designs include the ability for staff to enter the room and remove all dirt from the floor. Consider a water bib outlet located under each washroom sink, away from public view.

The floor, walls, benches, showers, washroom areas are sprayed with a cleaning and disinfection agent, power washed, with the wastewater going to a drain. A wet vac is used to remove any excess water and the building ventilation system is designed to quickly dry the area. Taking the time to properly design and invest in these high traffic areas will save staffing costs for the life of the facility.

2.37 Shower Design

Many facilities have moved away from open showers and moved towards a single private design. The open shower concept is more maintenance friendly while separate showers are more comfortable for the user. Given the needs of female users the design team should ensure that the final construction is inviting and safe. Changerooms must meet or exceed barrier free design standards. Common additions include a wash chair, showerheads with an extended hose to allow a long reach, and an emergency switch, which should be hooked to a flashing light outside the area to notify that someone in the room needs assistance.

Beyond the changeroom area design, getting persons with disabilities safely and without restriction to the recreation area will require research.

Designing the water source to a shower will also need discussion. Some facilities have opted for on demand hot water tanks to service 1 or 2 dressing rooms rather than transporting hot water from a boiler system that is far from the changeroom. If a central water heating system is to be used, then a circulation pump that delivers the water quickly is required. Controlling water use by way of a push button device that is tamper proof should be considered.

The shower area, including the floor and walls, should be tiled. Tile is more expensive to install but

is durable, easy to maintain and considered low-maintenance, saving staff time. Other options for the shower area are the use of plastic tiling, painted concrete walls, or the use of spray-on epoxy paint. These options are cheaper in the short term but have a higher ongoing maintenance cost.

Having an open ceiling to the dressing reduces moisture and condensation on the walls and ceilings of the shower area. Proper ventilation is essential. The use of an exhaust fan to the exterior will help provide adequate air ventilation by removing air moisture. Separating or dividing the shower room from the dressing room can provide a much-appreciated drying area.

2.38 Changeroom Benches and Hooks

All benches should be designed to be "free hanging" for ease of maintenance. The top of the bench should be a material that is easy to clean and disinfect.

Adequate clothing hooks above each space should be in place. These hooks must be durable to prevent vandalism. Installing a shelf is not required but often appreciated by users. These devices should be designed for use by both children and adults.

2.39 Change Room Flooring Design

The floor materials for use in dressing rooms should be comfortable to a bare foot and able to withstand extreme wear from traffic and in some areas skate blade contact. Research the marketplace for new materials that exceed proven installations. Choose the correct colour that not only matches the décor but also remains visually attractive during high use periods. The installation should be wall-to-wall with no water penetration points. Ensure that the floor drain installation is not disrupted during installation and the drain area is properly sealed.

Poured concrete floors with strategically placed protective matting may be a construction saving but will result in significant ongoing maintenance costs. Checking with public health as to the cleaning and sanitizing requirements of these installations is recommended.

2.40 Changeroom Doors, Locks and Hardware Design

Public facilities require heavy-duty doors, locks, and hardware to handle the ongoing use and abuse. The door design will be directed by the Building Code and meet the Fire Code where applicable. Adopted design features include doors that are made of 18-gauge steel with weldless seams. The door should be attached to a minimum 16-gauge steel frame. The door is best mounted to the frame using an industrial piano hinge that is installed from the top to the bottom of the door.

Heavy-duty door closures should be installed, pending the possible requirements of the Building Code. Purchasing several replacement closures to be held in stock is also recommended.

Dressing room security has been an ongoing industry challenge. The selected system must meet the restrictions of the Fire Code and provide adequate privacy but should not present an opportunity for misbehavior by locking from the inside. Some operations provide a locking design that allows the user to secure the door to control access.

If installing a traditional key system, select a design that ensures that the key lock and the handle on the door do not interfere with each other. The key lock should be located over the push/pull handle on the door as it allows easy turning of the key and stops users from jamming items into the key slot. Accessibility design should also be considered.

2.41 Changeroom Ceiling Design

Change rooms installed under seating areas, a common construction method, results in a concrete changeroom ceiling. Advancing construction methods allow for a dye to be injected into a plain concrete base to provide a permanent colouring. If not used, applying an epoxy paint will assist in maintenance. Another durable ceiling material is Duro-rock. Drywall should be avoided in a recreation facility as it is not considered durable and will require constant repair. All ceiling lights should be flush with the ceiling and covered with a steel cage. There should be no exposed pipes, except for sprinkler pipes.

2.42 Equipment Drying Room Design

Pending the design and expected use of the facility an equipment drying room may be considered. Often these options are offered when the facility is home to a competitive team. This area is best located adjacent to the team's dressing and

equipment storage room. Using the dehumidification system, a small duct drop from the discharge can provide a warm, dry airstream to facilitate drying of equipment before mould or odors set in. This system is a good sanitary practice and promotes odor free equipment. This area is also good for hockey bag storage for tournaments.

2.43 Officials Room Design

A room for game officials needs to be considered. This space should be close to the play area, away from the route to the changerooms, and also be close to an exit to the parking lot. The referee's room should not flow out to the lobby area. The design team should confirm whether the room will be restricted to single use or a home base for officials to leave personal items between events. The room should house a washroom/shower area and be designed for all genders. Lockers should be installed. An official's room does not have to be provided at no cost. A rental fee can be considered as part of the user fee system.

2.44 Personal Water Fill Stations Design

Providing personal water bottle fill stations will help move away from single use bottles. Locate these stations away from high bacteria areas such as washrooms. Design the station with a push button tap, hooked directly to cold water, located high enough to ensure water spillage stays in the basin.

2.45 Concessions/Food Services Design

Providing food services in a recreation facility requires careful thought and planning. The size and design must reflect the projected use of the facility and traffic flow. Larger communities or cities will be targeted by fast food franchises wanting to locate in high traffic areas of the facility. This can reduce potential profits and leave operational staff to handle the waste generated from other points of sale. The focus by Public Health departments, to have facility managers create "eating healthy at the rink" programs, is a socially accepted objective; however, these types of foods have a short and expensive shelf life which results in disposal and reduced profits. Finding a balance of facility operated, outsourced service providers, and vending access will require research as there is no one plan that will work in every building.

2.46 Food Preparation Area Design

Food preparation areas are spaces designed to prepare, serve, and clean food for large gatherings of people. Only industrial designed equipment should be installed. Consulting with public health officials on design expectations is recommended. Also, investing in an expert who has experience in designing these areas should be considered. Creating a user-friendly space that has proper equipment and is easy to clean and sanitize is the objective.

2.47 Telephones, Wi-Fi, and Future Technology Needs

There was a time when the recreation facility payphone was an essential part of the design, but this has very much shifted as cellular phones expanded into almost every person's hand. However, under swimming pool regulations there is a legal obligation to have an emergency phone, and this must be complied with. Investing in open public access to strong wi-fi signals is a good investment.

2.48 Staff Communications

The design team should consider how staff will communicate with each other. Handheld devices must be selected to function in a facility that has a high concentration of steel and concrete. Access to computers will only increase in demand. Speaking with technology service providers to determine design features would be diligent.

2.49 Facility Sound System Design

Consider a communication system that may be operated separately for events or used as part of the facility's emergency communication plan. Select quality speakers that deliver clear sound for each area and will not be impacted by the environment. Installing sound systems in change, locker and public washrooms should be part of the facility's emergency evacuation communication design. Having outdoor speakers attached to the system and wireless mics should also be considered.

Although it may be reasonable to design a system from construction drawings, adding a minimum of 25% more communication equipment, to be installed once the building is nearing completion, is recommended. Being able to view what is needed in real time will often bring fresh ideas or needs. Keeping original replacement parts in stock will be appreciated later in the facility's lifecycle.

2.50 Public and Operational Communication Centre Design

The traditional bulletin board that provided information on daily, weekly, and coming special events is being replaced with digital screens. The design team will need to consider what form of communication will best meet the needs of the operation. It is also a potential income source by selling advertising space to local merchants. The board should be posted with colourful, carefully lettered notices. Careless, misspelled, or out-of-date notices rob the bulletin board of its promotional value.

2.51 Facility Advertising and Branding Plans

Consider the branding of the facility during the design research, to blend various elements and reflect the building's purpose. Many traditional recreation facilities use verbiage such as "health and fitness centre" or "wellness centre", rather than "ice rink", "pool" or "community hall" as it better reflects the diverse, current and future needs of a community.

Advertising is a facility revenue generation opportunity that should not be given to users to profit from. Deciding what the advertising plan might look like will allow for proper electrical connections, access points for working at heights, as well as possible engineered anchor points.

Creating a policy as to what can or cannot be advertised such as alcohol, cannabis etc., will be helpful to facility administrative staff. It is recommended that facility staff create a facility marketing plan as a revenue source. There are reasons that outside agencies are glad to accept the responsibility of selling ads – there is money to be made.

2.52 Exterior Signage Design

Consider whether the facility will benefit from an electronic signage board to advertise upcoming events or promote services. These boards also provide advertising revenue opportunities.

2.53 User Award Display Area Design

Banners, pennants, and trophies are nice reminders of past sporting success but can be an operational and maintenance challenge to staff. All hung items must be fire resistant, they will require cleaning as to not support mold growth. Creating a policy at the time of construction is strongly recommended. The design team should discuss the need for the inclusion of a local sports hall of fame.

2.54 Supervisory Control Area Design

The supervision and control of staff, patrons and participants is exceedingly important for a successful operation. The locations of the manager's office and ticket/admission office are critical in the execution of proper arena management. The smaller the projected staffing levels are, the more critical these designs become. Locating supervisory offices and staff areas out of sight will leave the building unattended. The manager's and facility operators' office(s) should provide ready access to public areas while also having a view of an ice surface or aquatic bowl, providing added supervision and a quick response, if required.

2.55 Operational Control Centre Design

New technology that allows for remote monitoring of equipment in public facilities continues to expand and should be considered as an operational norm moving forward. Designing the facility so that all monitoring equipment is centralized would be a positive investment.

2.56 Admissions Sales and Customer Service Centre Design

Ideally, the entrance and foyer should provide a direct path to one or more customer service and/or admission sales locations. These areas need to be designed to both control and enhance the flow of patrons in and out of the facility, ensuring there is no disconnect as people purchase or show proof of admission. In smaller venues these locations are often connected to the manager's and/or facility staff office. This provides considerable efficiency for the office personnel or the manager, who can handle advance ticket sales or provide information easily from a centralized location. Portable ticket booths can also be provided for special occasions.

A small foyer is often designed as part of the admission area, which in some regions is very cold and drafty since the exterior doors are held open to admit even a short line-up of patrons. This creates an unpleasant area for both the patrons and the staff. The design should address these challenges.

2.57 First Response Equipment Installation Design

There are no legal obligations to install First Aid rooms, kits, or AEDs in a recreation facility. An aquatic facility has first response and First Aid kit availability requirements set out in their regulation. The decision to install any first response equipment comes with an obligation to maintain the equipment to ensure availability and proper function when required. Access to EpiPens and Naloxone kits in public locations is an individual operational decision, not a legal requirement.

First Aid requirements for workers is set out in Regulation 1101 and is a requirement to be met by supervisory staff of the facility. The design team should carefully research the expected level of first response by facility staff and accept the related costs of having and maintaining this equipment as well as the required investment is staff training.

2.58 Facility Security Design

Designing the building to provide maximum security is essential. Not only will these designs help control access and traffic when designed correctly, they will reduce maintenance costs as limiting access reduces waste and dirt deposits. Open concept public facilities allow for constant visual assessment of the conduct and safety of all who are in the building. These designs further promote proper air circulation.

2.59 Security Equipment Room Design

There was a time when security cameras and recording devices were limited to high-risk locations and communities. However, the benefit of having such equipment to assist in defending against legal action has justified the investment in this equipment. Designing and constructing a specific climate-controlled room to house this equipment securely should be considered. If this type of equipment is deemed to be a low priority by the design team, consider the future needs of facility managers during the entire life of the building.

2.60 Point of Sale Technology Design

Designing the facility to be "cash free" is recommended. Every design feature that will be a possible revenue source should be installed to accept payment electronically. The need for a safe, drop box or other features used to safely secure cash is a design team discussion point.

2.61 Operational Services

The previous comments on circulation apply as well to the operational services, such as custodial, janitorial, maintenance and policing.

Easy access to all parts of the arena allows for a much more efficient operation and service to the public. All areas should be well lit at all times. Dead end corridors and hidden corridor areas are to be avoided in any design, as they will create problems for staff. Janitorial ease of upkeep and convenience depends to a large degree upon two factors:

1. traffic flow and circulation
2. type and quality of building materials

A good building design considers janitorial problems and provides sufficient concourse or corridor space to allow for an efficient cleaning pattern. Of equal importance are the type and quality of materials used for walls and floors. A later section will deal with the general choices available.

The extent of policing, supervision and service will depend upon the number and type of activities and events. It is customary for the local police in smaller municipalities to either assist directly or be paid for special services at the arena. Medium and larger arenas usually hire off-duty policemen or take advantage of private protection personnel, on an hourly or contract basis. Some special activities may involve a greater police presence than typical events.

Some type of security protection may be required on a (24) twenty four-hour basis. A security system may be installed in certain areas such as the concession outlets and in the ticket, managers, and facility operator's offices. The use of a CCTV security system allows (24) twenty four-hour security that is tied in with the building's alarm system and connected directly to a security company that can respond quickly. This may further assist in reducing insurance costs.

2.62 Storage Space Design

Most recreation facilities are designed with insufficient, or poorly located, storage space. Most people go to a recreation facility for exercise while too many facility staff get their exercise at work. An average recreation worker will walk 10km in a typical 8-hour shift - much of this caused by poor facility

design. Of all the advice and direction that facility staff will provide, storage needs, location and design require special attention. Again, the design is for a 50-year period which will go through many different cycles of use.

Mechanical and electrical rooms are NOT storage rooms. It is important that the design team understand the regulated restrictions of use for these areas. In most cases, storage of any item is usually restricted to equipment or devices required for the maintenance, repair or replacement of equipment installed in that area. Placing light bulbs, janitorial supplies etc.is unacceptable as they may present a fire hazard.

Dead space areas may supplement storage locations but should not be the sole storage space. Areas under the seating in an arena may seem reasonable but these are often difficult to properly store anything. Continually moving items around to access specific items is a waste of staff time.

If feasible, design a large, attached garage-style room that blends into the design. Pending the size of the facility, industrial shelving should be installed in the same design as large hardware supply box stores. A mobile device that can lift and move equipment, furniture, insulated ice deck etc., will quickly repay the investment in reduced staff time and reduced chance of worker injury. A facility workshop should be considered where staff can make repairs to equipment. Having a specifically designed area that can house a variety of tools and equipment can significantly reduce the reliance on outside contractors. A dedicated workspace further controls dust, painting mess and other situations, which will get tracked throughout the facility, when done in areas not designed for this type of work.

Specific rooms for programming equipment may be required. An aquatic facility with different items for learn to swim, water aerobics, etc. should not be stored with staff cleaning or janitorial supplies.

Adding an unattached cold storage building to place seasonal equipment such picnic tables, waste containers, playground equipment etc. will always be used.

Again, pending the size and design of the facility several areas to store lights, janitorial supplies, cleaning equipment etc., strategically placed to reduce staff time to move to and from these areas, will have a quick return on investment in reduced staff time allowing workers to perform more effectively.

Facilities that have indicated that tournament play will be an important part of their recreation program, would benefit from the creation of a dedicated area for player equipment during games. This may seem like a luxury; however, it will reduce piles of equipment bags being stacked in common areas, often blocking emergency egress doors.

2.63 Facility Housekeeping Room Design

Public facility cleaning, disinfection and sanitization have become a high priority for those who manage and use these facilities. In previous projects these areas would often be referred to as janitorial "closets". Strategically placing well designed rooms that allow for proper storage and easy access of equipment and supplies is essential. These larger rooms should be supported with smaller storage areas that will allow for quick access during peak periods. A simple design test is how far would a staff member have to go to retrieve a roll of toilet paper. This to and from process costs staff time and money for the entire lifecycle of the facility.

The room will require water and electricity and should be designed and constructed to code. Design slop sinks with no required lifting of heavy pails of water to reduce the chances of worker injury. Consider if these areas would benefit from a double door installation that would allow for easy access for floor maintenance or storage of other future equipment. Be sure these rooms have good ventilation that will reduce smell and support drying of mops and other tools. Shelving should be selected to meet current chemical storage standards.

2.64 Facility Waste Control Design

Recreation facility's generate significant waste. Deciding if the facility will invest in recycling requires planning and investment. The perception of being environmentally friendly and the reality of costs associated with this vision are often disconnected in the planning stage. If the community does not have a proven recycling program it is unrealistic to expect the facility to be environmentally focused.

Moving waste through the facility to its collection area must form part of the building design. It is important to consider significant events that may occur in the structure and design the exterior waste collection location accordingly.

Collecting waste at main entry points is essential to maintaining a clean and tidy perception. Overflowing waste collection containers send the wrong message. Exploring new technologies such as waste systems that can accept waste for six (6) months or more, are available in the marketplace. These deigns require a deep well to be dug and a liner of more than 12 feet to be installed. The natural weight of the deposited waste compacts itself. It will require heavy equipment to remove and dispose of but the saving of staff time in not dealing with this area on a daily basis has a return on investment. The example is not given to require such an investment, but rather to showcase the opportunities for efficient operations and maintenance that are available.

2.65 Safe Fossil Fuel Storage Design

An audit of possible fossil fuels required for the operation should be performed. Once complete, a review of safe storage of these fuels, as set out in the applicable piece of legislation, should be undertaken. Providing a secure, well-lit area that is protected from vehicle traffic are basic construction and design requirements.

2.66 Back-up Power Supply Design

The design team should discuss the need and benefit of a back-up power supply. If the facility is to be used as an emergency shelter, then this equipment should be installed. The size of the unit required will be based on what equipment needs to be operational should there be a long-term power failure. This back-up system may require a large fuel holding tank which will need to be monitored and maintained. Meeting environmental designs will be costly. Maintenance and upkeep of this equipment needs to be part of the operational budget.

2.67 Conclusion

The information shared in this Module is a collection of historical challenges and approaches to improving operations by practitioners. By considering each point, the design team will be proactive in their efforts to create an inviting and functional recreational facility.

MODULE THREE

Ice Sheet: Design and Construction Considerations

3.0 Introduction

Ice sheets are a traditional installation to many recreational facilities. The advancements in design and construction have been significant. Constructing an ice sheet that will meet the needs of the community for the next 50+years will take research. An accepted ratio is one (1) artificial ice rink per 20,000 people.

3.1 What Does it Cost to Build a New Rink?

Ice rink construction costs, like everything else, is driven by design, want and need. The temptation to overbuild by communities that do not have the financial ability to afford the final construction is a chronic problem. This is often driven by other regional investment. The cost will be driven by what is wanted.

2021 - The cost to build a new ice pad and community centre in Beeton, Ontario appears to be increasing with every passing day. An updated cost estimate for the proposed facility sits at just over $29.5 million, which is almost $11 million more than the original estimate of $18.6 million, which was provided in 2018.

2021 - The Ma-te-Way Activity Centre in the town of Renfrew is a $15.9 million expansion of the facility.

2020 - The new community and recreation centre slated for West Ferris could cost the city at least $30 million in construction costs, the architects behind the building's design revealed this week.

2017 - The Pelham Community Centre is a $35 million, two-story recreational facility with two NHL-sized ice pads, one with 1,000 seats, along with a double gym and multi-purpose rooms.

Rink in a Box - To address the financial hurdle Rink in a Box has put together a boilerplate practice rink design that incorporates all the essential spaces of an ice arena. Using a standard template, rather than a unique design process, provides cost savings and efficiencies in the design and construction process. Rink in a Box has a basic ice rink framework at less than $6 million, including the ice surface, seating for 200, locker rooms, lobby and office, training space, concessions, and meeting spaces.

3.2 Design Questions

There are several key questions to be determined before design can occur. They include but are not limited to:

- Will there be one (1) pad or several?
- What level of competition will be played?
- Will the ice be left in year-round, or will the facility be a multi-purpose event centre?
- Will events be held during ice-in periods? If so, will the ice be removed or covered with an insulated floor?

3.3 Types of Arena Designs

Participation sheets are designed primarily for play with limited seating for spectators.

One-sided seating reduces the size of the operation as the ice sheet will be close to an exterior wall on the other side of the design. This reduces refrigeration and air management requirements as well as housekeeping.

Placing seating on both ends of the sheet, as well as completely surrounding the bowl, are the next stages of design to be considered. Again, this will be based on the current and projected growth in use.

3.4 Ice Dimensions

There is no legal requirement for specific ice rink dimensions. These decisions are often driven by regional need. All sporting organizations that may use the facility should be consulted regarding their specific needs. The objective is to have an exact dimension adhered to when installed, meaning if the design is 85 x 185 ft., it should not be 84 ft. 6 in. x 184 ft. 2in. The design should have few pieces of shielding that are not common sizes. Custom shielding will take longer to source and be much more expensive.

Common ice sheet dimensions (in feet) include:

- 85/90 x 185 – community rink
- 85 x 200 – NHL rink
- 100 x 200 – Olympic competitive rink

Some facilities have been designed to expand meaning that an Olympic design is put in place, but an NHL size sheet is the primary use. Seating and dasherboards are removed when an Olympic sheet are requested. This is an example of planning for growth and flexible service provision that, if included, is a small additional expense.

3.5 Spectator Seating Design

There are several types of seating available for an arena facility. If the seating is merely planking secured to concrete or wood risers and therefore subject to considerable foot traffic, paint or sealers should be applied once a year. Seats can be subject to a lot of abuse and wear if skaters are allowed to use them during Public Skating hours. Skaters should be limited to changing at ice level (in change rooms), to eliminate any liability of skaters climbing up and down steps. he best quality seats are flip-up, molded plastic seats and back, on a steel frame. These seats are available as a single or set of two per frame. Seat backs can be curved or straight. Medium quality seats are bench-like in character and do not flip or pivot. Molded plastic seats with no backs can also be purchased. The simplest type of seat is merely planking secured to a wooden or concrete riser with no backrest.

3.6 Multiple Pad Design

Designing a facility with multiple pads has many operational and construction benefits. Putting several pads under one roof allows for efficient staffing and management. A single refrigeration system to provide cooling to several pads also creates efficiencies. The design will attract tournament play.

3.7 Refrigeration Plant Design

The refrigeration room is the heart of any ice sheet operation. The size and design of the refrigeration plant will dictate the required level of competency of the persons in care and control of this system. Researching regulated responsibilities associated with the selected system is strongly recommended. The refrigeration system should be selected for its simplicity and efficiency. The introduction of “self-contained” or skid packaged plants to enable the facility owner to exceed set equipment horsepower ratings for certified staff requirements seems reasonable at the time of construction. However, the design team should research options beyond the recommendations of the architect. The objective should be the ability of the facility manager to reduce reliance on outside service contractors as much as possible once installed. Refrigeration equipment that has advanced technology will

require knowledgeable staff. This becomes more critical as the equipment ages. It is essential that the equipment be managed properly from the first day of operation. Staff should ensure that the system is being maintained to the manufacturer's recommendations, so that the warranty is available. It is important to note that once the system is installed and signed off as part of the construction project, the warranty period may begin whether the equipment is operational or not. Keeping the equipment design and installation with the same provider will eliminate a debate as to why the system may not be performing properly once installed. In addition, having the same provider also being responsible for overseeing the installation and integration of the air management and dehumidification systems is strongly recommended. When different service providers are selected to perform work that interfaces with various mechanical and electrical systems, it's difficult to determine the responsibility for improper function post construction. It's a good investment to have an independent evaluation of the recommended refrigeration and air management design prior to installation.

3.8 Refrigeration System Design Code

Refrigeration systems must meet the CSA B-52 Mechanical Refrigeration Code. These requirements are minimum design and construction standards. Exceeding these minimums will help ensure that the system will be safe and functional for the entire lifecycle. Selection of refrigerants will dictate room design requirements.

3.9 Built-up Refrigeration Plant Design

Built-up refrigeration system design is having each component delivered and assembled on site. Plant design and registered horsepower will dictate the level of operator certification. Regardless of registration, the required competency of those "responsible" for the plants operation and maintenance remains the same.

3.10 Self-Contained Refrigeration Plant Design

The system is manufactured off site and delivered on a skid to the facility and placed in the refrigeration room. Consider that everything being placed in the room at the time of construction will one day need to be replaced. Placing any piece in the room and then completing a wall system is creating an equipment replacement problem for a future manager. These systems are often recommended when significant plant horsepower is required. These plants allow owners to operate without certified operators being present, which may seem like a cost saving opportunity. However, while the requirement to have competent and capable staff may not be a regulated responsibility, it does remain the responsibility of the owner to ensure the plant is operated and maintained by skilled personnel. Inadequate staffing levels are never a long-term cost saving measure.

3.11 Plant Room Ventilation Design

The plant room's ventilation system must be designed to respond safely and effectively should there be a significant refrigerant leak. The exact requirements will be based on the type and amount of primary refrigerant held within the system.

3.12 Eyewash/Deluge Shower Design

Installation of these safety devices will be based on refrigerant selection. There are set standards that must be met for the design and installation, if required or desired.

3.13 Refrigerant Options

The marketplace continues to evolve with design, equipment, and refrigerant options. Selection should be based on proven operations from other similar applications. Traditional ammonia/brine systems are efficient and less expensive to install; however, they are often more expensive to maintain over their lifecycle. A freon/brine system is similar to ammonia/brine in its lifecycle expense. The addition of C02 as a refrigerant is another option available in the marketplace. A glycol to brine system is more expensive to install but considered more energy efficient and less corrosive, reducing operational and maintenance costs over the life of the construction.

3.14 Compressor Design Options

The two (2) most common types of compressors for ice sheet applications are reciprocating and screw compressors.

Screw compressors require minimal maintenance and are economical for selections of over 100 tons.

Reciprocating compressors usually require more maintenance but have a lower initial cost.

3.15 Chiller Design Options

Flooded chillers are usually large vessels that house ammonia or Freon. The design of the system will determine the amount required, which will indicate the level of risk if accidentally released.

Plate-and-frame chillers have a smaller refrigerant charge, higher thermal efficiency, longer life expectancy, and the ability to add plates to increase capacity if required. There are different plate materials that have varying life expectancies.

3.16 Condenser Design Options

Selection of this equipment will be based on geographic location and expected operating season of the ice sheet.

Water cooled condensers using re-circulated water from cooling towers, are quite acceptable in all but extremely cold climates.

Evaporative condensers, using re-circulated water use a combination cooling tower and water-cooled condenser all in one piece of equipment, are widely used.

Air cooled condensers use absolutely no water but have a higher initial cost than the above condenser options.

Will the unit be on a roof, a stand or on a pad outside of the room? Including the necessary safety features such as permanent access ladders, safety railings, and fall restraint safety points may need to be considered.

3.17 Refrigeration System Design Questions

- How close is professional service contractor support? The farther away, the more simplistic the design might be.
- How long will the ice season be? Will the system be designed to operate in cold climate or year-round? Again, expectation based on a 50-year lifecycle.
- What type of activities will be scheduled? Typically, a refrigeration system is designed to hold 1 ¼ to 1 ½ inches of ice. However, high caliber figure skating or sledge hockey may require thicker ice to ensure user safety, then a more advanced refrigeration system design may be required.
- Is the system designed to capture heat generated from the refrigeration cycle and have it repurposed in the operation?
- What level of training will facility staff require?
- If a release of refrigerant occurs, what surrounding buildings such as schools, home for the aged, day care or residential homes could be impacted?
- How complicated will it be to deal with a significant leak? Are local EMS prepared to assist during such an event?
- Is there a different level of insurance premium attached to any specific design?

Tip: Spend more time in properly designing mechanical systems and rooms and less time designing entrances and common areas.

3.18 Ice Surface Pad Design Options

The most efficient pad option is a sand base as it provides no insulation value. This design is often selected for facilities that will operate year-round with no plans of use outside of traditional ice sports or recreational activities.

A concrete base offers more options of use. The depth of concrete pour, which will range from 5 to 9 inches, will depend on the type of events to be hosted.

The operation would benefit from having a drainage system to assist in the ice removal task. Four or more drains, connected to a sewer system, placed under the boards around the perimeter of the ice surface, is a common design.

3.19 Low-e Ceilings and Paints

A low-e ceiling is a reflective sheet installed over the ice to assist in managing heat load. These are most often installed in poorly designed facilities. The architect should be challenged to design the area so that no such system is required.

Ice makers often look for building design to reflect the quality and performance of a "Yeti" cooler, not a typical "Coleman" cooler. When the insulation and air handling systems are designed well, there is less stress and maintenance required on the refrigeration system.

Low-e paints are an option to be applied to finish interior walls.

3.20 Ice Bowl Heating Design

Providing heat, for patron comfort, in the seating area of any ice sheet comes with several costs. The cost to operate the area heaters also requires the refrigeration plant or air handlers to remove or balance the heat load. Adding heat to the refrigerated area may also require dehumidification. Maintain humidity levels near 50% in optimum conditions. Failing to control humidity will result in reduced life expectancy of the facility. Dehumidification costs often outpace refrigeration costs. Fossil fueled heaters will require ongoing maintenance as they may contribute to indoor toxic air levels. There are several low impact heating options such as infra-red type designs that can be considered.

3.21 Ice Sheet Lighting Design

The marketplace offers a variety of energy efficient lighting designs. There are recommended illumination levels for all types of sports that must be researched by the architect. The major criteria or standard for lighting is measured in foot-candles, a measurement of light intensity at a given point. Key factors on selection include:

- Will there be a need to meet television broadcasting lighting levels?
- How much heat will each bulb generate as this heat will need to be removed by the facilities mechanical systems?
- How common are replacement parts to the selected light fixture?
- Can the lighting system offer different levels of lighting based on facility use?
- Will the ice sheet be painted to industry standards? Installing a high-quality ice paint can improve lighting levels by as much as 40%.
- Is there a need and benefit for a secondary lighting system for times when staff are performing work in the area or merely going from one area to another?
- Emergency lighting systems should be selected based on low-maintenance and upkeep.

3.22 Ice Sheet Electrical Design

Install electrical outlets that exceed minimum code requirements, especially if the facility is to be used as an emergency shelter location. All outlets should be GFCI protected. Pending the expected use of the facility, installing electrical connections above the surface for events like trade shows, will reduce the potential of trip and fall liability. If the facility is to be used for large entertainment type events, then a "plug and play" system with direct connections for lighting, sound, and other equipment, will reduce the need for electrical permits to be obtained for each event. If this is in fact an operational objective, a review of changeroom design and location should be conducted. It may be beneficial to design some changerooms for performer preparation and resting areas. Being able to quickly remove benches to make the area more inviting and attractive to meet performer needs might be a good early investment.

3.23 Dasherboard Design

The board, shielding and protective netting design will be based on the ice dimensions and seating configuration designs. The height of the boards and shielding, as well as the installation of protective netting, have industry recommended best practices to be met, but no set legal design specifications. The marketplace offers a variety of systems and materials that will require careful research based on intended use of the facility. It is critical that the design of the corner dasherboard match the capability of the selected ice resurfacer to ensure it can perform the resurfacing procedure. Board design, colours, thickness of plastic, anchoring options, shielding height and thickness are all discussed in the ORFA Boards, Shielding and Protective Netting resource that is available as a benefit of membership.

3.24 Rink Divider Design

Sporting organizations have adopted programming requiring ice sheet division, providing more use and encouraging younger players to better enjoy the experience. If this option is to be included, then ensure adequate storage and/or design is in place. Dressing room and parking lot requirements may also need to be reevaluated.

3.25 Score Clock Design

The design and options provided on the score clock will be based on user need. These devices are option considered sponsorship opportunities.

3.26 Goal Judge Box Design

There is no requirement to have such an enclosed area. League rule books may request that game lights be suspended to provide optimum viewing by patrons and officials. A blue or green light, denoting the end of each period or game, is placed adjacent to the goal red light indicator. The score clock from the timekeeper's box controls the operation of the blue/green light.

3.27 Media Centre Design

There is no legal requirement to provide a "press box" area. Installing these features will be based on need. Consideration should be given to the level of use as the space will need to be continually maintained. If the installation is being built into the rafters or superstructure, to allow as high and convenient an observation position as possible, then protecting those who move to and from these areas is critical. A common design is having the area divided into three sections or more, allowing for semi-private use by various personnel of the press and radio media. User comfort requires consideration for ambient air temperature, humidity, access to a washroom and possibly a kitchen facility. Access to a strong wi-fi, adequate electrical supply and other current technology requires research.

3.28 Installing the First Sheet of Ice

The first installation of ice Is usually part of the construction costs. The concrete pad must be properly tempered as refrigeration is added to the fresh pour and must be done correctly or damage to the pad may occur. Include the training of staff as part of the construction agreement, if possible.

3.29 Ice Maintenance Equipment Storage Design

The ice sheet will most likely be serviced by an ice resurfacer. Selecting the brand and model of resurfacer will assist in properly designing the room where it will be stored. The shift toward EV technology continues to increase and predictably one day may be the only option available. If a fossil fueled model is being considered then different design features for ventilation, fuel supply or storage requirements, as well as fire and explosion risks, will need to be researched. Basic design considerations include:

- Having adequate space to park the unit.
- Having a proper heating system – they are warm blooded vehicles.
- Will the ice resurfacer service one or multiple pads?
- Having a hot water supply that meets the scheduled needs of the facility.
- Having direct access - the less the unit has to turn going onto or off the surface, the less tire wear will occur.
- Will the unit be dumping in or outside the facility? If inside, a snow pit design that can handle the use schedule must be constructed. If outside, vehicular traffic, finished surface and snow dumping access will all need to be considered.
- Installing a ventilation system that matches the selected power source.
- Will toxic gas monitoring equipment be required?
- Installing self-lifting doors.
- Having a separate access door so the main exterior ice resurfacer door is not opened by staff, as a way to control heating costs.
- Entrance onto the ice sheet should have a minimal height. There should be no need for ramps.
- Installing adequate GFCI plugs in the room.
- Installing a separate plug if the ice edger is battery powered.
- Having separate ice resurfacer storage and refrigeration rooms lowers the risk of cross incident issues, albeit at an additional cost.

These rooms must also house a selection of hand tools used in the ice making and maintenance responsibilities.

If there is an expectation for large trucks to be able to load in and out of the ice resurfacer doors, then adequate room for maneuvering, as well as ease of entry and exit, should be researched.

3.30 Other Considerations

The design of an ice arena must include consideration for users' needs and safety.

- Will the facility offer on-site equipment storage for user groups?
- Will sporting nets have adequate space to be stored without blocking any egress?
- Are there control features to keep the public away from staff work areas?

3.31 Conclusion

Designing a functional ice arena requires thorough research. The best investment the design team can make is touring as many new buildings as possible and to speak directly with those on the frontlines about the building. Ask what is good, what is poor, what they wish was better designed, what they would do differently and where more thought and investment could have been made.

MODULE FOUR

Aquatic Facility: Design and Construction Considerations

4.0 Introduction

The decision to build an aquatic facility requires ongoing financial support to operate, manage and maintain. Pools rarely cover operating costs. Unlike other recreation infrastructure aquatic centres must have certified staff in place to open. The size and design of the pool will dictate the number of required on-deck staff. The design team must first determine the expected use of the facility. Again, balancing current and future needs, based on projected population growth or demographic changes, is essential. Obtaining the design support from individuals who have operated similar proposed designs would be diligent. Public health officials should be consulted as they play an important role in every public pool operation and management.

In Ontario, the Building Code and Public Pool Regulation 565, dictates construction, operational and management responsibilities for pools, splash/spray pads, spas, and other aquatic features. Again, exceeding minimum regulated responsibilities is strongly recommended to ensure that the facility remains safe and serviceable for its entire lifecycle.

In addition, there are a variety of standards that are available to assist in designing spas, water slides and other common aquatic features that should be sourced.

4.1 Pool Design Options

Pool design is another opportunity to create a unique recreational space. It is important that the final design does not reduce waterflow and circulation as "dead areas", where water does not move properly, are difficult to maintain. New and exciting designs often mean new and difficult operational and management challenges.

Public swimming pools can have multiple functions:

- Competition pools
- Exercise pools
- Rehabilitation / thermal / therapy pools
- Recreational and relax pools

Determining what type of sport is to be offered and whether the pool will be a competition pool will control design requirements.

Note: measurements are provided for reference only.

- Olympic swimming pools (50×25 m, depth min 1.80-2.00 m, depth max 2.10 m, lanes from 8 to 10, lane width 2.5 m)
- Semi-Olympic (21×25 m, min depth 1,20 mt, max depth 1,80 m; 8 lanes with lane width 2,5 mt)
- Minimum size pools (10×25 mt, min depth 1,20 mt, max depth 1,80 mt; 8 lanes)
- Women's water polo field (20x25mt, min depth 1,80 m)
- Men's water polo field (20x30mt, min depth 1,80 m)

Including water play attractions in the design drawings are quickly embraced by anyone viewing the pool's design concept. Zero depth entry provides a beach style experience; wave pools offer a stimulating swimming experience; spray decks, water slides and other innovations seem reasonable investment by those interpreting the vision of the community's need. However, each feature presents unique challenges to maintain both the infrastructure as well as the safety of the user.

Often classified as special feature pools, the design may include:

- Activity pools

- Body, tube, or raft water slides
- Wave or surf action pools
- Interactive play attractions
- Leisure or action rivers
- Catch pools

Each design offers challenges to those tasked with maintaining water quality and traditional treatment methods may need to be enhanced.

4.2 Maintaining Water Quality Through Design

Once the design and features are selected, the design team must then decide what system and design is best to manage water quality. The system must exceed operational need. Maximum bather load will determine the amount of circulation and filtration of pool water. The higher the bather load the quicker the pool water condition will change.

Pool regulations will indicate the amount of "make-up" water, or fresh water, that needs to be added. Used pool water may need to be drained by the operator or it may be water that is lost due to use and design. Regardless, make-up water must be treated and heated which is an ongoing maintenance cost. The larger and more complicated the pool design, the greater the expense to operate.

4.3 Automatic Water Treatment Control Design

Investment in technology that will assist in controlling water treatment is essential. This equipment will monitor chemical need and respond, to ensure safe and consistent water quality. This investment is also a cost saving feature as chemicals will not be overused, resulting in increased operational costs.

4.4 Water Testing Room Design

Constructing a water testing room is recommended. This well-lit, properly ventilated area will ensure that chemicals are stored safely; testing is performed with a reduced chance of cross contamination; and all testing equipment is properly rinsed after each test.

4.5 Reducing Slip and Fall Design

Every area in a pool offers some risk of a 'slip and fall', given the presence of water. It is essential that these areas be designed using slip resistant coverings. Materials that also reduce the growth of mildew and algae should be researched.

4.6 Construction Materials and Design Considerations

- All construction materials should be nontoxic to the user, of the highest quality, and offer maximum durability.
- All surfaces must be watertight, slip resistant, and able to withstand design stresses such as snow load or water table changes.
- Pool wall design should enhance a lifeguard's observation ability – not reduce it.
- No feature should create an entanglement issue for users.
- The water hydraulic system should exceed current suction entrapment standards.
- All drain covers must exceed current entrapment design requirements.
- Include sufficient railings or holding devices for entering and exiting the pool.
- Design appropriate lifeguard stations so that all areas of the pool have an unobstructed view.
- Install suitable barriers to prevent unauthorized access to the pool deck.
- Install appropriate levels of deck and pool lighting, based on projected use.
- Install sufficient deck drains to reduce the potential accumulation of stagnant water.
- There shouldn't be any trip hazard risks on deck surfaces or transition areas.
- Design decks with sufficient control joints to reduce the chance of damage from expansion.
- Design easy, but controlled, access to all control valves.
- All hose bibs should be designed to prevent backflow into potable water systems.
- Diving boards are considered a high risk of injury feature. If installed, they should be carefully researched.
- Accessibility design must be researched.

4.7 Pool Bowl Cladding Designs

After defining the type of pool to be built, it is necessary to choose an appropriate type of cladding that is safe, hygienic, and aesthetically pleasing.

Pool cladding goes from the bottom to the pool walls and is available in a variety of materials.

- Reinforced PVC: is adaptable, impermeable, resistant, and easy to clean. PVC pools have a smooth but non-slippery finish that is resistant to UV rays. A long installation time is needed as the PVC is fixed directly on the walls.
- Preformed Liner: has the same technical specifications as reinforced PVC but differs in application. The liner is prefabricated directly in the factory, according to the tank specifications and applied through a suction system.
- Ceramic: this type of coating is now used only for reinforced concrete pools. The most used material in the form of tiles is Gres. It is glued to the bottom and walls of the tank and requires an internal and external waterproofing treatment. Ceramic allows for the customization of the pool and is resistant to cleaning products, UV rays and biological agents. The weak point of this type of coating is the joints, which must be checked every 4-5 years.
- Mosaic: is used to create elegant and valuable projects and is available in many different textures and colours. The tiles that make the mosaic are generally 10 x 10 mm, 20 x 20 mm or higher. The laying phases, with the relative waterproofing treatment for swimming pools, is similar to the ceramic coating.
- Paints: the paint coating technique is used for concrete pools and consists of painting the walls of the structure with particular acrylic resin products. Paint does not guarantee a 100% hydraulic seal. Like the tiles and mosaic options, paint can display micro-fractures caused by changes in temperature and settling of soil.
- Glass fiber: is more expensive but very durable compared to paint, often lasting more than 10 years. The main advantages of fiberglass are low maintenance, being waterproof and resistant to water leaks. Its installation is quite simple and fast, and it can be applied to both new and old swimming pools. Even cleaning operations are quite easy.
- Natural stone: the advantages of using natural stone are - durability, low water absorption, and especially suitable for the pool edge, similar to non-slip tiles.

4.8 Heating Pool Water and Air Management Design

Getting the pool temperature right is a balance of water and air temperature management. There are recommended temperatures that will mean nothing to a patron that feels uncomfortable in the pool or spa.

- Recreational swim 27.8°C (82°F)
- Swimmers 4 or under 32.2-33.9°C (90-93°F)
- Children instruction 28.9-31.7°C (84-89°F)
- Competitive swimming 25-28°C (77-82°F)
- Spas 40°C (104°F)

Pools and spas are best operated at a relative humidity between 40-60%. In addition, an expected air exchange of 0.48 cubic feet per-minute of outdoor air per square foot of pool and deck, is standard. This is to flush any air contamination from pool chemicals. The design team must ensure the proper design and equipment selection. Pool management and operators must be trained to properly use these tools.

Pools and spas can be heated by:

- Fossil fueled heater
- Electric heater
- Heat pump
- Heat exchanger
- Solar heating

At times, a combination of heating is used. Proper selection and installation are critical to the cost of operation. Select the most appropriate and efficient HVAC and dehumidification equipment; and it's not an area where costs should be reduced. Key facility design features should include:

- Equipment that is capable of maintaining the recommended relative humidity levels, a minimum of 8 air exchanges per hour.
- Ventilate indoor pool air to the outdoors, not to other areas of the facility.

- Install low level return vents to extract air at the surface of the pool water.

4.9 Spa Design

Public spa designs and construction form part of the Building Code, section 3.12. There are water depth restrictions for public spas (1200mm) as well as slope restrictions of not more than 8%.

The spa must be surrounded by a hard surface and be sloped away from a swimming pool. The maximum depth of water to a bench or seat is 600mm. Barrier free access must be provided. If steps are provided, then a handrail, non-slip surface and a contrasting band for step identification must be installed.

The required circulation and disinfection design is based on the amount of water that will be in the spa. The spa and pool water circulation systems must be separated.

An emergency phone must be installed along with a clock timer for the water circulation pump and an emergency stop button.

The need for qualified staff to operate and maintain these installations is often overlooked.

4.10 Sauna Design

Constructing a sauna as part of a recreation facility will require a strict cleaning and disinfection program. Keeping the sauna away from a pool or spa is recommended as the sweat created from the experience should not be removed in these areas as it will disrupt and challenge water quality. Electric dry saunas are the most common designs.

4.11 Conclusion

Aquatic facilities require design by individuals with a strong working knowledge of regulation compliance and practical operation and management. Pools are considered energy burdens and as such researching equipment selection and best installation methods and designs is critical in managing these costs.

MODULE FIVE

Properly Managing and Staffing the Facility

5.0 Introduction

The investment by all who played a role in designing and constructing a state-of-the-art recreation facility will only be truly a success if a plan to properly staff the facility, with sufficient resources, is developed and adopted as part of the process.

Funding the ongoing maintenance and operation of the facility is often a balance of investment by users and non-users of the infrastructure. Private operations do not have the luxury of the tax base to assist in financial shortfalls or poor operational practices. Public operations must be managed by staff who understand their role in efficiently managing these investments and who are supported by senior administrative staff on this journey.

If the design team have made the right choices in equipment and materials, it is the responsibility of the facility management team to maintain each piece as recommended by the supplier to maximize life expectancy.

Hiring the staff with the necessary core skills to meet these objectives at every level of operations can be at no cost to the owner of the facility, if job postings adopt industry accepted certifications. For more than 75 years, the ORFA has focused on providing recreation staff with the required knowledge and training in core operational, supervisory, and managerial skills. The ORFA certification confirms that each member that obtains certification has a strong working knowledge of many of the items expressed in this resource. Request ORFA certification as a minimum entry requirement to ensure the facility is properly and safely operated and managed, throughout its entire lifecycle.

5.1 Pretty and Energy Efficient Can Mean Expensive to Operate and Maintain

Try not to over-design the beautification of the project while losing sight of the importance of functionality of the building. Some design teams chase energy efficiency and environmental goals only to discover the financial exhaustion of those responsible in managing the asset post construction. If these are goals of the design team, contact other facilities that have walked this pathway to clearly understand the long-term implications.

5.2 Private Management and Operation of the Facility

At times, owners opt to retain the services of a private management group to manage and operate the facility. This type of relationship provides a

buffer between the owner and users, allowing the building to be operated in more of a business fashion. Past relationships have resulted in costly capital investments by the owner when the contractual period expires. Often, the management company failed to properly invest in the maintenance, housekeeping, and general upkeep of the infrastructure. Ensure that these contractual relationships do not create an undue financial burden at the conclusion of the relationship.

5.3 Protect the Construction Owner's Manuals

As equipment and materials arrive on site the construction team will collect all applicable owner's manuals and supply two (2) copies of this information to the owner at the conclusion of the project. This information is critical in designing proper maintenance and operations policies and procedures. The manuals will also provide direction on limits, or avoidance of warranty, for any equipment, device, or materials. Using the wrong chemical or cleaning method once can destroy a finish or reduce the integrity of materials. Facility management must undertake an in-depth review of all supplied documents and extract the information that will guide the operations and maintenance of the facility. This is one of the most important steps in maximizing the investment lifecycle.

5.4 Asset Management Planning

Every new facility requires the development of an asset management plan that will guide management in maintaining the key elements associated with the building, including the equipment and machinery installed to cool, heat, and manage the condition of the air circulation within the structure. Further, the plan will identify the expected lifecycle of furniture, office equipment and other related fixtures associated with the design. A well-trained facility manager, who understands the concept of asset management and is able to apply these concepts, is ultimately planning for the ongoing maintenance of the facility, including the replacement of key pieces of the structure, equipment and support systems, in an organized and planned fashion, without disrupting operations. Asset management is considered a core responsibility of today's facility manager. When interviewing for senior management, asset management should form an important part of the interview process.

5.5 Cross Training Staff

Every recreation facility will require specialists who have advanced skill sets on core operational responsibilities. These individuals will assist the facility manager in their asset management goals. They may also further be responsible in training other frontline staff in their duties, so that all team members are equally prepared to perform the necessary tasks associated with facility upkeep and operations. Where possible, a plan that has staff cross-trained to assist in peak periods or staffing shortages, is ideal.

5.6 Properly Trained Staff at No Cost

Job postings and job descriptions should include a baseline of education and skills required. This is not designed to limit candidates but rather identify the education or professional accreditation deemed to be an asset at the time of hiring. Employees who arrive on site with proven education and/or certification are an immediate benefit to the operation. Those who lack this type of formal foundation will require more internal investment which should be planned for.

5.7 Properly Setting User Fees

Setting facility user fees is one of the most important and at times most difficult tasks of the build. The design team and senior management are excited to open the doors and have the community enjoy the investment. Often, the calculated user fee to cover operational costs is viewed as a barrier to use. In practice, if the actual user of the facility is not covering the costs of use, the facility manager must generate the shortfall from other revenue sources such as advertising, concessions, vending, locker or storage rentals, paid parking etc. Each time one of these potential revenue sources is redirected or outsourced, revenue to properly operate and maintain the infrastructure is lost. This lost revenue must then be sourced – usually from the taxpayer who is unaware of their contribution to others' recreational experience. Creating a realistic financial plan that harmonizes with the construction is critical. Those tasked with this responsibility must look to the future and how the decisions being made today will impact the community over the entire life of the facility. Whenever possible, projected user fees should be included in all design presentations so that all stakeholders are aware of the necessary financial resources being calculated to meet the

objective of a safe and efficiently operated recreation facility.

5.8 Additional Resources

The ORFA has a very comprehensive on-line Resource Library that includes enhanced information on many of the topics addressed in this resource and available as a "benefit of membership". The benefits of membership also include unlimited contact with ORFA staff who can assist with the many questions that the design team will encounter. The role of the ORFA is not to form opinion on any product or service available in the marketplace but rather to connect members with each other, so that information and experiences can be exchanged.

The ORFA Recreation Facility Asset Management (RFAM) software is the industry leading data collection system that has been designed by practitioners This software is available at no cost, as a benefit of membership, and can be used during the design and construction phases and subsequently rolled into the operational phase.

Visit www.orfa.com to learn more about membership or take advantage of the many tools available to assist in a successful build.

5.9 Conclusion

Building any new community recreation facility is an exciting time and when done correctly can give those who designed and constructed the investment a great sense of pride. On the other hand, if not well designed and constructed the facility can become an ongoing operational and financial challenge for years to come. The ORFA continues to invest in assisting its members in being prepared to meet all current and future challenges. We are here to serve.