EAST HANTS MUNICIPALITY

EAST HANTS MUNICIPAL SWIMMING POOL

AUDIT AND LIFE CYCLE PLAN

FINAL REPORT

May 1999

Lewis Engineering Inc.

EAST HANTS MUNICIPALITY SWIMMING POOL
FINAL REPORT

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1.0 Introduction and Summary

1.0 INTRODUCTION AND SUMMARY

1.1 OBJECTIVE AND SCOPE

This project comprised a detailed facility audit followed by a life cycle analysis of the East Hants Municipal Swimming Pool. The objective was to identify any existing problems that should be addressed immediately, and to establish a life cycle plan for the facility.

The first phase of the program, the facility audit, provided an evaluation of the facility relative to:

- physical condition of the building and its systems;
- functional and operational performance relative to: system performance (heating and ventilation systems, pool filtration, lighting, etc.), barrier free access, energy usage and all user needs;
- safety of the facility, particularly fire and life safety, and electrical safety;
- compliance with all relevant codes and standards;
- environmental performance relative to indoor air quality and presence of hazardous/banned substances; and
- specific owner requirements.

The facility audit established the baseline conditions of the program, and identified the current problems and deficiencies that need to be addressed. These problems and deficiencies were characterized and corrective solutions formulated. Recommendations for remedial action were subsequently defined, categorized into a three priority system, and costed. This three priority system is as follows:

- Priority 1 recommendations are those which the owner should implement without delay; they are recommendations to correct problems with fire and life safety, electrical safety, mandatory code compliance, occupational health, indoor air quality and the like;

- Priority 2 recommendations are those which will save the owner money (such as energy savings), extend the useful life of the building and/or systems significantly, and/or prevent or reduce deterioration or damage which could cause excessive expenditures later on;
- Priority 3 are all other recommendations, and while these are solutions to existing problems, they are generally not too serious, and can be usually budgeted in later years if necessary.

The second phase of the program, the life cycle analysis, combined the results of the audit with a comprehensive forecast and cost analysis of the capital upgrade and maintenance requirements for the next 20 years of the building's life. The result of this analysis was a computerized life cycle plan for the facility.

The detailed analysis of the building, recommendations and cost estimates, and life cycle plan are included in this final report.

1.2 BUILDING SUMMARY

1.2.1 Summary of Building Components and Systems

1.2.1.1 Site and Structural

The East Hants Municipal Swimming Pool is located on Highway No. 2, behind the East Hants municipal building in Milford, Nova Scotia.

The pool was constructed during the 1960's with a steel superstructure. Due to severe deterioration of the steel superstructure the building was closed in the late 1980's and the superstructure was removed from the site. The superstructure was rebuilt in 1992 with a timber superstructure.

The pool structure consists of twenty-six (26) curved glulam arches spaced at 6' - 0" centres. Each glulam arch is 16½" deep by 5" wide. Tongue and groove wood decking (2" x 6") spans between the glulam arches, and supports the insulation and shingles.

The foundations for the glulam arches consist of a continuous spread footing located at the perimeter of the building on the outside of the original foundations used for the steel superstructure. The base plates for the glulam arches are painted.

The pool, which is approximately 40 feet by 83 feet, is constructed of reinforced concrete, the shallow section of the pool is 4' - 0" deep and the deep section of the pool is 12' - 0" deep. A construction joint is located in the base slab of the pool and extends around the perimeter of the pool. The joint is located 2' to 4' from the walls and is filled with sealant. Refer to photograph in Appendix B, which indicates the joints in the pool.

The site has a paved driveway from the pool to Highway No. 2 and a small paved area at the front of the pool. The remainder of the parking area on the north and west sides of the pool is a gravelled surface. The south and east sides are grassed next to the building with good drainage away from the building.

1.2.1.2 Architectural

The building form is generated by the simple "arch-rib" truss shape, with two vertical gable ends, one containing the main entrance, and the other the emergency exit.

The functions/areas include the main pool pavilion, male and female change/shower/washroom areas, the staff office, and mechanical room on the main level, with a spectator gallery/multipurpose room, supervisor's office/meeting room, storage, mechanical and electrical rooms on the second level.

The building envelope is a fully developed contemporary wood frame wall and roof system, with the asphalt shingled sandwich type roofing assembly also forming the two long walls of the building.

1.2.1.3 Mechanical

Space heating is provided by hydronic heating appliances supplied by two oil fired hot water boilers. These appliances consist of horizontal unit heaters and duct mounted heating coils. Equipment is in fair condition but the chimney is undersized.

The pool hall is ventilated and dehumidified by a Dectron air handling unit. The unit is in fair condition but is lacking an air cooled condenser that would allow for better temperature control in the pool area, especially in the summer.

Controls are inadequate and inaccurate and require upgrading and recalibration.

Plumbing equipment and systems are in fair condition. Pool filtration equipment is in fair condition but much of the ferrous piping and fittings may be badly corroded and in need of replacement.

There are no year 2000 issues noted with any of the mechanical equipment surveyed at this facility.

1.2.1.4 Electrical

Electrical service for the East Hants Municipal Swimming Pool consists of one Nova Scotia Power service entrance rated for 200A, 347/600V, 3Ø, 4W, which feeds all electrical equipment found in the municipal pool building. This service originates at a 14.4kV power line located to the northeast of the building. The primary conductors are installed overhead and run from three 50kVA pole top transformers.

Building distribution originates at the main splitter in the electrical room. There are a few minor deficiencies that need to be corrected, all of which are low cost items.

The lighting system comprises mercury vapour fixtures over the pool surface, high pressure sodium (HPS) for the parking lot and outside building lighting, fluorescent fixtures in the lobby, locker rooms and office area for general lighting, and incandescent lighting in closets and storage areas of the building. The lighting system throughout the building is adequate, except for the stairwell where illumination levels were low. We recommend that the stairwell lighting be upgraded, a relatively inexpensive undertaking.

Building systems include: an emergency lighting system and a security/fire detection system. All appear to be in satisfactory condition and function reasonably, except the emergency lighting system which must be upgraded and the fire initiating devices added as per CEC and NBC requirements.

There are no Year 2000 issues noted with any of the electrical components or systems surveyed at this facility. The computer in the main office (Section 2.7.5.3) may not be Y2K compliant, but this item is not included in our audit mandate.

1.2.1.5 Energy and Environment

Energy use in the building is quite good for a building of this type and age. Energy improvements to improve efficiency could include pool blankets, pool water pump cycling, and reducing the building's ambient temperature. No problems with the indoor environment were detected.

1.2.2 Functional Overview

The building performs adequately for its primary purpose as a recreational swimming pool, however, it has found a market for party rentals of the mezzanine multi-purpose room, and has the potential to host a swim team. Considerable further development of the facilities should be undertaken if either of these new uses is to reach its full potential.

The facility was totally redeveloped in 1992, however, the original building footprint was modified only slightly, by means of locating new arch-rib wall foundations just outside the lines of the original Quonset hut footings. The size and layout of the original support spaces, including the change/shower rooms, staff facilities, office area, and lobby were substantially unchanged by the redevelopment.

These facilities are suitable only to the single function of recreational swimming. As there are no washroom facilities for use by spectators or other users of the mezzanine level, it is necessary for those users to remove shoes and go through to the change room facilities to gain access to washroom facilities. An added constraint, which affects even the primary use when pool parties arrive, is the limited amount of lobby space at the front entrance. Given the requirement for shoes to be removed by patrons prior to entering the change rooms, and for shoes to be placed in shoe bins, present lobby space, and lack of benches for this purpose, present a problem.

An expansion of the main lobby could be justified solely based on the need for improved crush space during pool parties. The broader implications presented by the multiple uses now contemplated should be addressed in the context of a schematic design study.

In the case of the multi-purpose room, a kitchenette and washroom facilities would greatly enhance the attraction for rentals, as would the application of an acoustic isolation strategy for the noisy pool air handling system which passes through the room, and the provision of some windows to provide exterior views and natural ventilation.

Various improvements to the pool deck equipment, including the provision of starting blocks, improved lane lines, and optionally some portable bleachers for use in the multi-purpose room would be appropriate if swim meets figure in future plans.

The relatively limited shower areas for each sex may not be easily improved as space is limited, however, we do recommend providing additional full size lockers within the change rooms.

While an effort has been made to provide a barrier-free individual washroom within the staff area, the main entrance, the change rooms, showers and pool do not meet CSA's national barrier-free design criteria established in 1990. This fact notwithstanding, however, these areas are reasonably free of physical barriers, and would be negotiable by certain physically challenged individuals.

1.3 SUMMARY OF RECOMMENDATIONS

The recommendations resulting from the facility audit are summarized, together with order-of-magnitude capital cost estimates, in Section 3.1 of this report. These recommendations are categorized and presented in a three priority system, as described in Section 1.3. The total cost estimate of all recommendations in each priority category are:

Priority 1	**$43,850**
Priority 2	**$205,220**
Priority 3	**$94,675**

These estimates are based on current industry and trade pricing but should be considered order-of-magnitude only.

The Life Cycle Cost Analysis program is presented in Section 3.2. It includes all of the above recommendations, programmed in the year which we feel appropriate relative to their priority, as well as other recommended construction upgrades and replacements, and maintenance items.

We consider the life expectancy of the facility to be indefinite with respect to the primary superstructure and architectural components, subject to maintaining appropriate maintenance and repair programs.

2.0 Facility Audit

2.0 FACILITY AUDIT

2.1 GROUNDS AND SERVICES

2.1.1 Grading and Drainage

Findings

The parking area in the front of the pool building slopes to a ditch at the north side of the site. The parking area on the west side of the pool slopes to a ditch along the west side of the site. On the south and east sides of the pool a narrow grassed area slopes away from the structure. Refer to photographs in Appendix B which indicate the grading around the pool building.

The site is generally well drained away from the building on all sides.

2.1.2 Paving and Surfacing

Findings

The asphalt paved driveway and the small paved area in front of the pool are in good condition and appear to be well maintained. The gravel parking areas are free from potholes and are also well maintained.

Recommendations

.1 Yearly gravel grading to eliminate potholes and to create a smooth transition from the gravel to asphalt surfaces should be carried out as needed. An allowance for yearly maintenance of the asphalt surface would allow repair of potholes or cracks which occur in the asphalt. An annual allowance of **$1,000** is recommended for this work.

annual.

2.2 BUILDING STRUCTURE

2.2.1 Concrete Foundations

Findings

The foundations for the glulam arches and the perimeter foundation wall appear to be in good condition.

2.2.2 Concrete Slabs-on-Grade

Findings

The concrete slab-on-grade surrounding the pool and in the front portion of the building appears to be in good condition. There are a few low areas in the concrete slab surrounding the pool which pond water.

2.2.3 Concrete Pool

Findings

The pool was full of water during this building audit. As reported by the maintenance manager for the pool the construction joints in the pool were recently sealed over the few weeks prior to the audit. At that time only selected areas were sealed. Prior to sealing the joints, water was leaking from the pool reportedly at a rate of approximately 2,000 gallons per day. Since the joints were sealed there has been still considerable water lost from the pool in the order of 1,000 to 2,000 gallons per day.

The crack in the bottom concrete slab located in the deep end and as indicated in the photograph included in Appendix B as well as the construction joint in the bottom slab of the pool, are most likely the main sources of the leaks in the pool. From the volume of water lost per day there does not appear to be a waterstop installed in the construction joint between the two adjacent concrete surfaces, therefore the sealant is the main means of retaining water in the pool. Sealant may deteriorate over time in a submerged condition and should not be used as the only means of retaining water in the pool.

Although there is no evidence of any detrimental effects from this loss of water on a daily basis the leaks in the pool should be repaired. The soils report prepared in 1991 by Jacques Whitford and Associates indicated the site was built up with a sandy silt fill which could be very susceptible to erosion by this volume of water leaking from the pool.

The coating system applied to the pool bottom and walls is severely deteriorated and is flaking off in the water from normal use of the pool.

Recommendations

.1 To prevent the leaking of the large volume of water from the pool on a daily basis the pool should be drained and all cracks and the construction joints repaired. The concrete cracks should be routered and an epoxy paste installed to permanently seal the cracks. The existing sealant should be removed from the construction joints and the joints filled with a properly installed two component sealant. This is considered a Priority 2 recommendation with a cost estimate of **$15,000** and will have a maintenance cost of approximately $5,000 every ten (10) years.

.2 The existing deteriorated coating system should be removed by a high pressure wash combined with sand and a new three coat epoxy coating system such as Amerlock 400 installed. This is considered a Priority 2 recommendation with a cost estimate of **$10,000**. This coating has a life of approximately ten (10) years Alternatively the pool could be tiled which would be a more permanent solution with a cost estimate of **$35,000** and have a maintenance cost of approximately $2,000 every five (5) years.

2.2.4 Building Structural Components

Findings

The existing glulam timber arches and wood decking appear in good condition. The wood roof decking does not appear to be coated with a coating materials to protect the wood from high humidity levels as found within the pool area. The coating on the glulam arches may not provide long term protection to the glulam arches in the high humidity pool area.

The anchor bolts located at the glulam base plates are showing signs of surface corrosion in several locations. Refer to the photograph in Appendix B.

At the east and west edges of the original mezzanine a steel beam and two steel columns were installed to support the edge of the mezzanine. These columns were re-located during reconstruction in 1992.

The steel beam is 6" deep and 6½" wide and spans approximately 15' - 0" between the north block wall and the first steel column. The second span is approximately a 12' - 0" span. The steel columns are 4" deep and 3⅞" wide. It appears that the columns were installed vertical, however, at some time the steel columns were removed and installed at an angle of 9' - 4" high and 2' - 8" at the base. Refer to the photograph in Appendix B.

A single sheet of plywood was removed during the audit to view the mezzanine framing. Refer to the photograph in Appendix B.

The existing floor for the mezzanine is of wood construction and consists of ¾" plywood, 2 x 10 wood joists spaced at 12" centre to centre, metal strapping and ½" drywall ceiling. The joist span varies from 18' - 0" span to 10' - 0" span. It is understood the municipality plans to use the mezzanine space as a weight lifting and exercise area. For this use and occupancy a floor live load of 4.8 kPa (100 psf) would be required in accordance with the National Building Code 1995 (NBCC).

Recommendations

2004

.1 An additional protective coating should be applied to the glulam timber arches to provide long term moisture protection to the arches in the pool area. This is considered a Priority 3 recommendation with a cost estimate of **$5,000**.

2000

.2 The anchor bolts, which are showing signs of corrosion, should be cleaned to bare metal and painted with a three coat painting system suitable for high humidity areas. This is considered a Priority 2 recommendation with a cost estimate of **$1,000**.

repair 1999
additional 2006

.3 The steel columns at the east and west sides of the mezzanine do not provide adequate support for the steel beam. Additional steel framing should be installed which frames between the first interior block wall and the glulam arches. This is a Priority 1 recommendation with a cost estimate of **$8,500**.

2008

.4 The mezzanine could be used as an exercise area providing additional steel framing is installed to support the wood joists where the spans exceed 12' - 0". The steel framing would be installed between the concrete block walls perpendicular to the spans of the wood joists. This is a Priority 3 recommendation with a cost estimate in the order of **$10,000 to $20,000**.

2.3 BUILDING ENVELOPE

2.3.1 Exterior Wall Systems

Findings

The two gable end walls of the pool building have formed steel claddings which are in excellent condition and should require no maintenance within the next ten years. At that point re-finishing of any visible rust outbreaks should be done, and kept up on an annual basis.

The unheated greenhouse type storm porch on the main entrance has single glazing which generates considerable condensate when warm moist air from within the main building meets cold glass surfaces. Algae growth was noted in the lower corners of the glass panels, suggesting that there is a considerable and routine condensation problem. This condition will lead to premature failure of the metal framing, which is not intended for this type of application, however, it may not have broader consequences.

The main roof/wall system is a simple and relatively reliable vented insulation sandwich design which should have a better membrane type roof than the asphalt shingle over roll roofing cladding it presently carries. There is some concern for the reliability of the shingling in keeping out rain water, as the upper areas are quite low-sloped. The shingle tabs should be cemented, as they tend to spring up due to the curved surface of the roof.

The design drawings show a roll roofing layer below these shingles, and if it is installed, it will provide a measure of further protection against water penetration, however, this product is not designed as an under-layer for a nailed shingle system and may admit water at shingle nail holes.

One weakness of this roof system is that it can be difficult to recognize leaks until an area of discoloured wood appears on the underside. At that point, repair can be extremely expensive. It would therefore be prudent to re-roof with a membrane system which can be inspected readily for surface deterioration, and replaced when necessary. This recommendation does not apply to the vertical end walls which are metal clad conventional wood framed walls.

Recommendations

.1 In year ten of the life cycle plan, re-roof with membrane system. This is a Priority 2 recommendation with a cost estimate of **$90,000**.

2008

.2 In year ten of the life cycle plan, prepare visible rust outbreaks and re-paint the metal claddings, doors and frames. This is a Priority 2 recommendation with a cost estimate of **$3,000**. Continue with bi-annual touch-ups thereafter within the budget identified in 2.3.1.3.

2008

Annual

.3 An annual exterior maintenance budget of **$500** is carried in the life cycle plan.

2.3.2 Roofs

Findings

The roof system is described and recommendations are made in Section 2.3.1 above.

2.3.3 Windows

Findings

There are no windows.

2.3.4 Doors

Findings

The main entrance doors and frame are in good condition, however, new door closers should be provided. This entrance should be considered for full barrier free access, including power assisted operators, as discussed in Section 2.5.

The mechanical room and mezzanine exit doors are in fair to good condition and require only routine adjustment and servicing. The pool emergency exit door and frame are in an advanced state of deterioration due to the high humidity of the pool space. This problem should be addressed by routine change-out of this exit door, frame and hardware.

Recommendations

.1 Replace pool exit door, frame and hardware in year two and on an eight year cycle. This is a Priority 2 recommendation with a cost estimate of **$2,000**.

2000

Reserve

.2 Establish a reserve fund for maintenance of exterior doors and hardware. This should include an annual maintenance allowance of **$200** per year.

2.3.5 Facade Components

Findings

The mezzanine emergency exit stairs have openings in excess of 100 mm in balustrades, and between the stair treads. Upgrading of existing facilities which were presumably installed prior to this requirement for openings not to exceed 100 mm is not obligatory, but is advisable in public facilities. There is also some concern for the structural adequacy of the upper stair railing, which are presently supported only from the top and intermediate landings. These deficiencies could contribute to an accident particularly if unsupervised children were using the stair (Ref. NBCC Sections 3.4.7.6(4)).

The building sign is in good condition.

Recommendations

1999

.1 Improve stair such that openings in rails, and risers are less than 100 mm, and upper stair rails are better supported. This is a Priority 1 recommendation with a cost estimate of **$1,000**.

2.4 BUILDING INTERIOR

2.4.1 Floors

Findings

The main level of the building comprises the ancillary support spaces for the pool, and the pool deck. Ceramic tile flooring covers all ancillary areas except the mechanical room. The pool deck is cast concrete with Miradur (non-skid) coating. (The pool tank and its coating is covered in Section 2.2.3 above.)

All ceramic tile finishes are in good condition, however, where they have been overcoated with Miradur in shower areas, the coating has discoloured due to constant long term wetting from dripping showerheads, standing water, etc. A replacement non-skid tile should be considered, primarily as a cosmetic improvement.

The pool deck coating is standing up relatively well, however, it also is stained from standing water and traffic in the entrance areas. Many low areas exist which do not drain properly. A re-application of the coating preceded by a well-graded topping of grout would solve this problem, however, a ceramic tile upgrade would be a preferable long-term solution.

The mezzanine multi-purpose and office areas have a painted sub-floor, and could be considered for a carpet or resilient sheet finish to facilitate maintenance and improve room acoustics.

Recommendations

.1 Replace shower area floor tile. This is a Priority 3 recommendation with a cost estimate of **$2,000.**

2002

.2 Improve grading and refinish Miradur pool deck or install ceramic tile on the pool deck. This is a Priority 3 recommendation with a cost estimate of **$10,000 or $22,000.**

2001

2001 .3 Provide floor finishes to the mezzanine rooms. This is a Priority 3 recommendation with a cost estimate of **$8,000**.

2.4.2 Walls

Findings

All interior wall surfaces were found to be in good condition (most areas are painted concrete block). The clear finished wood wall surface in the pool pavilion is beginning to show signs of deterioration due to constant wetting along the concrete foundation ledge where the wood finish terminates. This condition should be addressed by refinishing and changing the detail where the wood meets the concrete ledge, so that the water can dissipate without resting against the wood wall cladding.

The privacy screens in change rooms and the pool pavilion have begun to deteriorate due to constant contact with the wet floor. They would also benefit by upgrading of hardware (change room/toilet and dressing cubicles).

A tile base should be added to gypsum board walls in the porch.

Recommendations

reserve .1 Establish a reserve fund to cover interior painting of the wall surfaces. This should include an annual maintenance allowance of **$1,000** per year.

2001 .2 Repair and upgrade privacy screens and cubicle dividers. This is a Priority 3 recommendation with a cost estimate of **$2,000**.

2000 .3 Refinish the pool exterior wall and change the detail at the wall and foundation connection. This is a Priority 2 recommendation with a cost estimate of **$5,000**.

2001 .4 Provide tile base in the vestibule. This is a Priority 3 recommendation with a cost estimate of **$100**.

2.4.3 Doors

Findings

The interior doors are generally in good condition, however, the five doors and frames between the pool and the support spaces, similar to the fire exit at the far end, are showing signs of deterioration due to the constant wetting where the frame meets the floor. These units should be budgeted for replacement on a regular cycle.

The door hardware on all the interior doors is well worn due to heavy use, and should be renewed on the same cycle.

Recommendations

2000 .1 Replace the pool to support space doors, frames and hardware, and all other interior door hardware, first in year two, and then on an eight year cycle. This is a Priority 2 recommendation with a cost estimate of **$7,000** per cycle.

✓ 2000 .2 Provide a doorstop to the main stair upper door. This is a Priority 2 recommendation with a cost estimate of **$50**.

2.4.4 Ceilings

Findings

All of the ceilings were in good condition, however, there was one area of water damage in the women's change room, below the location where a servicing mast roof penetration has leaked. Repair of this leak at the roof is noted in the Electrical Section. Two other minor repairs, one in the stairwell and one in the lobby, are also necessary due to previous mechanical equipment leaks.

Recommendations

2001 .1 Repair the damaged ceilings. This is a Priority 3 recommendation with a cost estimate of **$500**.

2.4.5 Applied Fittings

Findings

All fittings are addressed in the Pool Components below.

2.4.6 Circulation Spaces and Stairwells

Findings

This section covers the front vestibule, lobby and mezzanine stair with respect to condition and adequacy.

One of the stair hand railings was not continuous to the top of the stair which violates the National Building Code. Railings are required on both sides of stairs exceeding 3' - 8" in width (Ref. NBCC 3.4.6.4(1)). Non-skid stair treads with detectable warning strips at the top landing, and a contrasting colour on the nosings should also be provided to improve safety.

As noted above, there are some concerns for the adequacy of the vestibule. A more effective heat source should be provided in this space as a measure to reduce condensation rates, and to reduce drafts into the lobby.

As a means of addressing functional limitations which have already been noted by staff, the main lobby should be expanded by means of a building addition to provide for more adequate crush space for shoe removal and traffic circulation in general.

The extent and nature of this expansion should be considered in the context of the full range of expanded uses which are presently contemplated for this facility.

This issue is explored more extensively in Section 1.2.2.

Recommendations

scheduled on 1999 August Shutdown. LewLanders investigated and decided it was not breeching any building codes ∴ not done

.1 Provide two continuous handrails with 300 mm horizontal extensions top and bottom on at least one rail. This is a Priority 1 recommendation with a cost estimate of **$2,500.** 1999

.2 Provide stair treads and top landing warning strips. This is a Priority 2 recommendation with a cost estimate of **$2,000.** 2000

2.4.7 Public Washrooms

Findings

Washroom facilities include those which are inside the change rooms, and the staff washroom off the pool office, which also serves as a public barrier-free washroom.

The change room toilet and lavatory facilities are adequate, although not barrier-free. The number of lavatory basins provided does not meet the NBCC, which would require two in each change room based on the number of toilets and/or urinals.

In view of the relatively light occupant load in the change rooms, we believe that the status quo is acceptable.

The staff washroom, which is made accessible only to members of the public requiring barrier free facilities, closely approaches full compliance with current barrier free design guidelines and should be considered adequate in this regard. A new towel dispenser should be provided. The door closer should be removed in the interest of barrier-free compliance as manoeuvring space at the door does not meet standards for doors with closers.

The lack of washroom facilities for non-swimming members of the public makes it necessary for persons to enter the change room area to use those facilities. As signs are posted requesting patrons to remove footwear before entering change rooms, this presents a significant inconvenience to people attending functions in the multi-purpose room, spectators, etc.

Based on criteria set by the National Building Code of Canada, the occupant load of the multi-purpose room is 226, assumed to comprise males and females in equal proportion. This is based on the floor area of about 1480 square feet, and an area per person allowance of 6.45 square feet, which is stipulated as the appropriate allowance for stadia and grandstands. By using the factor of assembly space with non-fixed tables and chairs, as might be applied to this space if its primary use is party rentals, a lower occupant load results (10.2 square feet per person). If the size of the room was reduced by partitioning a weight training area of say 330 square feet, which would have the same occupant load rating as the pool pavilion (100 square feet per person), the total count, including the appropriate allowance for the office space, could come to as low as 115 people. Assuming that it is undesirable to require users to travel to washrooms within the change rooms or to the individual washroom within the staff room on the lower level, and that the upper level washrooms should be provided, the NBCC would dictate that a washroom for each gender should be provided. The female washroom would require two water closets, and a lavatory, while the men's would have a single water closet and lavatory.

Space for two public washrooms meeting occupant load requirements for the mezzanine area exists in the area presently used for storage adjacent to the pool supervisor's office.

Recommendations

2000 .1 Provide two washrooms on the mezzanine level. This is a Priority 2 recommendation with a cost estimate of **$10,000**.

.2 Provide a new towel dispenser in the staff/barrier-free washrooms. This is a Priority 2 recommendation with a cost estimate of **$50**. 2001

2.4.8 Changing Rooms

Findings

The changing rooms are in good condition. The floor finish in the shower areas, the cubicle dividers, and the washroom facilities within the change rooms are the subject of comments and recommendations in the previous sections of this report.

The lockers provided for public use are sized for the storage of valuables, and we would suggest that these be augmented by a number of full-sized clothes lockers, and half sized lockers to fill available space across the wood exterior wall surface in each change room.

Recommendations

2001 .1 Provide additional lockers. This is a Priority 3 recommendation with a cost estimate of **$3,000**.

2.4.9 Pool Components

Findings

The pool equipment includes the bulletin boards, life jackets, floats, lane lines, diving board, ladders, slide, tot docks, pace clock, and "easy ladder" pool stairs. Most of this equipment is in good condition. In addition to the existing gear, the prospect of attracting, and properly accommodating a swim team would present the need for a range of additional equipment which is addressed below with a Priority 3 recommendation.

Recommendations

.1 Establish a reserve fund for the repair and replacement of non-fixed pool deck equipment (life jackets, floats, bulletin boards). This should include an annual maintenance allowance of **$1,500** per year.

annual ✓ operational budget

.2 Replace the diving board in year 15 of the life cycle plan (a new unit was installed in 1998). This is a Priority 2 recommendation with a cost estimate of **$10,000**.

.3 Replace the slide in year 10 of the life cycle plan. This is a Priority 2 recommendation with a cost estimate of **$2,500**.

.4 Replace the tot docks (two existing plus one additional) in year two and on a five year interval. This is a Priority 2 recommendation with a cost estimate of **$3,600** per cycle.

.5 Replace pool vac unit. This is a Priority 2 recommendation with a cost estimate of **$10,000**, with a continuing maintenance agreement valued at **$2,000** per year.

.6 Provide new or upgrade equipment for competition, including lane lines and storage reel, and the starting blocks. This is a Priority 3 recommendation with a cost estimate of **$14,000**. (Only required if swim team is established and does not include bleachers for the multi-purpose room.)

2.4.10 Fire and Life Safety (also see Electrical and Mechanical Sections)

Findings

The existing exit facilities and fire separations within the building meet all current fire and life safety code requirements. The size of the second exit door at the far end of the pool could prove too small if the occupant load was increased by means of bleachers, however, this is not a problem at present. Electrical and mechanical fire and life safety systems are addressed in their respective sections.

There is a hazardous condition where concrete foundation edge and steel column shoes are exposed along the pool decks. Sharp corners and edges should be ground back or a guard rail installed to reduce the risk of personal injury.

Recommendations

There are no recommendations relating to fire and life safety except those addressed in previous sections on the exterior fire escape stair (2.3.5), and the main exit stairwell (2.4.6).

2000 .1 Provide guard rail along perimeter of pool deck to guard users from contacting sharp projections. This is a Priority 2 recommendation with a cost estimate of **$1,000**.

2.4.11 Special Uses

Findings

The potential for an extended range of revenue generating uses on the mezzanine level could be met with certain upgrades to improve the amenity level. We also understand that a weight training area may be installed, however, the size and specifications for it have yet to be determined. It should be physically separated from the multi-purpose room, and have adequate ventilation. The detailed nature and cost of renovations related to the extended uses should be the subject of a comprehensive schematic design study.

Recommendations

.1 Provide washrooms (addressed in 2.4.7).

2005 .2 Provide kitchenette facilities. This is a Priority 3 recommendation with a cost estimate of **$4,000**.

.3 Provide floor finishes (addressed in 2.4.1).

.4 Provide windows to the exterior, two facing the front parking lot, two to the right side, two to supervisor office and meeting room. This is a Priority 3 recommendation with a cost estimate of **$6,000**. 2004

2003.5 Provide acoustic isolation for the pool ventilation system. This is a Priority 2 recommendation with a cost estimate of **$10,000**.

2.5 BARRIER FREE ACCESS

Findings

The path of travel from the designated parking space is reasonably level, except at the area immediately outside the vestibule. This area should be re-graded.

The main entrance doors should be upgraded to full power assist, and a barrier-free path of travel maintained through the staff area to the pool deck and individual washroom areas.

The barrier-free design criteria normally applied to public buildings would preclude relying on an individual washroom within the staff area for compliance, as is the case here.

Space constraints in the change rooms, however, and shower areas preclude achieving full barrier-free compliance on the main level without dramatically reducing general capacity. Enclosed, barrier-free changing vestibules, and shower cubicle in each change room would be required for a suitably dignified and complete response to the needs of the physically challenged.

The facility is probably negotiable by a significant number of wheelchair users, and although it would be necessary to roll through the gang shower, individuals could use the barrier-free washroom in the staff area for dressing after showering.

The mezzanine level is not accessible to non-ambulatory individuals, however, the stair gives access to visually challenged individuals, and improvements to bring the stair into compliance with contemporary best practice are recommended in Section 2.4.6.

Recommendations

.1 Provide a level asphalt area at the exterior approach to the main entrance door. This is a Priority 2 recommendation with a cost estimate of **$500**.

2001

.2 Provide power operators to the main entrance doors. This is a Priority 2 recommendation with a cost estimate of **$4,500**. (This includes guard rails and back check bollards to prevent accidental damage and injury when doors open automatically.)

2.6 MECHANICAL

2.6.1 Heating System

Findings

Space heating in the building is provided primarily by a hydronic heating system utilizing fan forced unit heaters in the locker rooms and main vestibule and a 750 mbh hydronic heating coil in the supply air duct to the pool hall. The heating system is supported by two New Yorker cast iron hot water boilers, rated at 551 mbh each (gross output). Boiler # 1, installed in 1992 during the facility restoration, is in good operating condition. Boiler # 2 is an older unit, installed in 1987, is in fair condition and operating efficiently. This is likely due to the regular maintenance each boiler is provided. Additional space heating is provided by an electric unit heater and electric baseboard throughout the mezzanine areas and the pool office on the main level.

Fuel supply for the boilers is provided by three 250 gallon oil tanks located in a shed located outside, near the northwest corner of the building. This oil storage shed was constructed in 1992 and includes a concrete spill containment berm. The shed itself is in excellent condition, and the oil tanks are in fair physical condition. The containment area is approximately 128 cu.ft. and this is adequate for an oil storage volume of 960 gallons. This containment volume is well in excess of the total stored fuel amount.

The boilers are forced draft appliances connected to a masonry chimney. The chimney is comprised of a single 12 x 12 clay liner and brick facing. The assembly is in very good physical condition, and has been recently extended to prevent reingestion of exhaust fumes into the air handling equipment. The flue connection from each boiler is an uninsulated 9" galvanized flue pipe complete with barometric damper. An adjacent 70 gallon oil fired domestic water heater is connected to the same masonry chimney with an uninsulated 7" galvanized flue pipe. The total connected load to this chimney is 1242 mbh. The effective area inside the clay liner is only 95 sq.in. The existing chimney is therefore undersized and contravenes CSA B-139 recommended flue areas. The original 'New Yorker' boiler installation specification calls for an 18"x 13" flue for a single 516 mbh appliance. CSA-

B139, in comparison, is not so conservative and recommends a minimum flue dimension of only 10" x 10".

The existing fan forced unit heaters located in each dressing room are functional but the casings are corroded and the fans are somewhat noisy. A preferred, modern heating arrangement uses hydronic radiant heaters installed in the ceilings. This arrangement could be included as part of an overall refurbishment of these spaces.

Recommendations

1999 .1 The installation of a second 18" x 12" chimney is required to support the exhaust from the two 551 mbh boilers. This is a Priority 1 recommendation with an estimated cost of **$4,000**. The existing chimney will be retained to exhaust the hot water heater.

1999 .2 Insulate breeching on boilers and domestic water heater, as this exposed pipe is considered a personnel hazard. This is a Priority 1 recommendation with an estimated cost of **$600**.

.3 Option No. 1 - The existing unit heaters installed in the dressing rooms should be replaced. This is a Priority 2 recommendation with an estimated cost of **$900**. 2002

Option No. 2 - The existing unit heaters installed in the dressing rooms could be replaced with a modern, radiant ceiling arrangement. This is a Priority 3 recommendation with an estimated cost of **$3,000**. This work would usually be a component of overall architectural improvements to the space involving the replacement of the existing drywall ceilings.

replace boiler #1 $4500 in yr 2007
#2 4500 in yr 2012

2.6.2 Ventilation

Findings

Building ventilation is provided by three supply air systems. The primary air handling system is provided by the 'Dectron DS-120' air handling and dehumidification system, delivering an original design volume of 11,000 cfm to the pool hall. This system was inspected and balanced in 1997, and now supplies approximately 11,740 cfm. The system operates in full recirculation mode without any fresh air until a return air temperature sensor calls for ventilation. This return air temperature is typically set at 86°F or 87°F. Upon a call for ventilation, a supply air fan delivers 3173 cfm into the supply air ductwork to the pool hall. This fan is interlocked with a roof mounted exhaust fan, rated at 3000 cfm. The concern is that a minimum constant volume of fresh air as suggested by ASHRAE standard 62-89 is not introduced to the space during all occupied hours. It is important to note however that air quality testing done at this facility found CO_2 levels on the pool deck within an acceptable range (an acceptable CO_2 reading is less than 1000 ppm).

The dehumidification system is essentially a closed loop heat pump with heat reclaim which rejects heat to the pool. The system was installed in 1992 and is in fair operational condition, however reports of swings in air and pool water temperatures are common. These reports are well documented and can be traced back to early 1993. These complaints were most common during the summer months. In addition, the unit has experienced water (condensation) leaks resulting in damage to the ceilings of the lobby below. The most recent experience involved a compressor malfunction, resulting from a lightning strike, leading to heavy icing, which shorted out the compressor. The controller shut down the unit on compressor failure and the ice melted, leaking through the unit casing and down to the ceilings below. Currently, the compressor is tripping out on high pressure. This is not a problem with the compressor but the result of a high return air temperature to the 'Dectron' unit. This problem is discussed in detail in the next few paragraphs of this report.

Dehumidification is the equipment's primary function, and the waste heat from this intermittent action is rejected to the pool. Once the pool water temperature is satisfied the heat must then be rejected to another device. Since no other device exists, excess heat continues to be rejected into the pool and the water temperature often ramps up to unacceptable levels. This elevated pool water temperature impacts on the pool deck temperature. These elevated temperatures are well documented. The issue is the "domino effect" beginning with the dehumidification process. This process rejects heat to the pool, which leads to elevated pool water temperatures, which leads to elevated pool deck temperatures, which leads to high return air temperatures, which impacts on the performance of the dehumidification equipment, and so on. The problem with this system is the absence of a remote air cooled condenser to reject heat from the system during the dehumidification process, once the pool water temperature is satisfied.

Upon review of the documentation available since concerns with the equipment developed, it was previously noted by another consultant that this air cooled condenser be installed. This recommendation was first tabled in March of 1993, approximately a year after the dehumidification system was put in operation. In July of 1996, the Municipality commissioned and received a design package for mechanical and electrical system improvements to the facility. Among those improvements was the design and specification for the installation of the air cooled condenser. The equipment was never installed. It is assumed the available capital budget was limited and the equipment cost deemed prohibitive (estimated then at $18,000) and removed from the contract.

Only a year later, in July of 1997, following familiar complaints from staff and patrons regarding pool water and deck temperatures, another consultant investigated and recommended this same air cooled condenser be installed. This equipment is a critical component in the dehumidification process, especially when the only provision for heat rejection is the pool. Unfortunately, without this air cooled condenser; a stable pool water temperature will rarely exist; and future complaints will be common.

The mezzanine area is served by a 'Lennox' split system air conditioning unit supplying 1700 cfm, complete with economizer and electric heating coil. The system was installed in 1993 and is in good operating condition with clean filters. The remote condenser is located in front of the building below the emergency exit from the mezzanine. There are no serious concerns regarding the operation of this air conditioning unit however there have been reports of condensation forming on the unit. This condensation is occasional and typically during cooling mode. It is believed that moisture carry over from the cooling coil is running down inside the unit. It is also believed that moist air in the mechanical room can condense on the unit's casing. The source of this moist air is unknown and there are no visible leaks in the ductwork to the 'Dectron' unit. A full drain pan was added below the unit to collect any excess condensate.

The third and final air handling system is a small heat recovery ventilator (HRV) providing 300 cfm to the mezzanine area. This unit was installed in 1992 to supply a small amount of fresh air to the mezzanine office area, prior to the installation of the 'Lennox' unit. This HRV is made redundant by the 'Lennox' unit, but it remains in operation. This HRV is not required and is simply wasting electrical energy. Some consideration could be made to relocating this unit to the office area on the main level, however the routing of ductwork could prove difficult.

Locker areas and the main level office are served by a single, wall mounted centrifugal exhaust fan, installed in 1996, exhausting 900 cfm. The fan is located on the north wall away from pedestrian traffic and is quiet in operation. The areas served by this exhaust fan are provided no direct make-up air. There are no door grilles or transfer grilles installed to allow air from adjacent spaces to enter the locker rooms. These rooms are certainly drawn negative while the fan is in operation, but the lack of make-up air to the spaces is likely limiting the required exhaust air volume. Additional air should be introduced to these spaces to ensure the proper air exchange rates. The installation of a make-up air system with heating coil is required. The introduction of a heat recovery ventilator (HRV) should be considered to allow exhaust air to pre-heat the incoming fresh air.

Recommendations

.1 The installation of an air cooled condenser is required to complete the dehumidification system and to allow the pool water heating system to function

1999

normally. This is considered a Priority 1 recommendation with an estimated cost of **$25,000**.

.2 The installation of a small air handling unit supplying the main level office and locker rooms should be installed to ensure the proper air flow in these spaces. This is considered a Priority 2 recommendation with an estimated cost of **$6,000**.

2004

2.6.3 Controls

Refurbish Dectron unit
2012 $14,000

Findings

There is little in the way of building control systems other than stand alone thermostats and a humidistat supporting the 'Dectron' unit and the air handlers. The 'Dectron' unit thermostat, located below a return grille on the pool deck, is a combination heating / cooling type which provides only a 1 or 1.5 degree deadband. These systems typically require separate thermostats. One for space heating set about 84, and a second for cooling (ventilation) set at 86 or 87. These should be set and access restricted to prevent unauthorized adjustment. A humidistat mounted in the pool hall is set to maintain relative humidity at 55% - 60%.

The thermostat and humidistat were long suspected to be a factor in the problems experienced with the 'Dectron' unit. Recently, it was discovered that cold air from the adjacent boiler room was migrating through the conduit opening and reaching the back side of the thermostat. These false readings were quickly corrected with a foam sealant injected into the opening. Air temperatures on the pool deck have been relatively constant since this problem was corrected.

It is also doubtful if the cooling stage of this existing thermostat is activating the ventilation system. This system is critical in maintaining space temperature. The regional manager for 'Dectron' equipment had visited the site at our request to inspect this installation and he believed the existing thermostat is not controlling the ventilation sequence properly. There have been many adjustments and modifications made to the control systems and therefore it is likely operating nowhere near its original design parameters. A certified refrigeration mechanic, or the manufacturer's representative, should be brought in to inspect and recommission all components in the dehumidification system.

Pool water temperature is controlled by an aquastat mounted in the pool suction line. It is uncertain if this aquastat is functioning properly or has been calibrated. Since there have been many concerns regarding pool overheating, this item should be inspected and either adjusted or replaced. Pool pump control is manual but it is understood the pump runs continuously. Some pools cycle the pump to conserve energy simply by running the pump on a schedule reflecting pool use.

Recommendations

.1 The existing temperature sensors in this facility are suspect at best. Many of the temperature problems could be corrected with proper inspection and maintenance of the control components of the dehumidification equipment. It is recommended a certified refrigeration mechanic, or the manufacturer's representative, inspect and overhaul as required all existing control components and recommission the system. This is a Priority 1 recommendation with an estimated cost of **$1,000**.

1999

.2 Install an electronic time clock controller on the pool water circulator. This will offer some energy savings and extend the life of the circulator. This Priority 2 recommendation is estimated to cost **$500**. Replace AquaState 2011 $750

2001

2.6.4 Pool Filtration Equipment

Findings

This equipment is located in the boiler room on the pool deck level. It consists of a single sand filter, a circulating pump, a small chemical container and metering pump, an 'Armstrong' shell and tube heat exchanger, and a mix of steel and plastic piping, valves, and fittings. Some of the equipment, the sand filter, heat exchanger, and their associated steel piping is original, circa 1967. The sand filter is in good physical condition despite its age. There have been no reports of surface corrosion or failures in the shell typically found in sand filters of this vintage. Sand filters usually do not last 30 years so it is likely this unit may soon require a replacement. Some other facilities have found success installing fibreglass liners inside the existing steel shells in order to extend the filters operational life.

Pool water piping above grade in the mechanical room is a mix of steel and plastic while below grade it is plastic. Pool water environments are naturally corrosive and the use of ferrous piping is not recommended. There have been no serious concerns noted about the ferrous piping currently installed and all valves and equipment function normally. The existing shell and tube heat exchanger had no evidence of corrosion either but it has been subjected to the same corrosive environment so it will also require inspection and cleaning.

The pool water circulating pump is located in a pit in the mechanical room and typically runs continuously. The pump was overhauled and re-installed in 1992 during the refurbishment of the facility and is in good operating condition, however it is somewhat suprising it is mounted down in a pit. Staff reported that the pump has been submerged and its bearing replaced. The current pump configuration is required to maintain the pump suction and inlet lines flooded. Therefore, relocation of the pump is not suggested. Some consideration should be given to cycling the pump to reflect pool use in an attempt to conserve energy.

The chlorine feed system installed at this pool is currently under review. There are several quotations for equipment replacement with the Municipality, and an upgrade is planned. The chlorine metering rate must be controlled accurately to ensure the correct amount of chlorine is being added to suit pool usage. In addition, excess chlorine will increase corrosion of any ferrous metals in the system.

Recommendations

.1 Inspection and cleaning of the existing shell and tube heat exchanger should be performed. This is a Priority 2 recommendation estimated to cost **$400**.

2000

.2 Install a fibreglass liners within the existing sand filter to extend its life. This is considered a Priority 2 recommendation estimated to cost **$5,000**.

2002

.3 Replace all ferrous piping and valves in mechanical room with PVC. This is considered a Priority 3 recommendation estimated to cost **$5,000**.

2005

Replace circulating pump + filter $1000 yr 2010

2.6.5 Plumbing and DHW Systems

Findings

Domestic hot water is provided by an oil fired 70 gallon water heater. Installed in 1992, the unit is in fair condition. Hot water makeup with this unit was reported to be too slow to ensure an adequate hot water supply when the facility is busy. The safety relief valve on this water heater is not piped to the floor as required by code.

Water supply is from an on-site well and the water pressure and quality is adequate by all reports. A water softening unit and descaler were installed recently and have performed well in reducing the build up of minerals and scale in the piping systems.

All plumbing fixtures in the facility are in fair physical condition. One toilet tank cover was damaged in the male locker room. The toilets and urinals are all of the flush tank variety. Shower heads and floor drains are also in fair condition. The building is connected to the municipal sewer system, and no drainage problems were noted. The facility is adequate in all respects for the number and layout of plumbing fixtures, however some consideration should be given to improve the barrier free requirements. This topic is covered in the architectural component of this report.

Recommendations

.1 Pipe safety relief valve on domestic water heater to floor. This is a Priority 1 recommendation with a cost estimate of **$50**.

1999

.2 Compliment the existing 70 gallon domestic water heater with a second unit of similar capacity. Hot water makeup should provide approximately 120 gallons per hour at 140°F. This is considered a Priority 2 recommendation with a cost estimate of **$1,500**.

2001

2000 .3 Install new water conserving shower heads. This is considered a Priority 2 recommendation with a cost estimate of **$120**.

2000 .4 Replace damaged toilet tank cover in male locker room. This is considered a Priority 3 recommendation with a cost estimate of **$75**.

2.6.6 Fire Protection

Findings

The building is protected by several portable multi-purpose type fire extinguishers located throughout the building. All have current inspection tags attached and are in good condition. The number of extinguishers and their layout is compliant with NFPA-10.

Recommendations

There are no recommendations regarding fire protection items.

East Hants Community Pool | **Project # EHM-304**

Major Mechanical Equipment / Systems | **Date: 26 April, 1999**

Item	Tag	Manufacturer	Model	Installed	Location	Service	Reference Section
1	AHU # 1	Dectron	DS-120-53	1992	Mezzanine mechanical room	Pool hall air handling and dehumidification	2.6.2
2	SF # 2	Greenheck	BSQ-HP-200	1995	Mezzanine mechanical room	Fresh air supply to pool hall (dehumidification system)	2.6.2
3	EF # 1	Greenheck	GB-180-5	1995	Roof	Exhaust air from pool hall (dehumidification system)	2.6.2
4	AHU # 2	Lennox	CBS-18-51-3P	1993	Mezzanine mechanical room	Mezzanine office and common area	2.6.2
5	AHU # 3	Heat-X-Changer	HP-300	n/a	Mezzanine mechanical room	Abandoned	2.6.2
6	EF # 2	Greenheck	BSQ Series	1993	West exterior wall	Washroom / locker room exhaust	2.6.2
7	Boiler # 1	New Yorker	FD-504	1987	Mechanical room	Building heating	2.6.1
8	Boiler # 2	New Yorker	FD-504	1992	Mechanical room	Building heating	2.6.1
9	DWH # 1	John Wood	n/a	1992	Mechanical room	Domestic hot water supply	2.6.5
10	P-1	Grundfos	n/a	n/a	Mechanical room	Heating coil AHU # 1 (pool hall)	2.6.1
11	P-2	Grundfos	n/a	n/a	Mechanical room	Perimeter unit heaters	2.6.1
12		S.A. Armstrong	n/a	1967*	Mechanical room	Pool water heating	2.6.4
13		Softy	TS-1200	1997*	Mechanical room	Water softener	2.6.5
14		Jacuzzi	n/a	1967*	Mechanical room	Sand filter	2.6.4

* - asterisk denotes estimate

2.7 ELECTRICAL SYSTEMS

2.7.1 Electrical Service

Findings

The electrical and distribution systems are illustrated on the Single Line Diagram, SK-304-E-01, presented at the end of this Section 2.7.

The electrical service for the East Hants Municipal Swimming Pool is rated 200A, 347/600V, 3 phase, 4 wire, and originates at a three phase pole line to the northeast of the building. The primary conductors are installed overhead, and run from three 50 kVA pole top transformers. The 4 #2/0 AWG copper secondary conductors are routed to the main 200A disconnect switch in the electrical room via a 2½" RGS service mast.

The 347/600V service appears to be in reasonably good condition. However, a large water stain was observed on the ceiling at the point of entry of the service mast.

The main service grounding consists of one bare copper conductor connected to the neutral of the main 200A, 347/600V disconnect switch. This ground conductor leaves the electrical room, and we assume it is connected to two ground rods installed as per the CEC requirements, although we could not verify this onsite.

The electrical room is located on the second floor, beside the mechanical room, and is adequate in size, with proper clearances for the distribution equipment. It is not equipped with fire alarm detection, and does not have emergency lighting or ventilation (Section 2-318 of the CEC).

The electrical service is metered by Nova Scotia Power (Meter #802411), with a multiplier of 90 and a Rate Code of 11M. The utility meter is located inside the electrical room, on the north wall.

NSPI billing does not record peak demand reading, therefore, it is not possible to determine the percentage of pool load on the service feeders and equipment. Instantaneous current measurements taken on February 16, 1999, at the main disconnect are as follows:

- Phase A - 64A
- Phase B - 63A
- Phase C - 62A
- Neutral - 1A

These values were measured when major mechanical and base building lighting loads were in operation, therefore, it is assumed that the service load is approximately 30% of capacity.

Recommendations

✓ 1999

.1 The ceiling appears to be leaking around the electrical service mast. Investigate and correct this problem. This is a Priority 1 recommendation with a cost estimate of **$100.**

2.7.2 Distribution System

Findings

Power distribution throughout the pool building originates at the main splitter which is rated 200 A, 600 V, 3 phase, 4 wire. The splitter is supplied from the main switch by three #2/0 AWG copper conductors.

From the 200 A splitter, power is distributed to a 100 A disconnect switch, a 60 A disconnect switch and a 30 A disconnect switch, as indicated on the single line diagram at the end of this Section, and summarized as follows:

.1 A 100 A, 600 V, 3 phase, 3 wire disconnect switch with three 100 A/600 V NRS100 fuses. This disconnect switch feeds the 'Dectron' unit, located in the mechanical room next to the main electrical room, via switch three #3 AWG copper conductors.

.2 A 60 A, 600 V, 3 phase, 3 wire disconnect switch with three 60 A/600 V CRS60 fuses. This disconnect switch feeds a 150 kVA, 600 V - 120/208 V, 3 phase, 4 wire, step down transformer. A three conductor 3 AWG Teck 90 cable feeds the primary of the transformer, and four 3/0 AWG copper conductors in 3" flexible conduit are fed from the secondary to a 200 A, 120/208 V, 3 phase, 4 wire disconnect switch. This disconnect switch is fused with three CT-200 fuses, which feed a 200 A, 600 V, 3 phase, 4 W rated splitter, located in the lower mechanical room.

.3 a 30 A, 600 V, 3 phase, 3 wire fusible disconnect switch with three 15 A, 600 V, K0515 fuses. This disconnect switch feeds a supply fan, via three conductor 14 AWG Teck 90 cable.

All distribution equipment inspected was found to be in good condition, with the exception of the following noted deficiencies:

- the marking of the distribution equipment;
- an oxidized connection in the pool circulating pump, which was corrected before leaving on February 16, 1999;
- equipment and supplies stored within a one meter radius of transformer and associated electrical equipment.

Recommendations

.1 All distribution equipment, disconnect switches, splitters, panel boards, and control panels must be clearly marked as to what they protect or control, and the maximum rating of overcurrent device that is permitted. This is to conform to CEC, Sections 2-100 (3) and 26-262. This is a Priority 1 recommendation, with an approximate cost of **$250**.

1999

.2 Remove pool equipment and supplies stored within one meter of electrical equipment in the lower mechanical room to meet the CEC requirements. This is a Priority 1 recommendation with a cost estimate of **$50**.

2.7.3 Lighting

Findings

The interior lighting system in the East Hants Swimming Pool consists of the following components:

- fifteen 250 W mercury vapour fixtures, pendant mounted 20' above water surface, to illuminate the pool area;
- thirteen 250 W high pressure sodium surface mount fixtures;
- surface mounted flourescent fixtures for the lobby, locker rooms and office area; and
- incandescent fixtures in closets and storage areas.

The pool lighting is supplied from a 30 cct. panel in the mechanical room, which is wired to toggle switches in the main office area. The remainder of the building's lights are controlled by toggle switches throughout the building.

The parking lot and outside building lighting is provided by two HPS pole top light fixtures, and three HPS wall packs mounted on the front of the building.

The inspection of all light fixtures was carried out on a room by room basis, and assessments are based on acceptable illuminance values found in the Illumination Engineering Society (IES) Lighting Handbook, Application Guide. The IES recommends the following lighting levels for the different activities:

- Swimming, (indoor)
    - Recreational: 300 lux
    - Exhibitions: 500 lux

Illumination levels were recorded at 30 points over the pool deck and pool area. These levels varied from a low of 230 lux, to a high of 400 lux with an overall average of 300 lux. This average value is adequate for recreational swimming (public swimming, lane swimming, etc).

Illumination values were measured in all other areas of the building, and were, for the most part, found to be adequate. There were a few areas throughout the building where there were light fixtures with non-functional lamps, and in these locations the light levels were low. We are confident that, with all existing light fixtures fully operational, illumination levels would be adequate, except for the stairwell leading to the second level. The following is a generalized list of spaces and the recorded illumination values in these areas:

- corridors and entrance ways: 400 - 660 lux
- stairwells: 40 - 60 lux
- mechanical and electrical rooms: 300 - 400 lux
- office: 300 - 500 lux
- locker rooms: 250 - 300 lux
- meeting rooms: 250 - 300 lux

Illumination values measured in the above areas of the building were generally adequate, except for the stairwell to the second level, where illumination levels measured low.

Recommendations

2000 .1 Install new lamps in existing fixtures that have either no lamps or non-functional lamps. This is a Priority 2 recommendation, with a cost estimate of **$100**.

2000 .2 Install two (2) 1' x 4' surface mount fixtures in the stairwell. This is a Priority 2 recommendation with a cost estimate of **$300**.

2.7.4 Electric Heating

There were supplemental electric heating systems found in this community pool building. These systems consist of: an electric baseboard heating unit located in the main office, a small electric unit heater on the mezzanine level, and a wall mounted electric force flow heater in the vestibule. The heating units are discussed in more depth in the mechanical section.

2.7.5 Systems

2.7.5.1 Fire Alarm System

Findings

There is no fire alarm system in this building. National and Provincial Building Codes do not require a fire alarm system in a building of this size and occupancy, however, smoke detectors are generally considered to be good practice for all occupied buildings.

A question has been raised relative to the use of CO detectors in this building. CO detectors are not required by code for buildings of this type.

Recommendations

.1 Smoke detectors should be installed in the electrical room and both upper and lower mechanical rooms. This is a Priority 2 recommendation with an approximate cost of **$500.**

2.7.5.2 Emergency Lighting Systems

Findings

The pool's emergency lighting system consists of individual emergency lighting units, complete with battery and dual lamps. Much of the building is served from several of these units wired to some remote head units. All of these units were functional, with the exception of the ladies change room. Overall, the building does not have sufficient emergency lighting. There should be additional units on the mezzanine level, and remote heads added in the electrical room, to satisfy the requirements of the National Building Code (NBC) and the CEC.

Exit signs were properly located throughout the building. There are a number of exit signs with non-functional lamps.

Recommendations

.1 Install additional emergency lighting on the mezzanine level and in the main electrical room. Wire to closest emergency battery pack to satisfy NBC and CEC requirements. This is a Priority 1 recommendation with an approximate cost of **$600.**

.2 Replace non-functional lamps in exit lights throughout the building. This is a Priority 1 recommendation with an approximate cost of **$100.**

.3 Repair non-functional emergency light in ladies change room. This is a Priority 1 recommendation with a cost estimate of **$100.**

2.7.5.3 Telephone/Communications Systems

Findings

The MT&T service runs from the main service pole overhead to the main electrical room. The telephone system appears to be sufficient for the use of the building.

The computer in the main office is currently not connected into the MEH local area network. The network server and distribution hub is located in the adjacent administration building. Connection of the pool computer into this network would require a new Ethernet cable run between the buildings, a new network card in the pool computer, and a spare port in the distribution hub.

The requirement for a public payphone to be installed is determined by the MTT Payphone Department. Criteria is based on client request, volume of people asking for the use of the phone, and the type of business.

Recommendations

1999 .1 Connect computer into MEH local area network. This is a Priority 2 recommendation with an approximate cost of **$500**.

2.7.6 Wiring Devices

Findings

Inspection of the facility's receptacles was performed on a room by room basis. All were checked as being operational. There are four GFCI receptacles in this facility, with one in each locker room and two in the pool area. All receptacles were found in good condition.

The voltage was measured throughout the building and found to be within the 5% allowable drop from the panelboard to receptacles, per the CEC.

Staff has reported electrical problems during functions in the mezzanine area with coffee urns, which is the result of excessive load being drawn from this circuit.

Recommendations

.1 Install a dedicated circuit to a receptacle on the mezzanine for coffee urns. This is a Priority 2 recommendation with a cost estimate of **$100**.

2.7.7 Mechanical Equipment Power Supplies

Findings

Mechanical equipment is supplied from a 20 circuit panel in the mechanical room. The pool water pumps and associated motors are supplied from motor starters in the lower mechanical room. All wiring associated with the pool equipment was found to be adequate.

All motor starters are of proper sizes, and have adequate overload protection. The electrical equipment associated with this equipment appears to be in good condition, and no apparent upgrades are necessary at this time, except to install lamicoid nameplates on the electrical equipment as recommended in Section 2.7.2.

2.7.8 Branch Circuit Wiring

Findings

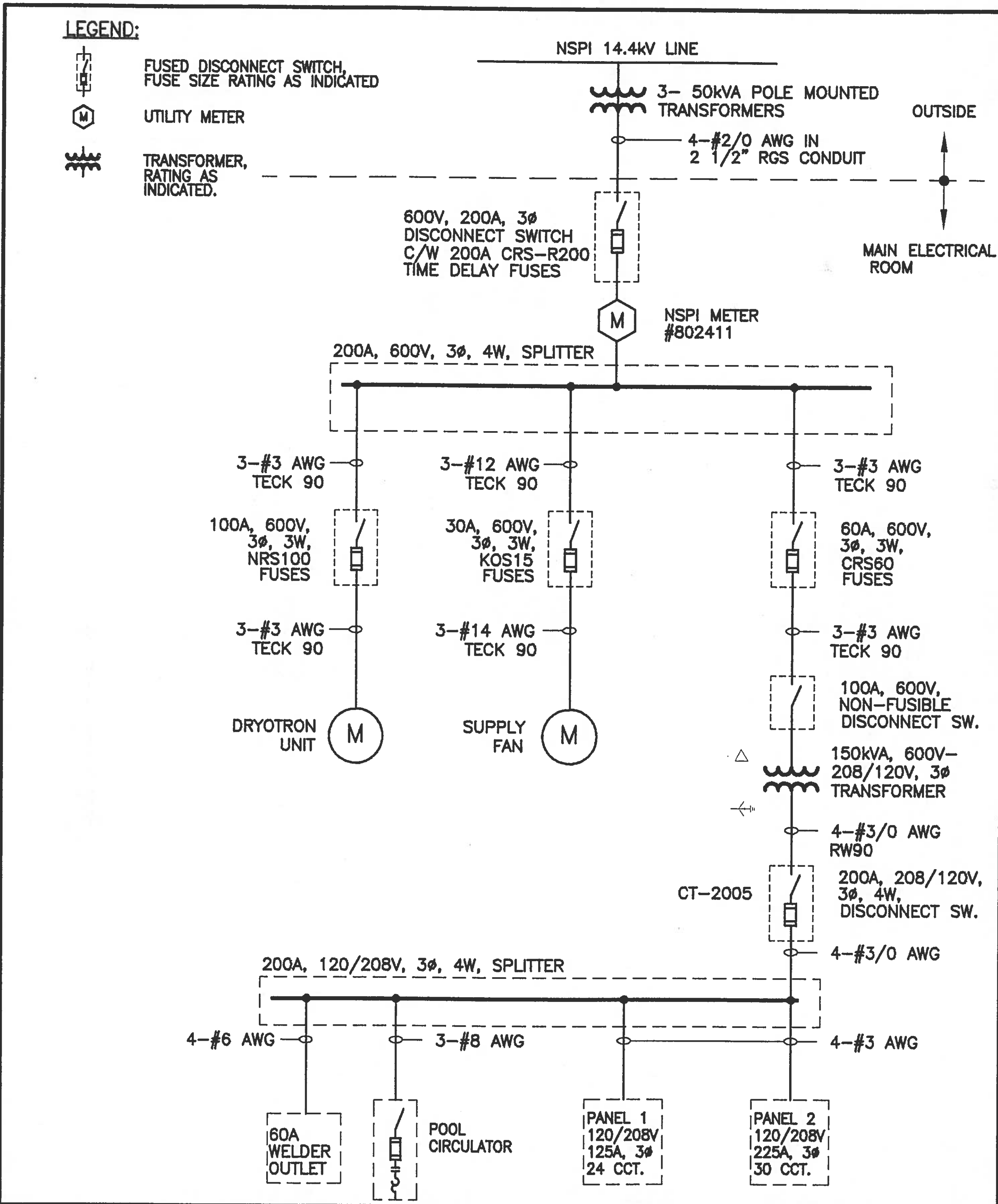
Branch circuit wiring refers to the wiring exiting the panelboards and terminating at various loads such as other panels, lighting, receptacles, etc. Most branch circuit wiring within the community pool consists of RW90 conductors run in electric metallic tubing (EMT), teck cable, flexible and armoured cable. Grounding and bonding is achieved by the use of a separate ground wire, or by means of the rigid metallic conduit system.

Exposed branch circuit wiring throughout the building was run in flexible armoured cable.

2.7.9 General Comment

All individual electrical equipment should be identified with a lamicoid name tag containing, at a minimum, the following information:

- equipment identification
- supply or feed voltage
- phase(s)
- source of power or equipment being supplied.



LEI PROJECT # EHM-304

SCALE:	NTS
DRAWN BY:	CAB
CHECKED BY:	RLW
DATE:	17/02/99
APPROVED:	
CAD. FILE #	SK-304-E-01

CONSULTANT: Lewis Engineering Inc.

CLIENT: EAST HANTS SWIMMING POOL

TITLE: 200A, 600V ELECTRICAL SERVICE

DWG. NO.: SK-304-E-01

REV. 0

2.8 ENERGY AND ENVIRONMENTAL REVIEW

2.8.1 Energy Review

Findings

Fuel bills for 1998 show a fuel consumption of 28,310 litres of No. 2 fuel oil. This number can be expressed as an annual equivalent heating load of 238,653 kWh or 20.2 kWh/ft². Electrical bills for the same period show an energy consumption of 319,500 kwh or 27.1 kwh/ft². This provides a blended energy consumption for the building of 47.3 kWh/ft². Information obtained from Energy Mines and Resources Canada indicate typical modern pool buildings have energy consumption rates of 60 - 70 kWh/ft². Therefore the energy consumption for this facility is much less than industry standards and considered very good.

Typical recommendations would call for use of a pool blanket, a two speed pool water pump motor, low flow shower heads, a lower pool water temperature (perhaps 81°F or 80°F), and a reduced supply air temperature to the pool deck (perhaps 83 or 82). These temperatures are still within an acceptable range. These recommendations will certainly impact on the energy consumption levels, however lower pool water or air temperatures may lead to complaints from pool users.

The two speed pool water pump motor has merit. Many other pools have adopted a policy of shutting off their circulating pumps when the pool is unoccupied and none have reported any problems with water quality. This type of approach requires the pool operators to assess the pool usage and determine how appropriate it would be to shut off the pump. An example would be a pool that had day time swims with only 10 - 20 people in the pool compared to another that had children groups or swim clubs with 40 - 50 people in the water at once. A decision regarding down time for the filtration system would have to be based on information like this. The previous recommendation for the time clock to control the pump will also allow the pool operator to override the clock and start the pump if the pool gets unexpectedly busy.

Pool blankets are a good idea and provide excellent energy savings. Without an automatic reel, however, they do require at least two people to roll and unroll. In this pool the usual staffing level in the morning and night when the blanket would be taken off and put on is one. The cost of having an additional staff member to come in for this job could quickly consume any energy savings associated with its installation.

Recommendations

2006 .1 Install pool blanket with automatic winch and hoist for operation. This is a Priority 3 recommendation with a cost estimate of **$15,000**.

.2 Reduce pool water and air temperatures to 80°F and 82°F respectively. This is considered a Priority 3 recommendation with no associated cost.

2.8.2 Indoor Air Quality Review

Findings

No major complaints about air quality were received during our inspection, and two independent air quality studies were performed recently. A comprehensive air quality assessment was completed in November of 1997 and found no concerns with the environment. A second study was commissioned in June of 1998, and again no concerns with the environment were recorded.

Certainly there are some concerns regarding air exchange in the locker rooms and lower level office and these are addressed previously in this report. Concerns were raised regarding combustion odors from the boiler room being detected in the stairwell leading to the second level. No evidence of leaks around concrete block work abutting the stairwell were noted, and some attention has recently been given to the sealing in that area. Still, minor traces of odors were detected and consideration must be given to a second chimney to support the boilers and water heater.

Complaints of odours from pool deck were received. This is most likely due to dried out drain traps allowing sewage odours to escape or an undersized drain line serving the deck drains which creates a siphon effect when full of water and renders the trap ineffective.

Regular manual priming of the drain pipe should solve the problem. The traps may also need to be cleaned of debris that could be contributing to the odour problem.

2.8.3 Hazardous Substances

Findings

Small amounts of cleaning products were found in the janitors closet on the second level. The space is not mechanically ventilated but there is so little product kept in this area it is not considered a concern.

Some pool water chemicals are stored in the mechanical room and in an external building housing the fuel tank. All chemical containers must kept at least 5'-0" away from sources of heat and protected from damage. A new dedicated chemical storage shed is planned to house these pool chemicals.

3.0 Life Cycle Plan

3.0 LIFE CYCLE PLAN

3.1 AUDIT RECOMMENDATIONS AND COST ESTIMATE SUMMARIES

3.1.1 Priority 1 Recommendations

Item No.	Reference Section No.	Description	Cost Estimate
		Site/Structural Architectural	
1	2.2.4.3	Install additional steel framing.	$8,500
2	2.3.5.1	Improve stair railings and risers.	$1,000
3	2.4.6.1	Provide continuous handrails.	$2,500
		Mechanical	
4	2.6.1.1	Install second chimney.	$4,000
5	2.6.1.2	Insulate breeching on boilers and DHW heater.	$600
6	2.6.2.1	Install air cooled condenser.	$25,000
7	2.6.3.1	Inspect and overhaul all existing control components.	$1,000
8	2.6.5	Pipe safety relief to floor.	$50
		Electrical	
9	2.7.1	Investigate and correct leak around service mast.	$100
10	2.7.2	Provide labelling for all distribution equipment.	$250
11	2.7.2	Remove equipment and supplies stored within one metre of electrical equipment.	$50
12	2.7.5.2	Install additional emergency lighting.	$600
13	2.7.5.2	Replace non-functional lamps in exit lights.	$100
14	2.7.5.2	Repair non-functional emergency light.	$100
TOTAL			**$43,850**

3.1.2 Priority 2 Recommendations

Item No.	Reference Section No.	Description	Cost Estimate
		Site/Structural Architectural	
1	2.2.3.1	Repair all cracks and construction joints.	$15,000
2	2.2.3.2	Remove and apply new coating system. 2001	$10,000
3	2.2.4.2	Clean and re-paint all anchor bolts.	$1,000
4	2.3.1.1	Re-roof with membrane system. 2008	$90,000
5	2.3.1.2	Re-paint the metal claddings, doors and frames. 2008	$3,000
6	2.3.4.1	Replace pool exit door, frame and hardware. 2000	$2,000
9	2.4.2.3	Refinish the wall and change the detail at the wall and foundation connection. 2000	$5,000
10	2.4.3.1	Replace the pool and support space doors, frames and hardware, and all other interior door hardware. 2000	$7,000
11	2.4.3.2	Provide a doorstop to the main stair upper door.	$50
12	2.4.6.2	Provide stair treads and top landing warning strips.	$2,000
13	2.4.7.1	Provide two individual washrooms on the mezzanine level. 2000	$10,000
14	2.4.7.2	Provide a new towel dispenser in the staff/barrier-free washrooms.	$50
16	2.4.9.2	Replace the diving board. 2013	$10,000
17	2.4.9.3	Replace the slide. 2008	$2,500
18	2.4.9.4	Replace tot docks. 2005 / 2010 / 2015	$3,600
19	2.4.9.5	Replace pool vac unit. 2002	$10,000
20	2.4.10	Install guard rail.	$1,000

Item No.	Reference Section No.	Description	Cost Estimate
21	2.4.11.5	Provide acoustic isolation for the pool ventilation system. 2003	$10,000
22	2.5.1	Provide a level asphalt area at the exterior approach.	$500
23	2.5.2	Provide power operators to the main entrance doors. 2001	$4,500
		Mechanical	
24	2.6.1.3	Replace existing unit heaters in dressing rooms. 2002	$3,000
25	2.6.2.3	Install small air handling unit for lower level 2004	$6,000
26	2.6.3.2	Install electronic time clock controller. 2001	$500
27	2.6.4.1	Inspect and clean heat exchanger. 2000	$400
28	2.6.4.2	Install fibreglass liners in sand filter. 2002	$5,000
29	2.6.5.1	Install second DHW heater. 2001	$1,500
30	2.6.5.2	Install water conserving shower heads. 2001	$120
		Electrical	
31	2.7.3	Install new lamps in existing fixtures.	$100
32	2.7.3	Install two surface mount fixtures in the stairwell.	$300
33	2.7.5.1	Install smoke detectors in electrical rooms. 1999	$500
34	2.7.5.3	Connect computer into EHM local area network. 1999	$500
35	2.7.6	Install dedicated circuit for coffee urns. 2000	$100
TOTAL			**$205,220**

3.1.3 Priority 3 Recommendations

Item No.	Reference Section No.	Description	Cost Estimate
Site/Structural Architectural			
1	2.2.4.1	Apply protective coating to glulam arches. 2004	$5,000
2	2.2.4.4	Install steel framing to support the wood joists if the mezzanine is to be used as an exercise area. 2008	$20,000
3	2.4.1.1	Replace shower area floor tile. DONE	$2,000
4	2.4.1.2	Improve grading and refinish Miradur pool deck. 2001	$10,000
6	2.4.1.2	Provide floor finishes to the mezzanine rooms. 2001	$8,000
7	2.4.2.2	Repair and upgrade privacy screens and cubicle dividers 2001	$2,000
8	2.4.2.4	Provide tile base in the vestibule. 2001	$100
9	2.4.4.1	Repair the damaged ceilings. 2001	$500
10	2.4.8.1	Provide additional lockers. 2001	$3,000
11	2.4.9.6	Provide new or upgrade equipment for competition 2007	$14,000
12	2.4.11.2	Provide kitchenette facilities. 2005	$4,000
13	2.4.11.4	Provide windows to the exterior. 2004	$6,000
Mechanical			
14	2.6.4.3	Replace all ferrous piping and valves. 2005	$5,000
15	2.6.5.3	Replace damaged toilet tank. 2000	$75
Energy and Environmental			
16	2.8.1.1	Install pool blanket. 2006	$15,000
TOTAL			**$94,675**

3.2 LIFE CYCLE ANALYSIS PROGRAM

Our Life Cycle Analysis program is presented in hard version on the following pages. A diskette containing this program will be submitted with the final report.

This program has been developed using the Quattro Pro spreadsheet software. It has very user friendly input and output tables.

The program can be spread over as many years as desired (we are basing the East Hants Municipal Swimming Pool Plan on 20 years, commencing with 1999). It has six main input sections, and a Life Cycle Cost Analysis Summary. The six sections are described briefly below:

.1 *Building Description* - This provides general information on the building.

.2 *Assumptions and Parameters* - This includes initial capital values of the building and its systems (before upgrade construction), an inflation table, discount rates, and other relevant parameters.

.3 *Construction Costs* - These are divided into two sub-sections. Sections 3.1 is Construction Upgrades. It covers the upgrades, modifications, and renovations that are being recommended for the building and its systems. Section 3.2 is Construction Additions. This covers expansions or additions that may occur at some future time. Our life cycle plan only deals with construction upgrades. However, the Construction Addition section is included, but left blank, so that East Hants Municipal Swimming Pool personnel can enter any planned additions which are currently known, or which may occur at a later date. The costs are broken down into the eight main audit categories noted previously, the systems and components within each of these, and then the audit recommendations and various other life cycle upgrades or replacements for each system/component.

.4 *Maintenance Costs* - These costs are also broken down by the eight main categories only, and then by predicted maintenance items within each category.

.5 *Operating Costs* - These are on-going non-maintenance costs such as operating and service personnel, energy costs, taxes, supplies, purchased services, financing costs, etc. We have included energy costs only, however, the East Hants Municipal Swimming Pool can add any other operational costs that they wish.

.6 *Summary Total* - This is simply a summary of all costs in the previous sections of the program.

This program is very flexible, and is meant to be an on-going planning and cost analysis tool for use by East Hants Municipal Swimming Pool personnel in the future.

By far the majority of the entries in the Construction Upgrade section of the program are the audit recommendations summarized in the previous section. We have no knowledge of the degree of capital funding available to East Hants Municipal Swimming Pool over the next several years, therefore, we could not use funding availability as a criteria in programming these recommendations. Consequently, we programmed them relative to their priority (noted as P1, P2 or P3 in brackets after each item), and our assessment of when they should be implemented assuming the East Hants Municipal Swimming Pool could get funding to perform this work at that time.

The flexibility of the program will permit the East Hants Municipal Swimming Pool personnel to revise any of the entries relative to budget availability, at any time.

Life Cycle Cost Analysis Summary - East Hants Municipal Pool

Project: Facility Audit and Life Cycle Costing - East Hants Municipal Pool

Client: Municipality of East Hants

1.0	Construction and Maintenance	Total 1-20 years	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1.1	Grounds and Services	$30,000	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500
1.2	Building Structure	$140,898	$8,500	$1,000	$46,748	$0	$0	$5,000	$0	$8,500	$0	$20,000	$0	$0	$51,149	$0	$0	$0	$0	$0	$0	$0
1.3	Building Envelope	$110,000	$1,700	$2,700	$700	$700	$700	$700	$700	$700	$700	$93,700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700
1.4	Building Interior.	$126,100	$4,500	$28,650	$23,650	$12,000	$10,000	$6,000	$7,600	$14,000	$0	$2,500	$0	$3,600	$0	$0	$10,000	$0	$3,600	$0	$0	$0
1.5	Barrier Free Access	$95,000	$4,500	$5,000	$9,000	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500
1.6	Mechanical	$115,845	$31,650	$1,595	$3,000	$9,000	$1,000	$7,000	$6,000	$1,750	$14,800	$1,400	$5,000	$2,000	$2,250	$19,500	$1,000	$1,000	$1,000	$1,400	$4,500	$1,000
1.7	Electrical	$7,700	$2,450	$750	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
1.8	Energy and Environmental Review	$15,000	$0	$0	$0	$0	$0	$0	$0	$15,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1.9	TOTAL CONSTRUCTION & MAINTENANCE (Current)	$640,543	$54,800	$41,195	$84,848	$27,950	$17,950	$24,950	$20,550	$46,200	$21,750	$123,850	$11,950	$12,550	$60,349	$26,450	$17,950	$7,950	$11,550	$8,350	$11,450	$7,950
1.10	TOTAL CONSTRUCTION & MAINTENANCE (As Spen	$821,345	$56,444	$43,492	$92,266	$31,305	$20,708	$29,647	$25,151	$58,241	$28,241	$165,636	$16,461	$17,806	$88,195	$39,814	$27,830	$12,695	$18,998	$14,146	$19,980	$14,289

2.0	Operating	Total 1-20 years	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
2.1	Personnel Costs:	$0																				
2.2	Energy Costs - Electrical	$500,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000
2.3	Energy Costs - Oil	$176,000	$8,800	$8,800	$8,800	$8,800	$8,800	$8,800	$8,800	$8,800	$8,800	$8,800	$8,800	$8,800	$8,800	$8,800	$8,800	$8,800	$8,800	$8,800	$8,800	$8,800
2.4	Energy Costs - Propane	$0																				
2.5	Miscellaneous Supplies and Service	$0																				
		$0																				
		$0																				
		$0																				
		$0																				
		$0																				
	TOTAL OPERATING (Current)	$676,000	$33,800	$33,800	$33,800	$33,800	$33,800	$33,800	$33,800	$33,800	$33,800	$33,800	$33,800	$33,800	$33,800	$33,800	$33,800	$33,800	$33,800	$33,800	$33,800	$33,800
	TOTAL OPERATING (As Spent)	$931,093	$34,814	$35,684	$36,755	$37,858	$38,993	$40,163	$41,368	$42,609	$43,887	$45,204	$46,560	$47,957	$49,395	$50,877	$52,404	$53,976	$55,595	$57,263	$58,981	$60,750

3.0	Total Construction, Maintenance and Operating	Total 1-20 years	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
3.1	Total (Current)	$1,316,543	$88,600	$74,995	$118,648	$61,750	$51,750	$58,750	$54,350	$80,000	$55,550	$157,650	$45,750	$46,350	$94,149	$60,250	$51,750	$41,750	$45,350	$42,150	$45,250	$41,750
3.1	Total (As Spent)	$1,752,439	$91,258	$79,176	$129,021	$69,163	$59,701	$69,810	$66,519	$100,850	$72,128	$210,840	$63,021	$65,763	$137,590	$90,691	$80,233	$66,671	$74,593	$71,409	$78,961	$75,039

SECTION 5.0 - OPERATING COSTS

5.0	Operating costs			Total 1-20 years	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
5.1	Personnel Costs:			$0										
5.2	Energy Costs - Electrical			$500,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000
5.3	Energy Costs - Oil			$176,000	$8,800	$8,800	$8,800	$8,800	$8,800	$8,800	$8,800	$8,800	$8,800	$8,800
5.4	Energy Costs - Propane			$0										
5.5	Miscellaneous Supplies and Service			$0										
5.6														
5.7														
5.8														
5.9														
5.10														
5.11	TOTAL OPERATING (Current)			$676,000	$33,800	$33,800	$33,800	$33,800	$33,800	$33,800	$33,800	$33,800	$33,800	$33,800
5.12	TOTAL OPERATING (As Spent)			$931,093	$34,814	$35,684	$36,755	$37,858	$38,993	$40,163	$41,368	$42,609	$43,887	$45,204

5.0	Operating costs	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
5.1	Personnel Costs:										
5.2	Energy Costs - Electrical	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000
5.3	Energy Costs - Oil	$8,800	$8,800	$8,800	$8,800	$8,800	$8,800	$8,800	$8,800	$8,800	$8,800
5.4	Energy Costs - Propane										
5.5	Miscellaneous Supplies and Service										
5.6											
5.7											
5.8											
5.9											
5.10											
5.11	TOTAL OPERATING (Current)	$33,800	$33,800	$33,800	$33,800	$33,800	$33,800	$33,800	$33,800	$33,800	$33,800
5.12	TOTAL OPERATING (As Spent)	$46,560	$47,957	$49,395	$50,877	$52,404	$53,976	$55,595	$57,263	$58,981	$60,750

SECTION 6.0 - SUMMARY TOTALS

		1999 Dollars
6.1	Initial Capital Value	$0
6.2	Construction (Upgrade)	$405,845
6.3	Construction (Capital additions)	$0
6.4	Total Regular and Major Maintenance	$214,800
6.5	Operating	$676,000
6.6	Grand Total (All Costs)	$1,296,645
6.7	Final Capital Value	$0

	Replace spent light bulbs			$2,000	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
	Total Electrical Maintenance (Current)			$5,000	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
	Total Electrical Maintenance (As Spent)			$6,887	$258	$264	$272	$280	$288	$297	$306	$315	$325	$334	$344	$355	$365	$376	$388	$399	$411	$424	$436	$449

4.8	Energy and Environmental Review			Total 1-20 years	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
				$0																				
	Total Energy and Environmental Maint. (Current)			$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	Total Energy and Environmental Maint. (As Spent)			$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

				Total 1-20 years	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	TOTAL MAINTENANCE (Current)			$214,800	$7,950	$7,950	$27,950	$7,950	$7,950	$7,950	$7,950	$7,950	$7,950	$8,350	$7,950	$7,950	$42,950	$7,950	$7,950	$7,950	$7,950	$8,350	$7,950	$7,950
	TOTAL MAINTENANCE (As Spent)			$293,110	$8,189	$8,393	$30,393	$8,904	$9,171	$9,447	$9,730	$10,022	$10,323	$11,167	$10,951	$11,280	$62,767	$11,967	$12,326	$12,695	$13,076	$14,146	$13,873	$14,289

	Construction Upgrades and Additions - Total	Install Date	Avg Lifespan	Total 1-20 years	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
3.9.1	Grounds and Services			$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.9.2	Building Structure			$68,000	$8,500	$1,000	$25,000	$0	$0	$5,000	$0	$8,500	$0	$20,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.9.3	Building Envelope			$96,000	$1,000	$2,000	$0	$0	$0	$0	$0	$0	$0	$93,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.9.4	Building Interior			$124,100	$2,500	$28,650	$23,650	$12,000	$10,000	$6,000	$7,600	$14,000	$0	$2,500	$0	$3,600	$0	$0	$10,000	$0	$3,600	$0	$0	$0
3.9.5	Barrier Free Access			$5,000	$0	$500	$4,500	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.9.6	Mechanical			$95,045	$30,650	$595	$2,000	$8,000	$0	$6,000	$5,000	$750	$13,800	$0	$4,000	$1,000	$1,250	$18,500	$0	$0	$0	$0	$3,500	$0
3.9.7	Electrical			$2,700	$2,200	$500	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3.9.8	Energy and Environmental Review			$15,000	$0	$0	$0	$0	$0	$0	$0	$15,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	TOTAL CONST. UPGRADES & ADDITIONS (Current)			$405,845	$44,850	$33,245	$55,150	$20,000	$10,000	$17,000	$12,600	$38,250	$13,800	$115,500	$4,000	$4,600	$1,250	$18,500	$10,000	$0	$3,600	$0	$3,500	$0
	TOTAL CONST. UPGRADES & ADDITIONS (As spent			$500,674	$46,196	$35,098	$59,971	$22,401	$11,536	$20,200	$15,421	$48,219	$17,918	$154,469	$5,510	$6,527	$1,827	$27,847	$15,504	$0	$5,921	$0	$6,107	$0

SECTION 4.0 - MAINTENANCE

4.1	Grounds and Services	Total 1-20 years	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	Snow removal	$10,000	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
	Asphalt maintenance	$20,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
	Total Grounds & Services Maintenance (Current)	$30,000	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500
	Total Grounds & Services Maintenance (As Spent)	$41,321	$1,545	$1,584	$1,631	$1,680	$1,730	$1,782	$1,836	$1,891	$1,948	$2,006	$2,066	$2,128	$2,192	$2,258	$2,326	$2,395	$2,467	$2,541	$2,617	$2,696

4.2	Building Structure	Total 1-20 years	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	Repaint structural members (girts and purlins)	$40,000			$20,000										$20,000							
	Repair pool leaks	$5,000													$5,000							
	Repaint pool	$10,000													$10,000							
	Total Building Structure Maintenance (Current)	$55,000	$0	$0	$20,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$35,000	$0	$0	$0	$0	$0	$0	$0
	Total Building Structure Maintenance (As Spent)	$72,898	$0	$0	$21,748	$0	$0	$0	$0	$0	$0	$0	$0	$0	$51,149	$0	$0	$0	$0	$0	$0	$0

4.3	Building Envelope	Total 1-20 years	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	Inspection and refinishing of steel cladding	$10,000	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
	Exterior door maintenance	$4,000	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
	Total Building Envelope Maintenance (Current)	$14,000	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700
	Total Building Envelope Maintenance (As Spent)	$19,283	$721	$739	$761	$784	$808	$832	$857	$882	$909	$936	$964	$993	$1,023	$1,054	$1,085	$1,118	$1,151	$1,186	$1,221	$1,258

4.4	Building Interior	Total 1-20 years	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	Painting allowance - interior	$20,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
	Pool Deck Equipment	$30,000	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500
	Pool Vac unit	$40,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000
	Total Building Interior Maintenance (Current)	$90,000	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500
	Total Building Interior Maintenance (As Spent)	$123,962	$4,635	$4,751	$4,893	$5,040	$5,191	$5,347	$5,508	$5,673	$5,843	$6,018	$6,199	$6,385	$6,576	$6,774	$6,977	$7,186	$7,402	$7,624	$7,852	$8,088

4.5	Barrier Free Access	Total 1-20 years	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
		$0																				
	Total Barrier Free Access Maintenance (Current)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	Total Barrier Free Access Maintenance (As Spent)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

4.6	Mechanical	Total 1-20 years	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	Replacement of air handling equipment filters	$4,000	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
	Boiler inspections and service	$10,000	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
	Chimney inspection and cleaning	$6,000	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300
	Inspect and clean pool water heat exchanger	$800										$400								$400		
	Total Mechanical Maintenance (Current)	$20,800	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,400	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,400	$1,000	$1,000
	Total Mechanical Maintenance (As Spent)	$28,760	$1,030	$1,056	$1,087	$1,120	$1,154	$1,188	$1,224	$1,261	$1,298	$1,872	$1,378	$1,419	$1,461	$1,505	$1,550	$1,597	$1,645	$2,372	$1,745	$1,797

4.7	Electrical	Total 1-20 years	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	Clean fixture lenses	$3,000	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150

	CONSTRUCTION UPGRADES	Install Date	Avg Lifespan	Total 1-20 years	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
2.7.2	Electrical Distribution		30																					
	Mark all dristribution equipment			$250	$250																			
	Tidy area in front of electrical panels			$50	$50																			
				$0																				
2.7.3	Lighting		20																					
	Install new lamps in existing fixtures			$100		$100																		
	Install new lighting in stairwell			$300		$300																		
				$0																				
2.7.4	Electric Heating		30																					
				$0	$0																			
2.7.5	Systems																							
2.7.5.1	Fire Alarm System		25																					
	Add smoke detectors in mechanical / electrical rooms			$500	$500																			
2.7.5.2	Emergency Lighting System		20																					
	Replace non functional lamps throughout			$200	$200																			
	Install additional emergency lighting			$600	$600																			
2.7.5.3	Telephone/Communications		20																					
	Connect computer to LAN in adjacent building			$500	$500																			
				$0																				
2.7.6	Wiring Devices		30																					
	Install dedicated circuit to mezzanine			$100		$100																		
				$0																				
2.7.7	Mechanical Equipment Power Supplies																							
				$0																				
2.7.8	Branch Circuit Wiring																							
				$0																				
2.8	ENERGY and ENVIRONMENTAL			$0																				
2.8.1	Install pool blanket winch and hoist			$15,000								$15,000												
				$0																				
	TOTAL CONSTRUCTION UPGRADES (Current)			$405,845	$44,850	$33,245	$55,150	$20,000	$10,000	$17,000	$12,600	$38,250	$13,800	$115,500	$4,000	$4,600	$1,250	$18,500	$10,000	$0	$3,600	$0	$3,500	$0
	TOTAL CONSTRUCTION UPGRADES (As Spent)			$500,674	$46,196	$35,098	$59,971	$22,401	$11,536	$20,200	$15,421	$48,219	$17,918	$154,469	$5,510	$6,527	$1,827	$27,847	$15,504	$0	$5,921	$0	$6,107	$0

	CONSTRUCTION UPGRADES	Install Date	Avg Lifespan	Total 1-20 years	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	provide guard rail			$1,000		$1,000																		
2.4.11	Special Uses																							
	provide kitchenette facilities			$4,000							$4,000													
	provide exterior windows			$6,000						$6,000														
	provide acoustic isolation of ventilation system			$10,000					$10,000															
2.5	BARRIER FREE ACCESS																							
	level asphalt area at main entrance approach			$500		$500																		
	power operators at main entrance doors			$4,500			$4,500																	
2.6	MECHANICAL																							
2.6.1	Heating Systems		25																					
	Install new masonry chimney			$4,000	$4,000																			
	Insulate boiler breeching			$600	$600																			
	Install radiant ceiling is locker rooms			$3,000				~~$3,000~~																
	Replace boiler # 2			$4,500									$4,500											
	Replace boiler # 1			$4,500														$4,500						
				$0																				
2.6.2	Ventilation		30																					
	Install air cooled condenser (1)			$25,000	$25,000																			
	Install air handler for lower level areas			$6,000						$6,000														
	Refurbish 'Dectron' unit (coils, bearings, compressor)			$14,000														$14,000						
	Replace air conditioning unit to mezzanine			$5,000									$5,000											
	Replace all exterior mounted fans			$3,500																			$3,500	
	Overhaul air cooled condenser			$4,000											$4,000									
				$0																				
2.6.3	Controls		20																					
	Inspect and refurbish all control components (1)			$1,000	$1,000																			
	Install electronic time clock controller			$500			$500																	
	Replace aquastat, thermostats, and humidstat			$750													$750							
	Test and recalibrate control functions of 'Dectron' unit			$500													$500							
				$0																				
2.6.4	Pool Filtration Equipment		20																					
	Inspect and clean pool water heat exchanger			$400		$400																		
	Insert new fibreglass liner in sand filter			$5,000				$5,000																
	Replace all ferrous piping and valves			$5,000							$5,000													
	Replace circulating pump and filter			$2,800									$2,800											
	Replace chemical feed pump to pool			$1,000												$1,000								
				$0																				
2.6.5	Plumbing and Domestic Hot Water Systems		40																					
	Pipe safety relief from water heater to floor			$50	$50																			
	Install additional water heater			$1,500			$1,500																	
	Install new water conserving shower heads			$120		$120																		
	Replace damaged toilet tank cover			$75		75																		
	Replace original 70 gal. water heater			$1,500									$1,500											
	Replace well pump			$750								$750												
				$0																				
2.6.6	Fire Protection Systems		50																					
				$0																				
2.7	ELECTRICAL			$0																				
2.7.1	Electrical Service		25																					
	Investigate and repair ceiling around mast			$100	$100																			
				$0																				

SECTION 2 - CONSTRUCTION COSTS

	CONSTRUCTION UPGRADES	Install Date	Avg Lifespan	Total 1-20 years	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
2.1	GROUNDS AND SERVICES			$0																				
2.2	BUILDING STRUCTURE		50																					
	repair pool leak			$15,000			$15,000																	
2.2.3	Repaint pool			$10,000			$10,000																	
2.2.4	coat gluelam beams ✓			$5,000						$5,000														
	paint anchor bolts			$1,000		$1,000																		
	repair steel columns			$8,500	$8,500																			
	additional steel framing at mezzanine (1)			$8,500								$8,500												
	additional steel framine to support gymnasium			$20,000										$20,000										
2.3	BUILDING ENVELOPE		25																					
2.3.1	Exterior Wall Systems																							
	repaint metal cladding doors and frames			$3,000										$3,000										
	replace roofing membrane system			$90,000										$90,000										
2.3.2	Roofs			$0																				
2.3.3	windows			$0																				
2.3.4	Doors																							
	replace pool exit door			$2,000		$2,000																		
2.3.5	Facade components																							
	improve stair (1)			$1,000	$1,000																			
2.4	BUILDING INTERIOR																							
2.4.1	Floors		20																					
	replace shower area floor tile ✓			$2,000				$2,000																
	improve pool deck finish			$10,000			$10,000																	
	provide flooring in mezzanine			$8,000			$8,000																	
2.4.2	Walls		30	$0																				
	repair privacy screens			$2,000			$2,000																	
	refinish wall to pool curb			$5,000		$5,000																		
	provide tile base			$100			$100																	
2.4.3	Doors		30																					
	replace doors			$7,000		$7,000																		
	provide doorstop			$50		$50																		
2.4.4	Ceilings		30	$0																				
	repair ceiling			$500			$500																	
2.4.6	Circulation Spaces and Stairwells		40																					
	improve handrails			$2,500	$2,500																			
	improve stair treads			$2,000		$2,000																		
2.4.7	Public Washrooms		20																					
	provide washrooms			$10,000		$10,000																		
	provide towel dispenser			$50			$50																	
2.4.8	Changing Rooms		20																					
	provide lockers			$3,000			$3,000																	
2.4.9	Pool Components																							
	replace diving board			$10,000															$10,000					
	replace slide			$2,500										$2,500										
	replace tot docks			$14,400		$3,600					$3,600					$3,600					$3,600			
	replace pool vac unit			$10,000				$10,000																
	provide competition equipment			$14,000								$14,000												
2.4.10	Fire and Life Safety																							

Life Cycle Cost Analysis - East Hants Municipal Pool

SECTION 1.1 - BUILDING DESCRIPTION

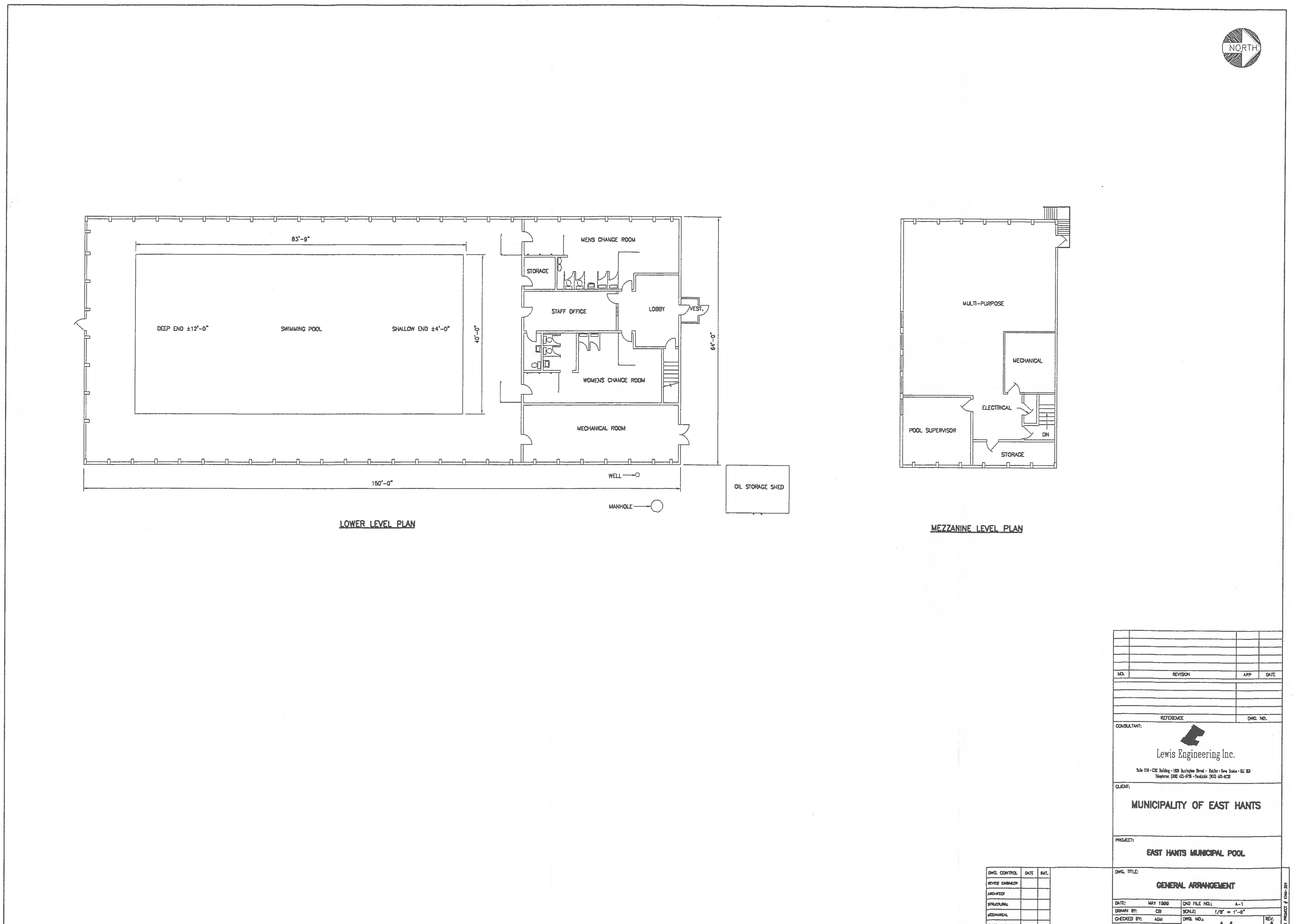
1.1.1	Building Name:	East Hants Municipal Pool
1.1.2	Location:	East Hants, Nova Scotia
1.1.3	Current Use:	Recreation
1.1.4	Current Configuration:	Original
1.1.5	Proposed Use:	Existing
1.1.6	Proposed Configuration:	Existing
1.1.7	Current Size (sq. M/Floors):	
1.1.8	Final Size (sq.M/Floors):	
1.1.9	Capital Maint / Replacement Req'd:	
1.1.10	New Construction req'd:	
1.1.11	Other:	
1.1.12	Other:	
1.1.13	Other:	

SECTION 1.2 - ASSUMPTIONS AND PARAMETERS 1999 Cdn. Dollars

1.2.1	Initial Capital Value:
1.2.2	% to Grounds and Services
1.2.3	% to Building Structure
1.2.4	% to Building Envelope
1.2.5	% to Building Interior
1.2.6	% to Barrier Free Access
1.2.7	% to Mechanical
1.2.8	% to Electrical
1.2.9	% to Energy and Environmental Review

1.3	Inflation Table				1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1.3.1	Inflation Rate (%):				3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
1.3.2	Inflation Multiplier				1.030	1.056	1.087	1.120	1.154	1.188	1.224	1.261	1.298	1.337	1.378	1.419	1.461	1.505	1.550	1.597	1.645	1.694	1.745	1.797

Appendix A
Reference Plan


NORTH
DEEP END ±12'-0"
SWIMMING POOL
SHALLOW END ±4'-0"
83'-9"
40'-0"
64'-0"
150'-0"
MENS CHANGE ROOM
STORAGE
STAFF OFFICE
LOBBY
VEST.
WOMENS CHANGE ROOM
MECHANICAL ROOM
WELL
MANHOLE
OIL STORAGE SHED
LOWER LEVEL PLAN
MULTI-PURPOSE
MECHANICAL
ELECTRICAL
POOL SUPERVISOR
STORAGE
DN
MEZZANINE LEVEL PLAN
NO.
REVISION
APP
DATE
REFERENCE
DWG. NO.
CONSULTANT:
Lewis Engineering Inc.
CLIENT:
MUNICIPALITY OF EAST HANTS
PROJECT:
EAST HANTS MUNICIPAL POOL
DWG. CONTROL
DATE
INT.
ARCHITECT
STRUCTURAL
MECHANICAL
ELECT. & INSTR.
DWG. TITLE:
GENERAL ARRANGEMENT
DATE:
DRAWN BY: CB
CHECKED BY: AGM
APPROVED BY: DGL
CAD FILE NO.: A-1
SCALE: 1/8" = 1'-0"
DWG. NO.: A-1
REV. A

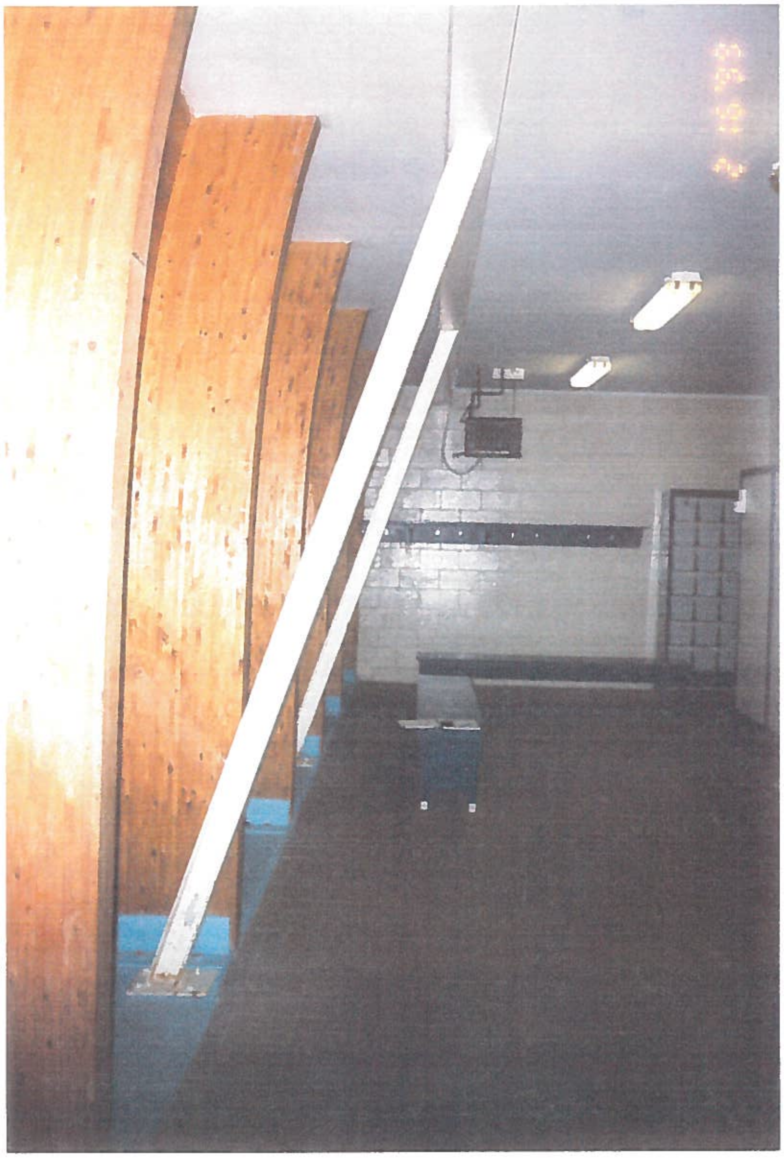
Appendix B
Photographs

East side of pool with sloped grass area adjacent to the structure.
Ref. Section 2.1.1

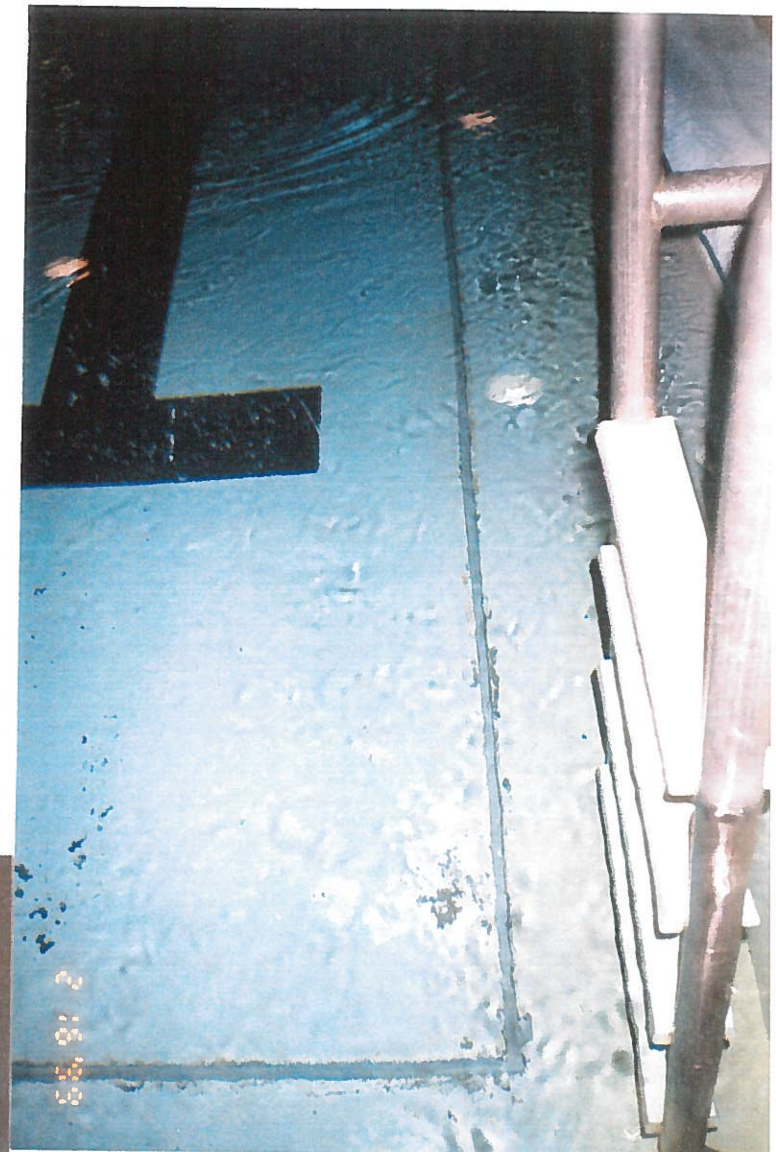
Paved driveway and gravel parking areas.
Ref. Section 2.1.2

Glulam arch base plate. Note surface corrosion on anchor bolts.
Ref. Section 2.2.4

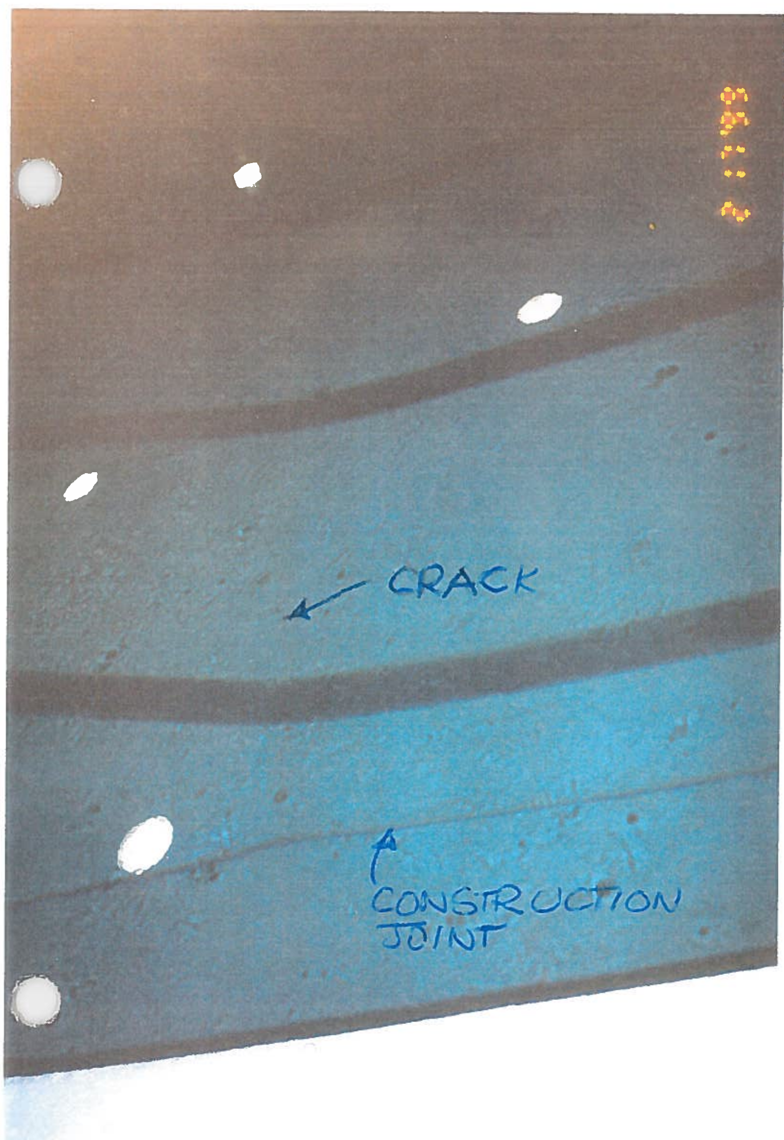
Plywood removed from mezzanine floor to view the framing for the mezzanine.
Ref. Section 2.2.4



Steel columns under steel beam at the east and west sides of the mezzanine.
Ref. Section 2.2.4



Pool construction joint
in shallow end.
Ref. Section 2.3.



Pool construction joint in deep end.
Note crack in the deep end of the pool.
Ref. Section 2.3

Stair and rails with excessively large openings.
Ref. Section 2.3.5

Stair and rails with excessively large openings.
Ref. Section 2.3.5

Miradur floor finish discolouration.
Ref. Section 2.4.1

Miradur floor finish discolouration.
Ref. Section 2.4.1

Miradur floor finish discolouration.
Ref. Section 2.4.1

Wood wall finish deterioration and rust at steel fastenings.
Ref. Section 2.4.2

Wood wall finish deterioration and rust at steel fastenings.
Ref. Section 2.4.2

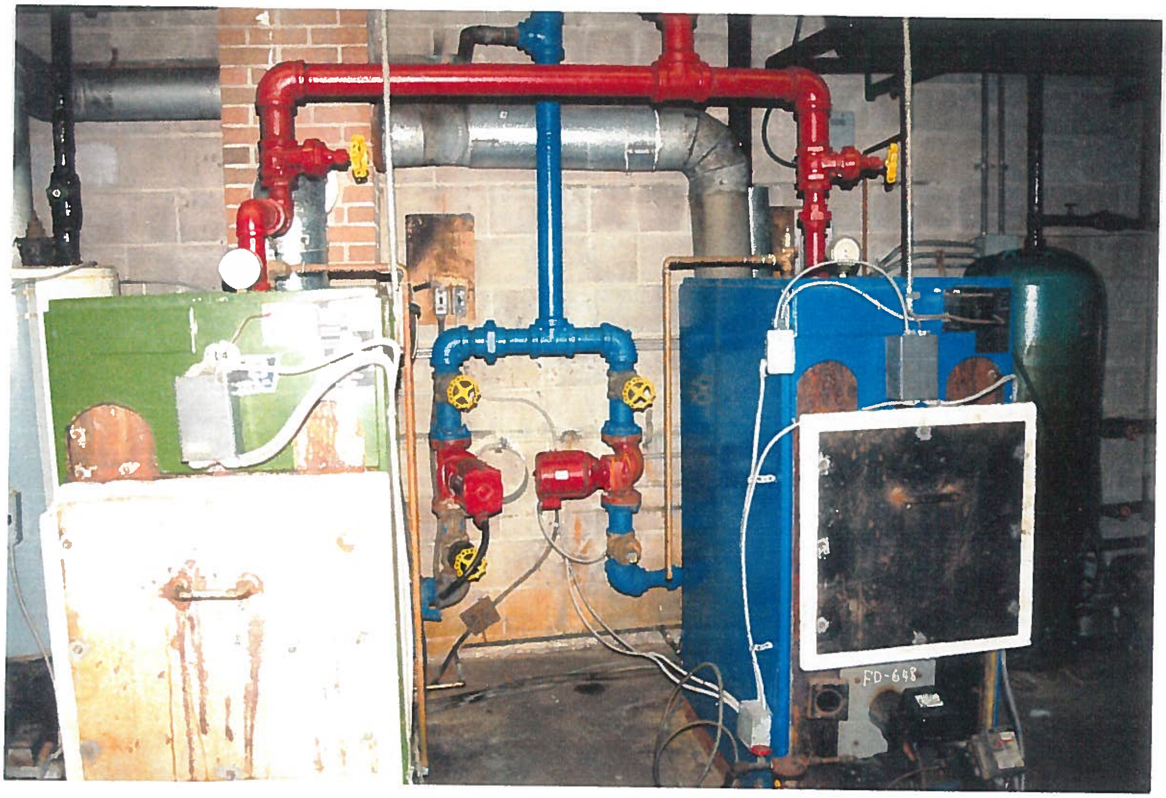
Deterioration of privacy screen leg due to wet environment.
Ref. Section 2.4.2

Tile base required.
Ref. Section 2.4.2

Women's change room door and frame.
Ref. Section 2.4.3

Water damage to ceiling at women's change room.
Ref. Section 2.4.4

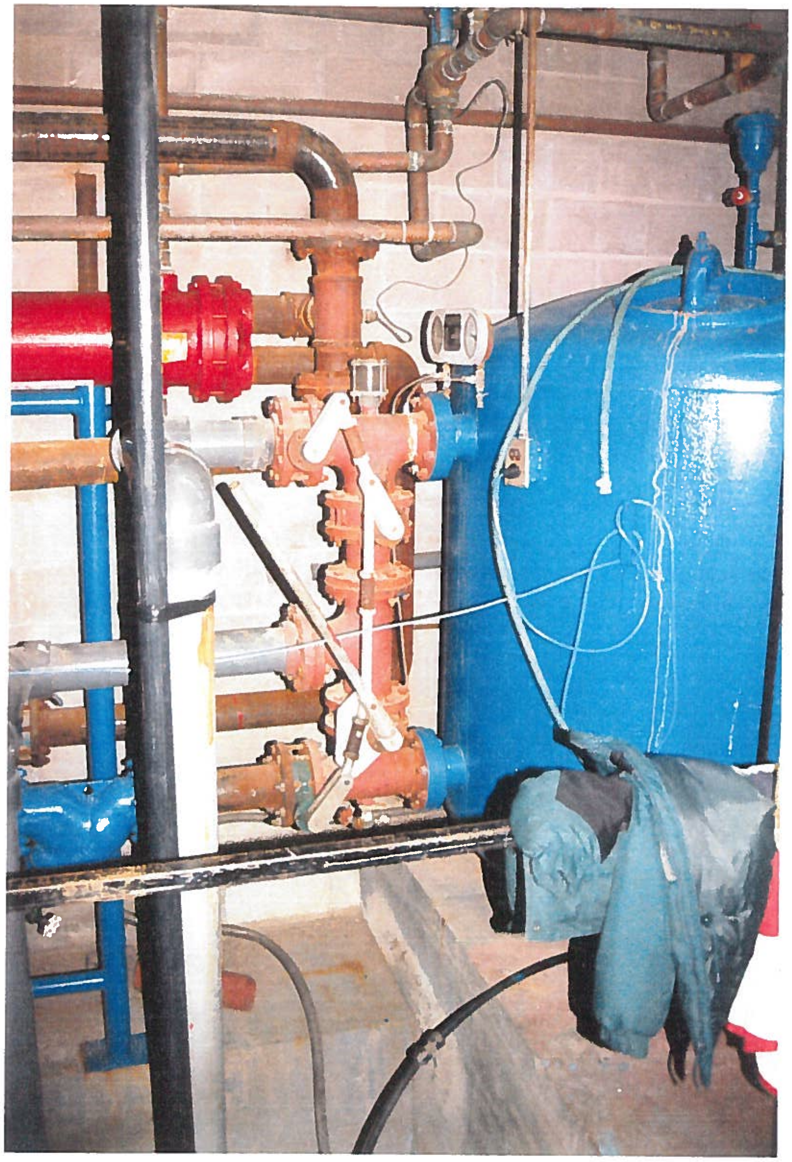
Excessive cross slope on paved area outside vestibule.
Ref. Section 2.5



Existing chimney showing three connected appliances.
Ref. Section 2.6.1

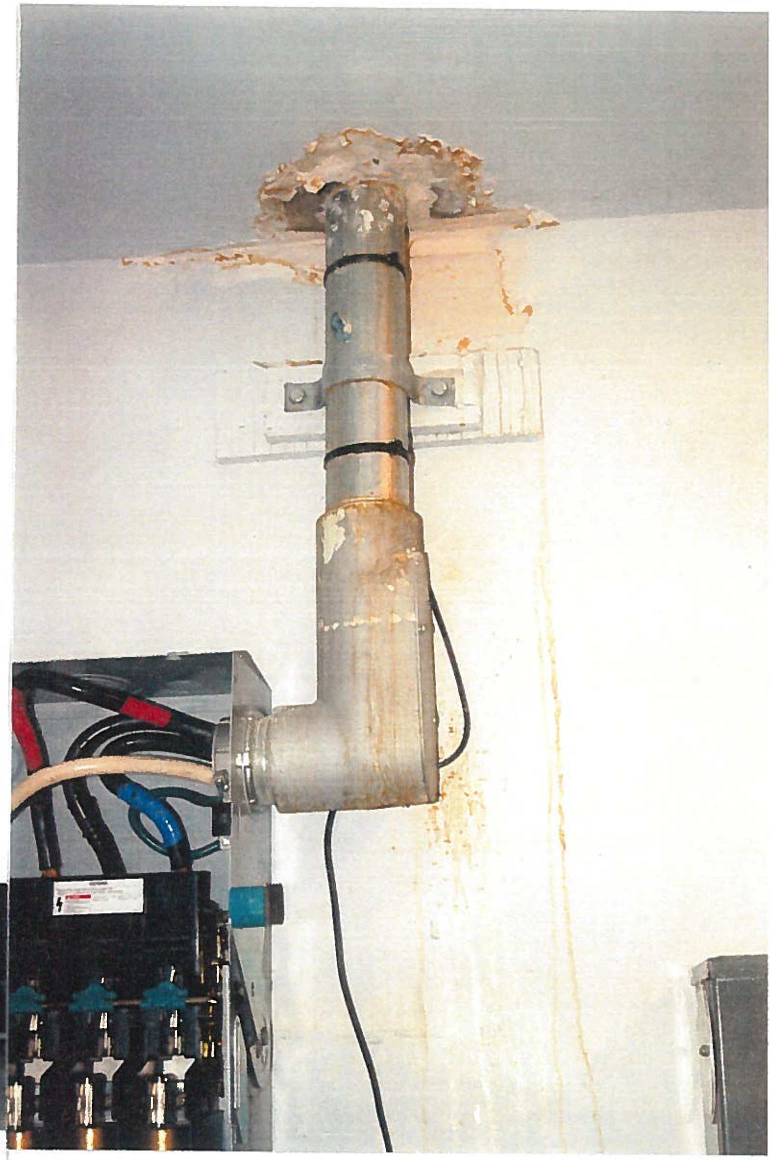
Existing corroded unit heater in locker room..
Ref. Section 2.6.1

Existing A.C. unit serving mezzanine area. Note drain pan.
Ref. Section 2.6.2

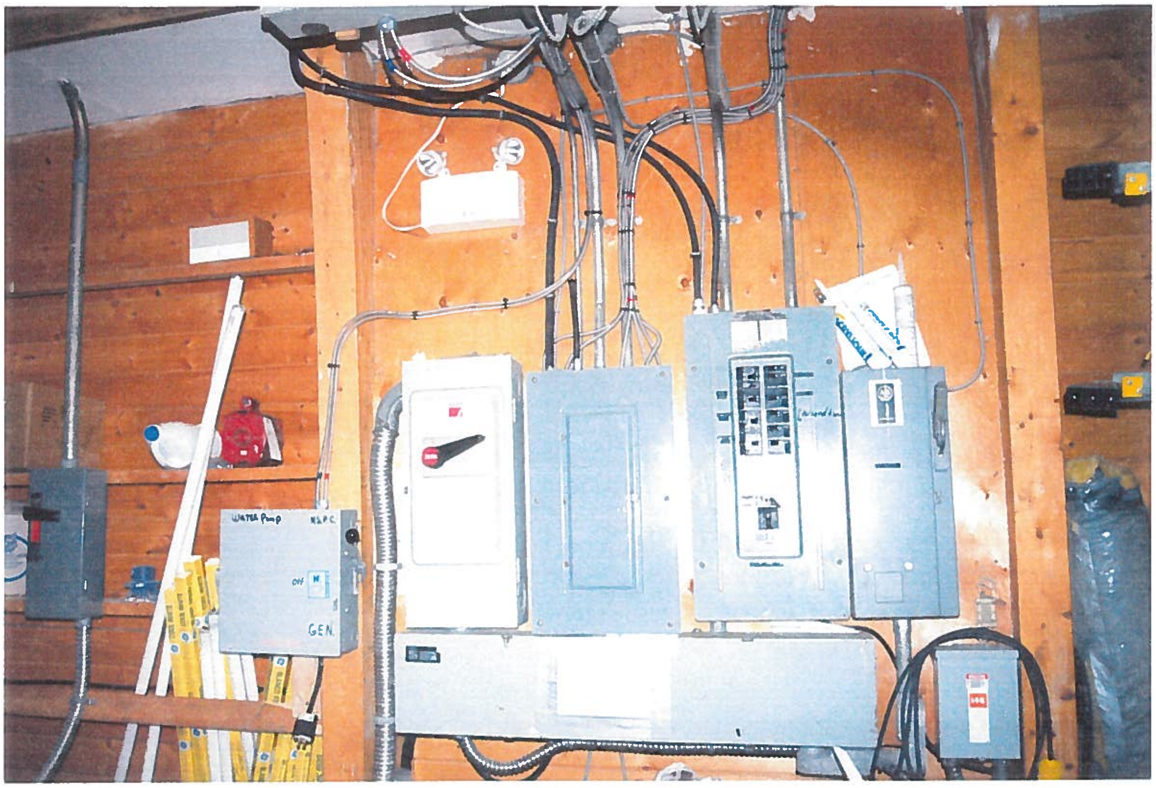


Existing ferrous pool water piping and valves.
Ref. Section 2.6.4

Water damage/main electrical.
Ref. Section 2.7.1



Lower mechanical room
electrical equipment.
Ref. Section 2.7.2



Unmarked electrical equipment in lower mechanical room.
Ref. Section 2.7.2

Lower mechanical room storage area.
Ref. Section 2.7.2

Appendix C
Support Information

TYPE: Project Description **Internal Ref#:** 2849

TITLE: **Energy-efficient, non-freezing air-conditioning system for indoor swimming pools** **DelStatus:**

Entered_by: SRP

Entered_on: 01/09/1996

Authors: CADDET

Date: 01/12/1993 **Country of Application:** Finland

Publisher: Mantta Municipality, Seppàlàn puistotie 15, 35800, Mantta, FI

Phone/Fax: +358-34-488-811, +358-34-488-8500,

Comments: Imported From Caddet Registry

ORDERING INFORMATION:

Description:

Cost: **Order #:** FI-94-503, 204, R217

Order From: CADDET, Swentiboldstraat 21, 6137 AE Sittard, P.O. Box 17, 6130 AA Sittard, Netherlands

Phone/Fax: Phone: 011-31-46-420-2224, Fax: 011-31-46-451-0389

SUMMARY

General Description:

In cold climate areas indoor swimming pools require a lot of heat energy. In Finland, for instance, an average consumption for swimming pools is 115 kWh/m3/year. The major energy loss, about 40-70%, is air conditioning, because the cold air from the ventilation system must be heated.

Another factor to consider is that the high relative humidity in the indoor air causes structural decay of the building. Damage may occur in a ten to twenty year period or even sooner. This is due to lack of dehumidification systems. A new non-freezing air conditioning system with efficient heat recovery including dehumidification system was developed in this project.

The Energent EG ventilation and heat recovery system uses a fixed-cell regenerative heat recovery unit (HRU) with a high heat capacity.

The patented HRU consists of two sets of aluminium cells which are alternately charged from the heat energy of the exhaust air. As one of the sets accumulates the heat of the exhaust air, the other one simultaneously releases the heat stored in it to heat the supply air. The flow cycles change at intervals of 30-60 seconds according to the need for heat and dehumidification.

The non-freezing element is achieved without a separate, energy consuming defreezing system.

The first Energent EG system was installed in 1988 in a swimming pool surroundings. Over a number of years the system has been developed and tested in a laboratory. One of the first improved EG-systems was installed in November 1992 at municipal swimming pool in Mantta, Finland.

According to the measurements of The Technical Research Centre of Finland the HRU transfers 80-90% of the heat energy of the exhaust air to the fresh supply air.

The annual energy consumption for heating the Mantta swimming pool was in previous years around 1,500 MWh. After installation of the EG-system in 1993 this was reduced to 600 MWh. The reduction of annual heat energy consumption is about 60%.

The system runs entirely with fresh air without circulating or return air, which should increase savings. The relative humidity was balanced between 60%.

Technical Data

The volume of the swimming bath is 7,600 m3, the area of the pool is 282 mý; the air ventilation rate is 20,160 m3/h. The indoor temperature of the bath is 27 øC.

Supply air flow is 5.6 m3/s, exhaust air flow 5.6 m3/s, efficiency is 80-85% and the need for additional heating is 100 kW.

Ventilation, heating and humidity are controlled from the regulating centre on the basis of measured results obtained from the temperature and humidity sensors.

The frame of the EG machine is made of epoxy-coated steel beams and the flow changer of aluminium-zinc-coated steel plate.

The filter frames are made of aluminium-zinc-coated steel plate. The casting of the machine is made of plastic-coated steel plate.

Thanks to their self-cleaning operating principle, the cassettes remain clean for years without washing.

Energy Data

The reduction of annual heating energy consumption was about 60%. In winter it was even more. For instance during winter 1990 the energy used for heating was about 200 MWh/month. After installation of the Energent EG in 1992 heat energy consumption was reduced in January- February 1993 to 60-70 MWh/month level; a eduction was about 70%.

Environmental Data

The comfort of the swimming bath was improved significantly as the personnel can afford to run the air conditioning system at full effect without limitations.

Economics Data

The investment on the Energent EG-system was FIM 300,000 (USD 54,000). The price of district heating energy was FIM 160/MWh (USD 31/MWh) in 1993. When the annual energy consumption reduced from 1,500 MWh to 600 MWh, i.e. a saving of 900 MWh, annual cost savings were FIM 144,000 (USD 28,000). On this basis the simple payback period is 2 years.

By taking into account the fact that structural damage will be minimised, the payback period could be much shorter.

TYPE: **Project Description** **Internal Ref#:** 48

TITLE: **Indoor swimming pools use pool covering, heat pump based dehumidifier & microprocessor control sys.**

DelStatus:

Entered_by: SRP

Entered_on: 15/01/1995

Authors: CADDET

Date: / / **Country of Application:** Canada

Publisher: The BAE Group, , St. John's, Newfoundland ,CA ,

Phone/Fax:

Comments: Imported From Caddet Registry

ORDERING INFORMATION:

Description:

Cost: $0.00 **Order #:** CA-87-021, REC 2

Order From: CADDET, Swentiboldstraat 21, 6137 AE Sittard, P.O. Box 17, 6130 AA Sittard, Netherlands

Phone/Fax: Phone: 011-31-46-420-2224, Fax: 011-31-46-451-0389

SUMMARY

General Description

Three public swimming pools in Manitoba, Ontario and Newfoundland have implemented energy conservation measures which control pool conditions and operations and save money for their respective municipalities. The Grand Bank swimming pool, The Arnprior Civic Centre pool and the Flin Flon Aqua Centre have introduced cost effective measures to control humidity levels and electrical demand. These include: - The use of a pool blanket to reduce the rate of evaporation; - A heat exchanger in the ventilation system or a heat pump-based dehumidifier to control the humidity level of the pool area; - A microprocessor-based unit to control electrical demand.

In addition, several lower-cost measures were undertaken. When the pools are not in use, the pool pumps are turned off and the controls of ventilation and heating system are set back.

Technical Data

Performance Data
Monitoring of the Grand Bank pool over a 12 month period showed reductions in energy use of 18 to 40% per month, with a 37% reduction in annual electrical demand. Installation of a dehumidifier at Arnprior produced reductions in annual energy use of 22%.

Economic Data

An initial investment of CA$55,110 at Grand Bank produced annual savings of CA$13,770 giving a simple payback period of 4 years. Investment of CA$55,000 at Arnprior only produced annual savings of CA$3,353, resulting in a payback period of 16.4 years. Estimated investment cost and annual savings at Flin Flon were CA$89,200 and CA$9,160 respectively, resulting in an estimated simple payback period of 9.7 years.

Environmental Data

TYPE: Project Description

Internal Ref#: 1502

DelStatus:

Entered by: SRP

Entered on: 15/01/1995

TITLE: Swimming Pools Retrofit with Dehumidifying Heat Pumps

Authors: CADDET

Date: 01/12/1991 **Country of Application:** United States of America

Publisher: Fred Hollinden,Greater Jasper Consolidated Schools, 1520 St. Charles St, Suite 1, jasper, Indiana ,US ,47546

Phone/Fax: Phone: +1-812-482-1801

Comments: Imported From Caddet Registry

ORDERING INFORMATION:

Description:

Cost: $0.00 **Order #:** US-93-506, 397

Order From: CADDET, Swentiboldstraat 21, 6137 AE Sittard, P.O. Box 17, 6130 AA Sittard, Netherlands

Phone/Fax: Phone: 011-31-46-420-2224, Fax: 011-31-46-451-0389

SUMMARY

General Description

Swimming pools in public school buildings in Indiana have been retrofitted with state-of-the-art dehumidifying heat pump systems engineered to significantly improve pool comfort level, eliminate condensation problems, significantly reduce operating and maintenance costs, and save energy. Examples of this innovation exist at Jasper High School in Jasper, Indiana and Floyd Central Junior-Senior High School in Floyd Knobs, Indiana.

With a pool dehumidifying heat pump operation, the warm humid air from the pool area passes through the dehumidifying coil and is cooled below its dew point, thereby condensing air moisture. The heat captured by the process and generated from the compressor power consumption are absorbed by a mechanical refrigeration system. This heat is then distributed as follows: The first priority is through a water-cooled condenser to heat and maintain pool water temperature. No supplementary pool water heater is required. All remaining heat is then transferred to the air and contributed to the pool enclosure heating requirement. This represents the heat generated by the compressor power consumption. The dehumidifying heat pump system maintains the pool water temperature at 28øC (83øF), pool air temperature at 29øC (85øF) and pool air humidity level at 50-60% year round. The leaving supply air dry-bulb temperature is always the same or higher than the entering return air, except when the air-conditioning unit is used. The energy cycle of this process is always 100% efficient since all latent heat is converted into sensible heat.

Technical Data

The existing roof-top air handling unit was replaced with a heat pump system engineered to greatly improve pool comfort level, eliminate condensation problems and reduce operating and maintenance costs. The heat pump is a high-performance, dehumidifying closed-loop energy recycler incorporating latent energy concepts based on psychometric principles and energy-saving innovations.

Energy Data

Annual energy savings at the Jasper High School is approximately 50,000 kWh. The Floyd Knobs Junior-Senior High School pool retrofit is saving over 51,000 kWh annually.

Environmental Data

At the Floyd Knobs project, estimated annual make-up water savings is 467 qm (123,000 gallons) per year since all of the condensate is returned to the pool. At the Jasper pool, estimated annual make-up water savings is 400 qm (105,000 gallons). With both projects, there is also substantial savings in chemical usage.

Economic Data

For the Jasper High School pool, the annual savings is USD 24,500 based on USD 0.49/kWh cost. The total project cost for the Jasper pool was USD 169,800, giving a simple payback period of 6.9 years. The savings is USD 30,600 annually based on USD 0.60/kWh electricity cost for the Floyd Knobs Junior-Senior High School pool. The total project cost for this pool was USD 105,000, providing a simple payback of 3.4 years.