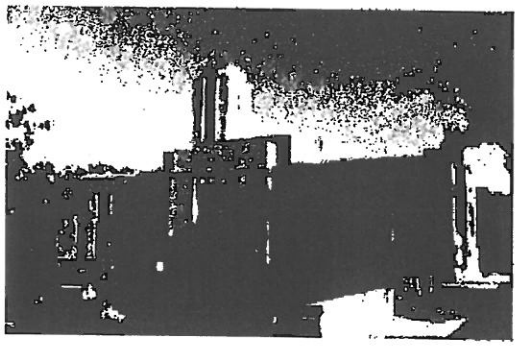

HALL OF WATERS
POOL RENOVATION STUDY

EXCELSIOR SPRINGS,
MISSOURI

November 9, 2004

Prepared By:
BUCHER, WILLIS & RATLIFF CORPORATION
&
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BUCHER, WILLIS & RATLIFF
CORPORATION

HALL OF WATERS POOL RENOVATION STUDY
EXCELSIOR SPRINGS, MISSOURI

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HALL OF WATERS POOL RENOVATION
EXCELSIOR SPRINGS, MO.

COST ESTIMATE

Bucher, Willis & Ratliff Corporation
& Waters Edge Aquatic Design
November 7, 2004

	COST ELEMENT	COSTS
1	Architectural	$ 510,000
2	Structural	$ 100,000
3	Mechanical	$ 450,000
4	Electrical	$ 230,000
5	Pool Work	$ 550,000
6	Construction Subtotal	$ 1,840,000
7	Bonds & Insurance	$ 60,000
8	**BASE CONSTRUCTION COST**	**$ 1,900,000**
9	A/E Services, Reproduction, Testing	$ 220,000
10	**TOTAL PROJECT COST**	**$ 2,120,000**

HALL OF WATERS POOL RENOVATION STUDY
EXCELSIOR SPRINGS, MISSOURI

EXECUTIVE SUMMARY

Background
Bucher, Willis & Ratliff Corporation (BWR) and Water's Edge Aquatic Design were retained to assess the physical condition of the pool area, pool enclosure, mezzanine, locker rooms and mechanical rooms; and the swimming and therapy pools, and provide recommendations and cost projections for renovating these facilities.

The evaluation team reviewed existing as-built drawings provided by the City. Site observations were conducted in May and June of 2004, The evaluations were based on current codes, standards and guidelines.

History
The Hall of Waters Building was constructed in 1937 and included two pools: a large indoor swimming pool and a smaller therapy pool. The popularity of the pools helped attract thousands of tourists to Excelsior Springs. The pools were utilized only during the summer, and were finally closed in ~~1987~~ 1992 due to poor attendance

Due to its location adjacent to the East Fork Fishing River, the pools have been flooded eight times since 1941. Following the major flood in 1993 the boilers in the sub-basement were replaced and relocated to a higher floor, the electrical service entry was relocated to the mezzanine, and the HVAC system and pool filter system were removed.

Building Facilities Findings
In general all finishes, fixtures and systems are 70 years old and show the wear and tear of time. This includes missing pool tile, cracked pool edge tile, spalled terrazzo, cracked glazed block and patched terrazzo at diving stanchions; hard ceilings and lay-in ceilings; plaster soffits, fascia and beam surrounds. As a result of the 1993 flood, all plaster walls at the ground floor level are in poor condition, and various items of equipment, some electrical service and mechanical equipment were removed.

Locker rooms were originally located on two levels, and should both be located on the same level as the pool for safety and accessibility for the disabled. The existing locker rooms are in extremely poor condition and will require total rebuilding. A proposed new locker room layout is included and was used as the basis for the cost projections.

The pool deck and mezzanine areas primarily need repair and restoration of existing finishes. At the mezzanine the perimeter railing system must be revised to meet current building code requirements for height and openness.

Structural
While the overall structural integrity of the building in the pool areas appears to be sound, the evaluation team did not remove any existing finish materials during the study. Further testing is recommended on the southeast pool deck columns and the pool shell where small cracks were

noted in the finish materials. There was no visible damage to the inner shell of the pools themselves.

The outside shell of the pool tank was examined from the basement. The concrete around each of the box-outs for pool lights will need to be repaired. In addition, we estimate that 400 square feet of delaminated concrete around the outer shell should be removed and repaired. Five or six of the basement columns surrounding the pool shell have delaminated surface concrete that requires repair.

Mechanical

Following the 1993 flood most of the mechanical systems serving the pools were removed. Most of the distribution ductwork located in the subbasement has been removed. There is still old sheet metal ductwork in the individual risers to the main deck and the pool mezzanine. Most of the distribution ductwork located in the subbasement has been removed. There is still old sheet metal ductwork in the individual risers to the main deck and the pool mezzanine. This system was installed to keep the area from freezing after the old H&V system was removed. The duct and piping systems that remain for the pool area are mainly above the pool in the ceiling space. The ceiling is gone and the exposed pipes and ducts are in need of complete replacement.

Due to possible re-flooding of the subbasement area, the new Pool HVAC equipment is not recommended to be located in the sub-basement level where the original equipment was located. Three possible locations for the new interior HVAC equipment were considered: roof mounted equipment, decentralized pool dehumidifiers, and equipment located in the old police area and men's lockers. The scheme locating the equipment in the old police and men's locker areas is recommended for several reasons.

Essentially, all of the existing ductwork located below overhead floor structures should be replaced where the new HVAC systems are installed. Existing vertical ductwork may be reused in certain locations.

The plumbing in the locker and pool areas is in bad condition and must be replaced. New water and waste piping can be supplied from overhead and from below the pool level floor by core drilling through the concrete slabs to connect to existing service lines.

Electrical

After the damage from the 1993 flood, the electrical service entrance and main distribution board were replaced and the electrical room was re-located to the Ground Floor Mezzanine. The existing main distribution board is 1,200 amp, 120/208V, 3-phase. This main distribution board feeds sub-panels located through-out the building. The utility meter indicated that the maximum demand for the entire building at a given moment was 292 amps. The main distribution board has three 100 amp spare circuit breakers.

Due to large new motor loads required by the pool renovation, it is likely that a new larger electrical service entrance and main distribution board would be required. It is recommended that the existing over-head electrical service from the utility pole to the building be replaced with an underground service during the renovation. The lights, conduit, conductors and switches in the Pool, Hydrotherapy Pool, and Locker Rooms are in poor condition and should be replaced.

POOL COSTS OVERVIEW

Total Estimated Costs for Pool Renovations - $550,000

Breakdown of Costs:

Structural Repairs $194,840
Including tile, concrete, filling in light boxes, grating, etc.

Pool Accessories $10,500
Including new ladders, ADA lift, cup anchors, depth markers, etc.

Pool Chemical System $9,500
Including liquid feeders, storage tanks, chemical controllers, eyewash station, etc.

Pool Recirculation System $159,960
Including recirculation pumps, filters, strainer baskets, piping, surge tanks, etc.

Pool Heating System $4,900
Including a pool heater for each pool, etc.

Design and Construction Costs $170,300
Including bonding, insurance, supervision, contractor profit and overhead, engineering design, etc.

Pool Assessment – General

The Hall of Waters pools are currently in need of extensive repair. The pool structure appears to be in fair shape in some areas and poor shape in other areas, while the recirculation system is virtually non-existent. The codes and standards used for the design of today's swimming pools are also not addressed in older facilities such as this. The continued threat of flooding by the East Fork Fishing River is also a concern.

Within the main swimming pool concerns were found with the ADA accessibility, diving clearances, concrete structure, recirculation piping and filtration system, proper signage, pool lighting, and health code compliance. Within the therapy pool concerns were found with the ADA accessibility, concrete structure, recirculation piping and filtration system, proper signage, and health code compliance.

At the time of closing the main pool, three diving boards were provided, two at one-meter height and one at three meters height. There are currently no slides or water features on the premises. The main pool is equipped with five swimming lanes, 25 yards in length. All the lanes are 5'-0" wide.

Both pools were constructed from cast-in-place concrete and were finished with "non-slip" tile both around the perimeter and throughout the basin. Four ladders around the pool provide access to the main pool. The therapy pool is accessed by a short, steep ramp at one end of the pool.

Pool Structure

The gutter structure around the main pool appeared to be in fair to poor condition. There were areas of extensive cracking, missing tile, and exposed rebar. The current gutter has the potential to cause serious injury due to its surface slickness, poor structural condition, and crevices in which feet can readily become wedged.

When hammer tested, the main pool walls and floors were found to be in good condition overall. However, some areas were found to have questionable structural integrity. When viewed from the backside, it was revealed that multiple areas of the pool structure were weak and cracking. Exposed rebar, spalling walls, and large cracks indicate weak components of the main pool structure. When the therapy pool walls were hammer tested, they were in good condition.

The pool floor in the main pool was hammer tested and found to be in fair condition. Large cracks were seen in areas of the floor, and the tile was discolored. The floor of the therapy pool was hammer tested and at least one spot of concern was identified.

Layout

The current one-meter standards for FINA, US Diving and NCAA require a minimum water depth of 11'-0" at the plummet. Both FINA and US Diving prefer a water depth of 11'-6", NCAA prefers a water depth of 12'-0", and NFSHSAA requires a water depth of 12'-0" at the plummet for one-meter springboards. The current depth of 9'-6" is insufficient for safe diving.

The lane widths of 5'-0" are below the minimum width of 7'-0" minimum required for competitive use. Therefore, the pool cannot be used for competitive events.

Pool Coatings
The Hall of Waters pools are currently covered with a white, ¾" square tile, that was noted in the original plans as being "non-slip". The grout in between the tiles appeared to be worn-down in some areas, exposing sharp edges of the tile. This allows debris to become trapped and encourages algae growth. Besides its grout concerns, the tile have also become discolored in many places and is also missing at a few locations. The missing tile can be a danger, causing patron injuries as well as a location for algae accumulation.

Pool Deck
The current pool deck is in good condition. No large cracks or trip hazards were noticed. A deck area to water surface area ratio of 1.5 to 2.0 is recommended. The current deck areas are slightly below this recommendation. 19 large columns surrounding the main pool also break the space up.

Recirculation System
The main pool recirculation systems original design was comprised of piping, a recirculation pump, filters, wall inlets, a main drain, valves, and an overflow gutter. The therapy pool recirculation system is not visible for the most part, and was not shown in the original plans. All of the recirculation equipment and much of the piping have been removed. From what was visible for the site visit, it has been deduced that the therapy pool recirculation system was comprised of piping, a recirculation pump, a wall inlet, an overflow gutter, a main drain, and fill pipe.

Pool Deck Equipment
Only one lifeguard chair was found on deck during our site visit. Others may have been used during pool operation.

There are currently four ladders built into the walls with tile covered steel pipe as ladder rungs. Tile on some of these ladder rungs have dilapidated. The ladder rungs are not a typical shape or surface, creating a concern for slipping and ease of use. The chrome plated bronze railing used for the ladders has been placed on top of the walls on the back side of the gutter, which could cause difficulty climbing out of the pool. The ladder rungs are designed in such a way that allows the potential for patron's limbs to be wedged between the rungs and the wall. These ladders do not provide a safe way out of the pool.

Two one-meter diving boards and one three-meter diving board were used at the facility at one time. A one-meter board is the only piece currently in place on the diving end of the pool.

Pool Lighting
Sixteen recessed areas around the perimeter of the pool are provided for underwater lighting. The lighting equipment that was once provided in these spaces has been removed. The recessed spaces, which held these lights, were examined and many were found to be in poor structural condition. Exposed rebar, cracking and spalling concrete are cause for concern in the structural integrity of these light boxes.

ADA Requirements for Pools
The pool does not currently have any ADA features. Under new ADA standards, a pool of this size needs at least one accessible means of entry.

Recommendations

The gutter structure and tile need to be repaired and replaced in order to ensure patron safety. For this to be accomplished, parts of the gutter will need to be removed and replaced. Gutter tile in these locations will need to be matched to the original tiles and replaced. Other areas will require tile replacement, although the structure will not need to be repaired.

The structure of the pool walls needs to be repaired in places. Many areas, particularly behind the pool walls showed large cracks and spalling. In addition, many cracks in the interior of the pool wall and floor were visible through the pool tile. These areas need to be addressed; removing the tile where necessary and replacing it with a matching tile once repairs are complete.

Where worn-down grout is visible in the existing tile, the grout should be replaced.

The diving board in the deep end of the pool needs to be removed. Further, signs indicating "No Diving" should be visible around the main pool shallow end and therapy pool.

A line, at least 4" wide in a color contrasting the pool floor, should be placed at the 5'-0" depth. The correct depth markings need to be properly indicated on the side of the main pool and wading pool.

It is likely that electrical bonding of both existing and future metal components will be required.

The proper number of lifeguard chairs need to be provided along the perimeter of both pools.

The current ladder design needs to be reevaluated. The current design makes climbing in and out of the pool difficult. The existing ladder rungs should be replaced with cast-in-place, recessed tiled steps. A new handrail will need to be installed that extends over the gutter ledge and spaced closer together. These changes should make entry and exit safer and easier for the patrons.

It is recommended that the existing underwater lighting be abandoned and the existing light niches filled, making the space flush with the wall and finishing with tile. Since the pool is only 9'-6" at it's deepest, overhead lighting should suffice for underwater visibility.

In order for the pool to be comfortable for all patrons throughout the year, a pool water heating system should be installed. This will require additional piping and a heater for both the main pool and the therapy pool.

The recirculation system, which is currently non-existent, needs to be redesigned and reconstructed. This will require engineering analysis of the inlet, outlet and main drain sizing, as well as resizing any pipes, pumps, valves and filters. What remains of the galvanized steel gutter outlet piping and other piping would need to be removed.

Properly sized filters would be needed for both pools. An adequate chemical feed system would be needed for both pools. Finally, the possibility of additional wall inlets, gutter outlets and larger main drains would need to be evaluated for both pools. The current wall inlets will need to be replaced, due to corrosion.

The discolored tile should be cleaned and repaired. The gutters, pool bottom and walls need to be thoroughly cleaned.

The standards set by the Americans with Disabilities Act require that an accessible route be provided into the pool. Given the historic preservation concerns, a portable lift is the best option for the main pool. A lift should also be provided in the therapy pool.

Costs

Due to the poor condition of the facilities, constraints of historical restoration, and the need to rebuild the locker areas and replace a vast majority of the mechanical, electrical and pool system equipment, the costs to renovate the existing facility to an operable condition are extensive for a pool of this size.

The costs projected here are total costs for renovating the pool, pool systems and pool area including the deck, mezzanine, locker rooms, and mechanical and electrical systems based on current costs for labor and materials. These costs should be escalated at least two percent per year for inflation once the desired completion date is established.

Construction Costs	
Architectural	$510,000
Structural	$100,000
Mechanical	$450,000
Electrical	$230,000
Pool	$550,000
Bonds and Insurance	$ 60,000
Design, Reproduction, and Testing	$220,000
GRAND TOTAL	**$2,120,000**

HALL OF WATERS POOL RENOVATION STUDY
EXCELSIOR SPRINGS, MISSOURI

INTRODUCTION

Bucher, Willis & Ratliff Corporation (BWR) and Water's Edge Aquatic Design were retained to assess the physical condition of the pool area, pool enclosure, mezzanine, locker rooms and mechanical rooms; and the swimming and therapy pools, and provide recommendations and cost projections for renovating these facilities. The evaluations utilized current codes, standards and ADAAG guidelines. Costs to repair, update and renovate based on these recommendations are included at the end of the report.

Professional architects and engineers from BWR performed a physical assessment of the existing facility on May 25, 2004. Those involved were Allen Tenner, architect; Rodney Holcomb, structural engineer; Rick Shea, mechanical engineer; and Craig Brewster, electrical engineer. David Schwartz, a licensed professional engineer with Water's Edge Aquatic Design, performed a physical inspection of the pool facility along with Katherine Schultz and Terry Bogart. These assessments involved detailed site observations taking notes, field measurements, photographs, and concrete soundings.

HISTORY

General

The city of Excelsior Springs has a rich history with its natural mineral water springs. Before completion of the Hall of Waters, visitors to the city did not have a central place to enjoy the five varieties of waters Excelsior Springs offered. For this reason, in 1935 a group of citizens decided a central location of all the waters would be ideal for the thousands of tourists the City saw every year. When the City's budget could not accommodate the estimated $250,000 to complete such a project, the citizens turned to the Federal Government and sought assistance from the Works Progress Administration. The WPA provided $1 million for a building that would be touted as the finest and most complete health resort in the United States.

The Hall of Waters was completed in 1937 and was equipped with various health related facilities, including two pools, a large indoor swimming pool and a smaller therapy pool. The therapy pool was not included in the original construction but was added as construction progressed. The pools were originally equipped with pressure sand filters and filled with sulpho-saline mineral water. The large swimming pool had two one-meter diving boards on each side of a three-meter diving board, and was covered in carefully laid ¾" square white tile. The popularity of this new facility helped to attract the thousands of tourists Excelsior Springs saw every year, including Presidents Franklin Roosevelt and Harry Truman.

While the pool was greatly enjoyed by its patrons, it was not without its problems. Its elevation next to the East Fork Fishing River has caused serious flooding at least eight times since 1941. At times the floodwaters have completely filled the pool and even reached the ceiling. Leaks in the pool's main drain have also caused a problem and in the 1980s the main drain was abandoned and a hole in the side of the pool wall in the deep end was constructed to replace the main drain. After the 1993 flood, the boilers that were located in the basement were replaced and relocated to the ground floor. The electrical service was relocated to the mezzanine level. The HVAC system in the pool area was essentially removed following the 1993 flood. The pool area was then heated by steam unit heaters located in the corners to keep the area from freezing and provide some comfort in the winter.

The pool was also not equipped with adequate HVAC systems and was therefore closed throughout the winter and covered with a temporary wooden floor system for sporting events.

The pool remained open until ~~1987~~ 1992 when it was finally closed due to poor attendance. At the time it was closed, the pool was seeing around 50 patrons per day. At that time, the charge for admittance was $1 and the pool was open from 9:00 to 4:00 Monday through Friday.

Since it's closing, some Excelsior Springs citizens have expressed a desire to see the pools refurbished and re-opened. Since the Hall of Waters is on the Historic Register, this would mean replicating all the details of the facility to as much historical accuracy as possible.

Previous Building Problems

The primary problem has been flooding. The basement level has pumps that work continually to keep that area dry. The floor level of the basement is below the surface level of the adjacent river.

Current Building Problems

There are piping leaks from the water bar located above the pool, the old steam lines in the area leak, and there is probably asbestos on the existing steam lines in the pool area.

STANDARDS AND GUIDELINES – BUILDING FACILITIES

The proposed renovation of existing building facilities is in accordance with current codes and guidelines. These include the following:

- 2003 International Building Code
- Missouri Department of Health, A Guide for the Design and Operation of Public Swimming Pools
- Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities
- A Guide to the New ADA-ABA Accessibility Guidelines

FINDINGS – BUILDING FACILITIES

The findings will be presented by each of the disciplines, architectural, structural, mechanical and electrical. In general all finishes, fixtures and systems are 70 years old and show the wear and tear of time. This includes missing pool tile, cracked pool edge tile, spalled terrazzo, cracked glazed block and patched terrazzo at diving stanchions; hard ceilings and lay-in ceilings; plaster soffits, fascia and beam surrounds. As a result of the 1993 flood, all plaster walls at the ground floor level are in poor condition, and various items of equipment, some electrical service and mechanical equipment were removed.

ARCHITECTURAL FINDINGS

General Observations

Men's and women's lockers must be on the ground floor level for accessibility. Using an elevator to access the pool from the mezzanine level through a public building corridor while everyone else goes directly to the pool is not a sympathetic solution for those with disabilities. The reverse is also true when going back to the mezzanine level when finished swimming or just to use the toilet. Secondly, using stairs with wet feet is a major safety risk.

The two locker rooms are in poor shape. This includes finishes, substrates (plaster), ceilings, fixture piping, fixtures, and curbs at footbaths and showers. Existing showers have been retrofitted with newer shower controls. The present locker rooms are small with narrow aisles which impact accessibility. Showers and foot baths exiting the locker rooms all have curbs that require removal. To be made both accessible and useable, the ground level locker room should be gutted and expanded into new areas on the same level.

The shallow end does not appear to be shallow enough for recreational or some accessible swimming.

Building Code Issues

Other than accessibility, the obvious code issue is the height and pattern of mezzanine railing. The railing will have to be modified to meet current code requirements.

The number of existing plumbing fixtures provided is adequate except for problems associated with accessibility. The occupant load of the pool is 162 based upon areas of deck, shallow pool, deep pool and diving pool.

Locker Rooms

Both existing locker rooms are in poor condition. These spaces are narrow and cramped and neither is handicapped accessible. All plumbing and lighting is seventy years old. The existing ground floor level locker room should be gutted and former jail space recaptured in order to provide new men's and women's locker rooms and family dressing room that are appropriately sized, function well and are above all accessible.

There should be a lobby, control counter, and common entrance to the locker rooms. Locker rooms should consist of men's, women's and a family dressing room that have direct access to the pool. There is an opportunity for these rooms to be appropriate in size, layout, number of

fixtures, furnishings, partitions, lockers, cubicles and all completely accessible. All plumbing, ventilation and lighting would be new because it doesn't exist now.

As a minimum, the men's locker room should include one water closet, two urinals, one lavatory and two showers; the women's locker room should include three water closets, one lavatory and two showers. This is based upon a total occupant load of 162. The occupant load is based upon the number of people per square foot of the pool deck, shallow pool, deep pool and diving pool areas. Each locker room should have 84 multi-tiered lockers, with benches for seating. In addition, four private dressing stalls should be provided in the women's locker area.

The family dressing room should include two rooms, a dressing room and a toilet with a shower, water closet and lavatory. The lobby, control counter, entrance, locker rooms and family dressing would receive all new flooring, wall finishes, and ceilings.

A proposed layout of the locker room and entry/control area at the main pool level is shown in Figure 1.

Pool Deck

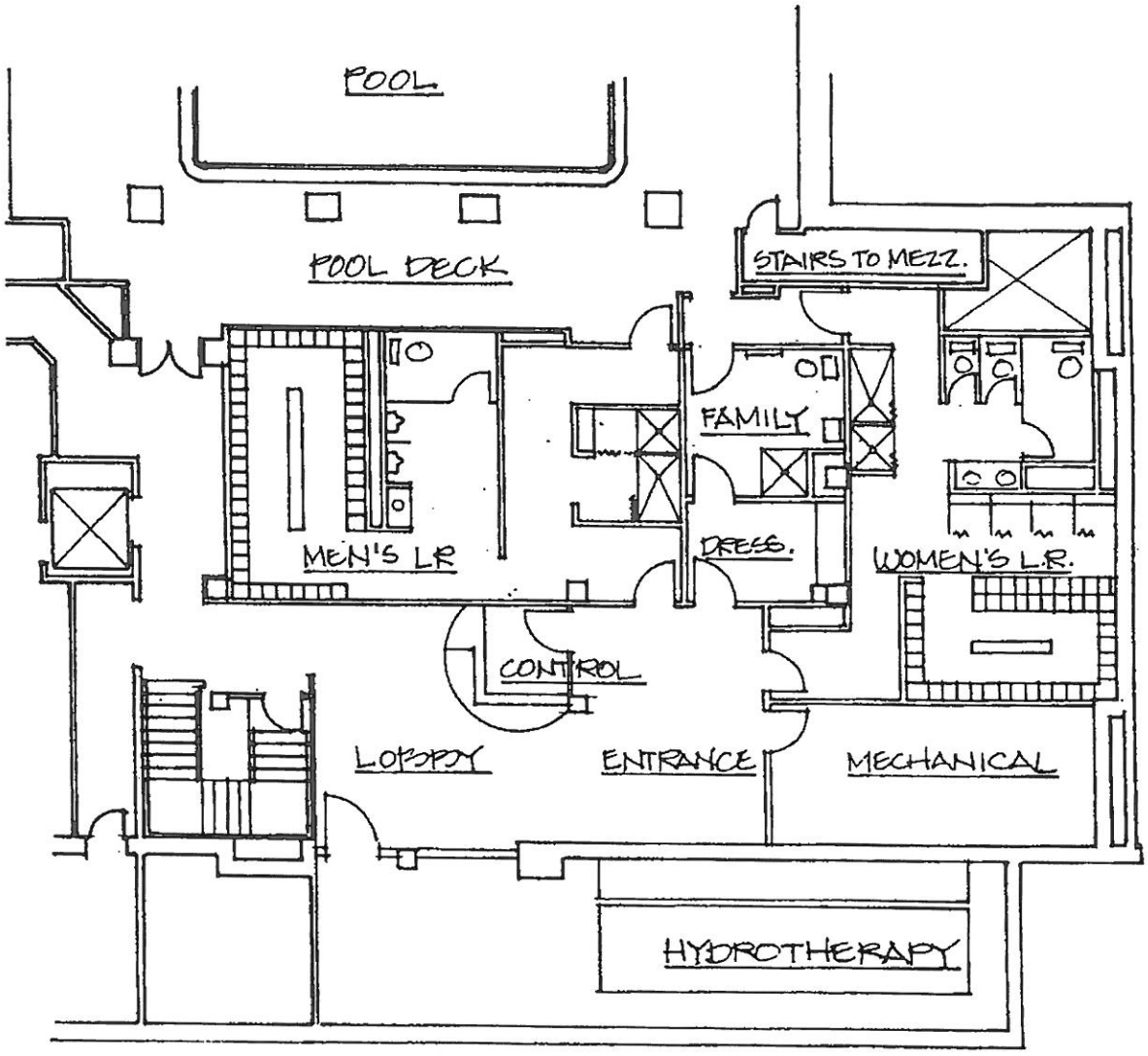
The pool deck area renovation involves primarily repair and restoration of existing finishes. Cracked tile at the pool corners on the raised deck edge should be sealed. All missing tile elsewhere should be replaced with matching tile. The non-slip coating should be removed from the terrazzo floor and the terrazzo should be patched at the previous diving board stanchion locations. The rough terrazzo between divider strips should be replaced and the entire terrazzo surface ground smooth. Minor cracks in glazed tile column coverings should be sealed. Damaged tile and substrate should be replaced where the cracks are more than 1/8 inch wide or the tile is offset. The plaster ceilings under mezzanine and the lay-in ceiling above pool should be replaced with moisture resistant ceiling materials. Damaged plaster fascia and soffit around the perimeter of the mezzanine should be repaired. The radiator enclosure on the west side at north end should be rebuilt. The flooring and walls where both sets of stairs to mezzanine were removed at south end must be repaired and rebuilt.

Mezzanine

The existing mezzanine handrail must be converted into a guard rail by increasing the height and the modifying the railing pattern so a four inch sphere cannot pass through. This may be accomplished by using safety glass or plexiglass over the existing railing. Facing the existing railing with glass eliminates the openings in the railing pattern and allows the railing height to meet that required by a guard. The plaster ceilings must be replaced and the beam coverings above the mezzanine must be repaired. A matching railing must be installed to close the opening where the existing stairs had been removed.

Proposed Interior Layout

Figure 1 of the lobby and locker room area illustrates a possible solution that provides a men's and women's locker room and a family room at the main pool level. The family room provides an area where an adult can help their child of the opposite gender or disabled spouse change clothes and shower. This plan shows users entering locker rooms from the lobby and from the locker rooms going directly to the pool without having to pass back through the lobby.



FLOOR PLAN
Scale: 3/32" = 1' – 0"

FIGURE 1: GROUND LEVEL LOCKER ROOM PLAN

STRUCTURAL FINDINGS

General

Two structural issues at and above the pool deck have already been noted in the Architectural Findings. Damaged tiles on the southeast pool-deck column, near the pool ladder, suggests that the concrete under the tile may be deteriorated and in need of repair. We recommend further non-destructive testing be performed prior to the tile on this columns being removed or repaired. The concrete ceiling area below the diving board is deteriorated and should be sounded and repaired. It appears that this area had been repaired in the 1980's. Leaks from the water bar above may be contributing to this deterioration.

Pool Shell

Radiating out from three of the four corners of the pool are small cracks in the pool deck, indicating a crack in the concrete structure below. We don't believe these cracks are of structural significance but if the tile in these areas can be safely removed we recommend the deck crack below be ground out and injected with epoxy.

The pool side shell is covered with tile. We did not risk damage to the tiles by sounding this surface. There is no obvious visual damage to the inner shell of the pool.

The outside shell of the pool tank was examined from the basement. The concrete around each of the box-outs for pool lights will need to be repaired. In addition, we estimate that 400 square feet of delaminated concrete around the outer shell should be removed and repaired. Five or six of the basement columns surrounding the pool shell have delaminated surface concrete that requires repair.

All of the observed concrete deterioration is the result of moisture. Delamination is caused by the rusting of embedded steel rebar. Driven by moisture, the steel rebar undergoes rust corrosion, the corroded steel surface expands and it pops the surrounding concrete loose.

Tank Room

As part of our tour of the facility we examined the "tank room" located under the North lawn. The roof of this room is in very poor condition. We recommend a more thorough structural evaluation of this roof before using the area below this roof for any purpose.

MECHANICAL FINDINGS

Existing Pool Heating, Ventilation and Air Conditioning (HVAC)

In the aftermath of the 1993 flood, most of the mechanical systems serving the pool were removed. The main pool system consisted of a 12,000 CFM Heating and Ventilating (H&V) unit for supply and a 12,000 CFM exhaust fan located in the subbasement. The H&V unit had steam heat from the steam boiler system. The outside air duct was from the west wall below the main entrance along a narrow driveway. The supply air had distribution ductwork that supplied air to both the upper levels of the pool deck on the outside wall and the pool mezzanine.

The return air or exhaust system had intakes in all four corners of the pool deck area routed through ducts located in the subbasement to the exhaust fan and discharged through a louver

along the south wall below the stairwell to the existing men's locker room. Most of the distribution ductwork located in the subbasement has been removed. There is still old sheet metal ductwork in the individual risers to the main deck and the pool mezzanine. This ductwork is still in place and is located above the pool.

There is presently a steam unit heater system; the main pool deck has three steam unit heaters located in three corners of the pool. There was a fourth in the NW corner at one time but it has been removed. The steam pipe that feeds these heaters comes from subbasement mains, up through existing abandoned ductwork and to the heaters on the deck. This system was installed to keep the area from freezing after the old H&V system was removed. This system will be removed if the pool is put back into use with all new HVAC equipment.

The duct and piping systems that remain for the pool area are mainly above the pool in the ceiling space. The ceiling is gone and the exposed pipes and ducts are in need of complete replacement.

None of the ductwork has any indication of being internally lined. Any duct replacement for new or existing systems will be externally wrapped. Internal duct lining is not to be installed due to the humid air being returned or exhausted.

Proposed New Pool HVAC

Due to possible re-flooding of the subbasement area, the new Pool HVAC equipment is not recommended to be located in the sub-basement level where the original equipment was located. Three possible locations for the new interior HVAC equipment were considered.

Scheme 1 – Roof Mounted Equipment: an HVAC unit could be located up on the water bar roof complete with energy recovery wheels and a condensing unit. This would require a supply duct and exhaust duct down to the pool area. The extreme northeast and northwest corners of the water bar room has the space necessary for the two duct risers. This would be a very viable mechanical option if the building was not on the Historic Register. The visibility of the unit on the roof and the cutting of the ceiling, which is not permitted, removes this Alternative from further consideration.

Scheme 2 – Decentralized Pool Dehumidifiers: This requires installing pool dehumidifiers on the mezzanine either hung from ceiling or on the mezzanine floor. Due to equipment size, there may be one required in each of the four corners. This alternative was not considered further since this would limit the mezzanine for use. Also with a decentralized system energy recovery is more difficult. Additionally, there are maintenance and outside air issues that may affect the Historic Building. This option was not explored further.

Scheme 3 – HVAC in old Police Area and Men's Locker: The locker areas were reduced in size to make room for the police area. This space is now abandoned. The proposed architectural renovation plan (Figure 1) locates the men's and women's locker on the same level as the pool. The existing women's locker area and the old police area will then be used for new women's and men's locker rooms. This will free up the existing men's locker space on the mezzanine level for a new mechanical equipment room. The new HVAC system could be located here. There will be some room left over in the old police

area for mechanical spaces. This includes a mechanical room that should be large enough to install the new locker room/hydrotherapy HVAC equipment as well.

Scheme 3, putting the HVAC equipment in the existing men's locker, is the most attractive alternative for keeping the HVAC system from flood damage for the following reasons. This will put the HVAC equipment above the flood plain and is directly adjacent to the pool area. If space permits the ducts would be located up high in the mezzanine area and feed down through the same location as the existing risers. If this is not possible the ducts may be routed down to the sub basement and supply air to the pool as originally designed. If the ducts in the basement were subject to flooding, replacement of sheet metal ducts would not be nearly as expensive as replacing the entire system.

The original system did not include air conditioning or dehumidification. The new HVAC system will require this so an outdoor heat rejection unit or condenser will need to be located outside. Depending on the physical size and space requirements this can be located on the main roof or it can be located at grade adjacent to the northwest corner of the pool area. This may require giving up some small space previously used for outdoor sunbathing. To prevent this, the possibility of locating it in the old drive thru area may be another alternative.

In either case the new Pool HVAC equipment would be located near the proposed space for the outdoor heat rejection equipment. For this reason Scheme 3 is the design that is recommended and the design that was used as the basis for mechanical construction cost projections.

Locker Room HVAC

The sub-basement also has an H&V unit serving the locker rooms. The women's locker room was larger but some of this space was converted into a police office. But this office has been abandoned due to the construction of a new police building southwest of the Hall of Waters Building. The ductwork is still in place for the men's locker, women's locker and the former locker/police station area.

The exhaust system for these areas is located on the roof and is still in place. The original exhaust fan has been replaced with a cabinet fan. This may have been a field change from the original design as the structure is designed to match to the new cabinet fan and duct configuration.

The locker room supply, exhaust and distribution ductwork are currently still in place. BWR recommends replacing this system in its entirety with the possible exception of duct risers that are in chases or behind finished areas. The HVAC unit will have to be relocated up a level to avoid future flood damage similar to the Pool unit discussed earlier. Mechanical spaces will have to be increased to allow for this unit to be installed as well.

The new supply and exhaust would be sized for the new spaces being planned. The ductwork in the locker areas has been exposed to wet conditions and should be replaced as well. Also due to energy conservation the supply and exhaust systems will be designed to recover waste heat from the exhaust air. This will require a reconfiguration that the present locker HVAC system cannot be modified for.

Hydrotherapy Pool Room HVAC

The small hydrotherapy pool room HVAC supply system was originally in the subbasement adjacent to the locker supply system. The system has been removed in its entirety except for some supply ducts in walls. The exhaust system is still in place but has been abandoned. The exhaust fan is located in a small closet off the Main Lobby Mezzanine. The discharge is on the roof.

Since the supply for this system has been removed, a new HVAC supply system will be required. The exhaust system may be reused but BWR recommends replacing this as well. Energy conservation of the exhaust air is desirable and this will require a reconfiguration of the exhaust system.

The proposed architectural layout has a mechanical room adjacent to the existing hydrotherapy pool room. The new HVAC equipment will be located here. A small unit for HVAC heat rejection will be located on the roof near other similar equipment.

Water Bar HVAC

The water bar is located on the main entry level. The area has a Ventilating AC Unit in a penthouse next to the elevator machinery room. The supply air to the water bar is just below the water bar roof and feeds diffusers in the ceiling. However, the return duct system is located down low where the return grilles are integral with the bar at floor level. The ducts then go below the floor and through the ceiling space of the pool area before it rises back up to the penthouse.

Next to the Water Bar Unit in the penthouse is an exhaust fan that exhausts smoke from the water bar area through three openings in the ceiling. Each opening is hidden by a large decorative chandelier. This fan was not running during the site visit. Due to the building becoming a non smoking facility, this fan has probably been shut down since it does not show signs of recent use.

This exhaust fan at one time had exhaust ducts over the existing lobby, but this duct has been removed. The lobby has HVAC supplied to it through a newer system located in the same penthouse. The heat rejection unit for this HVAC system is located on the roof next to the penthouse.

The Water Bar is heated by steam radiators located along the perimeter walls. The steam and condensate distribution piping is located below the water bar floor in the ceiling space above the pool. This pipe is original and probably insulated with asbestos. The ceiling is gone and the exposed pipes and ducts are in need of complete replacement. This includes the return ducts to the water bar space above. This duct has large holes in it and is basically nonfunctional for air return of the water bar space to its penthouse located unit.

To abate the asbestos on the steam and condensate pipe above the pool, scaffolding will need to be erected. Once in place the entire piping system should be replaced. The redesign will also make the steam traps more accessible in the future, as these normally require continuous maintenance.

The piping above the pool also includes the drainage piping from the water bar. Since this may be the only opportunity to access this piping that is also 50 years old, replacement of all

plumbing piping in the ceiling space above the pool should be included. This does not include the PVC mineral water pipes serving the water bar. This has been replaced and is mostly accessible from the mezzanine level.

Plumbing Systems
The existing plumbing piping and fixtures in the pool and locker areas are in extremely poor condition. All of the piping and fixtures should be replaced. New water piping and waste lines can be connected to existing distribution lines above the pool level ceiling or below the pool level floor.

ELECTRICAL FINDINGS

Main Electrical Room
After the damage from the 1993 flood, the electrical service entrance and main distribution board were replaced and the electrical room was re-located to the Ground Floor Mezzanine. The existing main distribution board is 1,200 amp, 120/208V, 3-phase. This main distribution board feeds sub-panels located through-out the building. The utility meter indicated that the maximum demand for the entire building at a given moment was 292 amps. The main distribution board has three 100 amp spare circuit breakers.

Due to large new motor loads required by the pool renovation, it is likely that a new larger electrical service entrance and main distribution board would be required. It is recommended that the existing over-head electrical service from the utility pole to the building be replaced with an underground service during the renovation.

Sub Electrical Room
This room contains a wire-way that is fed by over-head circuits routed from the main distribution board. From this wire-way several disconnect switches are fed. The wire-way is missing a panel cover, but is in otherwise good condition. It is recommended that panel cover is replaced and circuits are tagged during the renovation.

Pool Room
This room contains light fixtures, conduits, conductors and switches that are in poor condition. It is recommended that the entire lighting and receptacle system in this room be replaced.

Women's Locker Room
This room contains light fixtures, conduits, conductors and switches that are in poor condition. It is recommended that the entire lighting and receptacle system in this room be replaced.

Men's Locker Room
This room contains light fixtures, conduits, conductors and switches that are in poor condition. It is recommended that the entire lighting and receptacle system in this room be replaced.

Hydrotherapy Pool Room
This room contains light fixtures, conduits, conductors and switches that are in poor condition. It is recommended that the entire lighting and receptacle system in this room be replaced.

POOL ASSESSMENT - GENERAL

Water's Edge Aquatic Design reviewed and evaluated the pool facilities in the Hall of Waters and developed recommendations for complete renovation of the pool facilities. The following evaluation was prepared using current design guidelines and standards.

This report focuses on the recommendations for complete renovation of the facility. These recommendations encompass all aspects of the pool, including Health Code concerns, as well as ADA accessibility requirements.

STANDARDS AND GUIDELINES SUMMARY

This report compares the existing facilities to current state, federal and international design standards, guidelines, and building codes. Following is a list of the major regulations, codes, and standards some of which are referenced in this report.

- Missouri Department of Health (MDH), *A Guide for the Design and Operation of Public Swimming Pools*
- United States Swimming (formerly AAU)
- United States Diving
- National Collegiate Athletic Association (NCAA)
- Federation Internationale de Natation Amateur (FINA)
- National Spa and Pool Institute (NSPI)
- National Recreation and Park Association (NRPA)
- The Americans with Disabilities Act (ADA)
- Uniform Building Code (UBC)
- Uniform Plumbing Code (UPC)
- National Electrical Code (NEC)

The Missouri Department of Health (MDH) has provided a guide for public swimming pools, but does not currently have designated regulations. These guidelines reflect the minimum safety and water quality requirements for the operation and for the standards of construction for swimming pools.

United States Swimming, United States Diving, and FINA are organizations that publish standards for competitive swimming and diving. We refer to these standards for swimming and diving dimensions and clearances.

The National Spa and Pool Institute (NSPI) published standards in the early 1960's and are aimed at a wide variety of pool facilities. These standards have become widely accepted and have been adopted by some states.

The final ADA regulations pertaining to aquatic facilities have not been published. However, draft criteria are available through the Architectural and Transportation Barriers Compliance Board. The criteria provided by the ATBCB may be referred to within the following report.

SUMMARY OF FINDINGS AND RECOMMENDATIONS

The Hall of Waters pools are currently in need of extensive repair. The pool structure appears to be in fair shape in some areas and poor shape in other areas, while the recirculation system is virtually non-existent. The codes and standards used for the design of today's swimming pools are also not addressed in older facilities such as this. The continued threat of flooding by the East Fork Fishing River is also a concern.

The Findings section outlines what the Hall of Waters facilities currently offer; a main swimming pool and a therapy pool. Within the main swimming pool concerns were found with the ADA accessibility, diving clearances, concrete structure, recirculation piping and filtration system, proper signage, pool lighting, and health code compliance. Within the therapy pool concerns were found with the ADA accessibility, concrete structure, recirculation piping and filtration system, proper signage, and health code compliance.

FINDINGS

General

The Hall of Waters pools were built in 1937 and were closed in 1987. The main swimming pool provided recreational and lap swimming as well as diving. The therapy pool was used for therapy only.

The main swimming pool begins at a depth of 3'-6" and finishes with a depth of 7'-0", with a 9'-6" diving basin in between. The pool is 30'-0" wide and 75'-0" long. The total volume of the main pool is 105,055 gallons. Tiled concrete decking, intermittently broken up by building columns, surrounds the main pool.

The therapy pool, located in a separate room from the main pool, is 7'-0" wide and 20'-6" long. It goes from a depth of 2'-6" to 4'-0". The total volume of the therapy pool is 3,590 gallons. Tiled concrete decking surrounds the therapy pool on three sides, two of which are 2'-2" wide.

At the time of closing the main pool, three diving boards were provided, two at one-meter height and one at three meters height. There are currently no slides or water features on the premises. The main pool is equipped with five swimming lanes, 25 yards in length. All the lanes are 5'-0" wide.

Both pools were constructed from cast-in-place concrete and were finished with "non-slip" tile both around the perimeter and throughout the basin. Four ladders around the pool provide access to the main pool. The therapy pool is accessed by a short, steep ramp at one end of the pool.

SWIMMING POOL STRUCTURE

Perimeter Gutter

The gutter structure around the main pool appeared to be in fair to poor condition. There were areas of extensive cracking, missing tile, and exposed rebar.

Over time, most probably from the continued problems with flooding and lack of use, parts of the perimeter gutter have accumulated algae and other sources of discoloration. The gutter tile and grout have also become discolored in places from rust and other stains.

The current gutter has the potential to cause serious injury due to its surface slickness, poor structural condition, and crevices in which feet can readily become wedged. Further, its design is an inconvenience to pool patrons, as they must climb over it in order to enter or exit the pool. The MDH also makes note in its standards, "The gutter shall be designed to serve as a handgrip and *to prevent entrapment of arms or legs*."

Pool walls

When hammer tested, the main pool walls and floors were found to be in good condition overall. However, some areas were found to have questionable structural integrity. When viewed from the backside, it was revealed that multiple areas of the pool structure were weak and cracking. Exposed rebar, spalling walls, and large cracks indicate weak components of the main pool structure.

When the therapy pool walls were hammer tested, they were in good condition.

The tile on the walls of the main pool and therapy pool has been stained from rust and algae along with the gutter tile.

Pool bottom

The pool floor in the main pool was hammer tested and found to be in fair condition. Large cracks were seen in areas of the floor, and the tile was discolored.

The floor of the therapy pool was hammer tested and at least one spot of concern was identified. The tile was discolored.

Water loss

There had previously been a major concern with water loss. In the 1980s it was found that the pool was loosing approximately a foot of water per day, this amounts to 16,800 gallons per day. The problem was solved when the main drain was replaced by installing a new drain in the side of wall. Since then, water loss had not been a problem.

Diving Clearances

Standards for diving include FINA, US Diving, and National Collegiate Athletic Association (NCAA). Other standards or guidelines that apply to diving clearances include 10-States Standards, National Spa and Pool Institute (NSPI), and National Federation of State High School Athletic Associations (NFSHSAA). 10-States Standards have diving clearances that are several feet shallower than FINA, U.S. Diving and NCAA standards. NSPI standards are mainly directed at commercial and residential pools.

Due to the wide variety of users at public facilities, we recommend the most stringent diving clearances be followed. For this reason, we recommend the diving clearances suggested by FINA, US Diving and NCAA.

The current one-meter standards for FINA, US Diving and NCAA require a minimum water depth of 11'-0" at the plummet. Both FINA and US Diving prefer a water depth of 11'-6", NCAA prefers a water depth of 12'-0", and NFSHSAA requires a water depth of 12'-0" at the plummet for one-meter springboards. The current depth of 9'-6" is insufficient for safe diving.

The accepted standard for maximum bottom slope (from horizontal) in any diving basin is 30°. The slope of the main pool in the diving basin is 11°. This is not a problem.

The lane widths of 5'-0" are below the minimum width of 7'-0" minimum required for competitive use. Therefore, the pool cannot be used for competitive events.

Pool Coatings

According to pool standards, the finish of the bottom and sides of a pool are required to have a painted white or a light color. This helps to keep the pool patrons clearly visible to the lifeguards, as well as allowing the maintenance personnel to best view debris in the pool in need of vacuuming. A coating also prevents algae from easily maintaining a hold on the pool bottom and pool walls.

The Hall of Waters pools are currently covered with a white, ¾" square tile, that was noted in the original plans as being "non-slip". The grout in between the tiles appeared to be worn-down in some areas, exposing sharp edges of the tile. This allows debris to become trapped and encourages algae growth.

Besides its grout concerns, the tile have also become discolored in many places and is also missing at a few locations. The missing tile can be a danger, causing patron injuries as well as a location for algae accumulation.

According to many of today's design standards, where the slope of the swimming pool bottom changes to a slope greater than 1:12 and at the 5' depth line, the pool bottom and sides should be marked with a stripe at least 4 inches wide in a color contrasting with the pool bottom and sides. In addition, a float line with floats no more than 5 feet apart should be maintained in these locations. The main pool in the Hall of Waters has a slope steeper than 1:12 and does not provide a safety warning line across the pool to indicate the change in depth and slope.

The leading edge of each tread on all steps and submerged curbs or ledges should be maintained with a slip resistant stripe at least 1 inch wide of a color contrasting with the swimming pool floor. The ledge of the gutter is not marked with a strip of color contrasting the swimming pool floor. The pool ladder rungs of the main pool were covered in the same "slip resistant" tile as the rest of the pool, however the shallow area ladders were missing the tile.

Depth and Warning Markings

According to the MDH *Guide for the Design and Operation of Public Swimming Pools Manual* (Section 6.1.1), "Depth of water shall be plainly marked at or above the water surface on the vertical pool wall and on the edge of the deck, at maximum and minimum points of break between the deep and shallow portions, and at intermediate increments of depth, spaced at not more than 25-foot intervals measured peripherally. Markings shall be on both sides and ends of the pool. Where depth markings cannot be placed on the vertical walls above the water level, other means shall be used so that the markings will be plainly visible to persons in the pool."

The main pool does provide depth markings, however, they are not to the guidelines set by the Missouri Department of Health (MDH). The therapy pool does not provide any markings whatsoever. Furthermore, the main pool markings provided are not accurate. For example, the plans for the pool show the diving depth to be 9'-6", however the depth markings at that point read 10'-0". Where the depth marking reads 6'-0", the actual depth is 6'-4".

In addition, the words "NO DIVING" should be marked around the all parts of the pool except that part designated for diving. This is not currently done for either pool.

Safety Signage

There was no safety signage posted at the time of the site visit. These may have been removed since the time the pool was in use.

Pool Deck

The current pool deck is in good condition. No large cracks or trip hazards were noticed. A deck area to water surface area ratio of 1.5 to 2.0 is recommended. The current deck areas are slightly below this recommendation. 19 large columns surrounding the main pool also break the space up.

Bonding

The National Electric Code (NEC) requires bonding of all metallic parts of the pool structure, all metal parts within or attached to the pool structure, metal parts of equipment associated with the pool water circulation system, including pumps and all metal parts within 5 ft. of the inside walls of the pool. The purpose of this is to eliminate voltage gradients in the pool area, ensuring that all metal parts will be at the same electrical potential; thus providing some protection against shock hazard.

Electrical bonding was not checked during the physical evaluation. (If a bonding check is desired, an electrician should be sought to perform this work.) It is unlikely that these pools meet the criteria of the NEC.

Recirculation System

General

The main pool recirculation systems original design was comprised of piping, a recirculation pump, filters, wall inlets, a main drain, valves, and an overflow gutter. The therapy pool recirculation system is not visible for the most part, and was not shown in the original plans. From what was visible for the site visit, it has been deduced that the therapy pool recirculation system was comprised of piping, a recirculation pump, a wall inlet, an overflow gutter, a main drain, and fill pipe.

Piping
The piping was completely removed after the 1993 flooding. The existing piping that shows through the outside walls consists mainly of galvanized steel, some PVC and some ABS.

Recirculation Pump
The recirculation pump was removed along with the piping in 1993.

Floor and Wall Inlets
There are currently no floor inlets in either the main pool or the therapy pool. Eight wall inlets, in four sets of two are provided along the perimeter of the main pool. These inlets are arranged side-by-side and do not have adjustable fittings. Two sets of two are provided in the deep end, two sets of two are provided in the shallow end. There is one inlet in the therapy pool. Some of these inlets have rusted or corroded.

Main Drains
The six inch square main drain that had been used in the deepest part of the pool was replaced by a hole in the side of the deep end of the pool in the 1980s when substantial water loss was experienced. The deepest part of the therapy pool has a grate serving as a main drain as well.

Surge Tank
There currently is no surge tank. The pump, which has since been removed, operated by direct suction from the main drain.

Recirculation Rate
The recirculation rates for the pools are unknown. Given the volume of the main pool, the appropriate recirculation rate for a 6-hour turnover is 292 GPM. The appropriate recirculation rate for the therapy pool at a 1-hour turnover rate is 60 GPM.

Continuous Gutter System
Eight "scum gutter drains" are provided along the perimeter of the main pool. These drained directly to waste and were not part of the original pool water recirculation system. While most of the piping for these outlets has been removed, some of the original galvanized steel pipe remains.

Filtration System
The original filtration system was pressure-sand filters. It was eventually replaced with a vacuum diatomaceous earth filter. Both of these systems have been removed and nothing is currently in place.

Chemical Feed Equipment
No chemical feed equipment is currently in place.

Pool Water Heating
Pool water heating is not provided at this facility.

Pool Deck Equipment

Life Guard Chairs

Only one lifeguard chair was found on deck during our site visit. Others may have been used during pool operation.

Ladders

There are currently four ladders built into the walls with tile covered steel pipe as ladder rungs. Tile on some of these ladder rungs have dilapidated. The ladder rungs are not a typical shape or surface, creating a concern for slipping and ease of use. The chrome plated bronze railing used for the ladders has been placed on top of the walls on the back side of the gutter, which could cause difficulty climbing out of the pool.

The ladder rungs are designed in such a way that allows the potential for patron's limbs to be wedged between the rungs and the wall. These ladders do not provide a safe way out of the pool.

Lifesaving Equipment

The lifesaving equipment was not visible during the site visit.

Diving Boards and Stands

Two one-meter diving boards and one three-meter diving board were used at the facility at one time. During our site visit, a one-meter board was the only piece currently in place on the diving end of the pool.

Deck Benches

No deck benches were observed during the site visit.

Pool Lighting

Sixteen recessed areas around the perimeter of the pool are provided for underwater lighting. The lighting equipment that was once provided in these spaces has been removed.

The recessed spaces, which held these lights, were examined and many were found to be in poor structural condition. Exposed rebar, cracking and spalling concrete are cause for concern in the structural integrity of these light boxes.

ADA Requirements for Pools

The pool does not currently have any ADA features. Under new ADA standards, a pool of this size needs at least one accessible means of entry. This can be done through sloped entry or a lift device. A lift device was seen in the therapy pool area, which would make the therapy pool ADA compliant.

RECOMMENDATIONS

Improvements considered in this report range from aesthetic suggestions to code issues to life safety items such as diving clearances. Listed below are recommendations based on the findings from the evaluation. These recommendations are provided with the historic preservation of the facility in mind.

Safety

Cracked and broken gutter pieces, as well as missing tile, can be a location for patrons to get injured, as well as a location for potential algae growth. The gutter structure and tile need to be repaired and replaced in order to ensure patron safety. For this to be accomplished, parts of the gutter will need to be removed and replaced. Gutter tile in these locations will need to be matched to the original tiles and replaced. Other areas will require tile replacement, although the structure will not need to be repaired.

The structure of the pool walls needs to be repaired in places. Many areas, particularly behind the pool walls showed large cracks and spalling. In addition, many cracks in the interior of the pool wall and floor were visible through the pool tile. These areas need to be addressed; removing the tile where necessary and replacing it with a matching tile once repairs are complete.

Where worn-down grout is visible in the existing tile, the grout should be replaced, so as to protect the mortar bed supporting the tile.

The diving board in the deep end of the pool needs to be removed. Diving should no longer be provided at the pool, given the lack of proper diving clearance. Further, signs indicating "No Diving" should be visible around the main pool shallow end and therapy pool.

A line, at least 4" wide in a color contrasting the pool floor, should be placed at the 5'-0" depth. This is to ensure compliance with current swimming pool codes, which ultimately ensures patron safety.

The correct depth markings need to be properly indicated on the side of the main pool and wading pool. This is not only a codes requirement, but is also important in patron safety.

An electrician should check the bonding around both pools. As previously mentioned, it is likely that electrical bonding of both existing and future metal components will be required.

The proper number of lifeguard chairs need to be provided along the perimeter of both pools. The main pool should have at least one lifeguard chair. The therapy pool should have at least one lifeguard chair as well.

The current ladder design needs to be reevaluated. According to the MDH, "Where recessed steps or ladders are provided, there shall be a handrail at the top of each side thereof extending over the coping or edge of the deck." What's more, the MDH states, "Pool ladders shall be corrosion-resistant and shall be equipped with non-slip treads. All ladders shall be so designed as to provide a handhold." The current design makes climbing in and out of the pool difficult. The existing ladder rungs should be replaced with cast-in-place, recessed tiled steps. A new handrail will need to be installed that extends over the gutter ledge and spaced closer together. These changes should make entry and exit safer and easier for the patrons.

The boxes that once contained the underwater lighting present a unique challenge. Should the underwater lighting be maintained, an appropriately sized feature would have to be sought. This could prove very costly. The recommended alternative is to abandon underwater lighting and to fill the existing light niches, making the space flush with the wall and finishing with tile. Since

the pool is only 9'-6" at it's deepest, overhead lighting should suffice for underwater visibility. This will be especially true once the recirculation system has been properly sized and the water remains clear throughout usage.

Function

In order for the pool to be comfortable for all patrons throughout the year, a pool water heating system should be installed. This will require additional piping and a heater for both the main pool and the therapy pool.

Recirculation

The recirculation system, which is currently non-existent, needs to be redesigned and reconstructed. This will require engineering analysis of the inlet, outlet and main drain sizing, as well as resizing any pipes, pumps, valves and filters.

What remains of the galvanized steel gutter outlet piping and other piping would need to be removed. The preferred piping material to install for the recirculation system would be a combination of ductile iron pipe, red brass, and PVC. The sizes will be dependant on the recirculation rate in each pool. End-suction centrifugal pumps would need to be installed to provide proper recirculation for both pools. Properly sized filters would be needed for both pools. An adequate chemical feed system would be needed for both pools. Finally, the possibility of additional wall inlets, gutter outlets and larger main drains would need to be evaluated for both pools. The current wall inlets will need to be replaced, due to corrosion.

The original recirculation system provided direct suction from the main drain to the recirculation pump. This system should be abandoned and a surge basin should be installed near the pump. This will ensure patron safety by avoiding entrapment. Further, the original system used only the water from the main drain, while the gutter outlets went to waste. The new surge basin should be sized to handle the main drain and gutter outlet flow. This will provide better water circulation, as it is pulled from the top and bottom of the pool water.

Aesthetics

The discolored tile should be cleaned and repaired. The gutters, pool bottom and walls need to be thoroughly cleaned.

ADA

The standards set by the Americans with Disabilities Act require that an accessible route be provided into the pool. This can be done with a ramp or a lift. Given the historic preservation concerns, a portable lift is the best option for the main pool. A lift should also be provided in the therapy pool.

COSTS

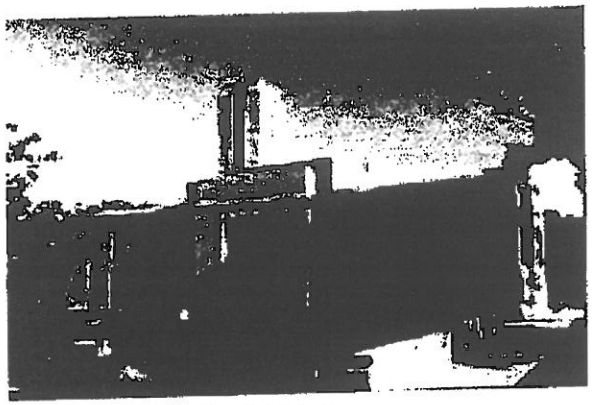
Due to the poor condition of the facilities, constraints of historical restoration, and the need to rebuild the locker areas and replace a vast majority of the mechanical, electrical and pool system equipment, the costs to renovate the existing facility to an operable condition are extensive for a pool of this size.

The costs projected here are total costs for renovating the pool, pool systems and pool area including the deck, mezzanine, locker rooms, and mechanical and electrical systems based on current costs for labor and materials. These costs should be escalated at least two percent per year for inflation once the desired completion date is established.

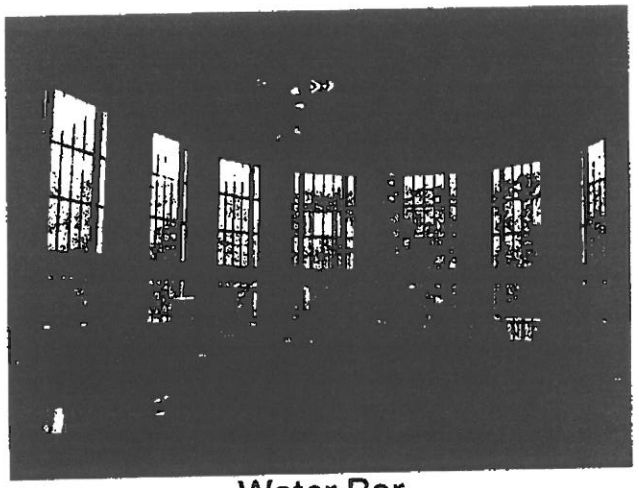
Construction Costs	
Architectural	$510,000
Structural	$100,000
Mechanical	$450,000
Electrical	$230,000
Pool	$550,000
Bonds and Insurance	$ 60,000
Design, Reproduction, and Testing	$220,000
GRAND TOTAL	**$2,120,000**

HALL OF WATERS POOL RENOVATION STUDY
EXCELSIOR SPRINGS, MISSOURI

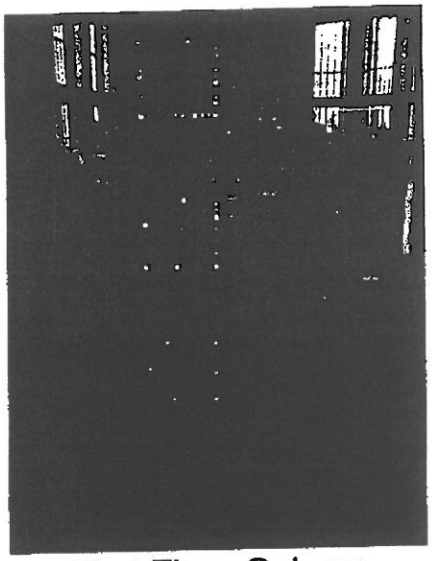
APPENDIX
EXISTING CONDITIONS



Hall of Waters



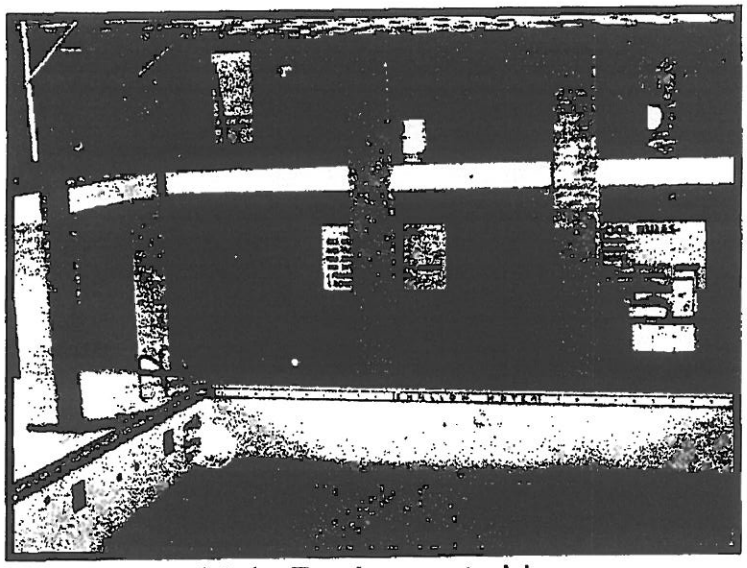
Water Bar



First Floor Column

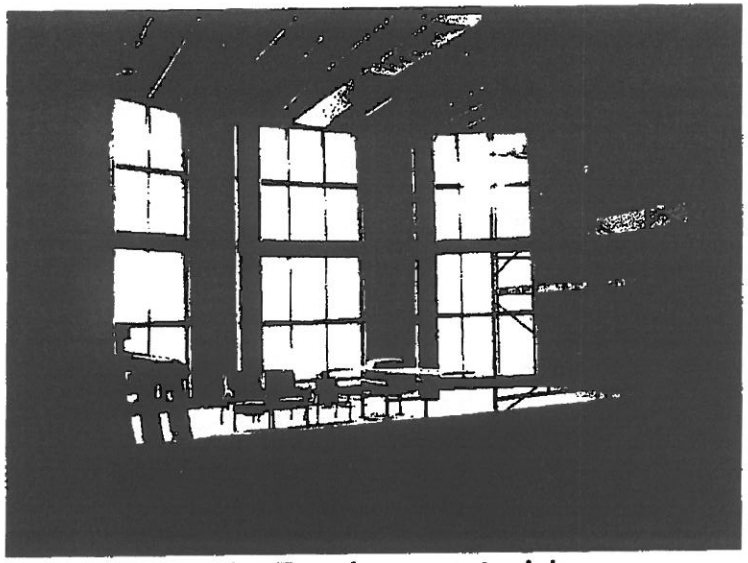
Water Bar Light

Water Bar Mezzanine

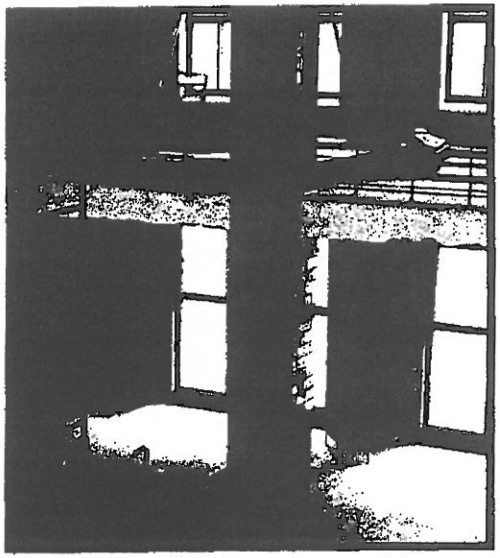


Main Pool – east side

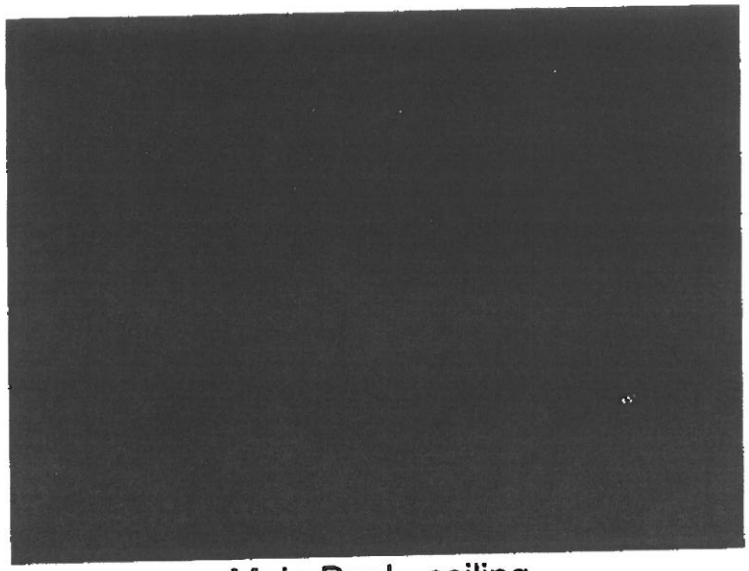
Main Pool – south end



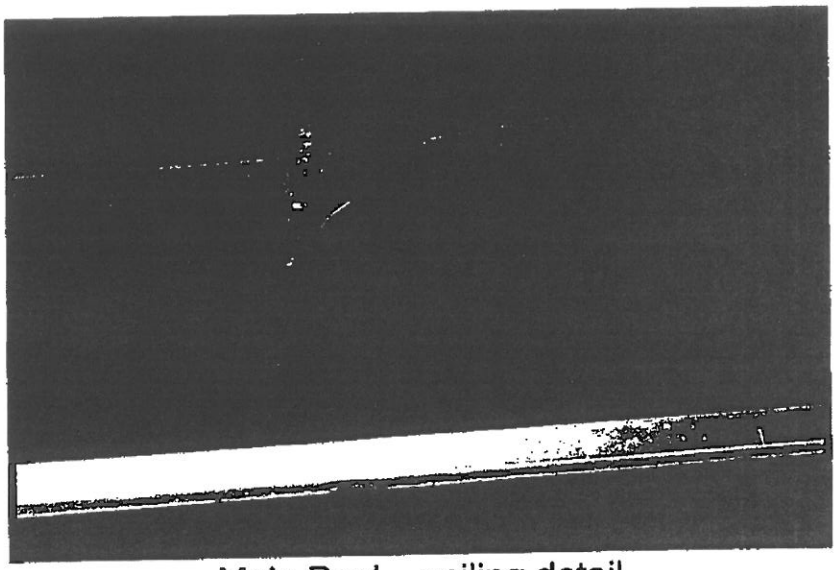
Main Pool – west side



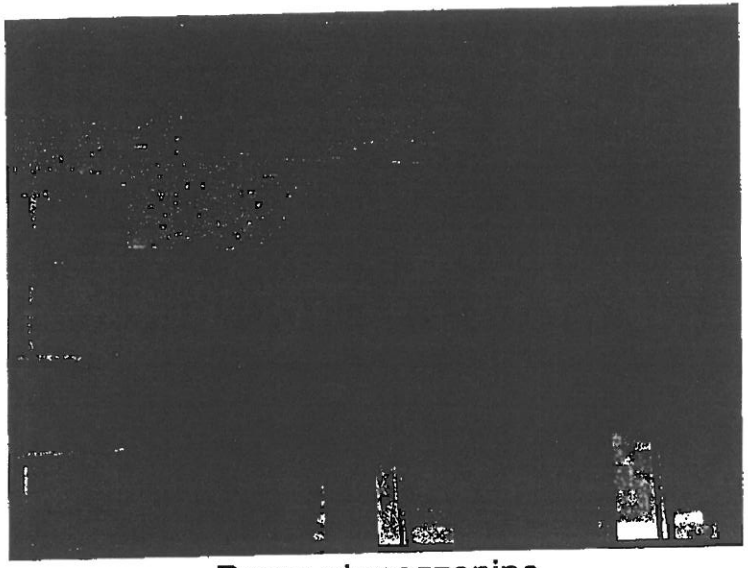
Main Pool – west side



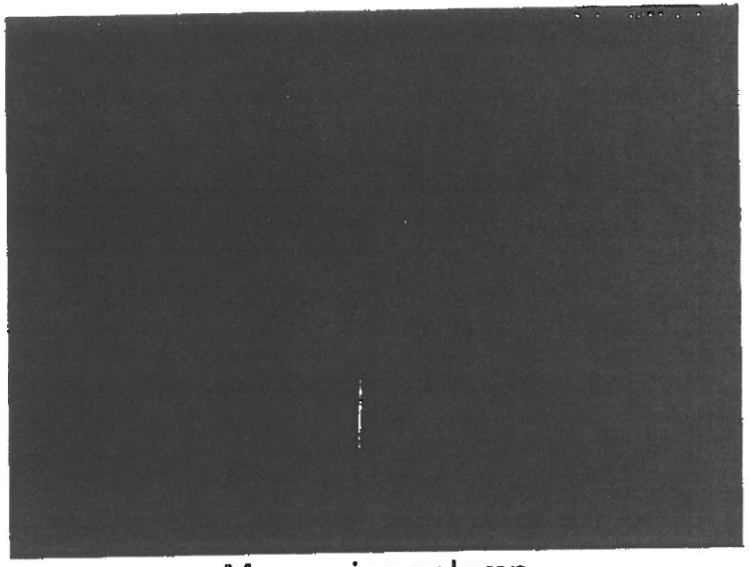
Main Pool - ceiling



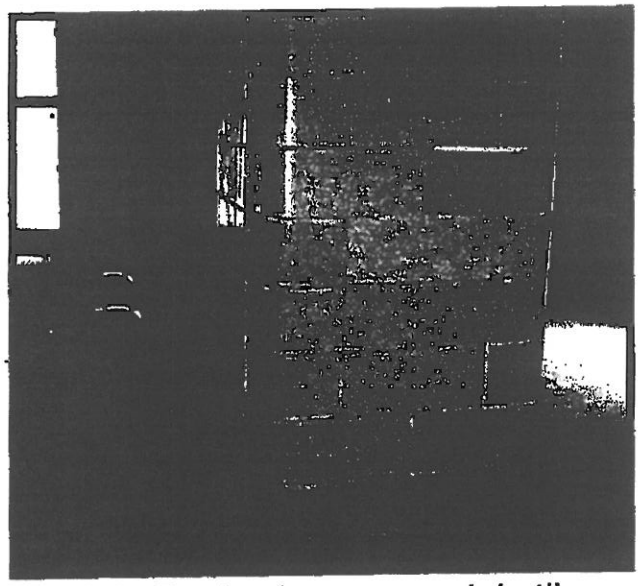
Main Pool – ceiling detail



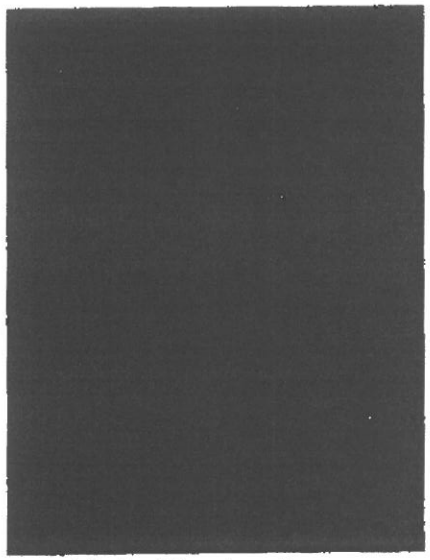
Beam at mezzanine



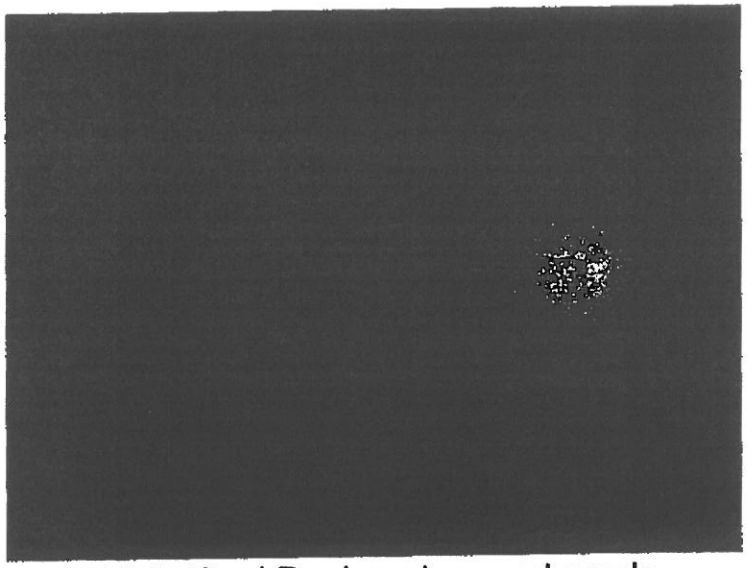
Mezzanine column



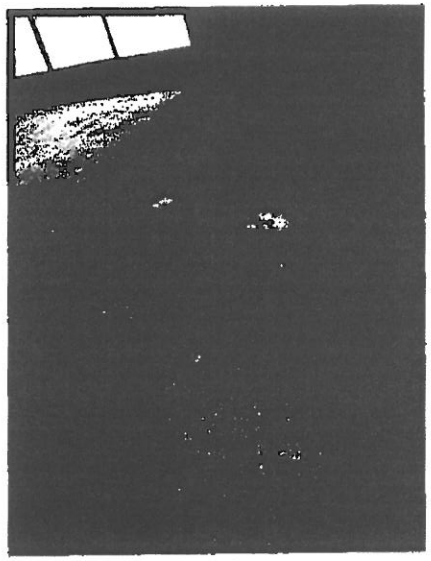
Main Pool column – crack in tile



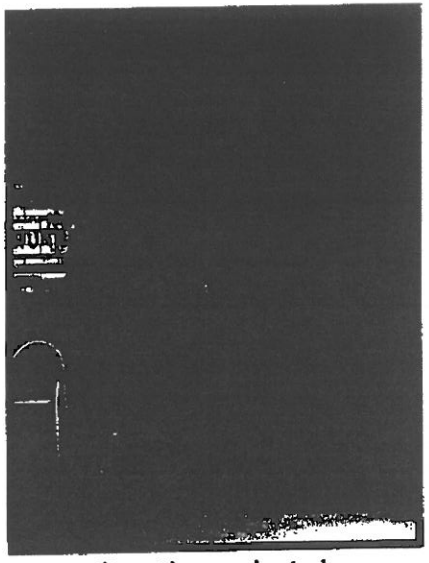
Main Pool column



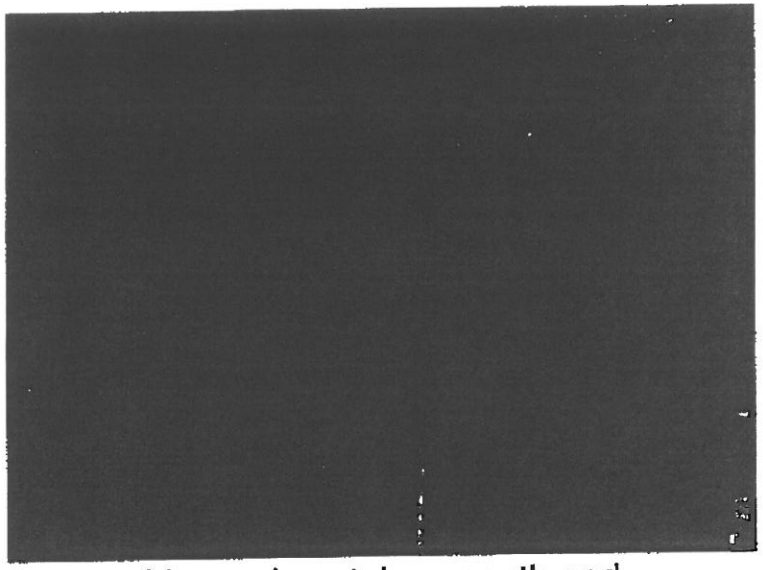
Main Pool Deck – observed crack



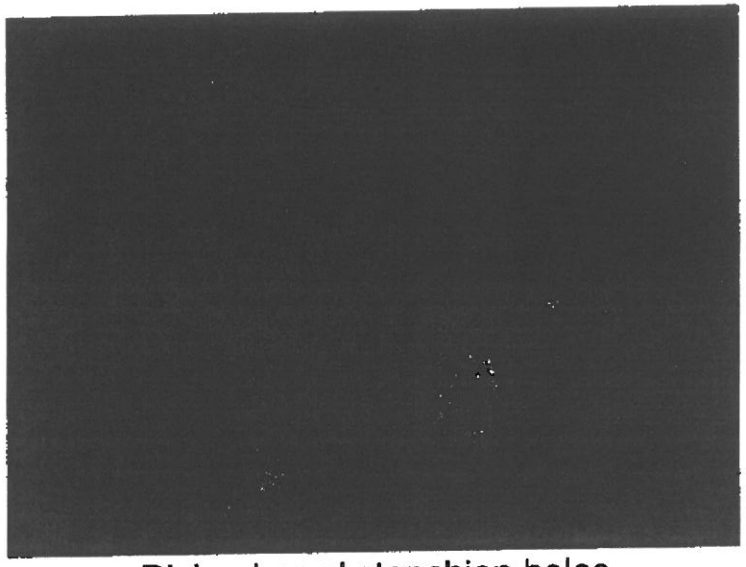
Main Pool corner



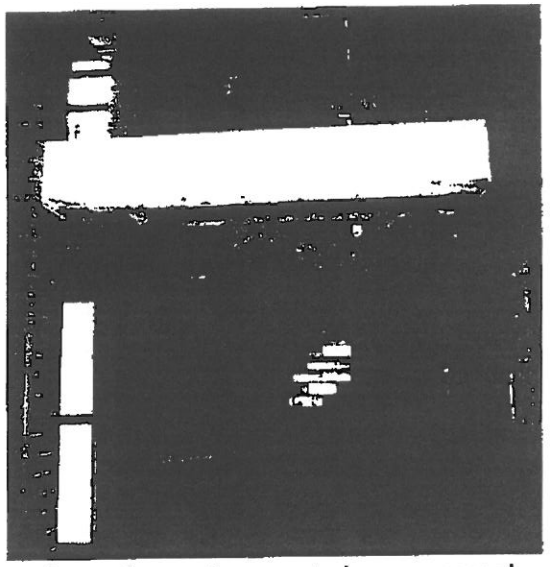
South end stair



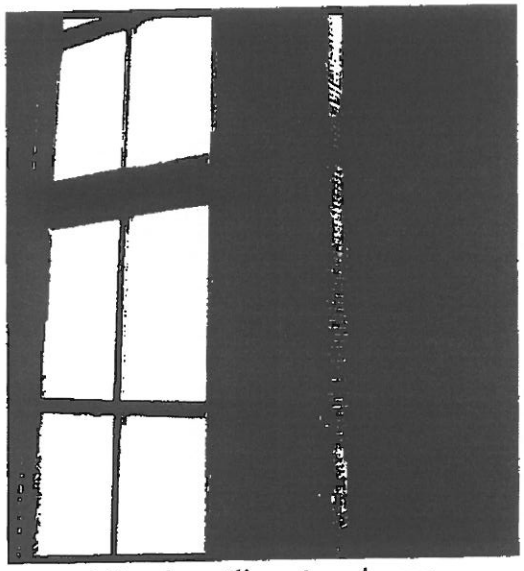
Mezzanine stairs – south end



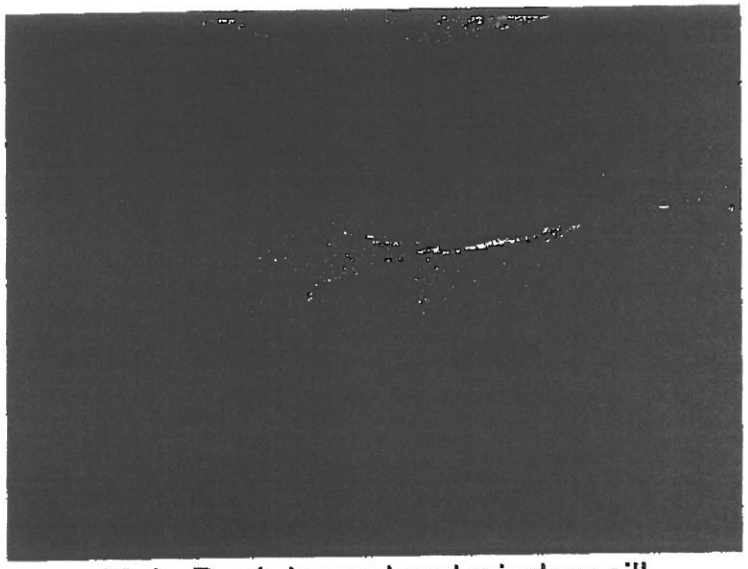
Diving board stanchion holes



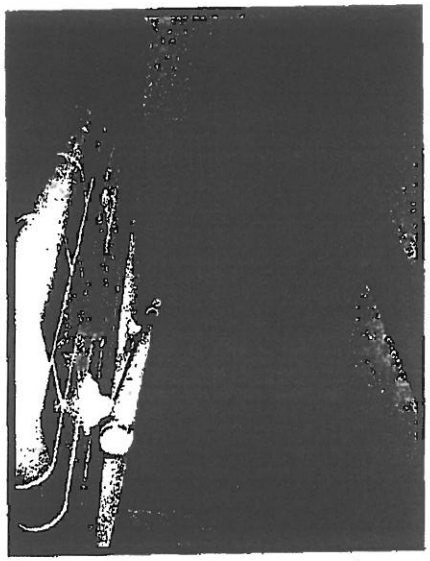
Opening where stair removed



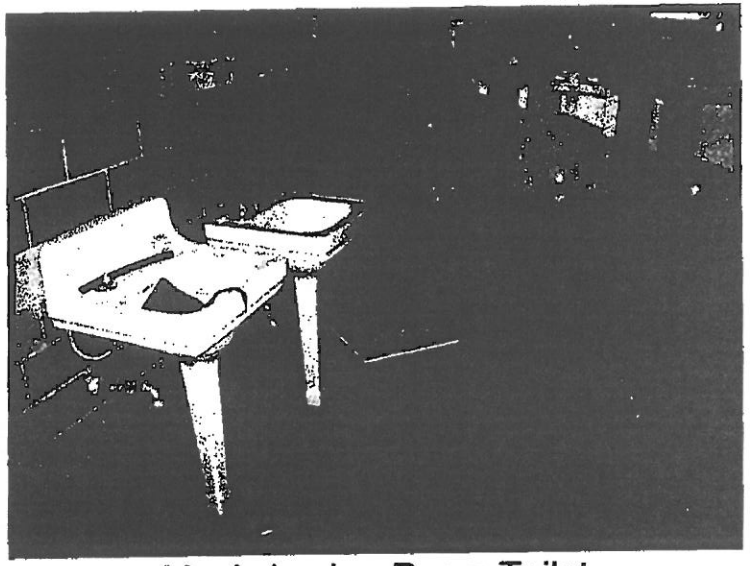
Missing tile at column



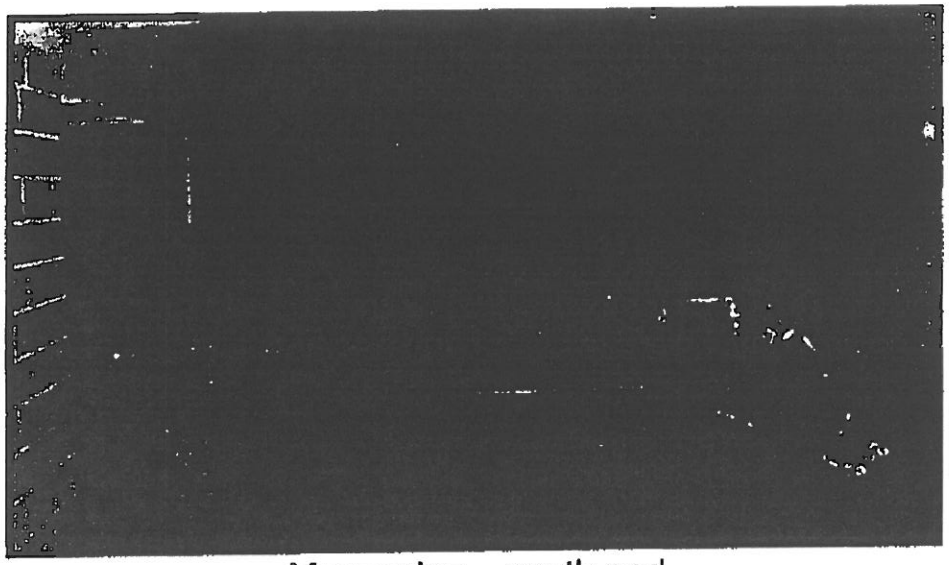
Main Pool -lower level window sill



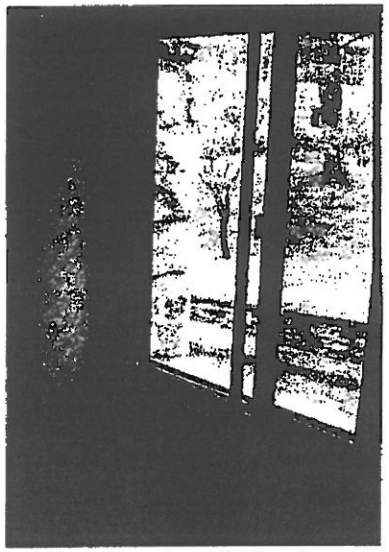
Stair to Basement



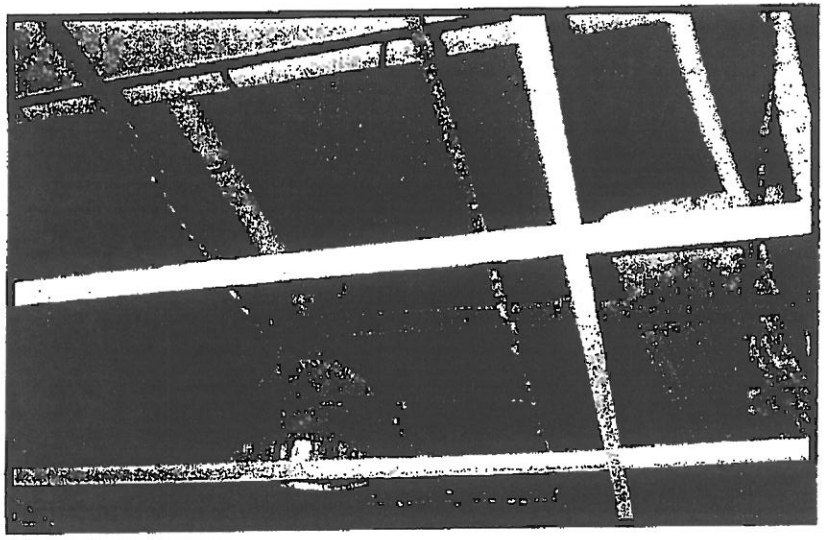
Men's Locker Room Toilet



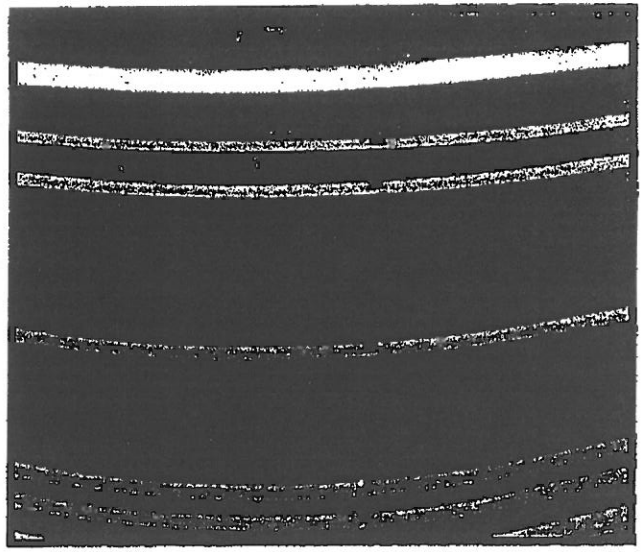
Mezzanine – south end



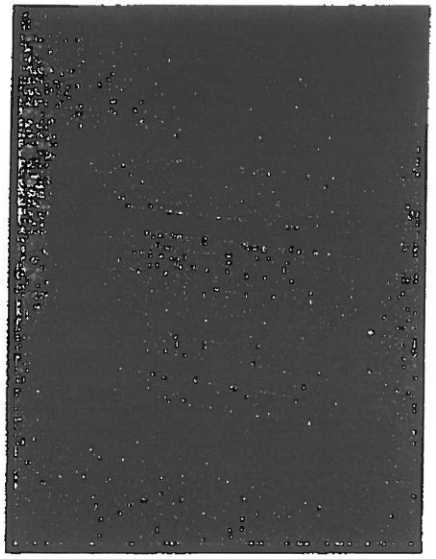
Mezzanine Window



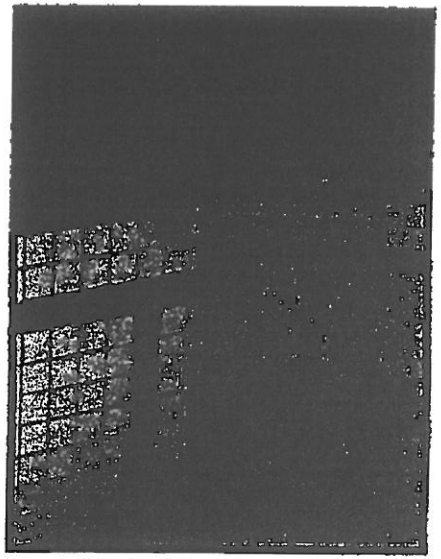
Mezzanine light fixture



Mezzanine Rail



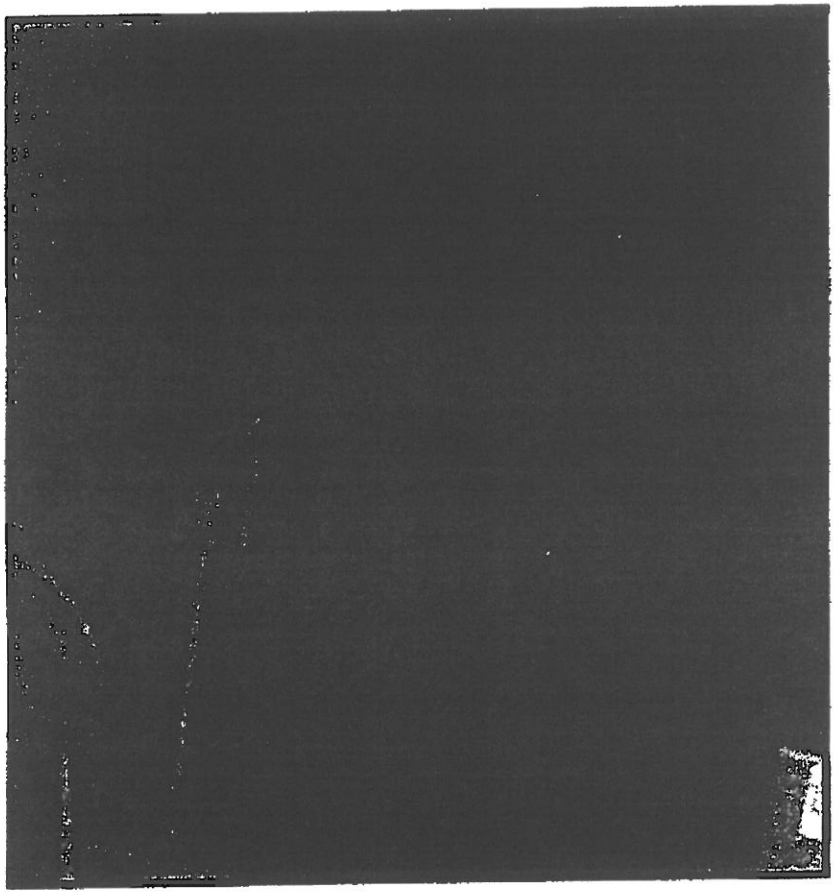
Main Pool ladder



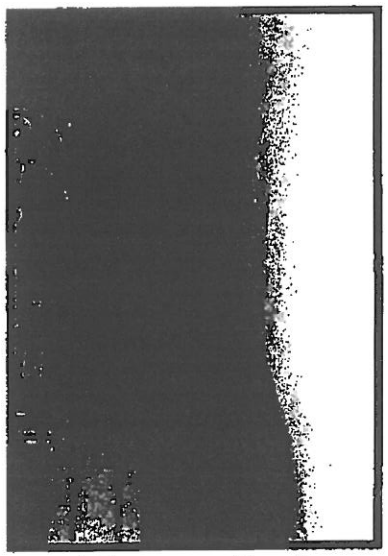
Main Pool corner

Pool light fixture enclosure

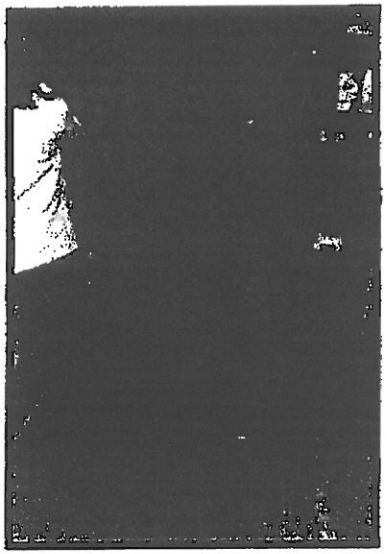
Underside Mezzanine



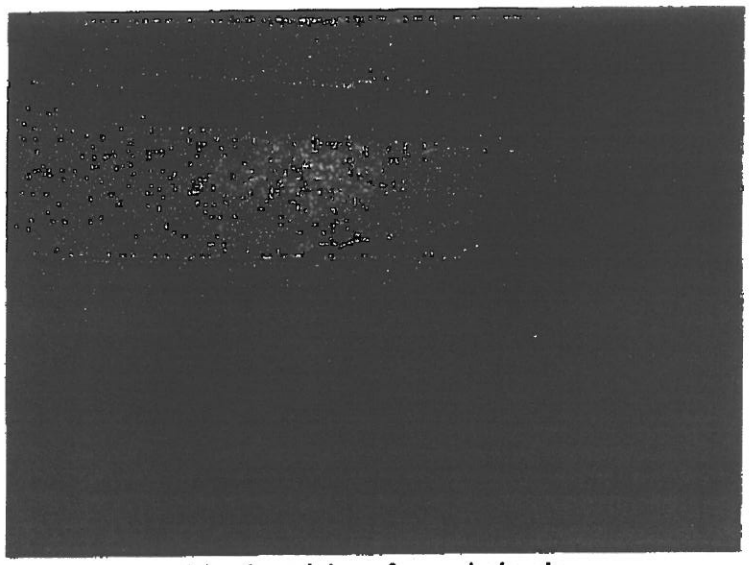
Therapy Pool



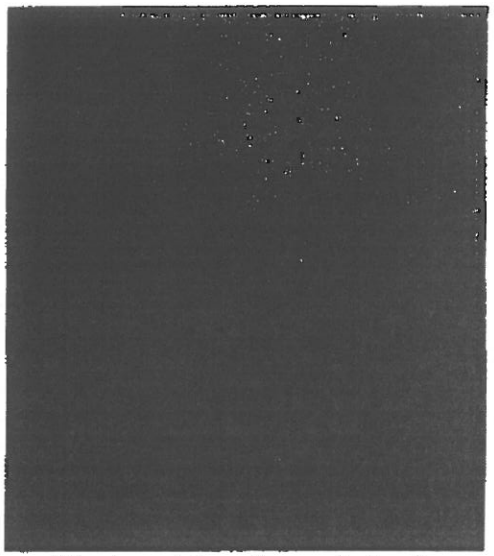
Therapy Pool



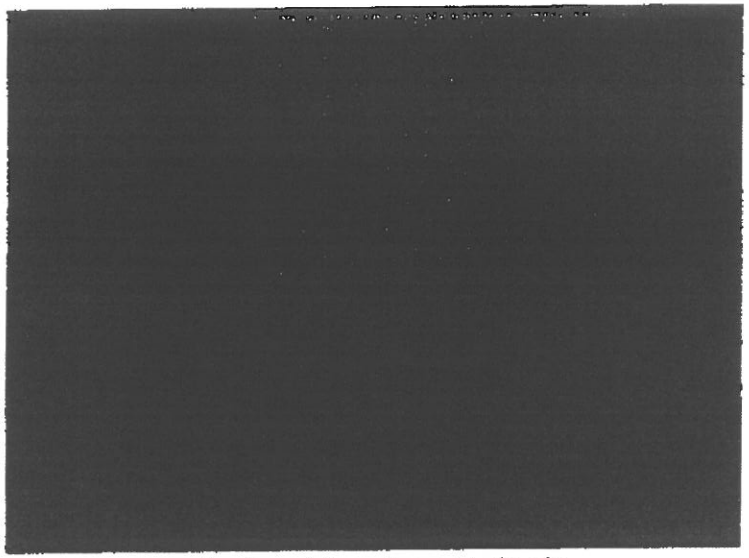
Therapy Pool



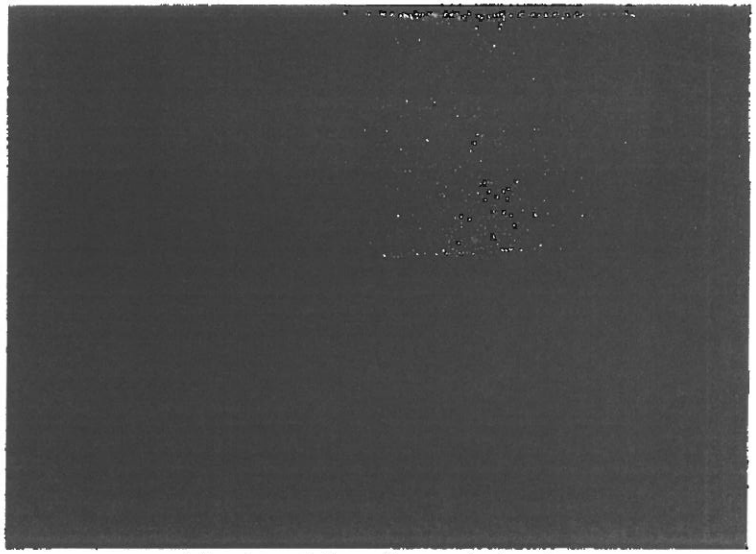
Underside of pool deck



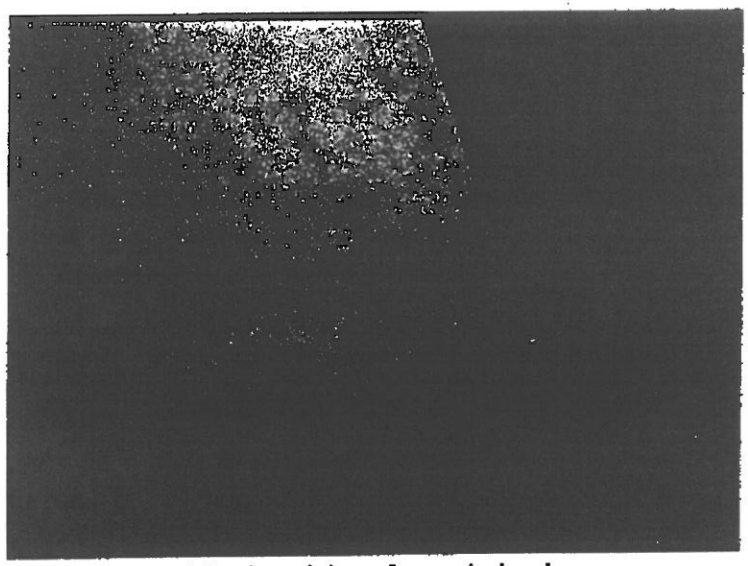
Underside of pool deck



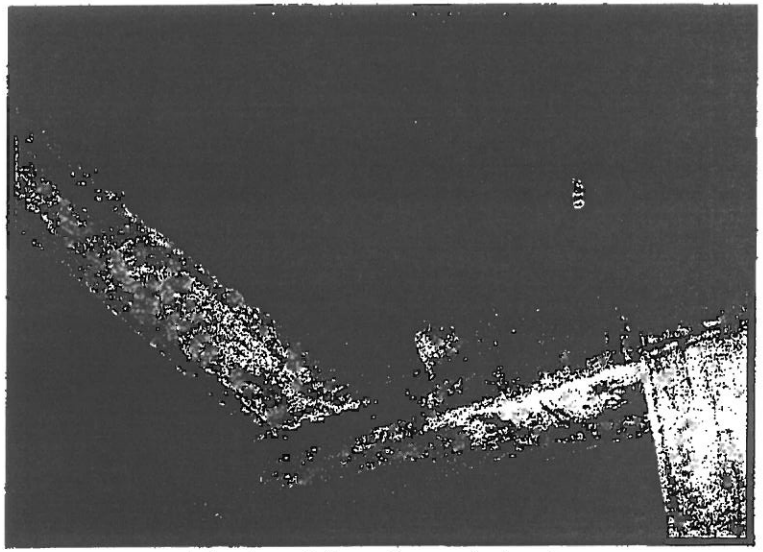
Underside of pool deck



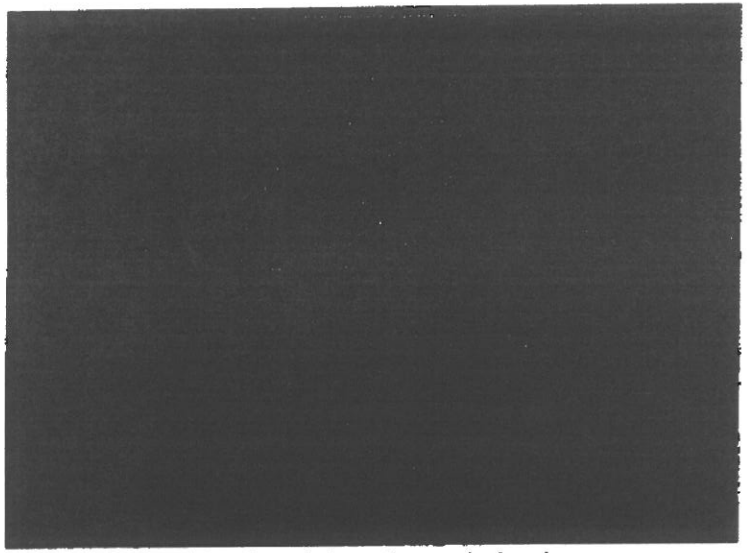
Underside of pool deck



Underside of pool deck

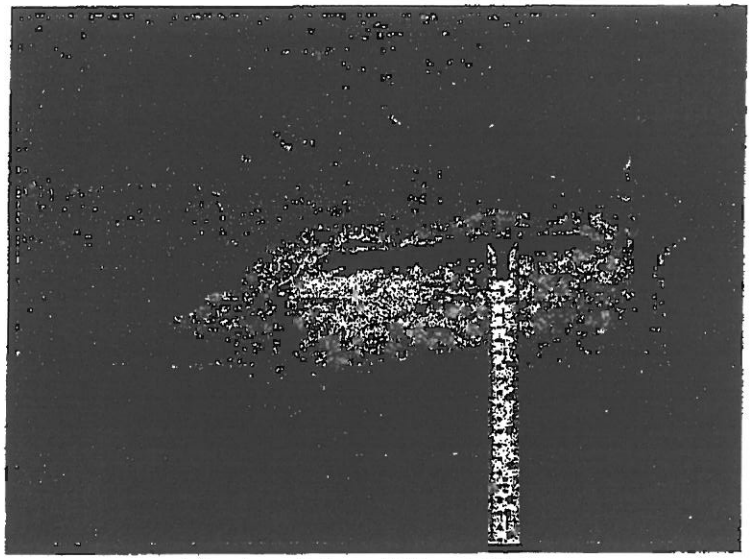


Underside of pool deck

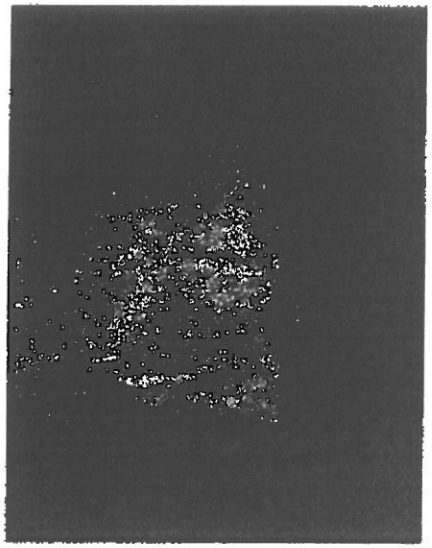


Underside of pool deck

Underside of pool deck

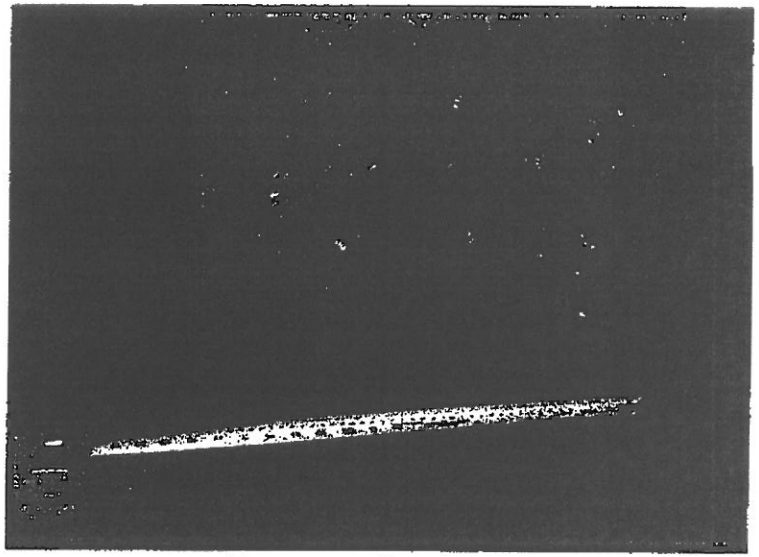


Underside of Pool Deck

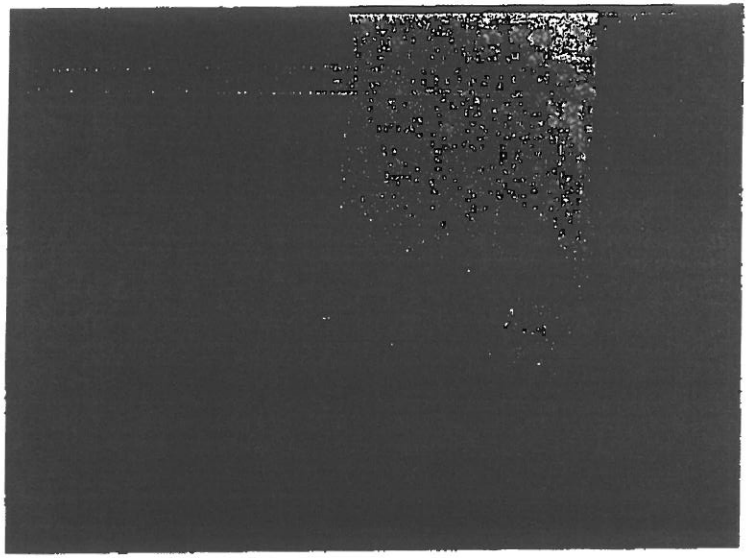


Basement column

Basement column

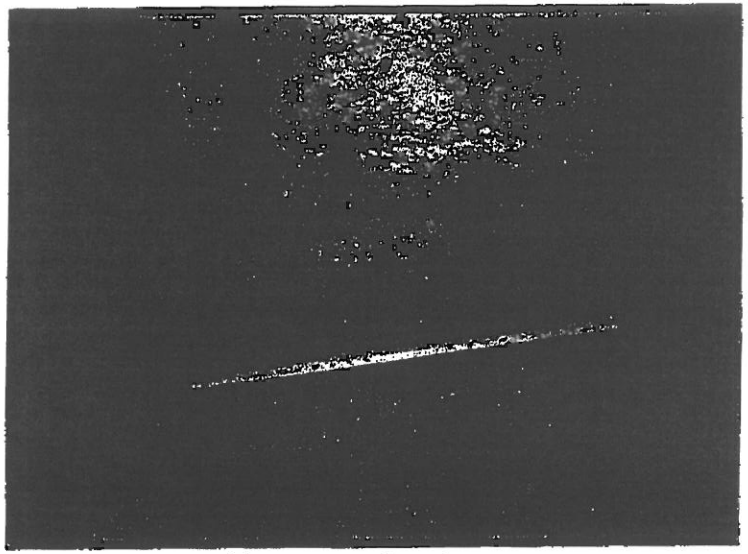


Basement column



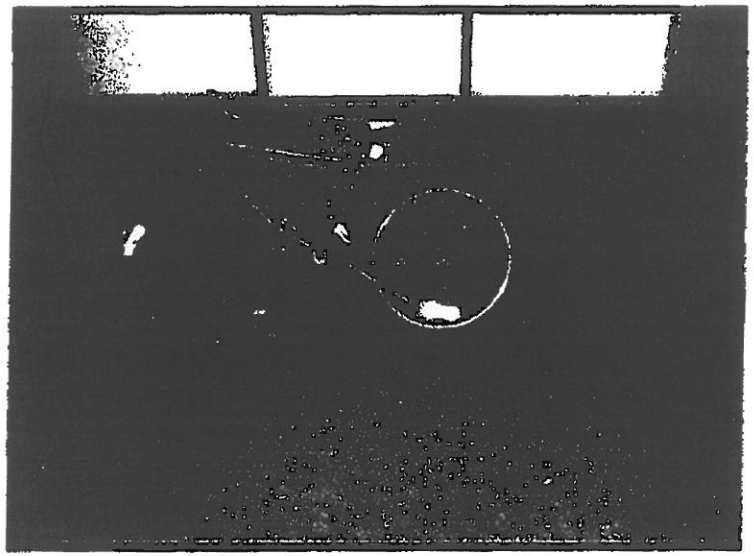
Basement column

Basement column

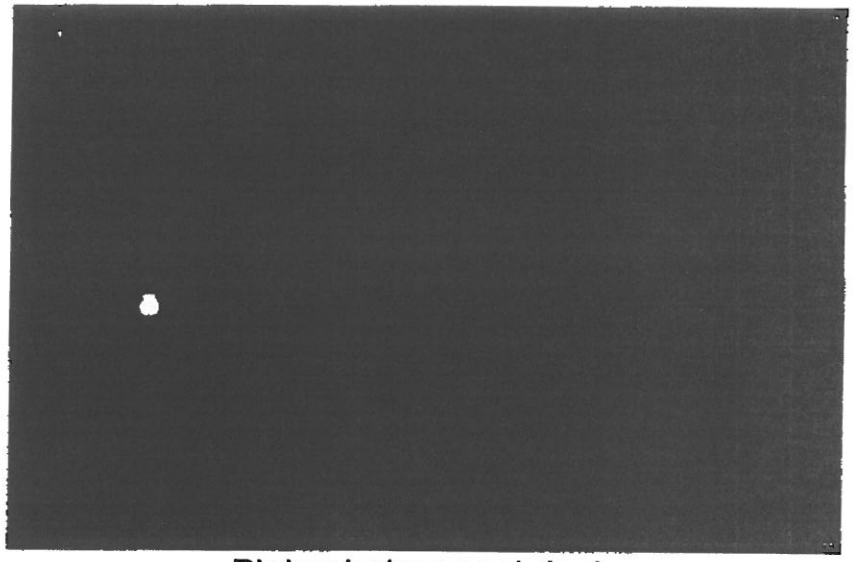


Basement column

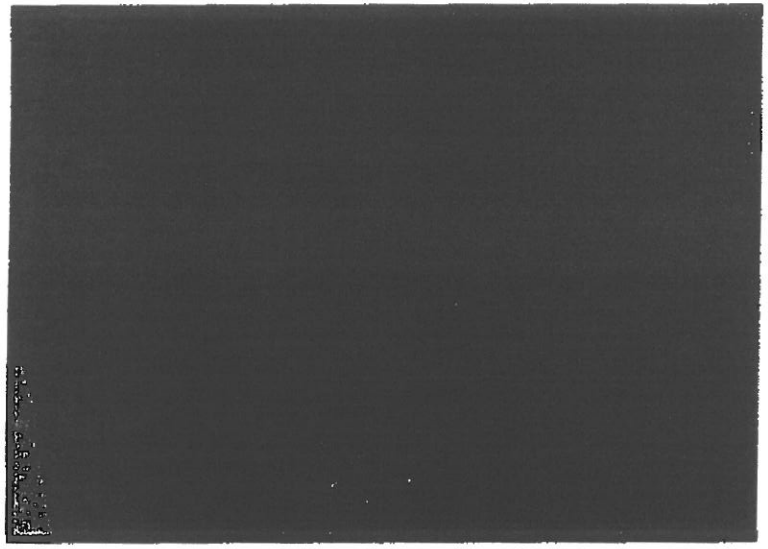
Basement column



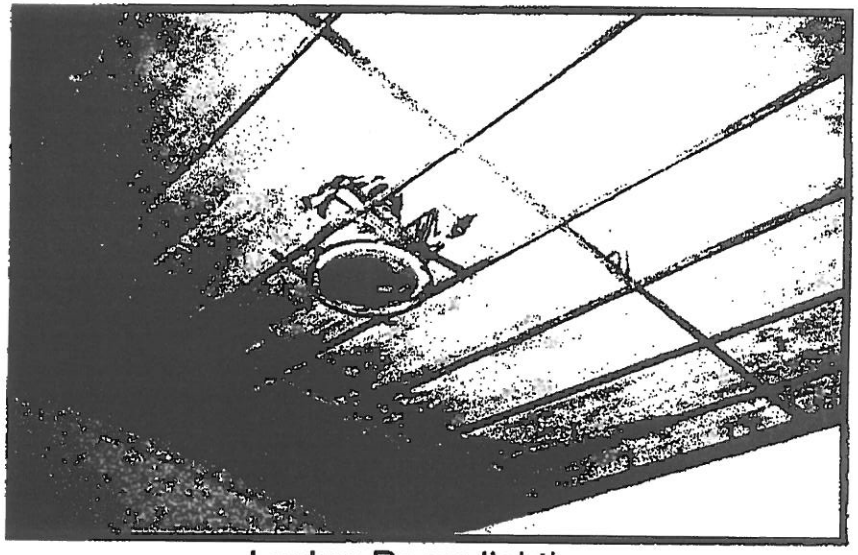
Main Pool – radiator enclosure



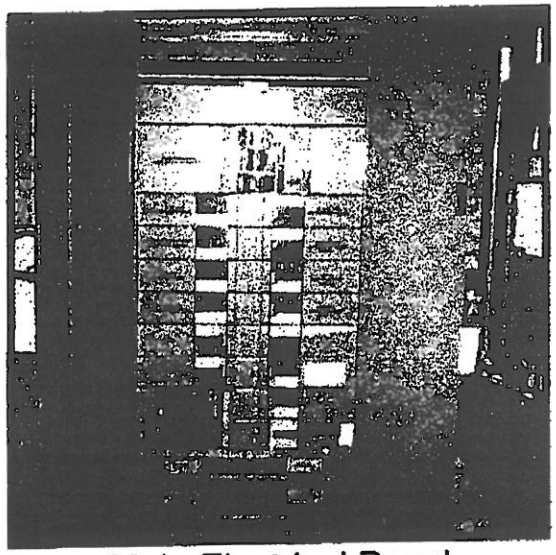
Piping below pool deck



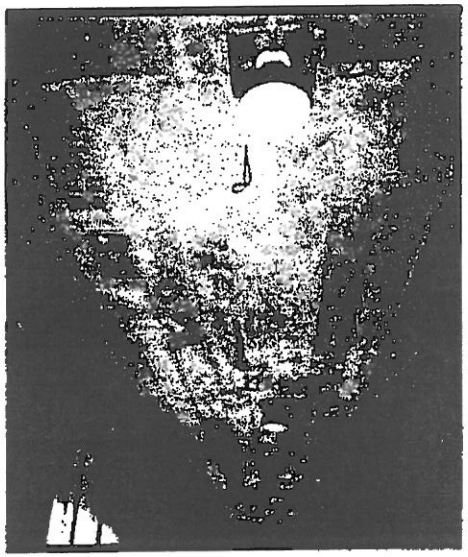
Old abandoned boiler



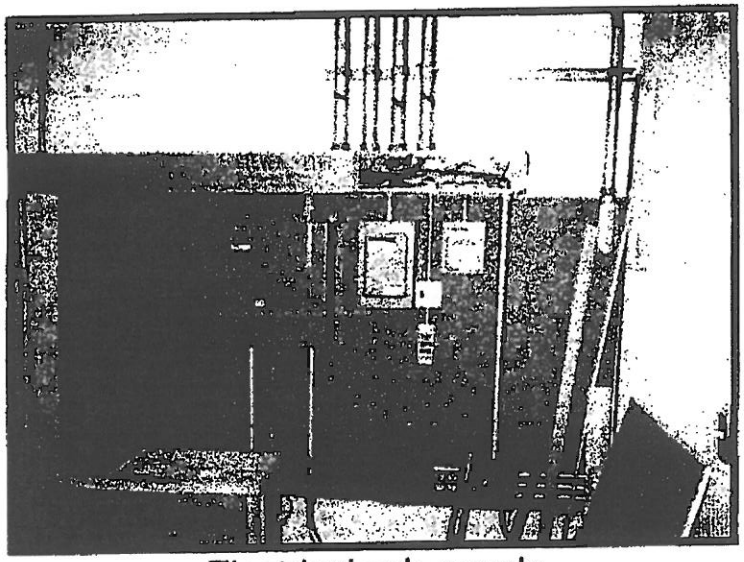
Locker Room lighting



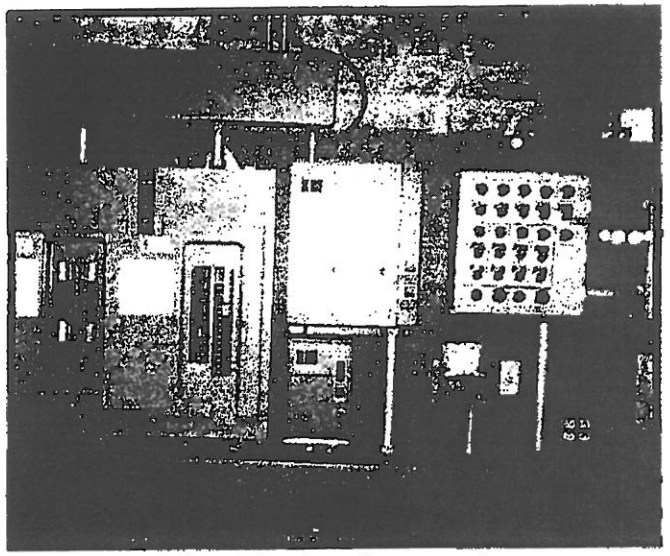
Main Electrical Panel



Lights below mezzanine



Electrical sub-panels



Electrical sub-panels