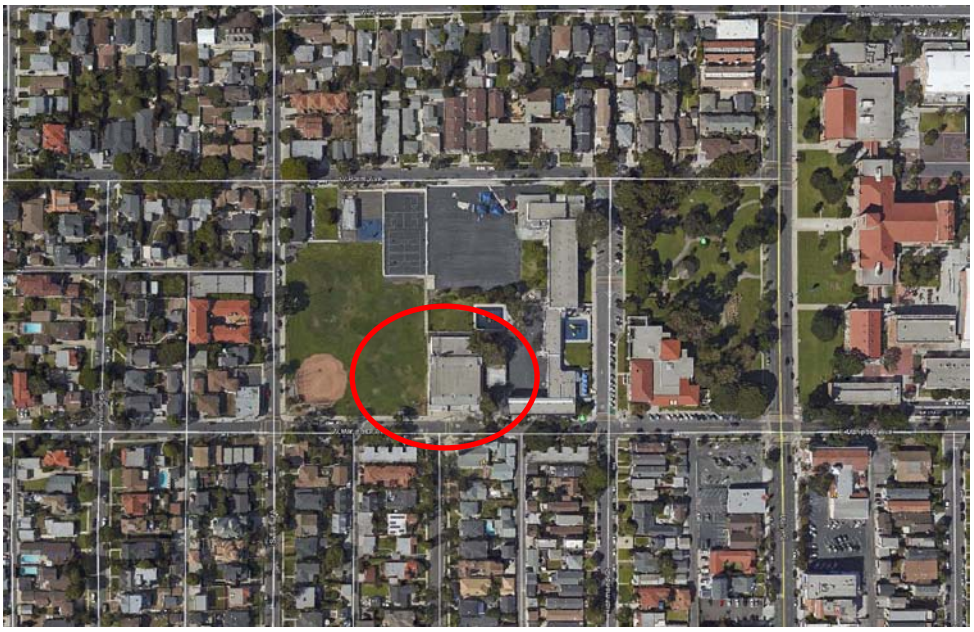
Technical Pool Study
for
UHRO SAARI SWIM STADIUM
219 W. Mariposa Avenue
El Segundo, CA 90245



April 1, 2015
Submitted By

ISG
Isaac Sports Group

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INTRODUCTION

ISG has completed a study of the Uhro Saari Swim Stadium ("The Plunge") in El Segundo, CA. The study draws from research conducted by ISD during the Program, Design, and Financial Analysis of the proposed El Segundo/Wiseburn High School Aquatic Center. The analysis and recommendations for the Plunge also take into account design, amenity, and mechanical issues relevant to new and expanding program and user needs based on the updating and integration of Plunge programming with the new Aquatic Center. Any renovation of The Plunge needs to take into account how the pool will be used in the future.

ISG brought Arch Pac Aquatics into the Study to conduct a detailed analysis of the current pool, focusing on current pool issues, mechanical issues, engineering issues, code updates required, potential phasing of work, and updated amenities to support enhanced programming. Ken Moeller, President of Arch Pac, visited The Plunge on March 14, 2015. This Technical Pool Study details specific code requirements, and analysis of the current pool, and recommendations for pool renovation. This report is provides the detail on which the Analysis Summary is based.

During that visit Ken was able to view and test mechanicals and work with pool staff on a variety of pool issues. Portions of the original construction documents were available for review and assisted in the study and recommendations herein. The actual measured pool dimensions were 60'-3" by 75'-3" "senior" (or "main") pool and a 20'-3" by 48'-3" "junior" (or "teaching") pool. The pool is enclosed and surrounded by a natatorium with bleachers and bathrooms, storage, and mechanical rooms. Within the natatorium the mechanical room is on the north and northwest side, the entry and foyer on the south and the stadium bleachers on the east and west sides with access from the outside, via stairs. Entry to the facility is from Mariposa and parking is on street. Service access is on the northwest side of the building with access into the pool mechanical room.

View of Natatorium to northwest from entry

Small Teaching Pool

This report compares the pools' existing condition with that required in the California Building Code (2013 edition), appropriate Title 24 amendments along with County Health Department regulations and pertinent sections of the UMC, UFC & NEC (National - electrical, mechanical & fire) Codes.

Deficiencies noted herein and proposed remedies are listed in the Analysis Summary as "recommendations". A cost to remove deficiencies and implement

recommendations is established, in a “spreadsheet” format, and is also included in the Analysis Summary. The goal is to establish a budget to modify, modernize and/or repair the facility, so as to bring it up to Code and to implement a plan to extend the life and utility of the facility, decrease the cost of maintenance & operations, ensure public safety, and better support future programming. The cost estimates (although preliminary) are to facilitate informed decisions, establish budgets and plan for the future.

View of swim stadium from frontage along Mariposa Avenue

Recommendations are prioritized, where possible. Picking and choosing items from various options based on desirability may not be an alternative as the County Health Department may defeat this process by requiring any work proposed be linked with other items as an all or nothing proposition. On more than one occasion requirements of modernization have been implemented only with the proviso that if any work was to be done, that all non-conforming conditions be corrected. Multiple jurisdictions, placing differing degrees of importance on certain items, make it difficult to orchestrate a budget based on the inability to pick and choose among the various proposed modifications.

*Note: that the code or an interpretation or paraphrase of same, is presented herein in **red**, while commentary is presented in **black**. Highlighted text is referencing the recommendations.*

THE SITE:

The pool complex was constructed beginning in November of 1938 which makes it 77 years old at the time of our visit. The natatorium is decidedly an “Art Deco” building in design which makes it historically significant and constructed by the WPA during the great depression. ADA access from street parking and pool access lifts have been addressed within the limitations of an existing building which was constructed prior to the imposition of ADA in 1973 as alluded to above. The pool is an important community recreational offering and its value to the community is evidenced by its heavy usage, along with the care and maintenance it receives. The main entry from the south is pictured above, work will need to be done with interior ramps and restrooms to allow greater access. Additional accessible exits should be provided and are required under today’s code, so additional accessible exit locations will need to be provided. Each exit should be via a self-latching and self-closing door with panic hardware for exiting without requirement of a key or special tool and be ADA accessible.

The pool mechanical equipment room is on the northwest side of the pool and pool equipment is contained within and around the pool mechanical room. Access for chemical delivery is from Mariposa along the west side of the natatorium through double doors on the northwest corner of the building. The natatorium is primarily constructed of reinforced cast-in-place concrete. The mechanical room walls are also concrete with the exception of the wall along the north side of the youth pool which separates the filter area with a steel mesh covered with plywood. The mechanical area also accommodates the storage area for pool chemicals. (About 300 lbs. of Calcium Hypochlorite and 200 gallons of Hydrochloric Acid – stored in 33 gallon “car-boys”). Storage vessels should be stored more safely and separately with seismic restraints and in dual containment vessels. This storage should also be appropriately labeled with proper signage.

View of pools mechanical room on the left and north side of the natatorium.

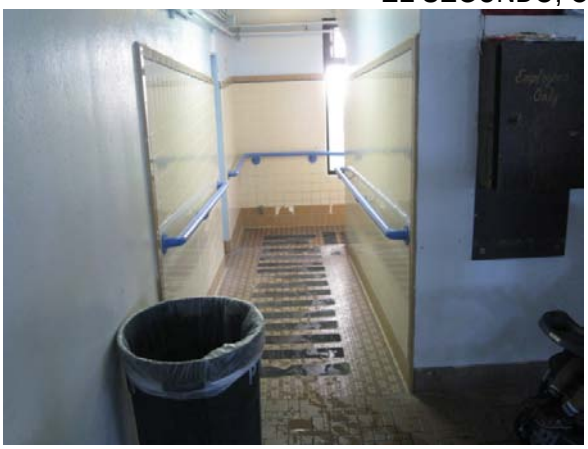
View of chemical storage vessels within pool mechanical room.

Ramp from Mariposa for wheelchair access.

ACCESS:

Swimming pools and their appurtenances shall be in compliance with the requirements of the state architect regarding access to public accommodations by physically handicapped persons. (ADA)

ADA access to the pool area and bathrooms needs to be addressed, exiting should be marked with self-illuminating signs. Doors are self-closing and self-latching as required by Code and should be marked as “exit” paths with panic hardware and accessible hardware. Ramps require handrails and no steps if under a 1/20 incline ratio.

View of ramp access to changing area and from changing area with abandoned Pedilieu and rinse.

POOL STRUCTURE

The pool shall be designed and durably built, watertight, and able to withstand anticipated stresses under both full and empty conditions, taking into consideration climatic effect, geological conditions, integration of the pool with other structures.

Both pools are constructed of cast-in-place concrete and appear level and capable of withstanding the pressures of ground water and soil as they have done for almost eight decades. The pool is ageing with some finish discoloration (pool is tiled as are decks) along with other finish wear and tear. The removal of the tile would expose the original concrete structure and allow the concrete structure to be thoroughly evaluated. It is probable that major modifications will require that most of the pool tile and deck tile be removed. It may not be practicable to replace the tile which covers it.

Typical tiles pool vessel and scum gutter – note; water is low by about two inches at time of photograph

Finish - the finished pool shell shall be lined with a smooth waterproof interior finish that will withstand repeated brushing, scrubbing and cleaning procedures. The interior pool finish shall completely line the pool to the tile lines, coping or cantilevered deck.

The tile over concrete is depicted in the photo above, it appears to be in a well maintained condition. The water line tile and freeboard are also tiled. The tiled curb around each pool prevents the pools from being ADA accessible and is not as user friendly for youth and senior programming.

Example of Rim Flow Gutter
Also called Flush Deck

Example of Rim Flow with Riser

Pool Finish Color. The finish color shall be white except for:

1. Lane and other required pool markings;
2. Handholds;
3. Copings;

The pool finishes were:

1. Lane lines are black tile and of a unique style other than CIF, NCAA or FINA.
2. Hand holds were of double bull-nosed and of scum gutter configuration.

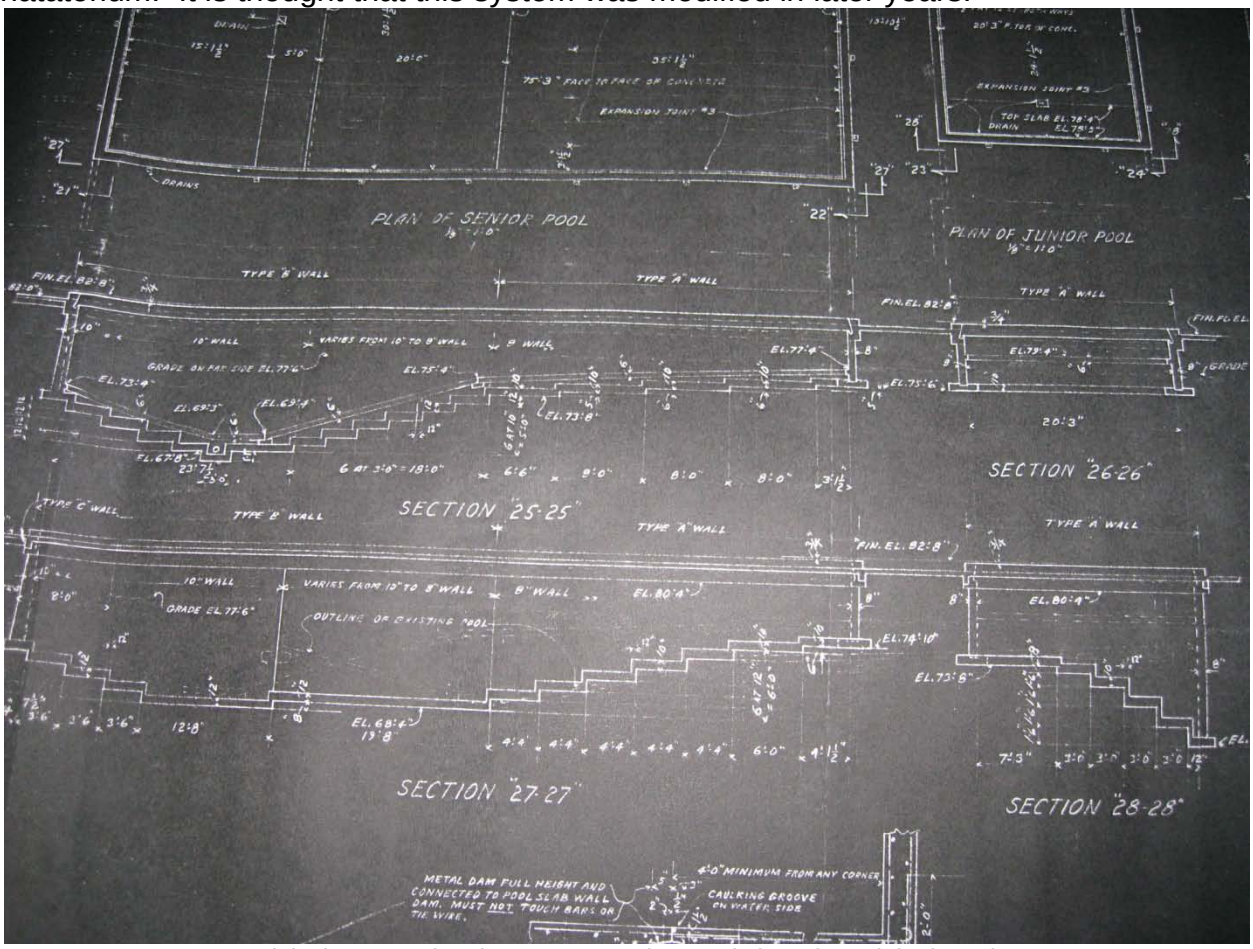
Pool Dimension & Slope. The dimensions and slopes of a pool shall be no greater than 1/10 at the shallow end to the 4'-6" line and thence a maximum slope of 1/3 to the deepest portion of the pool or main drain which should be at 8'-0."

The dimensions of the pools is 60'-3" by 75'-3" for the senior pool and 20'-3" by 48'-3" for the junior pool – both being rectangles. The adult pool depth is 4'-0" to 12'-0" deep. The slopes in areas less than 4'-6" are not greater than 1/10 incline ratio and those deeper than 4'-6" are not steeper than 1/3. The youth pool is 3'-0" to 4'-0" deep according to the depth markers if water level is at the top of the safety grab that constitutes the scum gutter dam wall.

Deck area between pools, note curbs around each pool typically – which defeat ADA accessability.

Drainable - The pool shall be completely drainable through a main drain that shall be located at the deepest point in the pool.

Each pool has two main drains both located in the deep end of each pool. The grates are of an approved Virginia Graeme Baker Act compliant type. It is assumed that the pump supplies are a pipe diameter and a half below the grate and that the sumps are deep enough to accommodate connections at this level so as to be VGB compliance as this would not have been revealed in review. At one time the pools were drainable by opening a line from the main drain to the sump west of the natatorium. It is thought that this system was modified in later years.



Original construction documents, sections and plans through both pools

Dimensional Tolerance - The pool construction tolerance shall not exceed 2 inches except with the tolerance of the water level of a pool with a nonadjustable overflow system shall not exceed 1/8 inch.

Both pools have scum gutters – a continuous nonadjustable overflow system and are within the tolerance of 1/8" all the way around. When the water level is at gutter level the gutter should draw evenly. It is suggested that the gutter be modified to a rim-flow style gutter and the curb be removed to allow for access. The use of a rim-flow gutter will also better accommodate a wide range of programming. Piping for each pool's recirculation system should also be replaced and separated.

Slope Break from Shallow to Deep Water. When a pool has a change in bottom slope

from shallow to deep water; flush-mounted devices for fastening a safety rope and buoys across the pool shall be installed where the water depth is 4’-6” feet.

The senior pool in its shallowest is 3'-6" (labeled at 4’-0”) but gradually deepens at about a 1/12 slope to 4'-6" in the center of the pool then at a steeper slope of approximately 1/3 to 12’-0”. The junior pool is 3’-0” on one end and slopes to 4’-0” on the opposite end.

Lane Line Markings. Slip-resistant lane lines or other markings at the bottom of the pool shall not exceed 12 inches in width.

The pool’s current lane lines are 6" wide lines and are of black tile.

Depth Marking Line. There shall be installed a straight line, 4 inches wide, of contrasting color across the bottom of the pool where the water depth is 4 1/2 feet.

The pool has this line and the rope buoy that separates shallow from deep end. Buoy line is not currently in-place nor is it typically.

Junior pool scum gutter and depth marker

Water Depth Markers - shall be clearly marked at the following locations:

1. Maximum depth
2. Minimum depth
3. Each end
4. At the break in the bottom slope between the shallow and deep portions

of the pool

5. On the perimeter of the pool at distances not to exceed 25 feet

Vertical depth markers were not in existence nor were warning markers

Depth markers shall be located on the vertical pool walls at each end and side of the pool at or above the water level. If a pool exceeds 20 feet in width, additional markers, shall be located on the edge of the deck next to the pool. The depth markers shall be located so as to be clearly visible to bathers in the pool. Markers shall be positioned to indicate the water depth accurate to the nearest 6 inches.

Depth markers were posted horizontally on the curb surrounding the pool. Markers should also be placed on the pool deck as non-slip tiles so that both the people in the pool and the people on the deck can discern the depth of the pool. No running and no diving tiles should also be placed on the deck alongside of each depth marker.

STEPS, RECESSED STEPS, LADDERS AND RECESSED STAIRS

A means of entry and exit to and from the pool shall consist of steps, recessed steps, ladders or stairs, or a combination of them. One means of entry and exit shall be provided in the shallowest portion of a pool if the vertical distance from the bottom of the pool to the deck is over 2 feet. A second means of entry and exit shall be provided in the deep portion of a pool having a depth greater than 41/2 feet. Where the width of the pool exceeds 30 feet, such means of entry and exit shall be provided at each side, not more than 100 feet apart.

The pool has ladders at each side

Note ladders on right and left and steps into junior pool and starting block on senior pool

Ladders. Ladders with a handhold shall be corrosion resistant and shall be equipped with slip-resistant tread surfaces. Ladders shall be rigidly installed and shall provide a clearance of no less than 3 inches or more than 5 inches between any part of the ladder and the pool wall.

Ladders where used are in compliance – they are anchored into the deck. Removable steps are at the shallow end but were not in place during our visit.

Steps shall have a minimum tread of 5 inches, width of 14 inches, and shall be designed to be readily cleaned.

Steps (rungs) located at ladders were compliant with the code they are part of the stainless steel structure and of white plastic.

Grab Rails shall be provided at the top of both sides and shall extend over the coping or edge of the deck for each ladder and step hole.

Grab rails are an integral part of the ladder and at each side of the ladder and extend over the coping as required.

Hand holds, l shall be provided with handholds around the entire perimeter installed not greater than 9 inches above the waterline. A bull-nosed coping or material equivalent in strength and durability, with rounded, slip-resistant edges shall be provided. The handhold shall not exceed 2 inches or be less than 1 inch and shall not exceed 2 1/2 inches in thickness.

Both pools are in compliance as each offers a continuous gutter dam wall capped a bull-nosed tile coping at water level. Although, water level sometimes varies as it is added to be above the hand hold when water polo is played. Hand hold should be modified as curb around pool is deleted.

Pool decks; a minimum continuous and unobstructed 4-foot-wide slip-resistant nonabrasive deck area of concrete or like material shall be provided flush with the top of the pool shell wall extending completely around the pool. The deck width shall be measured from the poolside edge of the coping lip.

The width of deck is greater than that required, unobstructed, slip-resistant and nonabrasive. Decks are in good condition and the slope is within the requirements of a maximum of ¼" per foot cross slope as imposed by ADA and are also non-slip or abrasive enough to also be in compliance with Code, even though the pools are technically inaccessible based upon the height of the curb surrounding each pool.

Drainage of the pool deck surface shall be sloped a minimum of ¼ inch per foot to deck drains or other approved surface water disposal areas. The pool deck surface shall not drain into the pool, its perimeter overflow channel or be connected to the pool recirculation systems.

The decks slope away from pool at the prescribed slope. The area drains are located around the perimeter of the pools in the approximate center of the deck.

Pool Coping - shall be slip resistant.

Pool coping and decks are slip resistant (tiles) and create an impediment to ADA access.

Pool Lighting - where provided shall be such that lifeguards may observe, without interference from direct and reflected glare from the lighting sources, every part of the underwater area and swimming pool surface, all diving boards or other pool appurtenances.

Pool lighting was present with high pressure sodium fixtures on the ceiling above for lighting and afterhours use. Clerestories are also provided to augment the ceiling mounted fixtures. Underwater lights are not in existence. We suggest the use of LED lights from above over the pool decks to provide better lighting, reduce energy costs, and allow for access from the deck to change bulbs. During the renovation of the decks would also be a good time to consider installing LED underwater lights.

Nighttime Use of pools requires underwater lighting fixtures that will provide complete illumination to all underwater areas of the pool with no blind spots. Illumination shall enable a lifeguard or other persons to determine whether:

1. A bather is lying on the bottom of the pool.
2. The pool water conforms to the definition of "clear pool water."

When the pool is to be used at night, pool deck areas shall be provided with lighting so that persons walking on the deck can identify hazards and safely exit.

The light sources above water level are in good repair and adequate. Exits must still be more clearly indicated and self-illuminated signage would be needed in case of an emergency. The Owner may wish to consider underwater lights as they are now technically much more feasible and a more common practice.

BATHHOUSE, DRESSING, SHOWER AND TOILET FACILITIES

Shower and dressing facilities shall be provided for pool users.

Number of Sanitary amenities required:

Current Pool Surface area: Senior Pool 4,534 sf and the junior pool 977 sf. one bather shall be considered for every 15 square feet of pool water surface area.

Bathers: 5,511/15 = 368 bathers are utilized to calculate amenities.

Of the 368 half will be female and half male

Showers. One shower shall be provided for every 50 bathers.

368/50= 7.36 or 8 showers

Toilets. Separate toilet facilities for each sex. One toilet shall be provided for every 60 women, one toilet plus one urinal for every 75 men.

368/2= 105 women & 105 men

184/60= 3.06 or 4 women's toilets

184/75= 2.45 or 3 men's toilets and 3 men's urinals

Lavatories. One lavatory shall be provided for ever 80 bathers.

368/80=4.6 or 5 lavatories

Drinking Fountains. One guarded jet drinking fountain shall be provided for the first 250 bather's and an additional fountain shall be provided for each additional 200 bathers or fraction thereof.

368-250= 2 drinking fountains required.

Provided:	**Required:**
Toilets: 3 female	4 toilets
2 male toilets and 3 urinals	3 & 3 toilets & urinals
all toilets are not ADA compliant	
Showers:	
28 showers	8 showers
Lavatories:	

4 sinks 5 sinks

Drinking Fountains:

1 fountain 2 fountains

None of the existing fixtures are accessible. They will need to be modified. The inadequate number of fixtures should also be addressed. A lot of modification to existing changing will be required. ADA or Family changing area should be considered.

Hose bibs - shall be provided for and located so that all portions of the pool deck area can be reached with a 75-foot length of hose attached to the hose bibb. Hose bibbs shall be located so that they do not constitute a safety hazard and shall be protected against backflow.

Hose Bibs need to be verified as functional and backflow (vacuum breaker) protected as well as being properly located. Each pool automated fill as well as domestic water should each be isolated with a reduced pressure backflow prevention device (RPBFP).

Pool Enclosure, the pool shall be enclosed by one or a combination of the following; a fence, portion of a building, wall or other approved durable enclosure.

The pool area is a natatorium and completely enclosed, the doors should be self-latching and self-closing and have panic hardware as required for ADA access, with dedicated EXIT signage as required.

Gates and doors opening into the pool enclosure shall:

1. Doors shall be equipped with self-closing and self-latching devices. The self-latching device shall be designed to keep the door securely closed. Doors shall open outward away from the pool except where otherwise prohibited by law. Hand activated door hardware shall be located at least 3 ½ feet above the deck or walkway.
2. Doors shall be capable of being locked during times when the pool is closed.
3. The pool enclosure shall have means of egress without a key for emergency purposes. Doors which will allow egress without a key shall be clearly and conspicuously labeled in letters at least 4 inches high "EMERGENCY EXIT."
4. The enclosure shall be designed and constructed so that all persons will be required to pass through common pool enclosure door in order to gain access to the pool area. All doors exiting the pool area shall open into a public area or walkway accessible by all patrons of the pool.

The doors to the pool area were self-closing and self-latching, they should be secured and locked when pool is closed. Doors need to have panic bars and ADA accessible hardware.

Required Signage:

Occupant Load Sign: A sign with clearly legible letters not less than 4 inches high shall be posted in a conspicuous place near the main entrance to a pool which shall indicate the number of occupants permitted for each pool.

Signs for Shallow Pool. Signs with clearly legible letters not less than 4 inches high shall be posted in a conspicuous place and shall state: NO DIVING ALLOWED.

Several signs are recommended from Occupancy Loading sign to "no diving" and "no running" signs. How to save a life, contacting emergency services "911" and pool rules. All should be added for patron safety – including the EXIT signs.

Pool Mechanical Equipment:

Pool equipment shall be mounted on a Portland cement concrete or other easily cleanable nonabsorbent floor material. Floors shall be sloped a minimum of 1/4 inches per foot to drains.

New equipment will require removal of existing concrete pads and replacement with new equipment pads.

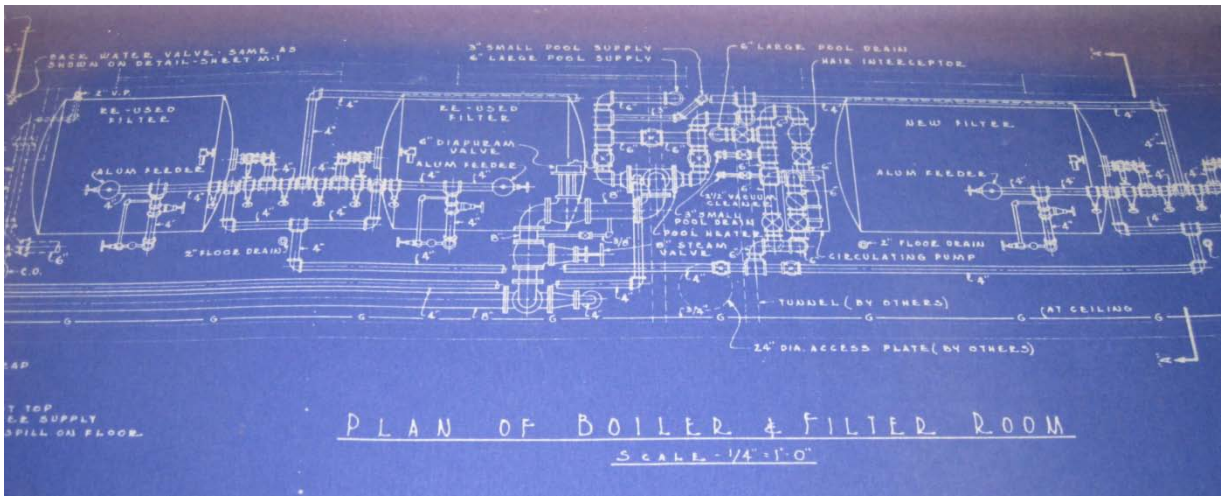
Existing rapid sand filters from original construction with iron pipes, typical of four (4)

Recirculation & Treatment System Components: Each pool will be provided with a separate recirculation and treatment system designed for continuous, recirculation filtration and disinfection of the pool water. The system shall consist of pumps, filters, chemical feeders, overflow systems, and all valves, pipes, connections, fittings and appurtenances. Installation shall allow for all filters, valves, pumps, strainers and equipment requiring adjustment shall be readily accessible for repair and replacement.

Pool Data: Existing Senior Pool
Area = 4,534 sf
Perimeter = 271'-0" lf
Depth= 3'-6" to 12'-0" (average = 7'-9")
Volume = 262,836 gallons
Turnover = 730 gpm. (6-hours)
Required filter area = 56 sf HRS

Existing Junior Pool
977 sf
137'-0" lf
3'-0" to 4'-0" (average 3'-6")
Volume = 25,578 gallons
Turnover = 72 gpm (6-hours)
Required filter area = 5.6 sf HRS
Consider 1-3 hr turnover
426-146 gpm
33 sf of filter area HRS

Current filtration is four combined rapid sand filters (RSF) and the required turnover when engineered was 8 hours so the total combined volume of the pools is 288,414 / 480 which equates to a flow rate of 600 gpm. Based on the aging conditions of the piping and pipes that actual current flow rate is estimated at 10 hours for both pools. The Saari natatorium was constructed on a site that contained an outdoor earlier pool and two of the filters were re-utilized while two were added to the mix to make four filters or two pairs of differing sizes. The exact filtration area of each is estimated as well as probable filtration and backwash rates. There are approximately 200 square feet of filter area (in the 4 filters) so each of the filters is filtering at between 3 gallons per square foot or approximately 150 gpm each. Backwash is assumed to be individually at about the same rate. Otherwise the sanitary sewer system would be overloaded. The turnover rate and filtration system and all associated piping require replacing if the turnover rate is to be increased to six hours.



Turnover of pool water: Six hour or less for public pools supported by a recirculation and purification system with sufficient capacity to accommodate turnover.

The turnover rates needed to meet code minimums will require piping to support the new re-circulation system and division of piping between pools. The small teaching pool with a high load of children users and shallow water should be on a much shorter turnover rate of between 1 to 3 hours.

Recirculation Pump Capacity: Pumps with other hydraulic (flow-head) characteristics

shall be permitted which comply with the flow capacity as required to accommodate a 6-hour turnover if a swimming pool or as required for other pool types.

Recirculation Piping and Component size: Piping systems, including all parts and fittings other than inlet devices, shall be sized so that the flow velocity shall not exceed 7 feet per second.

The actual piping sizes are only apparent in the pool mechanical room and appear to be adequate for current flow rates, however in actuality, pipe size is not known because existing plans or construction documentation for the facility were not available nor is piping under pool decks visible. The age of the facility indicates that it may have been plumbed with cast iron or steel piping the pipes which may have already been replaced once, and if not will be at the end of its useful life.

Pool recirculation pump with strainer - picture of below deck poop piping.

Flow Meter. The recirculation system shall be provided with a flow meter, accurate within 10 percent of actual flow.

Existence of flow meter – typically a paddle wheel type is part of automated controller.

Strainers - a hair-and-lint strainer shall be provided on the suction side of the recirculation pump.

Backwash Piping - including necessary valves is required for each filter vessel or element which is of a type requiring periodic backwashing.

Both the strainer and backwash piping and re-circulation pump are in place as required but will need to be replaced as piping is separated between pools and turnover rates are varied based on Code values.

Existing iron valves and piping at rapid sand filtration – note leak in filter

Valves - shall be accessible for operation and repair and shall not be located under any required deck area surrounding a pool. Valves, or other approved means of control, shall be installed on all recirculation, backwashing, and drain system lines which require shut off isolation, adjustment, or control of the rate of flow. Each valve shall be identified with appropriate markings affixed directly to or near the valve.

Appropriate valves were in place – but will need to be replaced as new recirculation system is installed.

Recently removed pipes and valves – not amount of corrosion

Existing surge tank and water makeup sensor (float actuated valve)

Backflow Protection - there shall not be a direct connection between any domestic water supply system and the pool or its piping system unless protected against backflow in an approved manner.

Domestic Water Supply - to the pool shall be supplied with water by means of a permanently installed pipeline from a public water supply system.

A Reduced Pressure Backflow device was not noted and was not a requirement in the 1930's. It will need to be added to the list of required improvements. The source of potable water to the pool should be verified and separated from domestic water sources.

Automated Controller – monitors chlorine levels and pH

Filters - regardless of type, shall be designed and constructed to withstand normal continuous use without deterioration which could affect filter operation. Each filter shall comply with all of the following provisions:

1. Maintain clean and clear pool water under anticipated operating conditions.
2. Structural or functional failures shall not permit the passage of unfiltered water.
3. Filtration surfaces shall be easily disassembled and inspected.
4. Filtration surfaces shall be easily restored to the design capacity.
5. Filtration parts shall be capable of resisting electrolytic corrosion (galvanic electric currents) due to the use of dissimilar metals.
6. Each filter vessel and element shall be installed, piped and provided with necessary valves so that it can be isolated from the system for repairs and backwashed individually.

The existing MIAMI TANK Steel, rapid sand filter vessels are in general failure and need to be replaced. The steel filter vessels were part of the original equipment for the pool, so they are at the end of their useful life and have been eclipsed by technological advances. They are currently keeping the pool water clean and pool useable for the most part – the junior pool was cloudy when visited. An increase in turnover rate should be considered. Filters should remove all material visible to the

human eye or 30 microns or greater. All smaller material is removed through oxidation and chemical treatment.

We recommend a regenerative media (perlite) filter – based on backwash capacity and availability of fill water. Regenerative media filters such as Neptune Benson Defenders will provide better filtration down to 1 micron and reduce annual utilization of backwash water by 75 to 85%. These filters will also require a much smaller floor area in the pool mechanical room allowing for use of this space for additional storage and family and handicap changing areas.

Chlorine erosion feeder and Stenner metering pump for acid to regulate pH – all controlled with automated controller

Chemical Feeders - and the auxiliary components shall:

1. Capable of being easily disassembled for cleaning and repair.
2. Be constructed of corrosion-resistant materials.
3. Permit repeated adjustments without loss of output rate accuracy.
4. Be constructed to minimize a stoppage from chemicals intended to be used therein or from foreign materials that may be contained in said chemicals.

Chemical Piping - used for the chemical feeder and its auxiliary equipment shall be resistant to the chemical and erosion action of the chemicals intended to be used therein and shall be installed to permit cleaning or otherwise to prevent clogging of the parts with chemicals.

Chemical Feed Pump - and its auxiliary equipment shall be installed to prevent uncontrolled discharge or siphonage of chemicals and fumes directly into the pool, its recirculation system or the pool area.

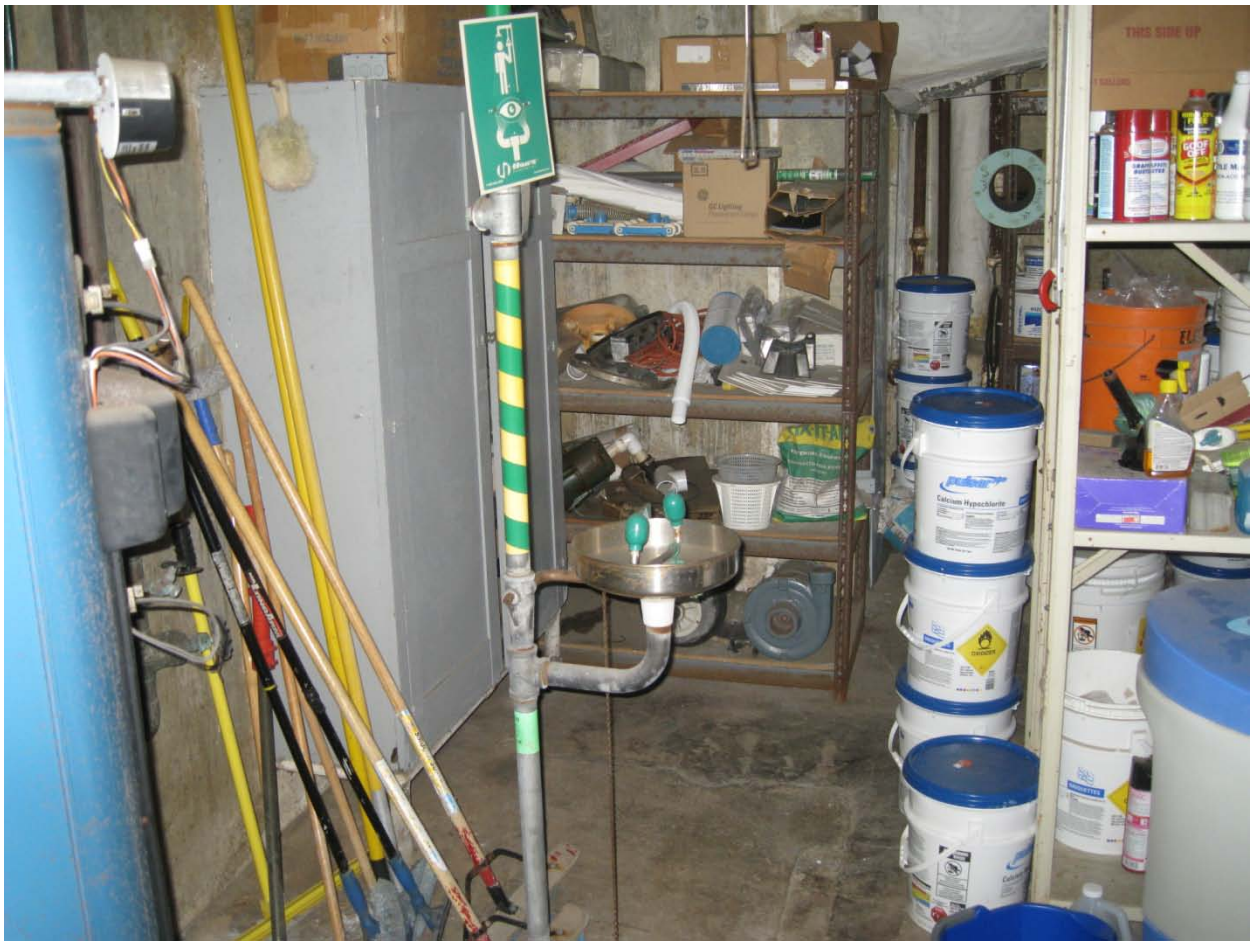
Chlorine and pH control and feed systems are in the pool mechanical room. The acid metering pump injects liquid chemicals into the pool return system at the injection point before filtered water is returned to pool (after pool heater). Both the metering pump for the acid and chlorine systems inject chemicals as controlled by the automated controller pictured on page 21. (U.S. Filter's STRANDTROL 4). A new automated controller will add more capability and is suggested and later technology is designed to

reduce maintenance and operational cost. The current automation was replaced about 20 years ago.

Chlorine Feeder - shall also:

1. Be capable of supplying not less than the equivalent of 3 gallons of chlorine per day (PPD) per 10,000 gallons of pool water capacity. (76,560/10,000)=7.6 x 3 or 23 gallons per day
2. Have a graduated and clearly marked rate of flow adjustment feature.
3. Be capable of delivering chlorine in aqueous solution at maximum design rate. The device shall not allow the backflow of water into the chlorine concentrate or gas to the atmosphere under normal operating conditions.

The current sanitation and oxidation system has the capacity of supplying the required sanitizer/oxidizer. It can be calibrated and adjusted. The HCl system can adjust pH and reduce alkalinity. Neither acid nor chlorine are being stored properly nor effectively. The off-gassing from either is destroying adjacent equipment such as electrical panels, pool heaters, etc. The storage tanks are also not seismically restrained nor are they vented with an exhaust system. Emergency shower and eye-wash is in place as required but proper equipment for handling chemicals was not noted as being immediately available nor was spill containment equipment.



Emergency eye-wash and shower – note storage of calcium hypochlorite on right in buckets

Pool Gutter System - shall be capable of continually withdrawing not less than 75 percent of the required circulation capacity, to provide continuous skimming of the water surface.

Surge capacity for continuous scum gutter pools (a fixed level skimming system) is one gallon for each square foot of pool surface area. Both the Senior and Junior pools are required to be on separate and dedicated recirculation and filtration systems and the same is true for surge tanks. Each pool should respectively have a surge capacity of Senior = 4,534 gallons and Junior of 977 gallons. The existing surge tank is not only combined but far smaller than required. New surge tanks should be implemented into the system as it is separated for each pool.

Main Drain Pump Supply Outlets - each pool shall be provided with a bottom drain and outlets through which circulation shall take place and by which the pool can be emptied. The bottom drain and recirculation outlets shall be covered with grates or other protective devices which shall be removable only with tools. Slots or openings in grates or covers shall not exceed ½ inch in the smaller dimension and shall be of such area, shape and arrangement to prevent physical entrapment or a suction hazard to bathers.

Each pool has two main drain pump supplies. Each main drain in order to comply with VBG should not have flow greater than 1.5 FT3 per second at pool turnover rate. The estimated pool turnover rate for the Senior pool is 730 gpm. Meaning that a main drain 2'-0" square half covered with grating will have a net open area of .65 sf. (allowable flow = 1.5 x 7.48 = 11.22 gps) 1.3 x 11.22 x 60 = 875 gpm capacity which is greater than proposed turnover rate of 730 gpm. Conclusion; that current main drains need to be replaced with larger drains as the pool is renovated at the turnover rate is increased. Main drains at 24 inches square being adequate to each handle 100 percent of the flow from any one drain to prevent suction entrapment by the water flow. Safety is the largest issue here along with compliance with Federal Law in the Virginia Graeme Baker Act.

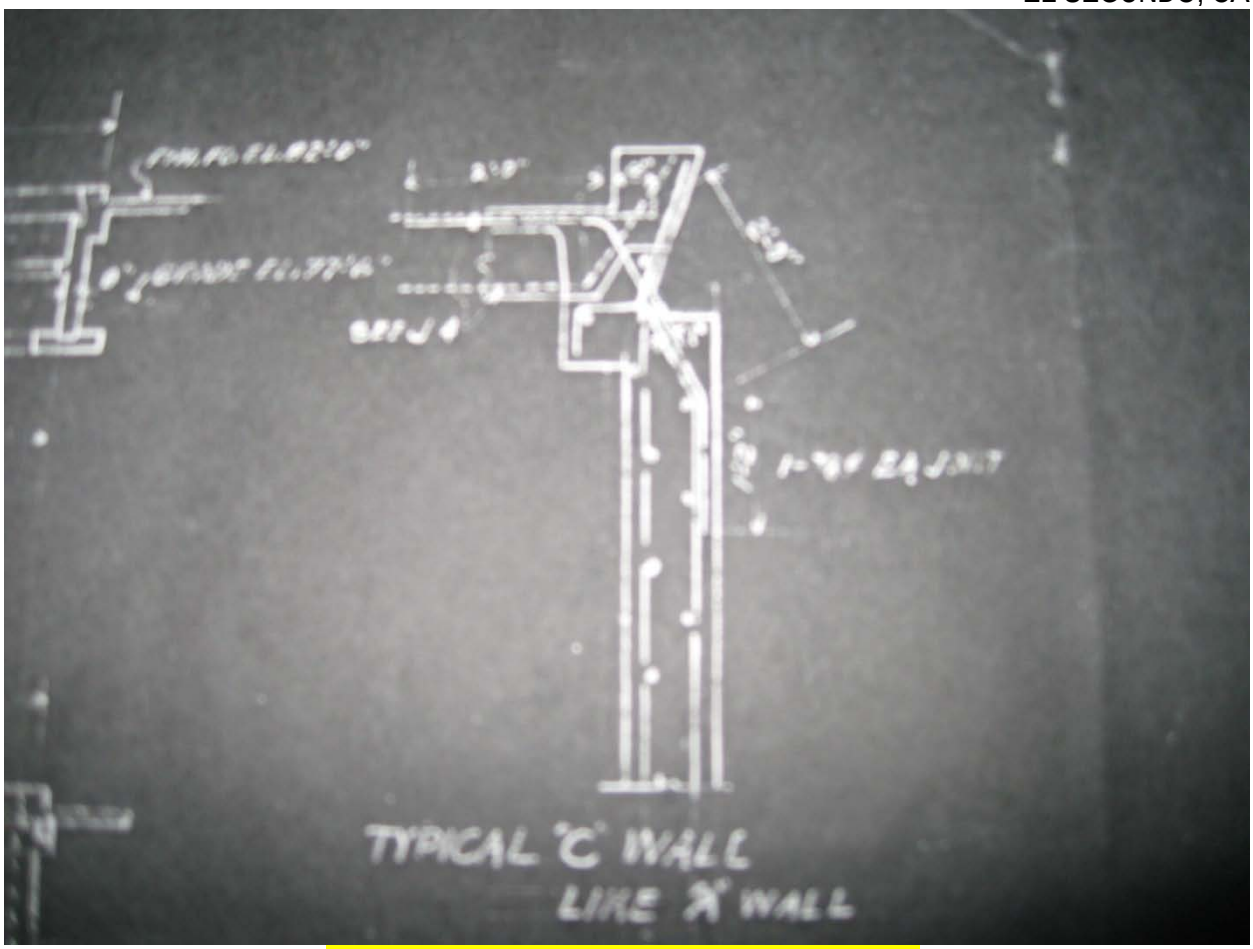
The estimated pool turnover rate for the Junior pool is 436 gpm. Meaning that a main drain 1'-0" square half covered with grating will have a net open area of .65 sf. (allowable flow = 1.5 x 7.48 = 11.22 gps) .65 x 11.22 x 60 = 437 gpm capacity which is greater than current turnover rate of 436 gpm. Conclusion; that current main drains being for the Junior pool will need to be replaced as the systems are separated and turnover rate is increased. A grate that is at least 1'-0" square can each handle 100 percent of the flow from any one drain to prevent suction entrapment by the water flow. Safety is the largest issue here along with compliance with Federal Law in the Virginia Graeme Baker Act.

Wall inlet

Inlet Fittings - pool shall be provided with not less than two recirculation inlets for the first 10,000-gallon capacity and one additional inlet for each additional 10,000-gallon capacity, or fractional part thereof, for a pool which exceeds 40 feet in width. Inlet fittings shall be separated by at least 10 feet and shall be located to ensure uniform circulation. . **Construction -** Inlet fittings shall not protrude greater than 1 ¼ inches into the pool and shall be shaped, rounded and smooth.

The pool is wider than 40'-0" and is therefore required to have floor inlets. The number of inlets required is 262,836 gallons / 10,000 = 28 floor inlets are required and are currently provided. These should be balanced and adjusted to provide an even flow of treated water, their current design is antiquated and impossible to balance. Because they truly should be floor inlets and dispersed throughout the pool a replacement system will need to be hydraulically designed.

As this pool has a corridor around the back of the pool wall which contains pool piping it will be easier to provide the required number of inlets as wall inlets and the engineer them so as to ensure that treated water is infused into the pool in a consistent and even manner. Existing wall inlets are utilized for both lane line targets and inlets and do not provide the treated water dispersal referred to. They are also no longer a manufactured item.



Modify scum gutter into rim-flow style continuous gutter.

WASTE WATER DISPOSAL

General Requirements - Material cleaned from filters and backwash water from any pool system shall be disposed of in a manner which will not create a (public) nuisance.

Piping - Sumps and drain piping shall have sufficient capacity to receive pool system backwash without overflow of the sump receiver.

Visual Indicator - A sight glass shall he installed on the wastewater discharge line from a filter.

Prohibited Connection - No direct connection of the pool or its recirculation system shall be permitted with a sanitary sewer, storm drain or drainage system. When permitted by local regulations, discharge to a sanitary sewer shall be through an air-gap-type separation.

Backwash of current rapid sand filters is at a rate within of 3 gpm/sf or as determined above – 150 gpm per filter. Each filter is backwashed separately for approximately five minutes. Approximately 3,000 gallons of pool water is backwashed into the sanitary sewer system during backwash. Current system for backwash seems adequate for handling the backwash quantity from the filter or the filter would not be functioning as well as it is. The new filtration system may require a larger sanitary sewer – once the selection of filter has been made this can be determined. If

regenerative filters are used the current sanitarhy sewer is more than adequate.

Electrical Service Connection with meter

NEC Article 680 – ELECTRICAL, Swimming Pools

Ground-Fault Circuit Interrupters shall be self-contained units, circuit-breaker types, receptacle types or other approved types. Wiring- Conductors on the load side of a ground-fault circuit interrupter or of a transformer shall not occupy raceway, boxes or enclosures containing other conductors unless the other conductors are protected by ground-fault circuit interrupters or are grounding conductors. Supply conductors to a feed-through type ground fault circuit interrupter shall be permitted in the same enclosure. Ground-fault circuit interrupters shall be permitted in a panel-board that contains circuits protected by other than ground-fault circuit interrupters.

Receptacles, Lighting Fixtures, Lighting Outlets, Switching Devices

Receptacles that provide power for a water-pump motor, or other loads directly related to the circulation and sanitation system, a permanently installed pool – shall be permitted between 5 feet and 10 feet from the inside walls of the pool or foundation and, where so located shall be single and of the locking and grounding types and shall be protected by a ground-fault circuit interrupter. Other receptacles on the property shall be located at least 20 feet from the inside walls of a pool and shall be shall be protected by a ground-fault circuit interrupter.

Lighting Fixtures located less than 5 feet measured horizontally from the inside walls of a pool shall be at least 5 feet above the surface of the maximum water level, shall be rigidly attached to the existing structure, and shall be protected by a ground-fault circuit interrupter.

Switching Devices
Switching Devices shall be located at least 5 feet horizontally from the inside walls of a pool unless separated from the pool by a solid fence, wall or other permanent barrier.

Motors - wiring supplying pool pump motors rated 15 and 20 amperes, 125 volt or 240 volt, single phase, whether by receptacle or direct connection, shall be provided with ground-fault circuit interrupter protection.

Cord & Plug Connected Equipment, fixed equipment rated 20 amperes or less, other than an underwater lighting fixture for a permanently installed pool, shall be permitted to be connected with a flexible cord to facilitate the removal or disconnection for maintenance or repair. The flexible cord shall not exceed 3 feet in length and shall have a copper equipment grounding conductor not smaller than #12 with a grounding type attachment plug.

Overhead conductor clearances, pools shall not be placed under existing service drop conductors or any other open overhead wiring; nor shall wires be placed in the area extending 10 feet horizontally from the inside of the walls of the pool.

Since there have been significant technological advancements in electrical service devices and specifically shock and stray current protection with regards to GFI protection of circuits, GFI receptacles, high efficiency lighting and switches. Electrical service should be addressed as well as its bonding, grounding, amperage and phase be replaced with new technology that will allow for 480v 3 phase power for pool mechanical systems that is monitored with a Variable Frequency Drive to control the higher horsepower pool recirculation pumps. The sub-panels should be gasketed – especially considering the storage of pool chemicals in the mechanical room proper and their propensity to corrode panels and electrical connections. Bonding wire (CU#8) were not in evidence around the pool mechanical room. Proper bonding should be verified.

Sub-panels

Underground Wiring, shall not be permitted under the pool or within the area extending 5 feet horizontally from the inside wall of the pool unless this wiring is necessary to supply pool equipment. Where space limitations prevent wiring from being routed 5 feet or more from the pool, such wiring shall be permitted where installed in a nonmetallic raceway system. The minimum burial depth shall be as follows.

18" Nonmetallic raceways listed for direct burial without concrete encasement

With all the electrical equipment around the pool, it seems as if all metal components can be or are bonded – especially with the access to the corridor in which the pool recirculation piping is contained.


Single recirculation pump for both pools – pump motor is 208-230/460v, 41-38/19A, 1760 RPM, 15HP, 3 ph

Equipment Rooms & Pits - Electric equipment shall not be installed in rooms or pits that do not have adequate drainage to prevent water accumulation during normal operation or maintenance.

Disconnects - A disconnecting means shall be provided and be accessible, located within sight from all pools and shall be located at least 5 feet from the inside walls of the pool.

Disconnect not required at time of pool construction but should be placed with reconfiguration – pool pump is not self-priming and in pool mechanical room above water level. This too should be remedied with new pumps which will be required as pool turnover rate is increased. A pump it below water level should be considered.

Underwater Lighting - The design of an underwater lighting fixture supplied from a branch circuit shall be such that, where the fixture is properly installed without a ground-fault circuit interrupter, there is no shock hazard and any likely combination of fault conditions during normal use (not re-lamping).

In addition, a ground-fault circuit interrupter shall be installed in the branch circuit supplying fixtures, so that there is no shock hazard during re-lamping. Compliance with this requirement shall be obtained by the use of a listed underwater lighting fixture and by installation of a listed ground-fault circuit interrupter in the branch circuit.

No lighting fixtures shall be installed for operation on supply circuits over 150 volts between conductors.

Lighting fixtures mounted on walls shall be installed with the top of the fixture lens at least 18 inches below the normal water level of the pool. Fixtures that depend on submersion for safe operation shall be inherently protected against the hazards of overheating when not submerged.

Underwater lighting is not currently utilized but should be considered. The J-boxes if utilized should be away from the pool edge by 10 feet and a foot above deck level and be water-tight and be properly bonded and grounded.

Bonding - It shall not be the intent off this section to require that the #8 or larger solid copper bonding conductor be extended or attached to any remote panel-board, service equipment or any electrode, but only that it shall be employed to eliminate voltage

gradients in the pool area as prescribed.

Bonded Parts - the following parts shall be bonded together.

All metallic part of the pool structure, including the reinforcing metal of the pool shell, coping stones and deck.

All metal fittings within or attached to the pool structure. Isolated parts that are not over 4 inches in any dimension and do not penetrate into the pool structure more than 1 inch shall not require bonding.

Metal parts of electrical equipment associated with the pool water circulation system, including pump motors and metal parts of equipment associated with pool covers, including electric motors. Metal parts of listed equipment incorporating an approved system of double insulation and providing a means for grounding internal non-accessible, non-current carrying metal parts shall not be bonded.

Metal sheathed cables and raceways, metal piping, and all fixed metal parts that are within 5 feet horizontally of the inside walls of the pool, and within 12 feet above the maximum water level of the pool, or any observation stands, towers, or platforms, or from any diving structures and that are not separated from the pool by a permanent barrier.

Common Bonding Grid - All the parts specified above Bonded Parts shall be connected to a common bonding grid with a solid copper conductor, insulated, covered, or bare, not smaller than #8. Connection shall be made by exothermic welding or by pressure connectors or clamps that are labeled as being suitable for the purpose and are of the following material: Stainless steel, brass, copper, or copper alloy. The common bonding grid shall be permitted to be any of the following:

Structural reinforcing steel - of a concrete pool where the reinforcing rods are bonded together by the usual steel tie wires or the equivalent.

A solid copper conductor, insulated , covered or bare, not smaller than a #8.

Pool Water Heaters - rated at more than 50 amperes that have specific instructions regarding bonding and grounding, only those parts designated to be bonded shall be bonded and only those parts designated to be grounded shall be grounded.

It is the common bonding grid that is difficult to verify, because the #8 copper wire was not in evidence throughout the pool mechanical room nor at the electrical panels. Metal equipment can be tested for continuity (to verify bonding). This test should be accomplished as the part of any proposed work, primarily because of the amount of electrical equipment on site.

Grounding - the following equipment shall be grounded.

Wet-niche underwater lighting fixtures.

All electrical equipment located within 5 feet of the inside wall of the pool.

All electrical equipment associated with the recirculation system of the pool.

Junction boxes

Transformer enclosures

Ground-fault circuit interrupters

Panel boards that are not part of the service equipment and that supply any

electrical equipment associated with the pool.

Pool Lighting Fixtures and Related Equipment - Wet-niche lighting fixtures shall be connected to an equipment grounding conductor sized in accordance with code - not smaller than #12.
The equipment grounding conductor shall be an insulated copper conductor and shall be installed with the circuit conductors in rigid rigid nonmetallic conduit.
Where installed within buildings, electrical nonmetallic tubing to protect conductors.

The **Junction box**, transformer enclosure, or other enclosure in the supply circuit to a wet-niche or no-niche lighting fixture and the field-wiring chamber of a dry-niche lighting fixture shall be grounded to the equipment grounding terminal of the panel board. This terminal shall be directly connected to the panel board enclosure. The equipment grounding conductor shall be installed without joint or splice. Where more than one underwater lighting fixture is supplied by the same branch circuit shall be permitted to be terminated on grounding terminals.

Panel boards - A panel board and, where installed a disconnecting means, that are not part of the service equipment or source of a separately derived system, shall have grounding terminal and the grounding terminals of the applicable service equipment or source of a separately derived system.

Proper bonding and grounding wires be on "all" metal components and that a SMPS (smart pump control system) or Variable Frequency Drive (VFD) be placed to regulate the pool recirculation pump and achieve operational economy. GFCI breakers be added as required and underwater lighting added depending on proposed program uses. We also suggest chemicals not be stored in same room with electrical equipment.

Natural gas service entrance and regulator

Existing gas fired pool heater

NATURAL GAS:

The existing boiler is adequate based current pool size and enclosure. The chemical storage container in the same room as the heater and off-gas from the acid is highly corrosive and will shorten the life of the heater as its vapors and air in the pool mechanical room that are utilized to fuel the combustion chamber in the heater. This should be corrected by removing the pool chemical storage tanks. As the pools are separated and additional boiler will be required and we suggest the use of an external heat exchanger so that corrosive pool water does not corrode the interior of the heater.

Domestic hot water storage tank for showers, etc. & hot water boiler for domestic supply.

Special attention should be paid to domestic hot water. The current system is designed incorrectly with a domestic hot water heater (with tank) supplying an approximate 1,200 gallon hot water storage tank. The smaller heater is not designed to supply the storage tank with hot water and the only reason it can is because patrons are not utilizing the showers as they once did. This system should be modernized and it is suggested that each side, men and women have their own separate hot water heater and that the systems be as demanded systems without storage tanks. Considering the distance between the storage tank and men's showers, and the type of water heater, and demand, it is clear that the men's changing area has difficulty in receiving heated water.

RELATED ITEMS:

Deck Equipment:

The pool should offer the usual accoutrements, such as backstroke stanchions, grab rails, rope anchors, etc., all still offering utility – these will need to be replaced as the physical shell (curb around the pool and gutter) are modified.

GENERAL MAINTENANCE:

There are many items that should be addressed in a complete review of the Plunge and its operations. Included in this study is the safe and efficacious operation of your pool by implementing a program to:

- Train maintenance and operation personnel; provide manuals, policies and procedures.
- First Aid equipment with a log for incidents
- Exits clearly marked and functional
- Material safety data sheets posted for chemicals being stored
- Opening and closing procedure checklist
- Water chemistry manual check equipment (test kit)
- Cleaning and maintenance equipment available and functional
- Life safety equipment readily available – see First-Aid above
- Pool safety such as use of buoy and shepherds hook.
- Pool covers and daily placement
- UV treatment to reduce chloramines in natatorium
- Dehumidification system and/or exhaust system
- Storage of deck equipment
- Correct storage of pool chemicals, properly labeled and seismically restrained.
- Safety items for pool maintenance personnel, emergency eye-wash, eye protection shield or mask, gloves, apron, boots, etc.
- Signage as required by code is in place and effectual – consider the need for an emergency shut-off switch
- Maintenance personnel certified as professional pool operators
- Establish emergency procedures and train personnel
  Existence of and use of a **daily pool log** for:
    - ORP, Chlorine, pH, temperature, water flow rates, pump pressure, make-up water introduced, total alkalinity, calcium hardness, saturation index.
    - Inspection of safety of decking, steps, railings, grates, inlets, lighting, guard stands, trash receptacles

- Inspection of pool mechanical equipment, gauges, heaters, filters, chemical feed systems, thermometers, sensors, etc.
- Storage of deck equipment

OSHA 29 CFR 1910.1200 Hazard Communication Standards

Need for written emergency response plan and procedures
Need to post Material safety data sheets
Train employees of hazards related to handling chemicals, treatment for exposure
Properly label containers and proper signage on doors
Train employees in safety equipment usage

UFC (Uniform Fire Code), Article 80: Hazardous Materials

Seismically restraining chemical storage tanks
Secondary Containment of hazardous chemicals
Fire extinguishing systems
NPFA warning signs (chemical signs required by OSHA 29)
Quantities of chemicals allowed (as allowed by CBC)
Proper ventilation and separation of chemical storage areas
Need to separate incompatible hazardous materials
Comply with storage requirements

Stairs to bleacher area on west and interior stairs to bleachers on east – none offered on west.

ADA (American with Disabilities Act), PL 101-336

Anticipate need of disabled by providing aids and services – lifts and ramps
Remove all physical barriers
Provide stairs to each side of the bleacher area and access

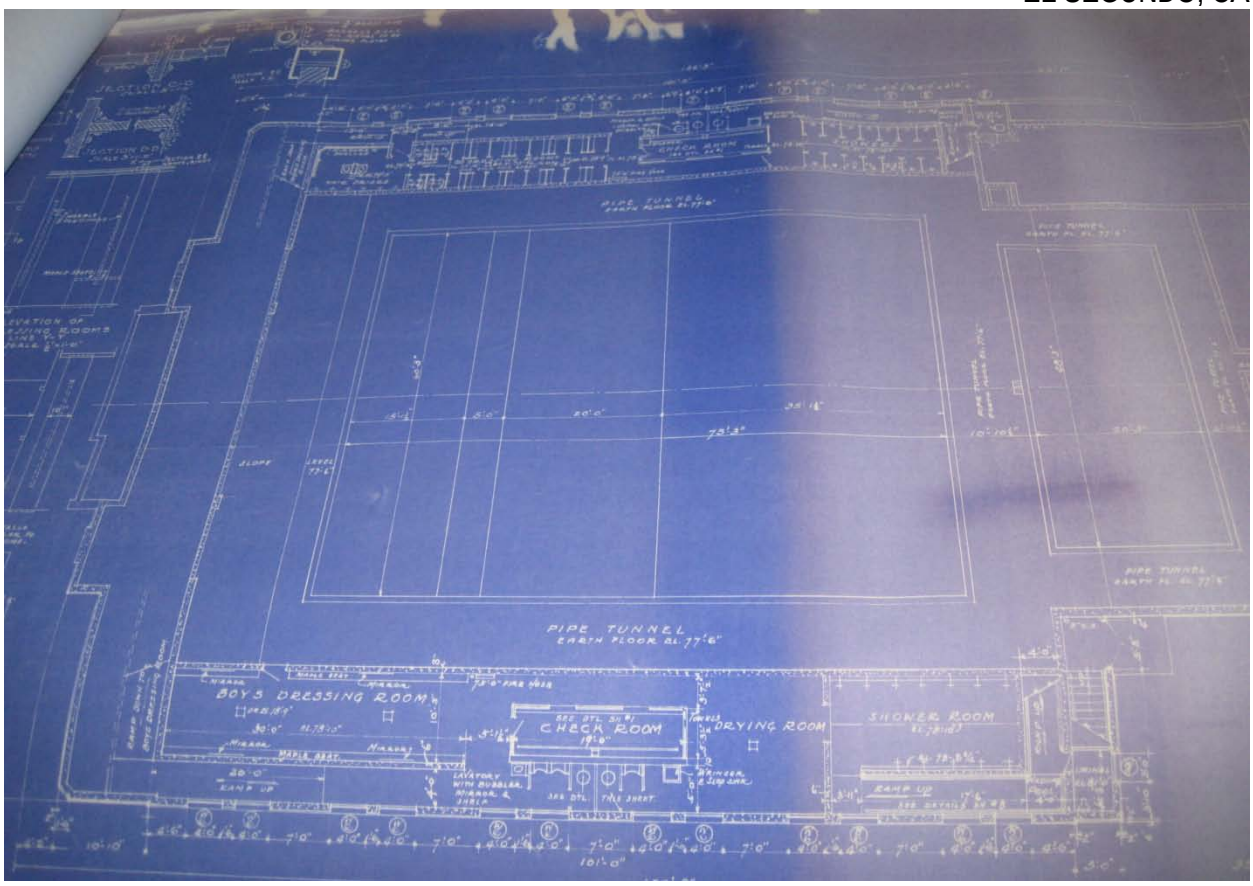
EPA (Environmental Protection Agency),

Clean Water Act prohibits discharge of chemically treated water into water source, after neutralization of chemicals water should be disposed into sanitary sewer.
Pool Chemicals are considered “pesticides” by the EPA and the need for safety precautions required.

COST EFFECTIVE POOL OPERATION:

It should be pointed out that in addition to the lawful and safe operation of your pool, the cost effectiveness of your pool operation should be addressed. Some areas that should be considered for managing the operations of your pool include:

- Limit water loss
- Limit heat loss from pool with covers - when not in use
- Energy efficiency of electrical equipment
    - Pumps – be sure of head, flow & energy expended are acceptable
    - Variable Frequency Drive to reduce energy usage/cost.
- Filtration
    - Proper Turnover rate
    - Proper System sizing & separation of each body of water.
    - Proper Gauges, (pressure, temperature, flow, etc.)
- Calibration
    - Proper valves & pipe sizes
    - Proper turnover rate
    - Automated monitoring of water quality
- Energy efficient lighting
- Energy efficient pool water heating
- Proper daily preventative procedures and routines
- Automated control system to help monitor and operate all systems
- Keep a daily log of all chemicals, etc. used or stored.
- Proper maintenance and upkeep
- GFCI outlets, properly bonded metal components



EXECUTIVE SUMMARY:

This facility is still suitable for small competitive swim competitions, but with the building of the new El Segundo/Wiseburn High School Aquatic Center, The Plunge will be used for a wider range of programming, including adult swim lap lanes, swim lessons, aquatic fitness, senior programming, therapy/rehab, and family activities. There will be some pre-team and recreational competitive swimming. The Plunge will continue have great utility and a long life as a community and recreational pool.

The pool is worth maintaining and operating and this can be accomplished economically. The cost of performing modifications to the pool to modernize it should extend its useful life and enhance its utility which will justify the cost of such a modernization. Many of the recommendations will also help significantly reduce annual operating costs and long term maintenance expenses.

There are many items that should be considered as presented earlier in this report. The following spreadsheet lists recommendations and the grid indicates the impact and benefits of each recommendation. These recommendations are categorized in the following areas:

- Priority (indicating the top priority items)
- Code Requirement
- Program/Best Practice (support programming or best management practice)
- Cost Savings (reduces annual operating and long term costs)

- Mechanical Systems
- Locker Rooms (and user amenities)
- Pool and Deck
- Comments (relevant comments on recommendations)

Each recommendation has a number to make it easier to find the recommendation in the cost estimation worksheet. The recommendations are in rough order of priority balanced by grouping with specific phases of the projects.