SECTION 131100 - SWIMMING POOLS

PART 1 - GENERAL

1.01 SUMMARY OF WORK *(for general guidance-not inclusive*)

A. Introduction

1. Provide labor, materials, equipment, and services necessary to replace the pool liner. This work must include the re-leveling of the pool rim and installation of the pool finish.

B. Work included in this section:

1. It is the intent of this section to place the entire responsibility for the replacement of the pool liner under one vested CONTRACTOR. Under this section the Swimming Pool Contractor will provide but is not necessarily limited to the following:

a. Provide equipment and services required for erection and delivery onto the premises the equipment or apparatus required for the work. Remove equipment from premises when no longer required.

b. Provide protection for the pool decks, surrounding structures, and existing equipment during construction.

c. Provide and maintain proper shoring and bracing for existing utilities and plumbing connections, as required.

d. Removal of the existing pool liner and any backing from the previous liner.

e. Preparation of the existing pool walls for the new liner and backing.

f. Ensure required bonding and grounding of the pool shell and fittings.

g. Provide and install shimming to re-level the rim flow gutter.

h. Provide and install a PVC liner finish in the pool, and any backing required, to replace the existing liner and maintain the proper function of the pool and gutter system.

i. Perform and pass the water tightness test, as outlined in this specification.

j. Remove all equipment and protection used during the project from the premises. Clean the premises as required to restore the facility to the condition it was in when the CONTRACTOR took possession.

k. Obtain final acceptance by jurisdictional health department, if required.

l. Obtain final acceptance and sign off by the OWNER, or representative of the OWNER.

C. Related work specified in other sections:

1. Section 131105 – Selective Demolition

2. The following work related to the project must be completed by the OWNER:

a. Removal and storage of existing loose deck equipment.

b. Provide a dumpster for disposal of all demolished materials. Properly dispose of materials as required by state and federal regulation.

c. Pump and dewater the site as necessary prior to emptying the pool.

d. Emptying of the pool and proper shut down of the mechanical systems prior to the start of work by the CONTRACTOR.

e. Maintain the site free from water while the pool is empty to avoid damage to the existing structure.

f. Fill the pool following the successful competition of the water tightness test.

g. Start, test, calibrate and adjust mechanical equipment, electrical equipment, recirculation, chemical, and other impacted systems following the shut-down.

h. Balance the pool water, following the competition of work by the CONTRACTOR.

1.02 QUALITY ASSURANCE

A. The specification details one (1) swimming pool liner removal and replacement. Certain technical aspects of the design are common only to pool systems planned for public use. Understanding these aspects, their functions and interaction through experience is vital to completing a successful operating system. It is a mandatory requirement that bidders will have achieved such experience as a prerequisite for bidding this project.

1. If the SWIMMING POOL CONTRACTOR is submitting on this project as the PRIME CONTRACTOR, the SWIMMING POOL CONTRACTOR must include a written performance bond from an approved surety company registered in the State of Alaska certifying that the SWIMMING POOL CONTRACTOR will provide 100% Performance, Labor, and Materials on this Project.

2. The Contractor must submit a list of projects meeting the following qualifications, including contact information must be submitted for review and approval at least 10 days prior to bidding of the project. The Contractor must have completed at least five (5) public-use pool line replacements with individual water surface areas in excess of 2500 square feet and a depth of 12’-0” or more within the past 10 years.

3. The Owner reserves the right to reject a bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the Owner that such bidder is properly qualified to carry out the obligation of the contract and to complete the work described or if the bidder does not have the qualifications stated herein. Subject to compliance with item 2 above on this specification.

1.03 REGULATORY AGENCY REQUIREMENTS AND ENGINEERING SERVICES

A. The system must comply with necessary pre-construction approvals obtained by the Owner and Owner’s Consultants from local regulatory agencies governing the design and construction of public swimming pools.

B. Give necessary notices, obtain permits, and pay government fees, and other costs in connection with his work, including the filing of necessary as-built drawings, prepare documents and obtain necessary approvals of governmental departments having jurisdiction over their work, as required. Obtain required certificates of inspection for his work and deliver same to the Owner and Owner’s Consultants before requesting acceptance and final payment for the work.

C. Include in the work, without extra cost to the Owner, labor, materials, services, apparatus, or drawings in order to comply with applicable laws, ordinances, rules, and regulations, whether or not shown on drawings and/or specified.

1.04 COORDINATION AND CLARIFICATION

A. If in doubt regarding the responsibility for work covered in this section and/or discovery of errors or omissions in the bidding documents, notify the Engineer through channels established by the specifications and request a clarification ten (10) days prior to the bid date.

1.05 ALTERNATIVES

A. Existing recirculation fittings appear to need repair. Bidders should include alternatives for repair, full replacement, or partial replacement of recirculation fitting.

1.06 CONTRACTOR'S ALTERNATE PROPOSAL

A. Submit bid to the owner based on materials, equipment and methods as specified in this Section. No substitutions of material will be allowed. Substitution of process may be considered.

B. It is the intent of the contract documents to encourage competition. The base proposal must include the construction methods and equipment as specified and detailed. Proposed system substitutions must have prior written approval by the Engineer.

C. If there is a deviation from the basis of design equipment, confirm that engineering criteria are appropriate for the substituted equipment.

D. Substitutions of specified construction methods and equipment must include a complete submittal as required by these specifications and drawings of appropriate scale incorporating required changes. Provide a list of at least ten (10) satisfactory installations comparable to this project that have been manufactured and installed under the manufacturer's current legal name. Submit a list of such projects with the name, address and current telephone number of the Owner's Operator and Engineer of Record to the Engineer on the bid date.

E. Changes or modifications to the Contract Documents that are not authorized by the engineer are the sole responsibility of the Contractor.

1.07 SUBMITTALS

A. Submittals must be made in accordance and in strict compliance with the following procedures and guidelines.

B. One (1) set of shop drawings and engineering data must be tabbed, indexed, and referenced to the specifications, compiled into an electronic submittal, and submitted. Each section of items must be prefaced by a cover sheet listing the items submitted within the section. Electronic submittals must be organized, numbered, and submitted in the same format and order as the project specifications. Only complete sets will be reviewed.

1. Engineering data covering systems, equipment, structures, and fabricated materials, which will become a permanent part of the work under this contract, must be submitted for review. This data must include drawings and descriptive information in sufficient detail and scale to show the kind, size, arrangement, and operation of component materials and devices; the external connections, anchorage and supports required; performance characteristics; fabrication and dimensions needed for installation and correlation with other materials and equipment. A certification, in writing, must be provided indicating that equipment will fit in the space allotted and as shown on the drawings.

2. Submittals regardless of origin must be stamped with the approval of the CONTRACTOR and identified with the name and number of this contract, CONTRACTOR'S name, and references to applicable specification paragraphs and contract drawings. Each submittal must indicate the intended use of the item in the work. When catalog pages are submitted, applicable items must be clearly identified. The current revision, issue number, and date must be indicated on drawings and other descriptive data.

3. The submittals will not be accepted from anyone but the CONTRACTOR. Submittals must be consecutively numbered in direct sequence of submittal and without division by subcontracts or trades.

4. The CONTRACTOR'S stamp of approval is a representation that the CONTRACTOR accepts full responsibility for determining and verifying quantities, dimensions, field construction criteria, materials, catalog numbers and similar data, and that he has reviewed or coordinated each submittal with the requirements of the work and the contract documents.

5. Each submittal must include a statement prepared by the originator of the drawings and data, certifying compliance with the contract documents except for deviations, which are specifically identified.

6. Deviations from the contract documents must be identified on each submittal and must be tabulated in the CONTRACTOR'S letter of transmittal. Such submittals must, as pertinent to the deviation, indicate essential details of changes by the CONTRACTOR (including modifications to other facilities that may be a result of the deviation) and required piping and wiring diagrams.

7. The CONTRACTOR must accept full responsibility for the completeness of each submission, and, in the case of a resubmission, must verify that exceptions previously noted have been considered. In the event that more than one resubmission is required because of failure of CONTRACTOR to respond to exceptions and rejections previously noted, CONTRACTOR must make further resubmissions in person at the consultant's office.

8. The need for more than one resubmission, or a delay in obtaining review of submittals, will not entitle the CONTRACTOR to an extension of the contract time unless delay of the work is directly caused by a change in the work authorized by a change order.

9. Review of drawings and data submitted by CONTRACTOR will cover only general conformity to the drawings and specifications, external connections and dimensions that affect the layout. Review does not indicate a thorough review of dimensions, quantities, and details of the material, equipment, device, or item shown. Review of submittals does not relieve CONTRACTOR from responsibility for errors, omissions, or deviations, or responsibility for compliance with the contract documents.

10. When the drawings and data are returned marked REJECTED, REVISE AND RESUBMIT or SUBMIT SPECIFIED ITEM, the corrections must be made as noted thereon and as instructed and six corrected copies (or one copy and one corrected reproducible copy) resubmitted.

11. Resubmittals must bear the number of the first submittal followed by a letter (A, B, etc.) to indicate the sequence of the resubmittal. Resubmittals must be indexed, tabbed, referenced to the specifications, and bound in a three-ring binder and submitted at one time.

12. When corrected copies are resubmitted, the CONTRACTOR must, in writing, direct specific attention to revisions and must list separately revisions made other than those called for on previous submissions.

13. When the drawings and data are returned marked NO EXCEPTIONS TAKEN or MAKE CORRECTIONS NOTED, no additional copies must be provided unless specifically requested to do so for record.

C. Permits, Receipts and Test Reports

1. Provide the Engineer with copies of permits and receipts for fee payments, as required.

2. Submit a sample format for each test report intended for use. Submit test reports required herein only on approved forms.

D. Include complete product data indexed, tabbed, and referenced to specifications with 8 ½" x 11" cover sheet covering:

1. Paragraph 2.01 – Swimming Pool Finishes

E. Include engineering construction drawings for any alterations to pool piping.

F. Reference Section 131105 – Selective Demolition

1.08 OPERATION AND MAINTENANCE MANUALS AND CLOSE-OUT SUBMITTALS

A. Detailed operation and maintenance information must be supplied for equipment requiring maintenance or other attention. The equipment supplier and/or CONTRACTOR must prepare an operation and maintenance manual for equipment. Parts lists and operating, and maintenance instructions must be provided.

B. Each operation and maintenance manual must include the following, as required to properly maintain the pool liner:

1. Equipment function and calibration, normal operating characteristics, and limiting conditions.
2. Assembly, installation, alignment, adjustment and checking instructions.
3. Operating instructions for startup, routine and normal operation, regulation, and control, shut down and emergency conditions.
4. One (1) copy of instructional videos.
5. Operating cycles must be specifically described in outline format and in referenced detail.
6. Include manufacturer recommended maintenance schedule, parts lists, and trouble-shooting information.
7. Using reference to keyed valves and wall diagram, include specific written instructions for procedures that must be followed for the following:
    a. Emptying and refilling the pool including de-watering during the period that the pool will be empty.
    b. Super chlorination.
8. Lubrication and maintenance instructions.
9. Guide to “trouble-shooting.”
10. Parts list and predicted life of parts subject to wear.
11. Outline, cross section, and assembly drawings; engineering data and wiring diagrams.
12. Test data and performance curves, where applicable.
13. Specific written instructions for procedure for emptying and refilling the pool including de-watering during the period that the pool will be empty. Provide a yellow warning sign 8-1/2 in. x 11 in., that must be mounted in the filter room, that reads:

    WARNING
    Prior to emptying Pool
    Consult O & M Manuals for Procedures

    Add another sign that reads:

    Keep Caps, Plugs and Tops Tight Fitting to Prevent Escape of Fumes.
14. One set of applicable submittals must be included in each manual.

C. The operation and maintenance manuals must be in addition to instructions or parts lists packed with or attached to the equipment when delivered, or which may be required by the CONTRACTOR.

D. Manuals and other data must be printed on heavy, first quality paper, 8-1/2 x 11-inch size with standard 3-hole punching and inserted in plastic covers. Drawings and diagrams must be reduced to 8-1/2 x 11 inches or 11 x 17 inches. Where reduction is not practical, larger drawings must be folded separately and placed in envelopes that are bound into the manuals. Each envelope must bear suitable identification on the outside.

E. Two (2) bound volumes of each manual must be submitted. Parts lists and information must be assembled in substantial manuals and permanent, three-ring or three-post binders. Material must be assembled and bound in the same order as specified, and each volume must have a table of contents and suitable index tabs.

F. Material must be marked with project identification. Non-applicable information must be marked out or deleted.

G. Shipment of equipment will not be considered complete until required manuals and data have been received.

1.09 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver material in manufacturer's original, unopened containers and crates with labels intact and legible.

B. Deliver materials in sufficient time and quantity to allow continuity of work and compliance with approved construction schedule.

C. Handle materials in a manner to prevent damage.

D. Store materials on clean raised platforms with weather protective coverings. Provide continuous protection of materials against damage or deterioration.

E. Remove damaged materials from site. OWNER will provide on-site provisions for disposal.

1.10 WARRANTIES

A. The CONTRACTOR warrants to the Owner and Engineer that materials and equipment provided under the contract will be of good quality and new unless otherwise required or permitted by the contract documents, that the work will be free from defects not inherent in the quality required or permitted, and that the work will conform with the requirements of the contract documents. Work not conforming to these requirements, including substitutions not properly approved and authorized will be considered defective. The CONTRACTOR'S warranty will exclude remedies for damage or defect caused by abuse, improper or insufficient maintenance, improper operations, modifications not executed by the CONTRACTOR or improper wear and tear under normal use. If required by the Engineer, provide satisfactory evidence as to the kind and quality of materials and equipment.

B. The CONTRACTOR must agree to repair or replace defective or non-complying work at no cost to the Owner upon written notification from the Owner within the warranty period. Pro-rated warranties are not acceptable.

C. Warranties must be for a period of one year from the date of substantial completion or the owner begins using the pool unless otherwise specified. Submit warranties covering, but not limited to the following:

1. Defects in material or workmanship of the pool liner and associated welds causing a loss of water for a period of ten (10) years.

2. Defects in material or workmanship of the pool liner installation items for a period of one (1) year.

1.11 SYSTEM TRAINING

A. A qualified representative of the CONTRACTOR performing work under this section must put the equipment into operation and instruct the Owner's representatives in the operation of this equipment to the Owner's satisfaction immediately after project’s substantial completion.

B. The CONTRACTOR’S training representative must have completed the equipment/system’s manufacturer’s training requirements and be certified, by the manufacturer, to provide and teach system training.

C. Training periods to consist of recorded on-site training.

1. Provide a project specific video recording instruction manual in addition to the training sessions. The video instructions must be project specific and must include information on the care, operation, adjustment, and maintenance of items provided by the CONTRACTOR under

the “Part 2 – Products” section of this specification. This video recording must be done separate from the Owner training.

2. The CONTRACTOR must include one (1) copy of video recording instructions in each Operations and Maintenance Manual.

1.12 POOL FILL WATER QUALITY

A. The Owner is to bear the cost of the water required for two (2) complete fillings of the pool (the initial water tightness test and the final filling). Removal of iron or copper (if in excess of .3 ppm) will be required for the final fill to avoid staining of the pool finish. Subsequent fillings or partial fillings (more than 25%) of the pool is by the CONTRACTOR, at its own expense.

B. Provide the necessary plant equipment so that the temperature of fill water will be within plus or minus 10 degrees of the ambient air and/or the pool structure at the time of filling. Extreme caution is urged if the temperature variance is greater than 10-degree F.

C. Provide the necessary chemicals and to adjust and balance the water chemistry in the pools to the following levels:

pH	7.4 - 7.6
Calcium Hardness	200 - 400 PPM
Total Alkalinity	80 - 120 PPM
Langelier saturation index	-0.3 - +0.3
Total Dissolved Solids (TDS)	not to exceed 1,500 PPM

1.13 START-UP CHEMICALS

A. The OWNER is responsible for balancing and maintaining the chemical balance of the pool water (including the cost of chemicals required) following the completion of work by the CONTRACTOR.

B. The CONTRACTOR is responsible for providing the OWNER with the same quantities of the necessary chemicals to maintain the pool operation as were present when the CONTRACTOR took possession of the pool.

PART 2 - PRODUCTS

2.01 SWIMMING POOL FINISHES

A. PVC Liner

1. Scope shall consist of the removal of the existing pool liner system and all associated wall/floor markings associated with the existing liner. Pool prep to remove items that may cause liner damage. The SWIMMING POOL CONTRACTOR shall replace the existing liner to include the pool interior, vertical and horizontal warning signage and wall and floor markings.

2. The CONTRACTOR will provide shimming to the existing pool structure, as required, to restore rim-flow to the gutter system.

3. Provide a reinforced, slip resistant, PVC membrane lining system with membrane system components obtained through one source from a single manufacturer.

a. Materials

i. Ensure that all materials used are compatible with the swimming pool environment, and that these materials are supplied as a system.

b. Components and Equipment

i. Flexible Reinforced PVC Membrane: The flexible PVC membrane shall be installed to the pool as required. The membrane shall be no less than 60.0 mil

in thickness (.060-inch/1.5 mm) and shall conform strictly with the following properties as listed herein. Only those membranes specifically formulated for swimming pool use shall be considered. Roofing membranes, general waterproofing membranes, and vinyl liners shall not be acceptable.

ii. PVC Liner Chemical and Physical Properties*:

Thickness:	60 mil	ASTM D374C
Specific gravity:	1.22 g/cc	ASTM D792/method A
Yield tension:	MD166 lb./in – XD160 lb./in	ASTM D638
Yield elongation:	MD 60% - XD 60%	ASTM D638
Break tension:	MD 95 lb./in - XD 90 lb./in	ASTM D638
Break elongation:	MD 110% - XD 104%	ASTM D638
Secant modulus	MD 1352 psi - XD 1125 psi	ASTM D5323 (100%):
Tear resistance:	MD 25 lb. - XD 24.7 lb.	ASTM D1004- Die C
Low temp. brittleness	-50°C – Pass	ASTM D1790
Water absorption:	<.79%	ASTM D570
Puncture Resistance:	125 lbs	ASTM D4833
Ply Adhesion	24 in/2 in.	ASTM D413
UV Resistance: Tensile Strength @ Yield	MD 12% - XD 16%	ASTM D4355
Fungal and Bacteria Resistance	No growth, staining or discoloration	ASTM G21-96
Resistance to Chemicals	Excellent resistance	ASTM D543
(Cyanuric Acid, Sodium Dichloroisocyanurate, Trichloroisocyanuric acid, Calcium Hypochlorite, Sodium Hypochlorite with 12 ppm solution)		Procedure I (73.4 F) for 7 days

MD = machine direction; XD = cross machine direction *Average values plus or minus 10%

iii. The flexible PVC membrane shall be furnished with a proprietary acrylic polymeric coating to resist abrasion, staining, UV deterioration and microbial action.

iv. Color: The field color of the liner shall be white with dark blue or black wall targets and floor markings.

v. Sanitizing Agents: Sanitizing agents, formulated from a mixture of halogenated organic compounds, and specifically designed for this purpose, shall be applied to the pool surface, beneath the pool liner, to prevent the growth of microbes or fungus.

vi. Felt: The interior surfaces of the swimming pool shall be covered with an engineered polyester fleece separator, a minimum of 125.0 mil in thickness (.125-inch/3.175 mm), weighing at least 10 ounces per square yard. The fleece separator must be resistant to freeze, thaw, moisture, soil chemical abrasion, or ultraviolet deterioration. All fleece separators shall be certified and guaranteed to be free of foreign materials, which could potentially be damaging to the liner.

Weight:	10 oz./sq.yd.	ASTM D5261
Thickness:	125 mils	ASTM D5199
Grab Strength:	305 lbs	ASTM D4632

Grab Elongation:	60%	ASTM D4632
Trapezoid Tear Strength:	100 lbs	ASTM D4533
Puncture resistance:	130 lbs	ASTM D4833
Mullen Burst Strength:	510 psi	ASTM D3786
Water Flow Rate:	80 gpm/ft	ASTM D4491
Permittivity:	1.07 sec-1	ASTM D4491
Permeability:	0.34 cm/sec	ASTM D4491
AOS:	70/0.210 sieve size/mm	ASTM D4751

vii. Adhesive: The adhesive use to apply the felt and the liner shall be compatible with swimming pool environment and prevent delamination of either component.

viii. PVC Steel Edging: A PVC-coated steel sheet, at least 20 gauge with PVC laminated on one side shall be used to form edges, angles, corners, or other transitions where a firm surface is necessary to weld the PVC membrane.

ix. Edge Sealant: Liquid PVC edge sealant solution shall be applied to all free material edges after welding. This process is to provide a properly detailed edge on material lap joints. Only those membrane systems utilizing an edge sealant solution will be considered, as this process is critical to the overall durability of the membrane.

x. Stainless Steel and Polymer Sheet: At least 20-gauge stainless steel or polymer sheet shall be used as required for reinforcement, shaping, or separation as required. It shall be installed over expansion joints when sealants or caulking have been installed.

xi. Penetrations: Compression flanges fabricated of rigid, white polymer, shall be furnished at all membrane penetrations or openings to the swimming pool. All transition flanges shall be secured with stainless steel anchoring systems.

c. Basis of Design: Systems supplied by RenoSys or Natare are considered pre-approved. Any other manufacturer must be approved by the Engineer.

PART 3 - EXECUTION

3.01 EXISTING CONDITIONS, INSPECTION AND PREPARATION

A. Carefully examine of the contract documents for requirements that affect the work of this section. Prior to starting work, notify the Engineer of defects requiring correction. Do not start work until conditions are satisfactory.

B. Protect materials and work completed by others from damage while completing the work in this section.

3.02 TOLERANCES FOR CONSTRUCTION OF THE POOL SHELL

A. The completed structures must be constructed level and to the dimensions, elevation, depths, and thickness as shown on the plans.

B. The elevation tolerance of the pool shell and gutter lip must be plus or minus 1/8 inch.

C. The vertical wall surface tolerance of the pool shell, for the first 36 inches from the water surface must be plus or minus 1/4 inch from plumb measured with a 6-foot straight edge.

D. For competitive racecourses, the following pool shell tolerances must apply:

Course	Tolerance	Minimum	Maximum
25 Yard	+ 1 3/16" /- 0"	75' – 3/4"	75' – 1 15/16"

1. The above dimensions include allowances for a touchpad at each end of the course. The maximum dimension includes the construction tolerance.
2. The above dimensions apply to a vertical plane extending 1'-0" above and 3'-0" below the surface of the water at points of both end walls.

3.03 WATER TIGHTNESS TEST

A. The water tightness test described within the following section is in accordance with industry standards for acceptable water loss from a pool vessel. Test reports must be provided and must include test locations within the structure, dates of testing, water level measurements, amounts of evaporation, measured volume corrections, retest results (if applicable), actions taken, and final results.

B. This test applies to the pool and gutter system.

C. Water Tightness Test Procedure

1. Preparation
   a. For stainless-steel pools: Securely seal all outlets prior to filling the pool with water.
2. Fill: Fill and then isolate the pool and gutter system. The water tightness test must begin after the vessel has been filled for a minimum of three (3) days. During the filling, outlets must be monitored for water tightness and concrete joints, if applicable, must be monitored for visible leakage. If visible leakage from the vessel is observed, the condition must be corrected prior to the start of the test.
   a. After the initial fill, ground water must be removed from the pool sight sump or the pool location de-watering system. This must be completed prior to the start of the water tightness test. De-watering of the pool sight sump must be maintained during the entire duration of the test.
3. 24-hour Allowable Loss
   a. Calculate the allowable water loss from the vessels. This is .1% of the total vessel volume. For the example, the vessel has a volume of 200,000 gallons, the 24-hour allowable loss will be 200 gallons.

Vessel	Total Volume (Gallons)	24-hour Allowable loss (.1% or .001 of Total Volume)
EXAMPLE	200,000 gal	200 gal
Pool 1		
Pool 1 Gutter		

4. Measurement
   a. Measurements must be taken at the pool and gutter system. Multiple test points with averaging are recommended for vessels which will be exposed to wind. Document the separate findings on the chart below. Repeat the measurements and document every 12 hours for a total of three (3) days. The Contractor must check the pool and gutter system for water loss with the Engineer or Owner's representative every 12 hours. Submit photo documentation of each measurement with the completed water tightness report. Example measurements are shown in the table below.
5. Evaporation Measurement Procedure

a. Fill a floating, restrained, partially filled, calibrated, open pan with water and allow the container to float within the pool during the testing period. This will be used to measure evaporation.

Vessel	12 hrs. passed	24 hrs. passed	Day 1 TOTAL	36 hrs. passed	48 hrs. passed	Day 2 TOTAL	60 hrs. passed	72 hrs. passed	Day 3 TOTAL
Example Pool	0.021 ft	0.010 ft	0.031 ft	0.016 ft	0.019 ft	0.035 ft	0.022 ft	0.017 ft	0.039 ft
Example Pan	0.008 ft	0.006 ft	0.014 ft	0.008 ft	0.007 ft	0.015 ft	0.009 ft	0.007 ft	0.016 ft
Pool 1									
Pool 1 Gutter									
Evaporation Pan									

6. Calculate Daily Loss

a. Calculate the total daily water loss for the vessels and record in the table below. If a vessel has a daily water loss that is greater than the calculated 24-hour allowable loss, the vessel cannot be considered watertight.

1) Daily Loss = 7.481 x Structure Surface Area (SF) x [Total Water Loss per Day (FT) – Evaporation per Day (FT)]

b. For the example, we have a body of water that is 200,000-gallon volume and 3,500 square feet of surface area. Measurements for this example body of water are recorded in the table above.

1) Day 1 Loss = (7.481 gallons per cubic foot) x (3,500 SF) X [(.031 ft water loss) – (.014 ft evaporation)] = 445 gallons Day 1 loss

2) Day 2 Loss = (7.481 gallons per cubic foot) x (3,500 SF) X [(.035 ft water loss) – (.015 ft evaporation)] = 524 gallons Day 2 loss

3) Day 3 Loss = (7.481 gallons per cubic foot) x (3,500 SF) X [(.039 ft water loss) – (.016 ft evaporation)] = 602 gallons Day 3 loss

Vessel	Daily Water Loss Day 1 (Gal)	Daily Water Loss Day 2 (Gal)	Daily Water Loss Day 3 (Gal)	Allowable Loss (calculated above, Gal)	Are daily values higher than the Allowable Loss? (Y/N)
EXAMPLE	445 gal	524 gal	602 gal	200 gal	Y, not watertight
Pool 1					
Pool 1 Gutter					

7. Evaporation

a. Evaporation must not have a significant effect on natatoria that are completely enclosed with no air circulation during the water tightness test. However, evaporation will have a significant effect on the water level in natatoria that has air movement across the water surface or are still partially uncovered.

8. If leaks are detected, repair the vessel, and make watertight in accordance with these requirements.

9. With regard to this test, the curing requirements, the final fill, and the cost of the water for two (2) complete fillings must be borne by the Owner. Expenses for subsequent fillings or partial fillings (more than 25%) of the pool must be provided and will not be borne by the Owner.

3.04 EQUIPMENT AND SYSTEMS INSTALLATION

A. Provide equipment and systems in accordance with manufacturer's directions. Equipment must be assembled and in place for final observation.

3.05 START-UP AND INSTRUCTION

A. Supply the services of an experienced swimming pool operator/instructor after the pool has been filled and initially placed in operation. During this period, the Owner's representatives who will be operating the pool must be thoroughly instructed in phases of the pool liner's operation. Deliver two (2) complete sets of operating and maintenance instructions for the PVC liner. Prior to leaving the job, obtain written certification from the designated Owner's representative acknowledging that the instruction period has been completed and necessary operating information provided.

B. Written reports of each of these visits outlining the pool's operation, competence and performance of the pool's operation personnel, and other pertinent comments must be submitted to the Owner and Engineer within one (1) week after each visit.

C. Provide specific written procedures that must be followed for emptying and refilling the pool as mentioned previously in this section. The procedures must be included in the bound volume of operating instructions and references in the front index with a note headed by the words: "CAUTION -- VERY IMPORTANT".

END OF SECTION 131100