



## Natatec PVC Pool Lining System



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The following pages include a typical specification (in the Construction Specification Institute format). This specification is intended to be used as part of a project or as a stand-alone specification for the purchase of a swimming pool, aquatic facility or water feature item. Other versions of this specification are available from Natatec or at [www.natatec.com](http://www.natatec.com), and we would welcome the opportunity to discuss your needs or tailor a specification to your particular requirements.

This specification is not proprietary or intended to limit competition. To the contrary, the purpose of this specification is to establish the **minimum** performance and quality standards. The use of this specification **does not preclude** other manufacturers or suppliers from bidding. In fact, the use of a comprehensive and detailed specification ensures that the purchaser or owner actually receives the expected quality and performance required from such a system.

Natatec recommends that purchasers understand their needs, specify the item that meets their requirements and demand that all potential suppliers meet those minimum requirements.

Please contact Natatec for assistance in selecting and specifying your swimming pool, aquatic facility or water feature items.

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**SECTION 13150 – SWIMMING POOL PVC MEMBRANE SYSTEM**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The provision of the Notice to Bidders, Instructions to Bidders, Proposals, General Conditions, Supplementary Conditions, General Requirements, related Sections and other Divisions of these documents if used as part of this project are included as a part of this Section as though bound herein.

**1.2 SUMMARY**

- A. It is the intent of this specification to describe the installation of a complete reinforced PVC membrane lining system specifically designed and formulated for use in swimming pools. The system shall consist of two layers of flexible PVC totally encapsulating a polyester inner reinforcement in combination with required accessory items to complete the installation. The sections of material shall be fuse bonded together at the site to form a watertight continuous membrane lining. The system shall be installed in accordance with the configuration as detailed on the drawings, including all necessary equipment within this specification. Individual rolls of reinforced PVC membrane shall be custom fitted and welded together at the job site using hot air welding techniques. Upon completion, the system shall provide a waterproof, yet flexible membrane, complete with all necessary fittings, attachments, flange transitions and markings.
- B. The performance characteristics and installation qualifications as established herein reflect the minimum requirements for any membrane system to be utilized on this project. Systems not meeting the minimum requirements established for this project will not be considered.
- C. This specification includes, but is not limited to, the following components:
- D. Flexible PVC membrane
- E. Slip-resistant reinforced PVC membrane
- F. Separator fleece
- G. PVC steel edging & sheets
- H. Galvanized, Polymer and/or Stainless Steel edging & sheets
- I. Sanitizing agents
- J. Transition flanges
- K. Edge sealants
- L. Adhesives
- M. Refer to Section \_\_\_\_\_, Alternates, for alternates that may affect the Work of this Section.
- N. This Specification describes Natatec® PVC Membrane Lining System as illustrated by the drawings. Should the requirements of this specification contradict any other section of the project specifications, this section shall govern.

**1.3 Scope of Work:**

- A. Work Included: The work specified herein and as indicated on the drawings includes, but is not necessarily limited to, furnishing all the labor, materials, equipment, appliances, services and drayage to all the operations related to the fabrication and installation of the PVC Membrane System. The Work shall be as herein specified and as denoted on the accompanying drawings.
- B. Related Work and Responsibilities Assigned to Others: Coordinate all activities with the appropriate party. Advise owner's representative if proper conditions are not maintained or if responsibilities of others are not properly completed. Related work responsibilities generally include, but are not limited to the following:
  - 1. Provide and maintain appropriate and suitable environmental conditions, including temporary heat shelter and weather protection for the completion of the work.
  - 2. Surface preparation beyond the scope of normal surface patching of concrete, surface repair or cleaning of the existing interior surfaces prior to system installation.
  - 3. Perimeter sealant, caulking, or other sealing except sealants that are integral to the PVC Membrane System.
  - 4. Removal and reinstallation of deck and accessory equipment.
  - 5. Provide means for storage and disposal of scrap material, coating debris, and other material in close proximity to pool area.
  - 6. Electrical work, including grounding of the pool, installation of underwater lights or other components, or any related electrical work.

7. Temporary facilities, including electrical power close to the installation site.
  8. Provide temporary water at fifty (50) psi (to gallons per minute) minimum for cleaning, rinsing, and test purposes, as well as facilities for draining pool and maintaining workable conditions within the pool area.
  9. Final cleaning of pool area outside of the PVC Membrane System.
  10. Provide and maintain all necessary barricades, signs, lights, flares, and other security as required protecting workmen and the public.
  11. Drain pool, coordinate with contractor to ensure proper hydrostatic relief is maintained. Closely monitor water table around pool to minimize hydrostatic damage to pool shell.
  12. Immediately after installation, protect pool from damage, contamination, spatter, and spillage caused by construction work of other trades. This shall include covering of pool with protective materials when necessary, and responsibility for prompt repair or corrective measures in the event of damage.
- C. Where items of the architectural, mechanical, or electrical general conditions, special conditions, and specifications are repeated in this Section of the Specifications or Project Documents, it is intended to call particular attention or qualify these items or to indicate that the requirements of this Section shall govern in the event of conflict with other Sections. It is not intended that any other parts of the documents shall be assumed to be omitted if not repeated herein. Should the requirements of any other Section of the project documents contradict this section, the requirements of this section shall govern.
- 1.4 DEFINITIONS
- A. References Standards: Certain applicable reference standards are incorporated herein to the extent such references are relevant, with the latest revision applicable including, but not limited to:
1. Fabrication standards:  
ASTM - American Society for Testing Materials  
ANSI - American National Standards Institute  
NSF - National Sanitation Foundation
  2. The following are utilized as applicable:  
NCAA - National Collegiate Athletic Association  
FINA - Federation Internationale de Natation Amateur  
USS - United States Swimming Incorporated
- B. The intent of these specifications is not to establish specific quantities, amounts, or dimensions. Thus, the reference to “one”, “each”, “an”, “a”, or like wording is for semantic purposes only. Unless specifically stipulated otherwise, provide materials, equipment, and items as detailed on the drawings or as reasonably required for complete, operational PVC Membrane System installation(s).
- 1.5 SUBSTITUTIONS
- A. The PVC Membrane System has been the subject of a detailed investigation, and the design and operation of adjoining equipment and systems is based upon the specified membrane system. All base bids shall include only that equipment and systems listed herein or subsequently approved by addendum. The Owner reserves the right to reject any and all substitutions without cause and for any reason whatsoever, and the contractor is obligated to provide only the products, equipment or systems as described by the specified manufacturer.
- 1.6 TRADE NAMES
- A. When a particular manufacturer’s product, system or brand name is designated in the project documents, either in the drawings, specifications or addenda thereto, only such designated products or systems by the named manufacturer may be provided.
1. When reference is made in the project documents to trade names, brand names or the products of a particular manufacturer, such references are made solely to indicate what products or systems may be furnished under the base bid and are not intended to restrict competition. Should any bidder desire to use products, systems or trade or brand names that are different from those mentioned in the project documents, application for the approval of such different products, systems, trade names or brand names must be provided to the Architect in writing a minimum of 10 days prior to the date set for the opening of bids.
  2. The burden of proving acceptability rests with the applicant and any application for approval must be accompanied with adequate and sufficient technical data, drawings and details to clearly and convincingly establish beyond all doubt that the proposed product or system meets or exceeds all express requirements of the project documents.

3. Unless requests for approval of other products, systems, trade names or brand names have been received and approvals have been published by addendum, only such designated products or systems by the named manufacturer may be provided.

### 1.7 SEQUENCING AND SCHEDULING

- A. Coordinate all work activities and installation of the PVC Membrane System with other building components and the work activities of other trades

### 1.8 DRAWINGS:

- A. The drawings are generally diagrammatic and are intended to convey the scope of work and indicate general arrangement. The drawings are intended for contractors having experience, skill and discretion in the execution of the work implied by the drawings.
- B. If directed by the Consultant or required for the successful completion of the project, the contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work. Under no circumstances shall any sizes be decreased or increased significantly or radical changes made in any part of the installation without the written consent of the Consultant or the Owner.

### 1.9 SUBMITTALS

- A. Upon notice to proceed under this Contract, installation details and submittal documents shall be provided, fully illustrating the materials and procedures to be utilized. These details and submittal documents, once accepted by the Owner or Owner's Representative, shall be the basis for the fabrication, installation and inspection.
- B. Product Data: Submit manufacturer's technical information and product data including basic materials and installation instructions for the PVC Membrane System including the following:
  1. List each material finished and application and cross-reference to the shop drawing(s).
  2. Provide dimensional shop drawings showing all pertinent dimensions.
- C. Program and Procedures: Prepare and submit a summary of the installation program which involves scheduling, preparation and installation procedures, quality control and project close-out. Submit to architect for approval.
- D. Submit comprehensive operations and maintenance manuals. Include recommendations for corrective action of typical situations that may be encountered.
  1. Submit recommended and required values for swimming pool water chemistry and other operational aspects of maintaining the swimming pool facilities.
  2. Maintenance Instructions and Maintenance Program: Provide complete descriptive information detailing proper care, maintenance and cleaning of the system.

### 1.10 QUALITY ASSURANCE

- A. This is a performance specification. The complete and functional reinforced PVC membrane system, as specified herein and shown on the drawings, is to be the basis for receiving bids. While it is not the intent of these specifications to, in any way, limit competition or restrict the bidder in the preparation of their bid, the bidder shall offer products and materials in literal compliance with these specifications. The bidders are cautioned that offering products or systems failing to meet these specifications will be considered non-responsive.
- B. The PVC Membrane System shall be the product of a firm having at least ten (10) years experience in the design, manufacture and installation of PVC Membrane Systems used in swimming pool, aquatic or water feature applications. The firm also must have at least ten (10) installations of similar projects currently in satisfactory operation for no less than three (3) years. All systems shall be in compliance with the code requirements that govern in the State of the installation.
  1. **In the event an alternate manufacturer's system is approved, all contractors will be so advised per addendum prior to bid opening to allow for inclusion of such a system or equipment in their bids. In the absence of approval for an alternate manufacturer, only the specified manufacturer's system may be incorporated in the project.**
  2. Listing or subsequent approval of a particular manufacturer as an approved manufacturer does not constitute acceptance of the manufacturer's standard configuration, materials, or equipment, except as they specifically meet or can be made to conform to the requirements defined in this specification. Any bid shall be assumed to include any and all costs to change, modify or otherwise comply fully with the requirements of this specification. Claims for additional compensation to comply with these specifications after bid for any reason whatsoever will not be considered. Only materials, equipment, or systems that absolutely comply with these specifications in all regards will be accepted. Any substitute systems from alternate manufacturers shall be in compliance with all requirements of these specifications.

- C. **Warranty:** The PVC Membrane System shall be guaranteed for workmanship, materials and performance for a period of ten (10) years with an option extended warranty for 15-years. This warranty shall not include or cover abusive or improper treatment to the PVC Membrane System by others either during construction or when operational.
  - D. A sample copy of the warranty statement in accordance with these specifications must be provided prior to approval.
- 1.11 **Delivery, Storage and Handling:**
- A. The PVC Membrane System components shall be delivered to the job site adequately packaged to prevent damage. Unloading and storage shall be executed by the Contractor. The materials shall not be stacked or stored in any manner which could cause damage or deformity. Site assembly or fabrication of any part of the PVC Membrane System without the complete coordination and supervision of the manufacturer or his representative is strictly prohibited.
- 1.12 **Project Site Conditions:**
- A. The project site shall be in accordance with the Manufacturers' technical bulletins. Access for the installation of the PVC Membrane System will be provided by others.
  - B. All surface preparation necessary to produce a reasonably smooth, firm, clean and dry surface shall be completed prior to the onset of installation. The surface must be free of angular materials, bubbles, voids and large cracks. These irregularities shall be filled with suitable patching material or covered with galvanized or stainless steel sheet as detailed on the drawings. Tar, oil, or petrochemical compounds must be removed or isolated. Surface preparation is part of this contract.
- 1.13 **Coordination:**
- A. The manufacturer shall provide complete descriptive information detailing the design, construction and installation. The contractor shall include all costs for visits to the project site to coordinate various aspects of design, construction, installation and commissioning of the lining system. Coordination shall include the cost for aspects of the installation and to coordinate manufacturing, testing and commissioning programs with the main contractor(s), and other suppliers. Such visits shall take place immediately upon notice to proceed to enable all contractors to be briefed, and a complete production and installation program to be established.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER

- A. **Manufacturer:** Natatec Corporation, Indianapolis, Indiana or Renolit Corporation (worldwide). All bids shall include only PVC Membrane Lining Systems from these manufacturers.
- B. The system specified is based upon either the Natatec® Swimming Pool Membrane System or Renolit AlkorPlan 2000, which are proprietary products of these manufacturers. The characteristics, standards and criteria listed herein have been established as the minimum acceptable values for any membrane product to be offered on this project. As all aspects and equipment within the pool system have been designed to utilize this system, products not approved and listed prior to bidding as meeting the minimum requirements listed will not be accepted as that could adversely affect the performance of the system.
- C. If alternate systems are approved prior to bidding, all bidders will be notified by addendum.
- D. **Source Limitations:** Provide all PVC Membrane System components through one source from a single manufacturer.

### 2.2 Materials

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

### 2.3 Components and Equipment

- A. **Flexible Reinforced PVC Membrane:** The flexible PVC membrane shall be installed to the dimensions detailed on the drawings and as required. The membrane shall consist of two (2) layers of PVC fuse, bonded to a polyester mesh substrate. The membrane shall be no less than 60.0 mil in thickness (.060-inch/1.5 mm), and shall conform strictly with the following chemical and physical 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. Additionally, only those swimming pool membranes meeting or exceeding the following ASTM test values, substantiated by independent documentation from a certified testing laboratory, shall be acceptable. The membrane shall be furnished in a color scheme as detailed by the drawings or in a standard color as selected by the owner.
- B. The flexible PVC membrane shall be furnished with a proprietary acrylic polymeric MicroShield coating to resist abrasion, staining, UV deterioration and microbial action. The polymeric coating shall be Natatec MicroShield™ coating or Renolit AlkorPlan 2000.

C. \*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
	<i>(Cyanuric Acid, Sodium Dichloroisocyanurate, Trichloroisocyanuric acid, Calcium Hypochlorite, Sodium Hypochlorite with 12 ppm solution)</i>	Procedure I (73.4 F) for 7 days
	MD = machine direction; XD = cross machine direction *Average values plus or minus 10%	

D. Slip Resistant Flexible Reinforced PVC Membrane: A slip resistant reinforced PVC membrane, 67.0 mil in thickness (.067-inch/1.7 mm) and identical in chemical and physical properties to the flexible reinforced PVC membrane described above, which includes a specifically designed embossed surface suitable for high traffic areas, shall be installed as detailed on the drawings. The slip-resistant surface shall be certified by independent ASTM Laboratory testing to comply with the requirements of ASTM C1028. Furnish in the color scheme as detailed by the drawings or as selected by the owner.

E. Separator Fleece: 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 and shall conform strictly to the following chemical and physical properties. All fleece separators shall be certified and guaranteed to be free of foreign materials, which could potentially be damaging to the liner.

F. Chemical and Physical Properties (Property Unit Value Test)

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 <sup>-1</sup>	ASTM D4491
Permeability:	0.34 cm/sec	ASTM D4491
AOS:	70/0.210 sieve size/mm	ASTM D4751



- G. 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.
- H. 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.
- I. 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.
- J. Transition Flanges: Compression flanges fabricated of rigid, white polymer, 1/4 inches thick, shall be furnished at all membrane penetrations or openings to the swimming pool. All transition flanges shall be secured with stainless steel anchoring systems.
- K. 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.

### PART 3 - EXECUTION

#### 3.1 Examination

- A. The supervising representative or installer shall verify that the site conditions are in accordance with the Manufacturers' requirements, shop drawings and/or technical bulletins and are suitable for the installation of the membrane.

#### 3.2 Preparation

- A. Surface preparation shall be completed prior to the commencement of installation. The surface shall be reasonably smooth without oil or tar-based materials present. Deteriorated surfaces or voids shall be filled with cementitious patching compounds. Areas immediately surrounding fittings, lights, and other transitions or entrances to the pool shall be sound and suitable for drilling of 1/2 inch diameter anchor holes for the installation of the PVC compression flanges.

#### 3.3 Installation and Application

- A. All work to be performed by skilled technicians having adequate experience with, and specific training in, the field welding and fabrication of flexible PVC swimming pool membrane systems. Additionally, to ensure the overall integrity of the installation, the installing crew shall be supervised by a crew leader having had no less than two (2) years experience in the application of PVC membrane systems on at least five (5) pool projects similar in size and scope to this project.
- B. To ensure the integrity of the membrane installation and to secure a single source of responsibility for any required warranty service, all membrane system installation personnel shall be full-time, regular employees of the prime bidder, system manufacturer or shall be a factory trained licensee of the Manufacturer. No sub-contractor or independent membrane installers shall be utilized without prior approval. The contractor shall be required to submit installers experience with any proposed alternate systems in writing to the consultant for approval prior to project bid.
- C. If requested, the Contractor shall submit the personnel and supervisor's experience in writing to the for approval prior to award of contract
- D. All work is to be performed in accordance with the manufacturer's technical bulletins. Should the requirements of these bulletins contradict this or any other section of the specifications, the procedures called for in the bulletins shall govern. The work under this section shall be performed by or directed by an authorized licensee of the system manufacturer so that the complete installation will function in accordance with the intent of these specifications.
- E. (Optional) Connection to existing perimeter gutter systems: When installing the PVC Membrane System in swimming pool or aquatic facilities with existing stainless steel perimeter gutter systems, a 12 gauge T-304 stainless steel compression skirt shall be continuously welded to the stainless steel gutter system.
- F. The compression skirt shall be fabricated as detailed on the drawings and shall provide a smooth, uninterrupted surface onto which the membrane shall be compressed. The PVC membrane and a silicone impregnated sponge gasket shall be compressed between a rigid PVC profile and the compression skirt through the installation of 1/4"-20 stainless steel screws, located no greater than 3" O.C. A semi rigid interlocking cap strip shall be installed over the PVC profile to finish the installation. Due to the critical nature of insuring a positive, permanent and enduring watertight seal between the PVC membrane and the stainless steel gutter system, only those systems incorporating a fully welded, stainless steel membrane compression skirt will be allowed.

- G. One method of meeting these requirements is furnished by Natatec Corporation of Indianapolis, Indiana and is available under license for use by any contractor installing a PVC Membrane System in a swimming pool facility.
1. (Optional) The PVC membrane contractor is responsible for pressure testing the existing stainless steel gutter supply tube and hydrostatic testing of the return trough prior to installing the compression skirt to ensure that the gutter system is watertight.
- 3.4 Sequence of Work
- A. Attach the fleece to the pool wall and/or the bottom with the appropriate adhesives in the amounts adequate to secure the fleece. Isolate deteriorated surfaces of voids, cracks, or any other areas with moisture proof composition board or galvanized sheet (20-gauge) as required.
  - B. As required for the configuration of the pool, the flexible reinforced PVC membrane shall be securely welded to PVC coated steel, which has been attached to the pool surface with appropriate anchors approximately four (4) inches (100-mm) on center.
  - C. Install PVC coated steel or shaped galvanized sheet as necessary to form angles, edges, corners, or other transitions.
  - D. Weld the flexible reinforced PVC membrane in accordance with the procedures established by the manufacturer. The joints shall be hot air welded with a minimum of two (2) inches of overlap. Probe all seams with a hand-held lance or air lance to ensure complete welding. Completely close the seam edge using a PVC edge sealing compound.
  - E. All seams in the membrane shall be one-piece, single overlap seams. Patching and overlaying of multiple layers of the membrane material is not acceptable. All material sections are to be applied in full roll widths and lengths except where pool conditions dictate otherwise. No scrap or short-roll material is to be utilized in the membrane installation. To minimize visible seams, the membrane is to be applied to the pool walls in horizontally oriented sheets. Applying the membrane to the pool walls in vertically oriented sheets is not acceptable. Any areas of the membrane which are damaged during installation are to be completely removed and replaced with new material. There are to be no visible patches on the completed membrane.
  - F. Apply special markings, targets, lines, etc., as indicated on the drawings or as specified. The owner's representative is to provide detailed instructions as to necessary markings.
  - G. After installation of the PVC membrane, apply an appropriate elastomeric sealant to all transitions between construction materials, utilizing only sealants suitable for submerged application, and compatible with the flexible reinforced PVC membrane.
  - H. All inlets, outlets, drains, underwater lights, skimmers, stanchion posts, and other required membrane penetrations shall be fitted with rigid PVC compression flanges securely anchored to the pool structure to ensure a watertight seal. The "wrapping and clamping" of the membrane material around stanchion posts, ladder rails, and other protrusions through the membrane will not be considered acceptable. Only rigid compression flanges shall be utilized for all membrane penetrations.
  - I. The PVC membrane shall be continuous throughout recessed steps and any other recessed areas in the pool wall. Compression flanging around recessed steps will not be considered acceptable.
- 3.5 Adjusting & Cleaning
- A. After installation is complete, "broom" clean all surfaces. Remove all scraps, debris, or construction material and dispose of properly
- 3.6 Field Quality Control
- A. Limit access to the project site to minimize possibility of damage to the membrane. Materials and equipment shall not be dragged across the surface of the liner or allowed to slide down the slopes. All parties working on the liner shall wear soft soled shoes. Immediately following installation, verify completion and testing of all seams. Retesting may be necessary to ensure complete sealing.
  - B. Upon completion of installation and testing, the completed PVC Membrane System shall be hydrostatically tested by filling the pool or water feature to the typical operating level and operating all systems for a period of 6 hours without evidence of leakage.
- 3.7 Demonstration and commissioning
- A. Provide at least three full sets of bound operation and maintenance manuals which fully detail the proper system operation and maintenance techniques.
  - B. In the company of the Owner's representative, inspect the completed installation, make final adjustments, place the system in operation and give operating instructions relative to its care and use.
  - C. Prepare a complete "Project Completion Report and Warranty Application," documenting the proper completion of the project, training of Owner's personnel, and application for warranty. Provide to Owner's representative for review and signature prior to turning over project to Owner.





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