

## SECTION 13 1100 - SWIMMING POOLS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The BIDDING REQUIREMENTS, CONTRACT FORMS, AND CONDITIONS OF THE CONTRACT and applicable parts of DIVISION 1 - GENERAL REQUIREMENTS, as listed in the Table of Contents, be included in, and made a part of this Section.

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

##### A. Introduction

- 1. Provide labor, materials, equipment, and services necessary to renovate the pool and sprayground. This work must include the structures and installation of pool finishes as well as products listed in Part 2 of Section 13 1100.

##### B. Work included in this section:

- 1. It is the intent of this section to place the entire responsibility for the construction of the pool and sprayground (including the construction of the pool shell 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 provided. Remove equipment from premises when no longer required.
  - b. Layout, excavate, remove from the construction site, replace, and grade materials as required beyond the limits of excavation of the pool shells to complete the work described in this section. Reference Division 31 - Earthwork.
  - c. Grade and replace load bearing or high plasticity index soil, pump and dewater as necessary to keep excavations free from water during construction and provide sub-surface drainage beneath the surge tank as needed or required in the project geotechnical report. Reference Division 31 - Earthwork.
  - d. Provide and maintain proper shoring and bracing for existing utilities, sewers and building foundations where required for related excavations. Reference Division 31 - Earthwork.
  - e. Provide electrical conduit, wiring, junction boxes etc. to low voltage pool equipment within pool filter/chemical rooms per Division 26 - Electrical. (Low voltage is considered less than 110 V.)
  - f. Coordinate for required bonding and grounding of the pool shell, fittings, and equipment.
  - g. Provide necessary piping and valving as shown on the drawings and specified herein.
  - h. Provide individually sized housekeeping pads for each pool pump. Provide housekeeping pads for pool equipment as required in the drawings.

- i. Provide the main drain hydrostatic relief system as shown on the drawings. Reference Division 31 - Earthwork.
  - j. Provide winterization products and services for the outdoor swimming pool(s) for a period not less than 12 months including a minimum of one (1) closing and one (1) opening. Provide one (1) additional opening if the outdoor facility is open for less than 40 days. Include winterization procedures with owner training.
  - k. Construct the cast in place or pneumatically applied concrete pool shell and cast in place surge tank as described in these specifications and detailed on the drawings, including reinforcement steel, inserts, fittings, fiberglass/stainless steel main drain sumps and embedded items (piping, anchors, etc.) for the pool(s). Reference Division 3 - Concrete and Structural. Before commencing the placement of concrete, verify electrical bonding of the pool embedded items and reinforcing steel. Also, coordinate and arrange required electrical, plumbing and or building inspections. Backfill and compact fill around the pool structure, piping trenches and excavations required by this work. Reference Division 31 - Earthwork.
  - l. Provide an epoxy paint finish in the pool with a slip resistant surface.
  - m. Provide for the storage of pool related equipment, materials, and systems. Items are the responsibility of the CONTRACTOR until accepted by the owner.
  - n. Obtain final acceptance by jurisdictional health department(s).
  - o. Start, test, calibrate and adjust mechanical equipment, electrical equipment, recirculation, chemical, and other supplied systems including deck and loose equipment. Instruct the Owner's representative in the systems operation and maintenance as described herein.
  - p. Provide and install trench drains on pool deck. (Alternate AC-02)
- C. Related work specified in other sections:
- 1. Section 13 1213 – Water Sprayground (Alternate AC-03)
  - 2. Section 13 1105 – Selective Demolition
  - 3. The following work related to the swimming pools must be completed by other trades.
    - a. Provide, erect, and maintain necessary barricades, signs, lights, and flares for pool construction to protect workers and the public.
    - b. Provide and maintain proper shoring and bracing for existing utilities, sewers and building foundations where required for swimming pool related excavations. Reference Division 31 - Earthwork.
    - c. Prior to concrete pours, verify electrical bonding of the pool embedded items. Coordinate and arrange required electrical, plumbing and or building inspections that must be performed on embedded items. Reference Division 26 - Electrical.
    - d. Provide sanitary sewer and storm drain connections. Reference Division 22 - Plumbing.

- e. Provide rules and regulations signage as required by code. Reference Division 1 - General Requirements.
- D. Related work specified in Plumbing section. Reference Division 22 - Plumbing. Work that must be completed by others.
  - 1. Provide piping from the trench drains on pool deck. (Alternate AC-02)
  - 2. Provide sanitary sewer piping from the filter room including floor drains, sumps, and sump pump.
  - 3. Provide water service to hose bibbs, flush hydrant boxes and auto-fill bypass to air gap above fill funnel(s).
  - 4. Provide water meter on the fresh water supply line upstream of the manual fill valve and the slow closing solenoid valve.
- E. Related work specified in Mechanical section. Reference Division 23 – HVAC. Work that must be completed by others.
  - 1. Provide air recirculation systems for pool related spaces.
- F. Related work specified in Electrical sections. Reference Division 26 – Electrical. Work that must be completed by others.
  - 1. Provide power to the exhaust fans for the chemical rooms.
  - 2. Provide motor starters, auxiliary contacts, magnetic relays, and other electrical control devices necessary for the complete operation of the pool systems. Provide power to Variable Frequency Drive pool pump starters and power from VFD to the pool pump motor.
  - 3. Ground and bond pool structures, fittings, and equipment in accordance with Article 680 of the N.E.C. Test and verify that the system electrical ground is true and solid. Provide certification to this effort.
  - 4. Obtain permits, inspections, and approvals of wiring including grounding and bonding of metal components associated with the pool in accordance with Local, State and National Electrical Codes.
  - 5. Confirm electrical conduits that penetrate the pool shell are watertight and installed per N.E.C. Article 680.

### 1.3 QUALITY ASSURANCE

- A. The specifications and drawings illustrate and detail two (2) swimming pool systems. 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 have achieved such experience as a prerequisite for bidding on this project.
  - 1. CONTRACTOR to refer to section 002113 – INSTRUCTIONS TO BIDDERS for bonding requirements.
  - 2. The SWIMMING POOL CONTRACTOR must include a bid bond from an approved surety company registered in the State of Pennsylvania certifying that the

SWIMMING POOL CONTRACTOR has adequate bonding capacity to provide a bid for this project. The SWIMMING POOL CONTRACTOR must submit a copy of the bid bond for review prior to SWIMMING POOL Contractor's selection.

3. If the Contractor has not received prior written approval for this project or has not been included in the pre-approved list of Contractors, they must submit a list of projects meeting the aforementioned qualifications, including contact information of the General Contractor 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 pools with individual water surface areas in excess of 4500 square feet and a depth of 11'-6" or more within the past 10 years.
4. The Contractor must submit prior to the start of construction the name of the on-site Project Superintendent including their relevant experience. The Contractor's on-site Project Superintendent must have completed at least five (5) public-use pools with individual water surface areas in excess of 4500 square feet and a depth of 11'-6" or more within the past 10 years. A list of projects meeting the aforementioned qualifications, including contact information of the General Contractor as well as Owner must be included with the experience submittal. Project Superintendent must not change on the project unless written authorization has been provided by the Architect and Owner.
5. 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.
6. The following bidders have been pre-approved. Bidders must meet the requirements listed above.

Acapulco Pools/Gall Construction  
Bernie Gall, John Robb  
1550 Victoria St. N  
Kitchener, ON N2B3EZ  
Phone: 519.743.6357  
Fax: 519.743.9698

Aqua Pools, Inc  
Randy Kolson  
1438 Electric Ave, P.O. Box L  
East Pittsburgh, PA 15112  
Phone: 412.824.6900  
Fax: 412.824.6910

Main Line Commercial Pools  
Gavin Grimes  
441 Feheley Drive  
King of Prussia, PA 19406  
Phone: 610.279.9285  
Fax: 610.277.4276

Olympia Pools  
Jim Ake  
4040 Penn-Belt Pl., Suite 100  
Forestville, MD 20747  
Phone: 301.420.2020  
Fax: 301.420.6322

High Tech Pools  
Jeff Hammerschmidt, Frank Duale  
31333 Industrial Pkwy  
North Olmstead, OH 44070  
Phone: 440.979.5070

Paddock Swimming Pool Company  
Mark Wilkinson  
15129-C South Lawn Lane  
Rockville, MD 20850  
Phone: 301.424.0790

Fax: 440.979.5076

Fax: 301.424.0556

Vincent Pools  
John Bray  
1823 Deep Run Rd  
Pipersville, PA 18947  
Phone: 215.766.7541  
Fax: 215.766.8175

#### 1.4 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. 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.

#### 1.5 COORDINATION AND CLARIFICATION

- A. Coordinate with other contractors or subcontractors' work relating to this section.
- B. Must establish with other contractors or subcontractors, having related work in this section, that work necessary to complete the pool(s) as shown on the drawings and in the specifications is included in the base bid and alternates to the Owner.
- C. 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 Architect through channels established by the specifications and request a clarification ten (10) days prior to the bid date.

#### 1.6 ALTERNATES

- A. Review the description of the alternates in Division 1 and on the drawings for possible effect upon work in this section. Alternates related to the work in this section are described in this division and on the bid proposal form.
- B. Alternates
  - 1. Alternate AC-01
    - a. Base Bid: Provide piping from the pump pit to the valve box as indicated on the drawings. All associated piping to be capped for future connection at pump pit and in valve box.
    - b. Add Alternate: Provide current channel as indicated on the drawings including current channel structure, island, wing walls, ladder, piping, and

pump required to provide a functional current channel. Alternate should include additional demolition required to provide the new current channel.

2. Alternate AC-02

- a. Base Bid: No work required. All area drains on the deck to remain.
- b. Add Alternate: Provide new trench drain around the perimeter of the pool as indicated on the drawings and specifications. Alternate should include additional demolition of deck and area drains. Connection to existing storm system by Plumbing Contractor. Coordinate with alternate PC-02, if accepted.

3. Alternate AC-03

- a. Base Bid: No work required. Existing sprayground to remain.
- b. Add Alternate: Provide new sprayground including new structural pad, play features, controls, feature return piping, main drains and piping to the existing balance tank, rain diverter valve and manifold with solenoid valves as indicated on the drawings. Alternate should include additional demolition required to provide new sprayground. The current recirculation system for the sprayground must remain. Existing sprayground pump #3 to be reused for new features.

4. Alternate AC-04

- a. Base Bid: Provide piping from the pump pit to the valve box as indicated on the drawings. All associated piping to be capped for future connection at pump pit and in valve box. Existing ramp and stair to remain and new anchors and railings to be installed in those locations.
- b. Add Alternate: Provide zero entry as indicated on the drawings including zero entry structure, piping, play features, wing wall, underwater bench and feature pump required to provide a functional zero entry. Alternate should include additional demolition required to provide the new zero entry.

5. Alternate AC-05

- a. Base Bid: No work required.
- b. Add Alternate: Provide new WiBit play feature as indicated on the drawings and specifications.

6. Alternate AC-06

- a. Base Bid: No work required.
- b. Add Alternate: Provide spring type pool cover.

1.7 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.
- 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 Architect.

- 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 Architect of Record to the Architect on the bid date.
- E. Changes or modifications to the Contract Documents that are not authorized by the architect are the sole responsibility of the Contractor.

#### 1.8 SUBMITTALS

- A. Submittals must be made in accordance with the requirements of Division 1 - General Requirements 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 in two stages. The first stage must include items for the pool shell(s), reference swimming pool structural specifications. The second stage must be for remaining items. 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 the 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 the 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 Architect with copies of permits and receipts for fee payments.



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 2.1 - Overflow System
    2. Paragraph 2.2 - Pumping Equipment
    3. Paragraph 2.3 - Filtration Equipment
    4. Paragraph 2.4 - Recirculation Fittings
    5. Paragraph 2.5 - Piping Systems
    6. Paragraph 2.6 - Chemical Treatment Systems
    7. Paragraph 2.7 - Chemistry Monitoring and Control Systems
    8. Paragraph 2.8 - Flow Meters
    9. Paragraph 2.9 - Water Level Controllers
    10. Paragraph 2.10 - Deck Equipment
    11. Paragraph 2.11 - Loose Equipment
    12. Paragraph 2.12 - Thermometers
    13. Paragraph 2.13 – Swimming Pool Finishes
    14. Paragraph 2.14 - Waterproofing
    15. Paragraph 2.15 – Sealants
    16. Paragraph 2.16 - Water Features and Support Equipment (Alternate AC-01 & AC-05)
    17. Paragraph 2.17 - Pool Concrete Coping (Alternate AC-01 & AC-04)
    18. Paragraph 2.18 – Pool Deck Trench Drain (Alternate AC-02)
    19. Paragraph 2.19 – Pool Cover (Alternate AC-06)
  - E. Include engineering/construction drawings for the pool structure.
    1. Reference Division 3 - Concrete.
  - F. Include engineering construction drawings for pool piping.
  - G. Reference Section 13 1213 – Water Sprayground (Alternate AC-03)
  - H. Reference Section 13 1105 – Selective Demolition
- 1.9 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:

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. A wall-mounted color-coded piping flow diagram must be provided in the pool equipment room. The diagram must be engraved on laminated plastic with color-coded piping to match the color of coding on piping, and including valves identified with number on tags. The minimum size is 11-inch x 17 inch.
6. Include manufacturer recommended maintenance schedule, parts lists, piping diagram (to agree with wall mounted diagram) and trouble-shooting information for pool mechanical equipment.
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(s) including de-watering during the period that the pool(s) will be empty.
  - b. Water level control adjustment and chemical control operation.
  - c. Normal surge tank operation and balancing.
  - d. Filter operation and backwashing; and
  - e. Super chlorination.
8. Lubrication and maintenance instructions.
9. Guide to "troubleshooting."
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(s) 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. Six (6) 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 the required manuals and data have been received.
  - H. The contractor must provide, assemble, and inventory all deck and loose equipment including any loose mechanical equipment prior to the Owner taking possession of the pool(s). Contractor must provide a checklist that has been signed by the Owner verifying receipt of all items listed in Part 2 - Products.
- 1.10 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.
- 1.11 WARRANTIES
- A. The CONTRACTOR warrants to the Owner and Architect 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 Architect, 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 surge tank structure causing a loss of water for a period of three (3) years.
  2. Defects in material or workmanship of the pool structure causing a loss of water for a period of one (1) year.
  3. Defects in material, manufacture and installation of the filtration, backwash, chlorination, pH adjustments and cleaning systems, including controls for a period of one (1) year.
  4. Defects in material, manufacture or installation of the recirculating overflow system and interior coating of the gutter/trench for a period of one (1) year.
  5. Manufacturer's minimum ten (10) year warranty against defective materials, components, and workmanship in the pool gutter grating system.
  6. Defects in material, workmanship, and installation of the pool pumps for a period of one (1) year.
  7. Manufacturer's minimum eighteen (18) month warranty against defective materials, components, and workmanship in the variable frequency drive system.
  8. Manufacturer's minimum fifteen (15) year warranty on the filter tank against defective materials or workmanship of the tank and components. (Additional warranty time may be purchased from the manufacturer.) Prorated warranties are not acceptable.
  9. Defects in material, workmanship, and installation of the pool piping system and recirculation fittings for a period of three (3) years.
  10. Manufacturer's minimum one (1) year warranty against defective materials, components, and workmanship in the sanitizing feed system.
  11. Manufacturer's minimum one (1) year warranty against defective materials, components, and workmanship in the pH buffer feed system.
  12. Manufacturer's minimum three (3) year warranty against defective materials, components, and workmanship in the ultraviolet sanitizing system stainless steel chamber. Low pressure ultraviolet PVC chamber, power supply and lamps must have a manufacturer's minimum 1-year warranty.
  13. Manufacturer's minimum five (5) year warranty against defective materials, components, and workmanship in the pool chemical controller. ORP, pH, flow and temperature sensors must be covered by a standard two (2) year warranty. Other sensors and flow cell components must be covered by a standard one (1) year warranty.
  14. Manufacturer's minimum one (1) year warranty against defective materials, components, and workmanship in the pool water level control system.

15. Defects in material, workmanship, and installation of loose and deck equipment including deck anchors for a minimum period of one (1) year.
16. Defects in material, workmanship, and installation of the pool painted finish against delamination for a period of one (1) year.
17. Defects in material, workmanship and installation of the surge tank and backwash pit waterproofing finish against delamination for a period of one (1) year.
18. Defects in material, workmanship and installation of the pool coping against cracking and delamination for a period of one (1) year.

#### 1.12 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. The representative from the CONTRACTOR must be either a CPO (Certified Pool Operator) or have an AFO (Aquatic Facility Operator) certification.
- D. Training periods to consist of 32 hours of on-site training and scheduled as follows:
  1. 16 hours of initial training on the complete swimming pool system. Training to include winterization procedures – Refer to Section 1.2 for winterization protocol. The 16 hours of initial training must be comprised of at least 4 hours of training on water chemistry analysis and adjustment. The water chemistry training will include in-depth review of the use of the Langlier index and its computation.
  2. The initial 16 hours of training 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.
  3. 16 hours of training after the Owner's staff has had experience operating the system. This time may be requested after the pool has been placed in operation within a period of one (1) year from the time the pool was accepted by the Owner. The additional training must contain at least 2 hours of review of water chemistry.
  4. 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.
  5. The CONTRACTOR must include one (1) copy of video recording instructions in each Operations and Maintenance Manual.

#### 1.13 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 (Sodium Hypochlorite)	80 - 120 PPM
Langelier saturation index	-0.3 - +0.3
Total Dissolved Solids (TDS)	not to exceed 1,500 PPM

#### 1.14 START-UP CHEMICALS

- A. The CONTRACTOR must maintain the chemical balance of the pool water (including the cost of chemicals required) until the pool and mechanical system(s) are fully operational and accepted by the Architect and the Owner.
- B. Provide the Owner with sufficient quantities of the necessary chemicals to maintain the pool operation after the owner begins using the pool.
  - 1. Contractor is required to provide chemical quantities as shown on the drawings for the following chemicals:
    - a. Sodium Hypochlorite
    - b. Sodium Bisulfate
  - 2. Contractor is required to provide chemical quantities as shown on the drawings for the following balancing chemicals:
    - a. Sodium Bicarbonate
    - b. Calcium Carbonate
    - c. Sodium Thiosulfate
- C. Chemicals must be provided to the Owner must include those required by the chemical feed systems provided.

#### 1.15 RECORD DRAWINGS

- A. Provide a complete set of record drawings of the entire pool system(s) including sub-systems. Record drawings must be prepared in accordance with the requirements of Section 017839 and must be a complete, stand-alone set. The CONTRACTOR is permitted to obtain original documents and copy them for this purpose only. Provide the record set on compact disk (AutoCAD Release 2010 or compatible software).

## PART 2 - PRODUCTS

### 2.1 OVERFLOW SYSTEM

- A. It is the intent of the specifications that the perimeter overflow system and surface cleaning be maintained under conditions of normal operation and that no water be discharged to waste except when cleaning the filters or emptying the pool.
- B. Concrete Perimeter Overflow System
  - 1. A perimeter overflow system consisting of a continuous concrete overflow channel must be provided as detailed and shown on the drawings for the pool(s). The bottom of the trough must be level throughout.
  - 2. The complete gutter trough interior must be coated with epoxy paint. Refer to section 2.15. Areas not meeting the manufacturer's recommended thickness will be recoated without additional cost to the Owner.
  - 3. Grating systems must be oriented to provide openings that are parallel to the edge of the gutter in the configuration as shown on the drawings. Perimeter systems to be covered by a protective grating machined from UV resistant high-density polyethylene (HDPE) top grating for maximum efficiency in quelling waves. Top grating must meet and/or exceed ASTM D2047 Slip Resistance (Wet) with a nominal value of 0.62 to create a non-skid surface. Open area of grating must not be less than 32%. Color selection by Architect/Owner.
  - 4. The grating must have the ability to receive machined depth markings and warning signs into the grating. Markings to contrast in color with grating.
  - 5. Materials, anchors, and fasteners must be 304L stainless-steel.

### 2.2 PUMPING EQUIPMENT

- A. Proposed substitutions must include a mechanical drawing incorporating required changes in layout, piping, and valves. The cost of such changes must be included in the price of the substitute. Confirm correct pump motor voltage prior to ordering pump. Motors must be capable of continuously running without overloading at points on the characteristic curve of the pump without overload or damage. Confirm by 1/4-inch scale shop drawing that the pumps provided will fit within the available space and can be reasonably removed for servicing.
  - 1. Pumps must be certified by the National Sanitation Foundation (NSF) and bear the certification mark.
  - 2. If the pump is powered with a VFD, the impeller must be trimmed to a maximum diameter based on the most limiting condition of either the diameter of the maximum non-overloading rated motor horsepower at the design point or a diameter resulting in 10% greater head than the specified head.
  - 3. The pump motor must be totally enclosed, fan cooled (TEFC) and premium efficiency of the horsepower and speed specified. A pump requiring larger horsepower is not acceptable unless submitted as a substitute and approved by the engineer, in which case necessary electrical revisions must be coordinated and provided.

4. The entire pumping unit must be mounted on a base using cap screws to preserve the back-pull-out feature of the pump. Pumps must not be secured with floor studs or “all-thread.” The pump base must be coated with the same epoxy coating as the pump.
5. Recirculation and Feature Pumps – Metallic Components
  - a. Provide horizontally mounted centrifugal pumps as shown on the drawings and described in these specifications. Each pump must be of a straight centrifugal, end suction, bronze fitted, close coupled type.
  - b. Pumps manufactured by Paco, Griswold, Aurora or Herborner are considered equal, provided they meet the requirements.
  - c. Pump casing must be cast iron fitted with a replaceable bronze case wear ring. Mechanical seals must be provided specifically for chlorinated water application. Pump impeller must be enclosed type of cast bronze or 316L stainless-steel, statically, and dynamically balanced, and trimmed for the specified design conditions. If a VFD must be used in conjunction with a pump, the impeller must be trimmed to the maximum diameter based on the rated motor horsepower. Bronze materials must be suitable for use in a chlorinated environment. Suction and discharge flanges must be provided and tapped for gauge connections. Provide steel or cast-iron bases with equivalent epoxy coating for corrosion protection.
  - d. Provide a fusion-bonded epoxy coating on wetted parts to protect pump internals from corrosion, including pump volute interior and complete pump impeller (bronze impellers only). Sandblast to bare, white metal. The thickness must be 8 to 12 mils (heavy film). Verify thickness by non-destructive testing. Coat parts as recommended by the manufacturer, including preheating parts to 400 degrees and electrostatic deposition or fluidized bed technique. Provide primers if required to resist chlorinated water <10 ppm. The coating must be Scotchkote 134 manufactured by Fusecote or approved equal.
  - e. Provide a hair and lint strainer, for each pump, of fiberglass or epoxy coated stainless-steel construction with a clear observation top in the sizes (or pipe sizes) indicated on the drawings. Verify and coordinate pipe and pump suction sizes in the field. Strainer must be of a low pressure drop full-open or a tapered eccentric reducing type. Straight reducing type strainers will not be acceptable without the addition of an approved tapered eccentric reducer between the strainer and the pump (in which case, sufficient space in the pump pit must be verified). Provide a stainless-steel basket with at least 4 times the free open area as the inlet pipe, and one spare basket with each strainer.
    - 1) Basis of Design: As manufactured by MerMade Filter Inc., or Neptune/Benson Inc., or Fluidtrol Process Technologies, Inc.
  - f. Recirculation pumps must be provided by the same manufacturer. Confirm voltages prior to ordering pumps.
6. Recirculation and Feature Pumps – Composite Components



- a. Provide horizontally mounted, self-priming, centrifugal pumps as shown on the drawings and described in these specifications. The pumps must be of a straight centrifugal, end suction, non-corrosive PPO Resin material construction, closed coupled type, with integral hair and lint strainer.
  - b. The pump body, seal plate, and attached hair and lint strainer must be constructed of non-corrosive PPO Resin materials, and close-coupled to an electric motor by means of an adaptor of the same material.
  - c. The pump must have a PPO Resin diffuser to aid in priming and it must contain a replaceable bronze wear ring for the impeller. The impeller must be of the closed type and PPO Resin, non-overloading at points on the performance curve. The mechanical shaft seal must be constructed of ceramic and carbon seal faces, with stainless steel, brass, and Buna N materials in the spring bellows portion. The impeller must be secured to the motor shaft by means of a stainless-steel key and locking screw into the end of the motor shaft. The pump must be capable of operating at up to 50 psi, 104° F continuous water temperature.
  - d. The electric motor coupled to the pump must be of the NEMA Rated series JM construction with stainless steel shaft inside a removable shaft sleeve of 300 series stainless steel. Motors must be continuous duty rated at 40° C (or realign better) ambient and be suitable for outdoor installation.
  - e. Pumps must meet Department of Energy (DOE) minimum efficiency standards for dedicated-purpose pool pump (DPPP) motors.
  - f. The pump strainer must consist of a PPO Resin body, Polycarbonate Resin Thermoplastic cover with O-ring seal, and Cam and Ramp Lid, and a strainer basket of mineral reinforced polypropylene material.
  - g. The strainer basket must be securely positioned below the suction inlet of the trap, with access for inspection and cleaning through a removable trap body lid. The trap body lid must be secured by means of a locking ring. Provide one spare basket for each strainer.
7. Other System Pumps and Motors
- a. Provide one (1) portable utility pump(s). The pump(s) must be a 1 HP, 3600 RPM, 115-volt, 1 phase, 60 cycle unit capable of 60 GPM at 25 ft. TDH.
    - 1) Basis of Design: Pump must be a Godwin GSP10 or approved equal.

B. Variable Frequency Drive Starters

- 1. Provide variable frequency drive starters (VFD) for the pool pumps. VFDs must be Eco-Flow-C by H2Flow Controls, AcuDrive by Pentair, GreenDrive by Neptune Benson, or approved equal.
  - a. Basis of Design: AcuDrive by Pentair
- 2. Ensure that equipment is provided with the correct operating voltage and that interconnected electrical and electronic equipment must adequately communicate and operate the specified pumping equipment. Equipment installations must meet or exceed the requirements of the National Electric Code and other local and state regulations.

3. Variable Frequency Drive Capabilities

- a. Provide complete VFD as specified herein or in the equipment schedule for loads designated that must be variable speed or variable flow.
- b. The VFD must convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of three-phase AC induction motors. The VFD must be a six-pulse input design, and the input voltage rectifier must employ a full wave diode bridge. The output waveform must closely approximate a sine wave. The VFD must be of a PWM output design utilizing current IGBT inverter technology and voltage vector control of the output PWM waveform.
- c. Indoor Applications: VFD must be fully enclosed in a corrosion resistant NEMA 12/IP54 UL listed enclosure.
- d. VFD and required options will be incorporated by the VFD manufacturer into an integrated package, with a single input feed and main disconnect.
- e. VFD must have a fused disconnect and battery back-up, for the purpose of maintaining programming in the event of a power outage.
- f. The VFD must produce an output waveform capable of handling maximum motor cable distances of up to 1,000 ft. (unshielded) without tripping or derating.
- g. The VFD must provide rated RMS fundamental output voltage. The VFD must utilize VVC<sup>PLUS</sup>, an output voltage-vector switching algorithm, or equivalent, in both variable and constant torque modes. This allows the motor to operate at a lower temperature rise, extending its thermal life.
- h. The VFD selected must be able to source the motor's full load nameplate amperage (fundamental RMS) on a continuous basis and be capable of running the motor at its nameplate RPM, voltage, current, and slip without having to utilize the service factor of the motor.
- i. The VFD must offer a programmable motor parameter that allows the total number of poles of a motor that must be programmed to optimize motor performance.
- j. VFD must automatically boost the power factor at lower speeds.
- k. The VFD will be capable of running either variable or constant torque loads. In either CT or VT mode, the VFD must be able to provide its full rated output current continuously and 110% of rated current for 60 seconds.
- l. An Automatic Energy Optimization (AEO) selection feature must be provided in the VFD to minimize energy consumption in variable torque applications.
- m. VFD must offer a motor spinning test that will run the motor at 5 Hz until the OK button is pressed. This feature will allow the user to determine if the motor is running in the correct direction.
- n. Switching of the input power to the VFD must be possible without interlocks or damage to the VFD at a minimum interval of 2 minutes.

- o. Switching of power on the output side between the VFD and the motor must be possible with no limitation or damage to the VFD and must require no additional interlocks.
  - p. An Automatic Motor Adaptation (AMA) function must measure motor stator resistance and reactance to optimize performance and efficiency.
  - q. Cooling must be via an aluminum heat sink and must prevent the introduction of ambient air to the electronics for cooling. With the exception of the water-resistant heat sink fan, electronics must be fully sealed within the enclosure.
  - r. The VFD must have temperature-controlled cooling fans for quiet operation, minimized internal losses, and greatly increased fan life.
  - s. VFD must provide full torque to the motor, given input voltage fluctuations of up to +10% to -10% of the rated input voltage.
4. Harmonics:
- a. The VFD must provide internal DC link reactors to minimize power line harmonics and to provide near unity power factor.
  - b. The VFD must be provided with line-side harmonic reduction, as required, to ensure that the current distortion limits, as defined in table 10.3 of IEEE 519-1992, are met.
  - c. Harmonic solutions must be designed to withstand up to 2%-line imbalances with the maximum Current Distortion not to exceed 11% at 100% load.
  - d. Harmonic solutions must be capable of withstanding up to 2% ambient voltage distortion with the maximum Current Distortion not to exceed 12% at 100% load.
5. Protective Features:
- a. VFD must have input surge protection utilizing MOV's, spark gaps, and Zener diodes to withstand surges of 2.3 times line voltage for 1.3 msec.
  - b. VFD must include circuitry to detect phase imbalance and phase loss on the input side of the VFD.
  - c. Printed Circuit boards must be conformal coated to reduce the corrosion effect from environmental gases and other conditions. The conformal coating must meet IEC 61721-3-3, Class 3C2 as standard.
  - d. Automatic "No-Flow Detection" must be available to detect a no-flow situation in pump systems where valves can be closed. This must be functional in closed loop control or when controlled by an external signal.
  - e. Dry-pump detection must be available to detect if the pump has run dry. If this condition occurs, the drive will be safely stopped. A timer must be included to prevent nuisance tripping.
  - f. End-of-Pump curve detection must stop the motor when the pump is operating outside of its programmed pump curve.
  - g. VFD must provide a flow compensation program to reduce energy by adjusting the Setpoint to match changes in flow (friction loss).

- h. VFD must include current sensors on three-output phases to detect and report phase loss to the motor. The VFD will identify which of the output phases is low or lost.
6. Interface Features:
- a. VFD must provide an alphanumeric backlit display keypad (LCP) which may be remotely mounted using a standard 9-pin cable. VFD may be operated with keypad disconnected or removed entirely. Keypad may be disconnected during normal operation without the need to stop the motor or disconnect power to the VFD.
  - b. VFD Keypad must feature an INFO key that, when pressed, must display the contents of the programming manual for the parameter that is currently viewed on the display.
  - c. VFD Display must have the ability to display 5 different parameters pertaining to the VFD or the load including: current, speed, DC bus voltage, output voltage, input signal in mA, or other values from a list of 92 different user-selectable parameters.
  - d. A red FAULT light, a yellow WARNING light and a green POWER-ON light must be provided. These indications must be visible both on the keypad and on the VFD when the keypad is removed.
  - e. Two-level password protection must be provided to prevent unauthorized changes to the programming of the VFD.
  - f. A quick setup menu with factory preset typical parameters must be provided on the VFD to facilitate commissioning.
  - g. A digital elapsed time meter and kilowatt hour meter must be provided in the display.
  - h. VFD must offer as standard an internal clock. The internal clock can be used for: Timed Actions, Energy Meter, Trend Analysis, date/time stamps on alarms, Logged data, Preventive maintenance, or other uses.
  - i. A battery back-up must be provided to maintain internal clock operation during power interruptions.
  - j. Inputs and outputs must be optically isolated.
  - k. The VFD must have two analog signal inputs. Inputs must be programmable for either 0 -10V or 0/4-20 mA.
  - l. One programmable analog output must be provided for indication of the drive status. This output must be programmable for output speed, voltage, frequency, motor current and output power. The analog output signal must be 0/4-20 mA.
  - m. The run permissive circuit must be capable of sending an output signal as a start command to actuate external equipment before allowing the VFD to start.
  - n. The VFD must be equipped with a standard RS-485 serial communications port and front-of-drive accessible USB port.

7. Adjustments:
  - a. The VFD must have an adjustable output switching frequency.
  - b. Four complete programming parameter setups must be provided, which can be locally selected through the keypad or remotely selected via digital input(s), allowing the VFD to program for up to four alternate control scenarios without requiring parameter changes.
  - c. In each programming setup, independent acceleration and deceleration ramps must be provided. Acceleration and deceleration time must be adjustable over the range from 0 to 3,600 seconds to base speed.
  - d. The VFD must have four programmable "Bypass frequencies" with adjustable bandwidths to prevent the driven equipment from running at a mechanically resonant frequency. The feature must offer a Semi-Automatic program to simplify the set-up.
  - e. VFD must include an automatic acceleration and deceleration ramp-time function to prevent nuisance tripping and simplify start-up.
  - f. The VFD will include a user-selectable Reset function, which enables the selection of between zero and twenty restart attempts after a self-clearing fault condition (under-voltage, over-voltage, current limit, inverter overload, and motor overload), or the selection of an infinite number of restart attempts. The time between restart attempts must be adjustable from 0 through 600 seconds.
  - g. An automatic "on-delay" function may be selected from 0 to 120 seconds.
  - h. The VFD will include a user-selectable Auto-Restart function that enables the VFD to power up in a running condition after a power loss, to prevent the need to manually reset and restart the VFD.
8. Bypass
  - a. Provide a manual bypass in conjunction with the VFD for the recirculation pump(s) consisting of a door interlocked main fused-disconnect pad lockable in the off position, a built-in motor starter and a four position DRIVE/OFF/BYPASS/TEST switch controlling three contactors. In the DRIVE position, the motor is operated at a programmable speed or flow rate from the VFD. In the OFF position, the motor and VFD are disconnected. In the BYPASS position, the motor is operated at full speed from the AC power line and power is disconnected from the drive so that service can be performed. In BYPASS Position, a soft starter will be in the circuit to allow the motor to avoid an across the line start. In the TEST position, the motor is operated at full speed from the AC line power. This allows the drive to give an operational test while continuing to run the motor at full speed in bypass.
9. Individual VFD options such as bypass, motor selection contactors, etc. must be incorporated by the manufacturer onto a single panel with a single input feed and main disconnect function. Enclosures must be UL listed and fully assembled by the VFD manufacturer.
10. Service Conditions:

- a. The ambient operating temperature of the VFD must be -10°C to 50°C (14 to 122°F).
- b. 0 to 95% relative humidity, non-condensing.
- c. Elevation to 3,300 feet (1000 meters) without derating.
- d. VFD's must be rated for line voltage of 525 to 690VAC, 380 to 480VAC, or 200 to 240VAC; with +10% to -10% variations. Line frequency variation of  $\pm 2\%$  is acceptable.

C. Pump Gauges

- 1. Pressure gauges must be provided on the discharge of the pumps.
- 2. Compound gauges must be provided at the intake port of the pumps, after the hair and lint strainer.
- 3. Gauges must be liquid filled, 316L stainless-steel bourdon tube type with a minimum 2-1/2-inch diameter dial, high impact polypropylene or stainless-steel case, corrosion resistant white scale with black divisions and numerals, 300 Series stainless-steel heavy duty rotary bushed movement, black enameled balanced Micrometer pointer.
  - a. Basis of Design: Gauges must be manufactured by Weksler Instrument Corporation or approved equal.
- 4. Scale ranges must be selected to indicate the normal system operating pressure of each system or location within the system. Pressure ranges must be calibrated in psig (0-60 psi) and compound gauge must be calibrated in inches of mercury (0-30 in Hg / 0-60 psi).
- 5. A stainless-steel filter type pressure snubber must be provided for each pressure gauge consisting of a 3/8-inch diameter by 1/8-inch-thick micro metallic stainless-steel filter and placed in the line just before the pressure gauge. Provide isolation brass valves or brass gauge cocks at each gauge for easy replacement and maintenance.

## 2.3 FILTRATION EQUIPMENT

- A. The filter system must consist of high-rate pressure sand filter tanks as shown on the drawings. Every aspect and component of the filter system must be certified by the National Sanitation Foundation (NSF) and bear the certification mark. The filter must have an engraved metal data plate permanently affixed on the face of the system that describes operational data and instructions and indicates startup date.
- B. It is the intent of these specifications to describe a filtration system complete in every respect with accessory items and supplied and warranted by one manufacturer.
- C. Horizontally Oriented Fiberglass Tanks
  - 1. The filter tanks must be horizontally oriented single cell fiberglass tanks, minimum 42 inches in diameter. The filter system must be listed as approved by the National Sanitation Foundation prior to bid date.
    - a. Basis of Design: Fiberglass filters must be the product of Stark/Pentair, Waterco, or Neptune Benson provided they meet the specifications and

layout. System design is based upon Neptune-Benson. Valves must be provided to backwash one filter at a time.

2. Filter tanks must incorporate components and feature as described in this section.
3. Two (2) saddle style bases must be provided for tank support. Systems that incorporate stacked tanks must include similar bases and mounting saddles for the upper vessel. Tank supports and connections must be seismic rated to support the filter tank(s) for the appropriate seismic zone where the project is located. Access to the tank must be provided by a 14" x 18" manhole with two (2) curved yokes. Manhole seal must be complete with a one-piece 1/4" neoprene gasket and positioned so that internal pressure from the filter will augment the seal. No additional hardware or through bolts will be allowed.
4. Each filter tank must be equipped with the necessary flanges and connections for the internal and external piping. Connections must be comprised of fiberglass flanges and schedule 80 PVC flanges.
5. Tank connections 2 inches and smaller must be 150 lb. Type 316L stainless-steel threaded full couplings. Tank connections 3 inches and larger must be heavy steel bosses drilled and tapped both sides to receive standard flanged fittings or Sch. 40 Type 316L stainless-steel nipples.
6. The discharge from the automatic air release valve must be hard piped to waste. Each filter tank must have a means of releasing air. Each coupling or orifice must be provided with a slotted PVC sand retainer or stainless-steel strainer. An automatic air release system must be provided for each tank.
7. The drain system must consist of a 3/4-inch 316L stainless-steel coupling mounted at the lowest point in the bottom head. This drain must be valved and piped to the nearest floor drain or backwash pit.
8. Filter Piping - Internal
  - a. The lower internal distribution system must be a horizontal header/lateral arrangement. The header must be Schedule 80 PVC construction, capped on one end and flanged or threaded at the other end for field connection. Lateral connections must be spaced no more than 6 inches on centers and must be 1-1/2-inch FPT connections. Attachments to header must be solvent welded and thermo-welded to ensure integrity of connection.
  - b. Under drain system must be factory installed and constructed of extra heavy Schedule 80 high impact PVC. Multiple PVC main headers must be tapped and threaded to receive laterals.
  - c. Laterals must consist of 1-1/2-inch Schedule 80 PVC pipe with openings as required. Each lateral must be fabricated complete with socket cap on one end and male adapter on the other end. Both fittings must be solvent welded to the slotted pipe. Laterals must be designed and sized at the factory, so they are installed in the field and over the entire cross sections area of the filter.
  - d. The upper distributor must consist of PVC piping Schedule 80 and/or deflector plate per manufacturer standard design.

- e. Each filter must be supplied with a pressure equalizing upper internal distribution system consisting of a horizontal header/lateral arrangement. The header piping must be constructed of Schedule 80 PVC. The header/lateral piping and connections must be designed and sized to provide uniform distribution and unrestricted flow during the filtration and backwash cycles.
  - f. Upper laterals must be constructed of Schedule 80 PVC pipe with machine slotted openings or orifices. Machined slots or orifices must be clean, de-burred and free of obstructions that would not permit the free flow of water through the opening. Details of the lateral attachment to the header must be submitted for review and approval.
  - g. The lower and upper distribution systems must be properly supported and anchored. Hardware in wetted areas must be Type 316L stainless-steel or non-metallic. Tank interiors must be inspected prior to the media being placed in the filters.
9. Filter Piping - External (Face)
- a. External face piping must be Schedule 80 PVC pipe and fittings. Flanges must be located so as to allow for easy dismantling of face piping. Fittings must be solvent cemented.
  - b. Piping must be drilled and tapped where necessary to accommodate gauge tubing connectors.
  - c. Valves 3" and larger must be constructed with cast aluminum S12A alloy (as defined by ASTM B275) housing and fully coated with Rilsan on interior and exterior surfaces. Internal components include EPDM resilient lining, Rilsan coated ductile iron disc and 316L stainless-steel shaft. Valves must be rated for 150 psi bubble tight shutoff. Unless otherwise specified, nuts and bolts must be stainless-steel with stainless-steel washers and used when secured to PVC flanges. Systems incorporating solenoid, pneumatic, pressure amplified, hydraulic or multi-directional valves are not acceptable.
  - d. Standard accessory items must include sight glass rated for 50 psi with polycarbonate glass, remote mounted gauge panel with two 4½" diameter pressure gauges, ¼" petcocks, ¼" poly vent tubing with PVC compression adapters.
10. Backwash Control
- a. The filter manifold face piping must be designed to allow for one (1) filter tank to backwash at a time while the recirculation system is operating. A manual backwashing system must be provided with the filter system.
  - b. Manual Backwash System: The manual backwash system must be equipped with a face piping configuration such that the operator must manually control and operate both the time and sequencing of the backwash cycle. Valving on the filter face piping must be a mechanical linkage device allowing the operator to simultaneously move two (2) valves at once. Mechanical linkage components must be PVC or Type 316L Stainless-steel.
11. Automatic Air Relief Valve



- a. A 1" valve must be provided to automatically and continuously release air in the filter. The valve must be fabricated of plastic with Buna-N seals. A plumbing kit must be provided with two (2) PVC ball valves to allow manual air relief and isolation of the automatic valve. Valves fabricated of cast iron, bronze or stainless-steel valves will not be accepted.

#### 12. Filter Media

- a. Filter media must be a carefully selected grade of hard uniformly graded silica material. Media must be milled angular shaped particles of silica quartz. The filter sand must have a particle size between 0.45 mm and 0.55 mm and have a uniformity coefficient not to exceed 1.53. Specific gravity must not be less than 2.5 with a pH of 7.0.
- b. Media (sand) must be cleaned and free from clay or limestone deposits. The bottom layer of support media must be placed by hand to avoid damage to the under-drain system and leveled before the addition of the upper layer of filter media.
- c. Media must be delivered after approval by the manufacturer of the filter and stored in 100-pound bags for ease of handling and elimination of possible contamination.
- d. Media must be supplied by the filter manufacturer and approved by the filter manufacturer prior to shipping.

#### 13. Support Media

- a. A gravel support media of a hard-coarse aggregate with a sub-angular grain shape with a particle size of 1/8" x 1/4" must be used on the inside of the bottom head to the elevation where the filter media commences. The specific gravity must not be less than 2.5. Support media must be placed by hand to avoid damage to the underdrain system and leveled before the addition of the upper layer of filter media. Concrete under fill is not recommended. Support gravel must be delivered and stored in 100-pound bags (approximately one cubic foot) for ease of handling and elimination of possible contamination. Media must be free from minerals which can precipitate onto pool surfaces.
- b. Sand must be a carefully selected grade of hard, uniformly graded silica material. Media must be naturally rounded particles of silica or milled angularly shaped particles of silica quartz. Sand must have a particle size between 0.45mm and 0.55 mm (#20). No more than 1.5% is allowed to pass through a #40 sieve (.0164"). Uniformity coefficient must not exceed 1.53. Specific gravity must be not less than 2.5. The filter must contain a minimum bed depth as recommended by the manufacturer. Systems which do not provide a minimum bed depth will not be accepted. Sand must be delivered and stored in 100-pound bags (approximately one cubic foot) for ease of handling and elimination of possible contamination. Media must be free from minerals which can precipitate onto pool surfaces.

## 2.4 RECIRCULATION FITTINGS

- A. Main drains must be PVC/Fiberglass box with PVC grating or 12-gauge 316L stainless-steel as sized on the drawings. Grate openings must not exceed 11/32 inch in width, providing an open flow area to allow water velocity not to exceed 1.5 fps. The grate must be PVC or stainless steel and fit closely and flush with top surface of frame and secured to frame with vandal proof fasteners. The exposed edges of main outlets must be rounded and smooth, free of burrs and sharp edges. Main drain covers must comply with the Virginia Graeme Baker Act and ANSI/APSP-16 2017.
- B. Provide a water bonding fitting PB-SK-20 manufactured by Perma-cast Swimming Pool Products or approved equal. Bonding fitting must be installed at the lowest point of the main drains.
- C. Provide hydrostatic relief valves consisting of a 2" cyclac relief valve connected to an FPT commercial style Schedule 80 PVC collector tube. The collection tube must have seepage holes, 3/8 inch in diameter, and must be screwed securely to the valve body. The hydrostatic relief valve must be designed to seal with minimum pressure and must have a non-plugging, self-cleaning raised valve seat. The hydrostatic relief valve must be Hayward model #SP1056 with collector tube model #SP1055, Aquastar model #HVC101 or approved equal.
- D. Concrete dropout boxes (converters) must be concrete sumps with 12-gauge 316L stainless-steel frame and PVC grating and sized as shown on the plans. Grate openings must not exceed 11/32 inch in width, providing an open flow area to allow water velocity not to exceed 1.0 fps. The grate must be PVC and fit closely and flush with top surface of frame and secured to frame with vandal proof fasteners. Provide a no-leak seal flange at the midpoint of the boxes.
- E. Wall inlet fittings must be cyclac directional inlet Hayward model #SP-1421-E mounted in model #SP-1022S, Aquastar model #3301 or approved equal from Sta-Rite. (Alternate AC-01 and AC-04)
- F. Valve Box
  - 1. Valve box cover(s) that are not specified on the drawings or specifically identified as another size or material must be a solid HDPE lid(s) by Daldorado or approved equal. Access covers must be sized as shown on the drawings and be constructed of 1" thick marine grade HDPE with a slip resistant surface. Valve box must be provided with a 3" x 3" x 1/4" FRP I-beam across the center of the opening as shown on the drawings. The valve box cover must come with corrosion resistant hardware to secure the hatch. The access cover must have an identification plate with 1.5" high font identifying the contents below the cover. Refer to Architect for color selection.
- G. Anti-vortex plates must be provided at the suction points of the main recirculation pump(s) in the surge tank(s). Each plate must be connected to the suction pipe via a PVC flange and must be 1/2 in. thick with minimum dimension of at least 2.5 times the connecting pipe diameter. The plate must be located 4 inches above the finished floor of the surge tank. Four (4) 3/4 in. stainless-steel threaded rods, nuts, anchor bolts and washers must be used to fix the offset distance and provide a secure base for the suction pipe. Manufactured fiberglass or PVC anti-vortex plates by Daldorado, Neptune-Benson or approved equal.

## 2.5 PIPING SYSTEMS

### A. General

1. Provide recirculating piping between the pool(s) and the filter room, fill receptor and interconnecting piping to and from the chemical feed systems and chemical controller.
2. Provide necessary pipe supports and support systems required to support associated piping and valves.
3. Provide other tubing, conduit, or piping associated with equipment specified herein. Coordinate with other trades.

### B. Pipes

1. Pipe routing as shown and detailed on the contract drawings is diagrammatic only and is not intended to show minor details or exact locations of piping systems. Installation is required and must be adjusted to accommodate interference and adjustments anticipated and encountered. Pipe sizes on plans refer to the nominal inside diameter of the pipe.
2. PVC swimming pool piping must be NSF approved and conform to the requirements of ASTM D-1785.
3. PVC pipes must be the product of one manufacturer. Approved manufacturers of PVC piping are Eslon, Harvel, and Chemtrol or approved equal.
4. Swimming pool piping above the floor or deck in the filter room must be Schedule 80 PVC.
5. Swimming pool piping below the filter room floor or deck must be NSF approved, Schedule 80 PVC.
6. Swimming pool piping under the pool floor must be NSF approved, Schedule 40 PVC and concrete encased. Transitions between Schedule 40 and Schedule 80 must be encased in concrete.
7. Below grade swimming pool piping not located beneath the pool floor can be backfilled with native granular material free of ice, clay, debris, organic matter, and rocks larger than 4" across their greatest dimension, and per recommendations indicated in the project geotechnical report.
8. PVC and CPVC fittings must be the product of one manufacturer. Molded fittings must be manufactured by Asahi, Eslon, Chemtrol, Harvel, Spear, Lasco or acceptable substitute. Fabricated fittings must be manufactured by Harrison Machine, Plastinetics, or acceptable substitute.
9. Vertical sight sump piping must be NSF approved, Schedule 40 PVC. Horizontal sight sump piping must be NSF approved, Schedule 40 PVC that is perforated and wrapped with fabric and have 3/8" diameter holes located top and bottom on 4 ft centers. Horizontal sight sump piping must extend 1 ft minimum beyond the main drain.
10. Chemical feed lines from chemical feeders to recirculation piping must be Schedule 80 PVC piping. Piping must be hard piped into the recirculation piping via tee or saddle per the drawings. Required valves must be of PVC construction.

11. Splash collar for the fill funnel must be clear Schedule 80 PVC and manufactured from a Type I, Grade I PVC compound with a Cell Classification of 12454 per ASTM D1784. The pipe must be manufactured in compliance with ASTM D1785.
12. Y-strainers for piping sized 4" or smaller must be Hayward YS Series strainers with FPM O-rings or approved equal. Y-Strainers for piping sized 6" or larger must be Fluidtrol WYE Series strainers with EPDM gaskets or approved equal. Provide an extra perforated screen with each strainer. (Alternate AC-03 and AC-04)
13. Flanged plumbing connection hardware must be stainless-steel.
14. Materials must be installed by workmen thoroughly skilled in their trades and work must present a neat and mechanical appearance when complete. At no additional expense to the Owner, replace or correct work not judged acceptable by the Architect, Owner's testing agency, or their consultants.
15. Support hardware, brackets, fasteners, hangers, etc. furnished and installed in the surge tank must be 316L stainless-steel.
16. No installation allowed that will provide a cross-connection or interconnection between a distributing supply for drinking purposes and the swimming pool, or between the pool and a sanitary or storm water sewer system that will permit a backflow of water into the pool water system.
17. Piping must be hydrostatically (water) pressure tested for leaks before and after backfilling to guarantee water tightness. Pneumatic (air) pressure test not allowed.
18. Provide water seals for watertight penetrations of concrete walls and floor slabs.
  - a. Pool Concrete: Water seals must be coupling or sleeve type with a thermo welded or molded flange and the O.D. must be sized to 150% of the O.D. of the pipe. The thermo-welded type must be welded from both sides. Water seals must be located at the centerline of the wall or slab being penetrated prior to placing the concrete to assure a watertight seal. Manufactured fiberglass and PVC water seal fittings by Daldorado, A.S.A. Manufacturing, Aqualogic or approved equal.
  - b. Pump Pit: Link seals must be provided in the sizes and quantities shown on the drawings and installed to provide flexible watertight penetration. Metal parts must be made of 316L stainless steel. Links must form a continuous rubber seal that is tightened with a series of stainless-steel bolts to form a watertight seal. Link seals must be manufactured by GPT, Calpico Inc. or an approved equal. Xypex Patch'n Plug or approved equal must be used to seal pipe penetration. Link seals must be installed with either a cored hole or a Century Line pipe sleeve.
  - c. Surge Tank: Water seals must be coupling type with a thermo welded or molded flange and the O.D. must be sized to 150% of the O.D. of the pipe. The thermo-welded type must be welded from both sides. Water seals must be located at the centerline of the wall or slab being penetrated prior to placing the concrete to assure a watertight seal. Manufactured fiberglass and PVC water seal fittings by Daldorado, A.S.A. Manufacturing, Aqualogic or approved equal. Link seals are also acceptable with a cored hole or a Century Line pipe sleeve.

- d. Renovation:
    - 1) For wall penetrations with dry-side access (Mechanical Room/Pipe Tunnel), provide Link Seals with bolt head access from the dry side, Xypex Patch and Plug (on the wet side), Xypex Concentrate and Dry-Plug, and Xypex Megamix II or Non-Shrink Grout.
  - 19. Adhere to the applicable provisions in Division 22 - Plumbing, "General Provisions" and "Basic Materials and Methods" for installation of piping system.
  - 20. Mechanical equipment must be connected into the recirculation piping system must be connected utilizing flanged or union connections.
  - 21. Provisions must be made to purge pipes in the system.
  - 22. Concentric reducers must be fiberglass by MerMade Filter, Inc., or equivalent reducers of schedule 80 PVC construction.
- C. Pipe Hangers and Supports
- 1. Manufacturer
    - a. Subject to compliance with these specifications, pipe hanger and support systems must be manufactured by Cooper B-line (basis of design), Inc, TOLCO, and Anvil International or approved equal.
  - 2. Hangers
    - a. Pipes 2 inches and smaller
      - 1) Adjustable steel clevis hanger, B-Line models B3100 or B3104.
      - 2) Adjustable steel swivel ring (band type) hanger, B-Line model B3170.
    - b. Pipes 2-1/2 inches and larger
      - 1) Adjustable steel clevis hanger, B-Line model B3100.
      - 2) Adjustable steel yoke pipe roll, B-Line model B3114.
  - 3. Multiple or Trapeze Hangers
    - a. Trapeze hangers must be constructed from 12-gauge roll formed ASTM A1011 SS, Grade 33 structural steel channel, 1-5/8 by 1-5/8-inch minimum, B-Line B22 strut or stronger as required.
    - b. Mount pipes to trapeze with 2-piece pipe straps sized for outside diameter of pipe, B-Line B-2000 series.
  - 4. Wall Supports
    - a. Pipes 2-1/2 inches and smaller
      - 1) Steel offset "J" hook hanger, B-Line model B3600.
    - b. Pipes 3 inches and larger
      - 1) Welded strut bracket and pipe straps, B-Line models B3064 and B2000 series.

- 2) Welded steel bracket B-Line model B3066 or B3067 with roller chair or adjustable steel yoke pipe roll. B-Line model B3120 or B3110.
  5. Floor Supports
    - a. Electroplated carbon steel adjustable pipe saddle and nipple attached to steel base stand sized for pipe elevation. B-Line model B3092 and B3088T or B3090 and B8088. Pipe saddle must be screwed or welded to appropriate base stand.
  6. Vertical Supports
    - a. Steel riser clamp sized to outside diameter of pipe, B-Line model B3373.
  7. Plastic Pipe Supports
    - a. V-Bottom clevis hangers with galvanized 18-gauge continuous support channel, B-Line models B3106 and B3106V, to form a continuous support system for plastic pipes smaller than 1 inch or flexible tubing.
    - b. A vented and sloped continuous PVC Schedule 40 pipe no smaller than 1-1/2 inch outside diameter will be used to route flexible tubing with the appropriate pipe supports.
  8. Supplementary Structural Supports - Design and fabricate supports using structural quality steel bolted framing materials. Channels must be roll formed, 12-gauge ASTM A1011 SS Grade 33 steel, 1-5/8 inch or greater as required by loading conditions. Submit design for pipe tunnels, pipe galleries etc. for approval. Use clamps and fittings designed for use with the strut system.
- D. Hanger Attachments
1. Upper Attachments
    - a. Beam Clamps
      - 1) Beam clamps must be used where piping must be suspended from building steel. Clamp type must be selected on the basis of load supported and load configuration.
      - 2) C-Clamps must be locknuts and cup point set screws similar to B-Line model B351L or B3036L. Top flange c-clamps must be used when attaching a hanger rod to the flange of structural steel, B-Line model B3034 or B3033 or approved equal. Refer to manufacturer's recommendations for set screw torque. Retaining straps must be used to maintain the clamp position on the beam where required.
      - 3) Center load beam clamps must be used where specified. The steel clamps must be B-Line models B3050 or B3055. Forged steel beam clamps with cross bolt must be B-Line B3291-B3297 series or approved equal as required to fit beams.
    - b. Concrete Inserts
      - 1) Cast in place spot concrete inserts must be used applicable, either steel or malleable iron body, B-line B2500 or B3014 or approved equal. Spot inserts must allow for lateral adjustment and have means for attachment

to forms. Select inserts to suit threaded hanger rods sizes, B-line models N2500 or B3014N series.

- 2) Continuous concrete inserts must be used where applicable. Channels must be 12 gauge, ASTM A1011 Grade 33 structural quality carbon steel, complete with Styrofoam inserts and end caps with nail holes for attachment to forms. The continuous concrete insert must have a load rating of 2,000 lbs/ft. in concrete, B-Line models B22I, 32I, or 52I or approved equal. Select channel nuts suitable for strut and rod sizes.

E. Hanger Accessories

1. Hanger rods must be threaded on both ends or continuously threaded rods of circular cross section. Use adjustable lock nuts at upper attachments and hangers. No wire, chain, or perforated straps are allowed.

F. Hanger Finish

1. Indoor Finishes
  - a. Hangers must be zinc plated in accordance with ASTM B633 or must have an electro-deposited green epoxy finish.
  - b. Strut channels must be pre-galvanized in accordance with ASTM A653 SS Grade 33 G90 or must have an electro-deposited green epoxy finish.
  - c. Zinc Plated hardware is not acceptable for use in chemical rooms.

G. Valves

1. Valves 3 inches and larger must be butterfly type valves, with PVC body, 150# SWP with stainless-steel shaft, PVC or polypropylene disc and replaceable resilient seat bonded to a rigid shaft and guaranteed for bubble tight shutoff from 27-inch vacuum to 150 PSI. Extended neck 2 inches beyond flanges for insulated piping must be provided with handle for manual operation. Valve components must be suitable for swimming pool chlorinated water service. Butterfly valves must be Georg Fischer Type 563, Asahi/America Type SP Pool-Pro, Chemtrol Model-B, Simtech VP series, Colonial Valve 411 Series, or approved equal.
2. Valves smaller than 3 inches must be PVC true union ball valves, full port, three-piece construction, blowout-proof stem, Viton seal with socket end connectors.
3. Check valves must be a quick closing non-slam type, either self-aligning wafer or flanged type, of corrosion resistant materials suitable for use in a swimming pool environment. Provide check valves in accordance with the manufacturer's recommendations. Locate check valves at least 5 pipe diameters from pumps and fittings. Check valves must be Technocheck Corp., model 5050, with epoxy coated cast iron body and bronze swing plates on a stainless-steel spring, Colonial Valve model 601N or 601NP PVC valve with EPDM O-ring and stainless-steel spring or approved equal, for installation between 150 lb. flanges.
4. The modulating float valve in the surge tank must have a PVC body and stainless-steel wafer disc. Hardware must be non-corrodible. The float-operated valves must be provided horizontally on the main drain lines in the surge tank(s). Valve must consist of non-corrosion components including shaft, float arm, pins, and floats. Valve must be suitable for mounting on a 125E class standard PVC flange. The float

arm leverage weight and pivot lengths must be adjustable to obtain desired ratio of surge tank level change to pool gutter overflow level change. Two floats and a stabilizer required. Valve must be model FV-D XWB (Extra Weight Ball) as manufactured by MerMade Filter, Inc. or approved equal manufactured by Neptune-Benson, EPD, or Fluidtrol Process Technologies, Inc.

5. Submerged valves up to 3 inches must be PVC true union ball valves. Submerged valves over 3 inches must be PVC bodied, wafer type, butterfly valves with stainless-steel handle extensions as required. Valves must be by approved manufacturers listed above. Submerged valves must be provided with stainless-steel connectors. The stem housing extensions must be properly supported and braced.
6. Butterfly type valves 8 inches and larger must be fitted with a watertight gear operator.
7. Valves located 7 feet or greater off the floor must be fitted with a chain operator.
8. Submerged valves, valves buried below grade, or valves not readily accessible, must be provided with a stainless-steel reach rod and handle.
9. Valve hardware must be 316L stainless-steel and meet ANSI hardware installation guidelines.

H. Pipe and valve identification

1. Exposed pool piping must be equipped with color coded flow directional arrows at thirty (30) inch intervals per local and state swimming pool health code. Verify that pool piping identification is in accordance with local and state health regulations.
2. Valves must be identified with minimum 1-1/2-inch diameter plastic laminate engraved tags with minimum 1/2-inch-high numbers. Tags must be fastened to valves with a nylon attachment (zip tie). Valves must be described as to their function and referenced in the operating instruction manual and wall mounted piping diagram that must be prepared.

## 2.6 CHEMICAL TREATMENT SYSTEMS

A. Sodium Hypochlorite (Liquid Chlorine)

1. Chemical feeders for chlorine must be peristaltic type pumps. Chemical feed pump(s) must be provided and connected to the filtered water return lines to the pool(s) as shown on the pool plans. The pump(s) must be capable of feeding a solution to the pool(s) to maintain chlorine (12% sodium hypochlorite) level against the back pressure involved and must be fully adjustable while in operation.
2. Chemical feeders must be manufactured by LMI, ProMinent, G. H. Stenner & Co., or approved equal.
3. The pump(s) must be provided complete with fractional horsepower motor for 120V, 60 Hz current, plastic feed lines, and fitting necessary for connections to the pool system piping.
4. Chemical pumps must be electrically connected to and operated by the water chemistry controllers.



5. The chemical pump(s) must be affixed with a metallic stamped label indicating the chemical being pumped and the pool to which it is connected.
6. Wall mount or provide non-metallic shelf support for the chemical feed pump(s).
7. Feeder systems must be provided with a check valve at the point of injection into the pool recirculation system.
8. Provide "Vapor Shield" vent check valve for the bulk tank which seals container while allowing the liquid to remove via pump. The Vapor-Shield must prevent an internal vacuum and collapse of a sealed container. It will also prevent the pump from developing a vacuum-lock while attempting to remove the liquid from the sealed container. The Vapor-Shield must prevent the release of chlorine vapors. The Vapor-Shield body must be constructed entirely from schedule 80 PVC with polypropylene tube fittings and factory-installed chlorine resistant viton sealant on threaded connections. The diaphragm and O-rings must be constructed of chlorine resistant viton. No metallic or materials not rated appropriate for use with chlorine must be used. The Vapor-Shield must be fitted with a  $\frac{3}{4}$ " male NPT threaded fitting to allow for the installation onto a threaded bulkhead fitting located at the top of the bulk chlorine tank. The unit must be supplied with no less than fifteen (15) feet of polyethylene tubing. Vapor shield chlorine vent must be Recreonics #52-095 or approved equal. An Acid Fume Scrubber, part #7747090, with refill reagent kit, #7747091, manufactured by ProMinent is an equal.
9. Bulk Chlorine Tank
  - a. Provide two (2) 200-gallon bulk chlorine solution tanks in the chlorine room as shown on the drawings. The tank must be a double wall bulk tank constructed of polyethylene rigid support with top manway and vent. Tank must be 41" outside diameter by 52" high. The manufacturer must be Chemtainer, Industries, TC4152DC or approved equal.
  - b. Bulk chlorine tank must be provided with fittings for venting as shown on the drawings. Coordinate fitting locations at the top of the tank with manufacturer prior to ordering. Field cutting tank for additional piping penetrations will not be accepted.

B. pH Buffering System (Dry Acid)

1. Shop drawings complete with a piping diagram depicting the location in which the dry acid feeder is connected to the system must be provided and approved prior to installation. Installation of the system must be as specified in the manufacturer's directions with no exceptions taken.
2. Acid Rite
  - a. General Description
    - 1) The system must be designed to erode Acid-Rite tablets, creating an acid solution, and feeding the solution intermittently or continuously as required for pool applications. The system must be a single pre-assembled, package unit with a welded aluminum frame consisting of an Acid-Rite feeder, electrical box, centrifugal pump, and balance tank for ease of installation and operation. The system must be the Acid-Rite pH Adjustment System by Axiall, a Westlake Company. Only Acid-

Rite Tablets by Axiall must be used with a red colorant added for safety (to help prevent accidental mixing with other chemicals).

- 2) The system must use an NSF Standard 50 listed erosion feeder and tablet combination and must be capable of meeting the requirements of the Health Department having jurisdiction over the installation.

b. System Features

- 1) Delivery must be by erosion feed technology for accurate control of acid addition. Soaking type, spray and/or vortex technology systems are not acceptable.
- 2) The acid feed system must automatically and continuously feed a limited quantity of acid solution as needed. When the system is not running, no more acid solution than that amount which can be fed in 2 minutes or less must be left in the tank to prevent dilution. Batch systems preparing excess quantities of solution for delivery over an extended period are not acceptable.
- 3) A centrifugal pump wired to the system electrical box must feed freshly mixed acid solution only as required for maximum efficiency. Batch systems requiring the use of a metering pump or pumps to feed pre-prepared standing solution are not acceptable.
- 4) Piping in the acid feed system must be Schedule 80 PVC. Systems with flexible tubing are not acceptable.

c. System Components

- 1) Acid Feeder: Acid-Rite feeders by Axiall are designed exclusively for Acid-Rite tablets by Axiall. Tablets are placed on a plate inside the feeder; as water flows across the plate, the tablets erode at a rate proportional to the flow rate. The lid color must be red, matching the pail lid color to avoid mixing chemicals.
- 2) Inlet Filter: A filter is included to prevent debris from entering the float valve.
- 3) Inlet Water Supply Connection: 1" Socket (water supply of 10 GPM required).
- 4) Solution Tank Capacity:
  - a) Model 2500: 22 gallons
  - b) Model 450: 6 gallons
- 5) Primary Solution Tank Level Control: Made from Schedule 80 PVC and 316L stainless-steel, this 1" float valve meters the flow through the feed system. The float valve opens or closes to maintain the pump rate as it is manually throttled.
- 6) Solution Delivery Pump: Delivers acid solution to the aquatic system return line. A single-stage centrifugal pump is provided for systems with pressures up to 20 PSIG.

- 7) Solution Injection Pump Air Bleed: Used to prime the pump at start-up.
- 8) Flow Meter: A flow meter, measuring the flow of the water-dissolving stream through the feed system.
- 9) Primary Backflow Prevention: A PVC check valve prevents reverse flow of water into the system.
- 10) Discharge Flow Control Valve (manual): PVC gate valve allows operator to adjust flow of solution to the pool system.
- 11) Overflow Port: A 1" FPT port is located on the back side of the feeder solution tank.
- 12) Stacking Cartridge:
  - a) Model 2500: Utilizes divider plates to permit control of lower delivery rates.
  - b) Model 450: Utilizes a stacking cartridge that allows 1-7 stacks of tables to permit control of lower delivery rates.
- 13) Outlet Connection: 1"
- 14) NEMA 4x Electrical Enclosure
- 15) Aluminum Frame: Type 6061-T.

#### C. Ultraviolet Dechloramination and Disinfection System

##### 1. Low Pressure UV

- a. Ultraviolet Disinfection Equipment: Must operate within the UVC electromagnetic spectrum emitting 185nm and 254nm wavelengths to provide constant disinfection/inactivation of bacteria, algae, molds and viruses, and destruction on monochloramines, trichloramines, and dichloramines at 40 or 45 mj/cm2 @ 91% UVT. Refer to drawings. Sentry Aqua Guard by ChlorKing or approved equal. Deviations/exceptions must be provided in writing to and approved by the designer prior to the bid date.
- b. Certifications
  - 1) Certified for pool and spa end use.
  - 2) Product must meet the requirements of NSF/ANSI 50, Annex H.1: Disinfection Efficacy for the  $\geq 3$  log reduction of *Enterococcus faecium* (ATCC #6569) and *Pseudomonas aeruginosa* (ATCC #27313).
  - 3) Product must have secondary disinfection certification and been tested to confirm a minimum inactivation equivalent of 3 log (99.9%) *cryptosporidium parvum* in accordance with NSF 50 and the US EPA UV DGM
- c. The UV System must consist of:
  - 1) The ultraviolet light disinfection chamber constructed from schedule 80 PVC with an interior lining of 316L stainless steel, (models SAG-

120APVC-CR to SAG-480APVC-CR), or 316L stainless steel, electro-polished and passivated, (models, SAG-120A-CR through SAG-1200A-CR). Refer to drawings.

- a) Each chamber must contain 1 – 12, 120-watt high output amalgam lamps and quartz sleeves emitting 185nm and 254nm wavelengths to provide constant disinfection/inactivation of bacteria, algae, molds and viruses, and destruction on monochloramines, trichloramines, and dichloramines at 45mj/cm2 @ 91% UVT.
  - b) Each chamber must contain 1 – 12 quick disconnect sleeve removal assemblies so that lamps and sleeves can be easily and timely removed from the chamber without having to drain any water from the chamber when cleaning/repair/replace is required.
- 2) One (1) power supply containing 1 – 12 ballasts with the following information clearly visible on the front panel:
    - a) mW/cm2 display
    - b) mJ/cm2 dose display
    - c) Actual flow (gpm) of the pool circulation system
  - 3) The design of the system to be such that the disinfection chamber can be installed vertically or horizontally, and that inlet/outlet flange configuration can be same side or apposed side for easy installation.
  - 4) Ultraviolet light systems that do not utilize high output amalgam lamps and emit only 254 nm wavelengths are not accepted as equal.
  - 5) Ultraviolet light systems tested and certified at mj/cm2 output of lower than 45 and UVT higher than 91% are not accepted as equal.
  - 6) The manufacturer to verify proper operation of the lamps and all controls by connection to water for a factory test prior to shipping.
- d. Chamber Construction
- 1) The ultraviolet light system to be constructed of schedule 80 PVC with an interior lining of 316L stainless steel, (models SAG-120APVC-CR to SAG-480APVC-CR with flows up to 352gpm), or passivated, electro-polished 316L stainless steel, (models, SAG-120A-CR through SAG-1200A-CR with flows up to 1,141gpm)
  - 2) The chambers to allow access for maintenance at least one end.
  - 3) Union/flange sizes to be available from 2" – 12" (model specific).
  - 4) An air bleed valve to be located on the top of the chamber for removal of unwanted trapped air.
  - 5) A drain plug to be located at the bottom of the chamber for easy draining during routine repair/maintenance.

- 6) A flow sensor/pressure sensor to be field installed and wired to the power supply to not allow the system to operate when there is not sufficient flow.
- e. Output and Transmittance
  - 1) The ultraviolet light system to be third party tested and certified for operation at 45mj/cm2 at 91% UVT.
- f. Ultraviolet Lamp(s)
  - 1) Ultraviolet lamp to be 120-watt high output amalgam lamp(s). Lamp(s) to be designed to emit continuous Ultraviolet light wavelengths of 185nm and 254nm to provide constant disinfection/inactivation of bacteria, algae, molds and viruses, and destruction on monochloramines, trichloramines, and dichloramines.
- g. UV Strainer
  - 1) The UV system must be provided with a downstream strainer to protect against the possibility of lamp/quartz breakage traveling downstream.
- h. Controls
  - 1) LED display showing mW/cm2, mJ/cm2 and flow rate of the pool recirculation system. The system to also be capable of individual lamp monitoring through the use of a current sensor.
- i. Electrical Controls
  - 1) The ultraviolet light system to be equipped with a single pole contactor for supply voltage. Supply voltage to be 110-120 volt/60 hertz/single phase.
  - 2) A standard 10 amp or 20-amp GFCI breaker to be acceptable.
  - 3) An additional 110-120 volt/60 hertz/single phase to be required for secondary control.
- j. Operation and Ratings
  - 1) The UV unit to be capable of continuous operation without interruption at 45mj/cm2 for 13,000 hours EOL. Intermittently operated lamps where on/off cycles exceed once per day will reduce lamp life significantly.
  - 2) The UV unit to be capable of operating in air temperatures between 35F and 110F and water temperatures between 40F and 104F.
- k. Manufacturers must maintain spare or replacement parts in the USA for same day or not longer than next day delivery in North America.

## 2.7 WATER CHEMISTRY MONITORING AND CONTROL SYSTEMS

- A. A programmable pool chemical automation system must be provided for continuous monitoring and control of the pool(s) water chemistry and related disinfection equipment. Installation of the system must be per the manufacturer's specification. A factory trained/authorized representative must provide training to the Owner and the training

must be video recorded. Water chemistry controllers must be provided by ProMinent Fluid Controls, BECS Technology, SB Control Systems, or a technically equal system capable of providing equal performance for operating functions.

- B. The water chemistry control systems for the pool(s) must feature and be capable of the following. Water chemistry controllers without these capabilities and features are not considered equal. Water chemistry control system requirements are based upon the following products: ProMinent DCM513, BECSys5, Chemtrol 3000.
1. Continuous, real-time monitoring and control of pH and ORP.
  2. System flow rate, water chemistry balance calculations, water temperature, and other readings and control as deemed necessary for the project per this section.
  3. The controller must manage the recirculation pump with a programmable Fireman Cycle feature, which automatically turns off the UV and Auxiliary systems prior to shutting off the recirculation pump.
  4. Management of the recirculation pump on/off status.
  5. Management of the water level in the pool or surge tank and must provide programming to lock out chemical feed during potable water fill events.
  6. The utilization of simultaneous ORP and PPM (bracketing) control for managing both the quantity and quality of the sanitizer/oxidizer. Controllers that do not have the ability to control simultaneously to ORP and PPM control points or that utilize an alternate chlorine set point or boost function will not be considered equal.
  7. Actuating outputs in the following operator selectable modes: off, manual, automatic, proportional and must have a manual on fail-safe timer to ensure that if the controller is left in manual mode, the controller will revert back to automatic mode to prevent an over-feed event.
  8. Programmable events can be time set to occur daily, weekly, or monthly.
  9. Remote monitoring of the recirculation flow rate of the system when installed with compatible magmeters.
  10. Provide use of flow signal as a supplemental chemical feed interlock to prevent the dosing of chemicals during a system low flow/no flow condition.
  11. Controller must continuously monitor data-log while being monitored and control via two-way remote communication.
  12. Controller must continuously calculate and display the Langelier Saturation Index and Ryznar Index using either sensor data and/or manual input for pH, temperature, total alkalinity, and calcium hardness.
  13. Programmable high and low alarm levels for control functions with operator-selectable feed lockout and alarm buzzer options.
- C. Performance and Certifications
1. The controller system must be NSF/ANSI 50 listed for automatic controller equipment for swimming pools, spas, and other recreational water facilities.
  2. The controller system must be certified to UL61010/IEC61010, standards.

3. The controller must automatically activate the appropriate chemical feeders in order to maintain the sanitizer/oxidizer level:
  - a. Within +/- 0.1 parts per million (PPM) or +/- 10 mV (millivolts) of oxidation reduction potential (ORP)
  - b. The pH within +/- 0.1 pH unit of the set points selected by the operator.
  - c. Set point and calibration levels must be adjustable with a keypad mounted on the front panel of the unit as well as the remote interface.
  - d. The controller must use pH sensor with +/- 0.04 accuracy in the operational range of 6.8 – 8.2 as certified by NSF.
  - e. An ORP sensor with an accuracy of +/- 3% mV as certified by NSF.
- D. System Supply
  1. The controller must be factory supplied with:
    - a. ORP, pH, temperature, and free chlorine sensors.
    - b. A flowrate sensor to measure system flowrate.
- E. Hardware
  1. The controller must have:
    - a. A minimum of seven (7) fully configurable digital inputs.
    - b. A minimum of four (4) fully assignable digital outputs.
    - c. A minimum of nine (9) configurable analog inputs.
    - d. A minimum of five (5), 115 VAC fully assignable relays.
    - e. The controller must be capable of expanded capabilities with an optional input/output expansion card kit.
    - f. High voltage field wiring must be through a separate NEMA 4X factory engineered and supplied enclosure that precludes direct access to controller electronics. High voltage connections must be clearly identified, and a field wiring diagram must be provided with the controller for installer reference. Controller high-voltage relay assignment parameters must be programmed at the factory prior to delivery to installation location.
    - g. The controller must include a sensing flow cell that is hydraulically designed to allow verified correct flow and consistent pressure across sensors. Flow cell will be clear PVC that is modular in concept and have the flexibility to add supplementary water chemistry sensors as desired. The sensing flow cell must include a safety flow switch sensor, water spigot, and isolation valves.
- F. Communications
  1. The controller must have as a standard feature:
    - a. Controller must include the capability of ethernet connection and secondary wireless communication.

- b. The controller must allow full two-way remote communication and full control of parameters.
- c. Accessibility with a standard internet browser using a fully interactive Ethernet TCP/IP graphical interface that includes security access codes.
- d. Real-time monitor/control with real-time auto polling, data logging, email and text alarms and providing both graphical and report formats via a personal computer, smartphone, or tablet device.
- e. Controller must have the ability to facilitate email or text alarm notifications, historical graphing, and real-time control via a personal computer, smartphone, or tablet device.
- f. Controller must have the ability to export a .csv file once per day with reading type, time, and reading. The export must be done via email and must include the controller serial number. Export data must include ORP, pH, and Temperature.
- g. The controller must have the ability to allow software upgrades and programming as needed in the field.

G. Commissioning and Manuals

- 1. The control system must be provided with on-site start-up operator training performed by a representative trained and authorized by the controller manufacturer.
- 2. The manufacturer must supply an operation and maintenance manual describing features, operating instructions, maintenance procedures and replacement parts.
- 3. Installation of the system must be per the manufacturer's specification and no exceptions must be allowed. A factory trained/authorized representative must provide training to the owner and the training must be video recorded.

## 2.8 FLOW METERS

A. Flow Meter

- 1. Flow meters (1 required) must be provided according to the manufacturer in the filtered water return lines to each of the pools. The flow sensor must be the GF Signet 2551 insertion magmeter. Provide the coaxial cable from the sensor to the display/transmitter. Flow meter accuracy must be +/- 2% of reading.
- 2. Backwash piping flow meter (1 required) must be a pilot, impact ball, variable area type with one piece, impact resistant machined acrylic plastic body. GPM scale must be permanently etched or imprinted on the meter. Flow rate indicator must be of stainless-steel material. The scale range must be appropriate for specific flow rate. Pipe size to accommodate backwash rate. The backwash piping flow meter must be BLUE-WHITE series F-300 or approved equal.

B. Refill Flow Meter

- 1. Refill flow meter (1 required) must be provided on dilution piping to backwash tank. Flow meter must be one-piece meter body of injected molded polysulfone adapters, viton o-ring seals, and 316L stainless-steel floats and float guide, impact resistant machined acrylic plastic body. GPM scale must be permanently etched



or imprinted on the meter. Flow rate indicator must be of stainless-steel material. The scale range must be appropriate for specific flow rate. The manufacturer must be BLUE-WHITE model #F-45750L-12, 3/4" M/NPT @ 1.0 to 10.0 GPM or approved equal.

## 2.9 WATER LEVEL CONTROLLERS

### A. In Surge Tank Water Level Controller

1. Provide a water level sensing and control system for the pool(s) that will monitor the water level in the surge tank and automatically activate the auto water make-up control valve. For sensing water level and activating make-up water control valve for each pool, use Series ELC-810 Controller housed in a watertight NEMA 4X UL94 5V UL flammability rated polycarbonate enclosure to meet IP66 and NEMA 4, 4X, 12 and 13 ratings. The Controller must utilize one sensor to control water level. ELC-810 series must have a menu-driven LCD display screen and utilize a five-switch user interface for navigation through the menu. The menu must allow changing the following settings: delay to shutoff, alternate sensor option, maximum time on, manual override, delay to normal, type of sensor, high level option, flow sensor active, and sounder with alarm. Menu settings must be capable of password protection. The Controller must be capable of displaying the following data: last fill time, last drain time, last alarm. The Controller must be capable of determining the following: maximum time on exceeded, over current to solenoid valve, no valve/valve wiring problem, and sensor not working properly. The Controller must have a low voltage interlock with auto water make-up solenoid valve, must provide adjustable time delay for increasing level and manual override; and requires 115 VAC, 1 phase, 60 Hz power. Manufactured by AquatiControl Technology, model ELC-810-SS-ST-XXX (Coordinate the specific length(s) of cable required for each controller prior to ordering). Refer to drawings for additional information.
2. Provide a proximity switch sensor that must be sensitive to within +/- 1/8" (4mm) of nominal water level. Supply voltage to sensor must be 12V to 24V DC from Controller. Current consumption must be < or = 15mA. Response frequency must be 100Hz. Maximum control output must be 200mA. The sensor operating temperature must be -25 Deg. C to 70 Deg. C. Operating humidity must range from 35% RH to 95% RH. The sensor must be mounted in a 1" SCH80 PVC pipe (length must be determined by depth of surge tank). Sensing pipe must be mounted to surge tank wall with composite/non-metallic hangers and stainless-steel hardware. Sensing pipe must be capable of being submerged under water safely. Refer to drawings for additional information.
3. Wiring from the sensor to the Controller must be provided and must be connected to the terminal points mounted within a corrosion resistant, nonmetallic NEMA 4X enclosure. Wiring connections must be made through the bottom of the enclosure. The enclosure size must be no less than 8" wide x 5" high x 4" deep. The access door must be the entire front face panel of the enclosure. Confirm location in field.
4. Major components must be plugged in using WAGO terminal blocks for ease of installation and replacement. Unit must be designed to activate a 24-volt AC solenoid valve.

5. Provide a make-up water solenoid valve, normally closed, stainless-steel fitted, bronze body, 24 VAC slow closing type. Size to pipe. Interlock with automatic water level control system. Refer to the Drawings for additional information. Such as ASCO or approved equal.
6. Discharge of make-up water must be into a fill funnel and piping to the pool. Refer to the Drawings for additional information.

## 2.10 DECK EQUIPMENT, INSERTS & ANCHOR SOCKETS

A. The following items must be supplied unless otherwise noted. Proprietary names are to designate performance only. Equal products will be accepted.

1. Removable ladders (1 required) must be provided as required in quantities and to the dimensions as shown on the drawings. Ladders must be fabricated of one continuous length of polished and buffed tubing. The tubing must be ASTM-A-554 grade 304L stainless-steel, 1.50-inch OD x 0.120-inch wall thickness, and must be passivated, in compliance with ASTM A967-99, incorporating organic acid passivation techniques for maximum corrosion resistance. Bends must be smooth and free of wrinkles. Rubber caps must be provided on the bottom ends of the ladder railings. Removable ladder as manufactured by Spectrum Products, Paragon, SR Smith or approved equal. (Alternate AC-01)
  - a. Anchor sockets must be provided as required in quantities as shown on the drawings. Anchor sockets for ladders must be of the wedge type, cast bronze, 4 inches in depth and made to receive 1.50-inch OD tubing as manufactured by Paragon #28105, SR Smith #AS-200B, Spectrum #54052 or approved equal. The wedge must be cast bronze, incorporate a stainless-steel tightening bolt, and flat washer, and be designed as the sacrificial element to the anchor system. Metallic components must be passivated, in compliance with ASTM A967-99, incorporating organic acid passivation techniques for maximum corrosion resistance. Anchors must be provided with flush closure caps and escutcheons with set screws where indicated. Escutcheons must be of the keyhole or oblong shape, similar to the casted, electro-polished stainless-steel escutcheon with set screw by Paragon #28303SS, SR Smith #IEP-200, Spectrum #35222 or approved equal.
2. Entry rails must be provided as shown on the drawings, fabricated from one continuous piece of polished and buffed ASTM-A-554 grade 304L stainless-steel, 1.50-inch OD x 0.120-inch wall thickness, polished and buffed to 320 grit finish and must be passivated for maximum corrosion resistance. Bends must be smooth and wrinkle free. Custom rails as manufactured by Spectrum Products, Paragon, SR Smith or approved equal. Custom rail submittal drawings must be complete with details of custom fabrication and installation information.
  - a. Anchor sockets must be provided as required in quantities as shown on the drawings. Anchor sockets for railings must be of the wedge type, cast bronze or stainless-steel, 4 inches in depth and made to receive 1.50-inch OD tubing as manufactured by Paragon #28105, SR Smith #AS-200B, Spectrum #54052 or approved equal. The wedge must be cast bronze, incorporate a stainless-steel tightening bolt, and flat washer, and be designed as the sacrificial element to the anchor system. Metallic components must be passivated, in compliance

with ASTM A967-99, incorporating organic acid passivation techniques for maximum corrosion resistance. Anchors must be provided with flush closure caps and escutcheons with set screws where indicated. Escutcheons must be of the keyhole or oblong shape, similar to the casted, electro-polished stainless-steel escutcheon with set screw by Paragon #28303SS, SR Smith #IEP-200, Spectrum #35222 or approved equal.

3. Anchor sockets for stanchions must be of cast bronze or stainless-steel, sized to receive a full 6 inches penetration of 1.90-inch OD tubing as manufactured by Paragon #38201TC, Spectrum Products #23626, Kiefer #700103, SR Smith #AS-100D or approved equal. Each anchor socket must be provided with a flush threaded, vandal proof closure cap Paragon #38201TC, Spectrum Products #23628, or Kiefer #700103C and a grounding lug with screw. Provide Paragon #38303, Spectrum Products #23630, Kiefer #700103K or approved equal spanner wrenches for removing the closure cap. Anchors or sockets must be provided with flush closure caps and escutcheons with set screws where indicated.
4. Starting platform anchor sockets must be provided as required in quantities as shown on the drawings. Anchors sockets for single post starting platforms located on the rollout gutter must be designed to prevent rocking. A stainless-steel cap must be provided to flush mount on the deck when platform is removed. The anchor socket must be cast T304 stainless-steel with wedge assembly consisting of a bronze wedge and T304 stainless-steel hardware. Anchors for starting platforms must be by the starting block manufacturer - Paragon Quickset Dual-post wedge anchor.
5. Lifeguard Chairs (Alternate AC-01)
  - a. Lifeguard chairs must be constructed of UV inhibited recycled HDPE chairs. Maximum seat height must be 48" above the pool deck. Joints must be secured using T- 316L stainless-steel screws. The chair must include an umbrella guide and holders. Refer to architect for color finish.
    - 1) Lifeguard chairs (1 required) must be Spectrum Products Mendota #45023, Tailwind Furniture #LG510, Kiefer Forever Guard Chair #500231, SR Smith Sentry #SLGC42 or approved equal.
6. Surge tank access hatch (1 required) must be provided as shown on the drawings. The access hatch must be a single door 3'-2" x 2'-6" with 1" fillable pan to receive concrete fill to match the surrounding deck. The frame must be ¼ inch extruded aluminum with built in neoprene cushion and continuous anchor flange. Door must be ¼" aluminum plate reinforced with aluminum stiffeners as required. The door must be equipped with heavy continuous stainless-steel hinges and must have compression spring operators for easy operation. The door must open to 90 degrees and lock automatically in that position. The door must be built to withstand a live load of 150 lbs. per square foot and equipped with a continuous Type 316L stainless-steel hinge, tubular type, and an automatic hold open arm with release handle. Hardware must be type 316L, 18-8, stainless-steel. A flush lift handle and a snap lock with removable key wrench must be provided. Factory finish must be mill finish with bituminous coating applied to the exterior of the frame. The access door must be Type TER-3 single leaf pan type door as manufactured by the Bilco Company.

7. Sleeves for surge tank valve extensions must be Spectrum Products Valve Extension Body #1910387 with Lid and Key #36450, or Spectrum Products Bronze Anchor Kit 1.90-inch O.D. x 6-inch-deep Anchor (field modification required) with Lid and Key #23638-00.
8. Surge tank ladder rungs must be ½ inch Grade 60 steel encased with co-polymer polypropylene plastic as manufactured by M.A. Industries, Inc, or approved equal.
9. Pool Lift
  - a. The pool lift (2 required) must be a battery powered handicap lift with footrest assembly. Lift must comply with the Americans with Disabilities Act Access Guidelines (ADAAG), be capable of lifting 300 lbs, and must include a seat belt assembly. The following accessories must also be provided: caddy, arm rest assembly, lift cover, extra battery, wired controls. Stainless-steel components must be 304L. Lift must be a SR Smith Splash Aquatic Lift Extended Reach #370-0000, Spectrum Products Horizon Long Reach BP 300 #2030086, Aqua Creek Products LLC Mighty 400 #F-MTY400 or approved equal. Confirm pool lift fits on pool perimeter and operates correctly.
  - b. The anchor for the pool lift must be furnished with the lift. The anchor must be an embedded sleeve made of glass reinforced copolymer, 300 series stainless steel, or bronze. The depth of the anchor must be 6 inches, and the anchor must include a lug for proper bonding with the pool structure. The anchor must be installed in accordance with manufacturer's instructions, including required or recommended support footings. Manufacturer must provide an anchor cap and key for times when the lift is not in use. Sockets must be provided as stainless-steel or cast bronze for swimming pool accessories.
10. Provide a ship's ladder in the size and shape shown on the drawings. The ladder must be aluminum with aluminum stiffeners if required by OSHA.
11. Provide aluminum safety railing and anchors at pump pit as shown on the drawings. Railing to be able to be removed for serviceability to the pumps. Railing to meet all applicable building code requirements. Provide safety chain at railing as indicated.

## 2.11 LOOSE EQUIPMENT

- A. The following items must be supplied unless otherwise noted. Proprietary names are to designate performance only. Equal products will be accepted.
  1. Cup anchors for floating lane ropes and safety ropes must be incorporated into the perimeter overflow system. Cup anchors must be 316L stainless-steel with stainless-steel threaded eyebolts. The heavy-duty cup anchors must be 3-3/8-inch diameter. Cup anchors must be Spectrum Products #58280, SR Smith #WA-100, Paragon #14-503 or approved equal.
  2. The lifeline must be 3/4-inch blue and white polyethylene rope with floats that are 5-inch diameter by 9-inch-long. Floats must be spaced on five-foot centers. Metallic rope hooks must be stainless-steel. Provide lifeline at five-foot break between shallow and deep water as shown on the drawings. Lifeline must be equal to Recreonics #14-

438.BW or Lincoln Aquatics #44-115 safety line rope, Recreonics #14-381, Lincoln Aquatics #44-190 or Competitor Swim #350EZBW locking 5" x 9" floats, and Recreonics #14-456 or Lincoln Aquatics #44-125 rope end hooks.

3. T-wrench for operation of valve extensions must be fabricated of  $\frac{3}{4}$ " diameter SCH 40 stainless-steel pipe. The T-wrench must be 4'-0" in length with a 24" long welded "T" handle. The wrench must be fitted with a  $\frac{3}{4}$ " square stainless-steel male end, 1" in length, for operation of valve extensions at the surge tank. Two complete T-wrenches must be provided.

## 2.12 THERMOMETERS

- A. The following items must be supplied unless otherwise noted. Proprietary names are to designate performance only. Equal products will be accepted.
  1. Portable thermometer (1 required) must be a molded ABS plastic tube body type with the ability to measure temperature in both degrees Fahrenheit and Celsius. A 3 ft. polyethylene cord must be attached to thermometer. Thermometer must be manufactured by Pac-Fab/Rainbow #R141036 or approved equal.

## 2.13 SWIMMING POOL FINISHES

- A. Paint
  1. A high build epoxy paint finish must be provided in the pool(s) with a slip resistant finish where required. Contrasting colored paint must be provided at the stair nosings, wall targets, floor lane markings and other installations as shown and detailed on the contract drawings and in strict accordance with these specifications.
  2. The interior surfaces of the gutter trough must be painted with a high build epoxy. The color must be white or an approved light color.
  3. Provide a sample mock-up on a 4'-0" x 4'-0" plywood sheet showing the coating with the non-slip additive. Sample must be submitted and approved by Owner and Architect prior to application of the painted finish.
  4. Coating must be a low VOC compliant polyamidoamine epoxy suitable for chlorinated water below 3.2 ppm and for installation on concrete surfaces. Coating must be Tnemec L69 Hi Build Epoxoline II, Induron Perma-Clean II Epoxy or approved equal. Color must be white.
  5. Quality Assurance
    - a. At least ten (10) commercial public-use pools with individual water surface areas in excess of 4500 square feet of pool surface area or more must have been completed within the past 5 years by the painting contractor.
    - b. Submit a letter of approval from the pool paint manufacturer prior to application of the pool paint. Provide manufacture with required estimated square footage to ensure proper material usage.
  6. Surface Preparation
    - a. Existing Concrete

- 1) Surface must be structurally sound and free of foreign substances and debris that could reduce or impair adhesion. Paint must be removed by sand blasting or water blasting. Shot blasting, scarifying, or grinding can also be accepted methods of surface preparation. Surface defects or holes must be patched per manufacturer's recommendations. Submit all patching materials for review. Architect/Engineer to review finish after surface preparation prior to paint.
  - a) Pressure Washing: The washing or cleaning of a surface by a stream of water ejected from a nozzle at high velocity, typically in the range of 1,000 psi – 4,000 psi.
  - b) Water Blasting: The cutting, abrading, or removal of a surface or substrate by a stream of water ejected from a nozzle at ultra-high velocity, typically in the range of 10,000 psi – 40,000 psi.
- b. Cast-In-Place Concrete
  - 1) Allow concrete to cure a minimum of 28 days per ACI 308 and specification 13 1101 - Swimming Pool Cast-in-Place Concrete. Perform moisture test of the concrete to ensure dryness. Either the plastic sheet method test (ASTM D 4263) or the Anhydrous Calcium Chloride Test (ASTM F 1869) must be performed prior to painting. Document test with pictures and submit results for record.
  - 2) Brush-off pool interior surfaces, then blast clean to remove laitance and weak surface concrete, foreign substances and debris that could reduce or impair adhesion, dirt, oil, grease, curing compounds, or other foreign materials, to produce an anchor profile similar to medium grade sandpaper referencing SSPC-SP13/NACE6 and ICRI-CSP 2-4 Surface Preparation of Concrete. Blasting must open up surface voids, holes, and irregularities. No holes or holidays in the paint surface are allowed. Fill holes or irregularities that cannot be satisfactorily painted with an approved grout or Tnemec Series 215 Surfacing Epoxy, Induron EFS707 Epoxy Surfacer and Filler or Induron Mortarchem. Do not entirely remove the surface or completely expose the underlying aggregate.
- c. Pneumatically Applied Concrete
  - 1) Allow concrete to cure a minimum of 28 days per ACI 308 and specification 13 1102 – Swimming Pool Shotcrete. Perform moisture test of the concrete to ensure dryness. Either the plastic sheet method test (ASTM D 4263) or the Anhydrous Calcium Chloride Test (ASTM F 1869) must be performed prior to painting. Document test with pictures and submit results for record.
  - 2) Prior to applying paint to a pneumatically applied concrete surface, a brown coat plaster leveling surface must be applied. The pneumatically applied concrete surface must be prepared for the application of the brown coat by removing foreign substances and debris that could reduce or impair adhesion, dirt, oil, grease, curing compounds, or other foreign materials. Brown coat must be applied to

provide a clean, firm surface similar to a medium grade sandpaper, suitable for the application of paint. No holes or holidays in the paint surface will be allowed. Fill holes or irregularities that cannot be satisfactorily painted with an approved grout or Tnemec Series 215 Surfacing Epoxy, Induron EFS707 Epoxy Surfacer and Filler or Induron Mortarchem.

7. Application Procedures

- a. Before applying material, measure and record the temperature and relative humidity. Apply only if surface and air temperature is above 50°F and at no lower temperature than 5°F above the dew point, unless otherwise approved by the manufacturer. Low temperature cure option must be submitted for approval if required. Do not apply when the relative humidity is greater than 85%. If possible, plan the painting schedule so that painting is done in the coolest part of the day. Provide adequate ventilation during application to minimize odor.

8. Application of the First Coat

- a. After the pool surface has been thoroughly dried and cleaned the first coat can be applied. Surface spreading rate must be observed so as not to exceed the recommended manufacturer's rate of application. The first coat must be applied at a minimum rate of 200 SF per gallon and must conform to local VOC requirements. First coat must be thinned 10%. The first coat must be allowed to cure for 12 hours at a minimum temperature of 70°F prior to second coat, unless otherwise approved by the manufacturer. Low temperature cure option must be submitted for approval if required.

9. Application of the Second Coat

- a. After the first coat dries, the second coat must be applied at a minimum rate of 200 SF per gallon and must conform to local VOC requirements. The second coat must be allowed to cure for 12 hours at minimum temperature of 70°F prior to final coat, unless otherwise approved by the manufacturer. Low temperature cure option must be submitted for approval if required.

10. Application of the Final Coat

- a. After the second coat dries, the final coat must be applied at a minimum rate of 200 SF per gallon and must conform to local VOC requirements. Slip resistant additive (rounded dry silica sand) must be applied with the final coat to required areas as shown on the contract documents including but not limited to the zero entry, steps and stairs and ramp areas. Remove loose sand after the final coat has been cured by sweeping or vacuuming. The final coat must be allowed to cure for 7 days at 70°F before filling the pool, unless otherwise approved by the manufacturer. Low temperature cure option must be submitted for approval if required.

11. Specialty Paint

- a. Application of contrasting paint including the stair and bench nosings, wall targets, floor lane markings must be done after final coat of finish paint has cured for 24 hours.

12. Application of the Finish

- a. Application must be made by brush, roll, lamb's wool applicator or spray.

2.14 WATERPROOFING

A. Products

- 1. Interior surfaces of surge tank and backwash pit with NO additional finishes: Apply two (2) coats of Vandex BB White, Xypex Modified, Xypex Megamix I, Miracote BC Pro or Basecrete directly to surface of surge tank and backwash pit.

B. Surface Preparation

- 1. Surface must be structurally sound and free of foreign substances and debris that could reduce or impair adhesion. Surfaces must be roughened by sand blasting or water blasting. Shot blasting, scarifying, or grinding can also be accepted methods of surface preparation. Surface defects or holes must be patched per manufacturer's recommendations.

- a. National Plasterers Council Surface Preparation Definitions

- 1) Pressure Washing: The washing or cleaning of a surface by a stream of water ejected from a nozzle at high velocity, typically in the range of 1,000 psi – 4,000 psi.
- 2) Water Blasting: The cutting, abrading, or removal of a surface or substrate by a stream of water ejected from a nozzle at ultra-high velocity, typically in the range of 10,000 psi – 40,000 psi.

C. Application

- 1. Do not apply materials under conditions where the ambient air temperature is less than 40 degrees Fahrenheit, or to a frozen substrate.
- 2. The mixing of products, quantities and application procedures must be done in accordance with the manufacturer's recommendations.

2.15 SEALANTS

- A. Provide sealed expansion joints as shown on the pool and pool structural drawings or noted on the construction/expansion joint layout, and as required. Expansion joints must be constructed and sealed as indicated and in accordance with the manufacturer's recommendation. Sealant must be manufactured by LATICRETE International, Inc., Mapei, or Deck-O-Seal.

- 1. For submerged joints:

- a. Latasil, one component, neutral cure, high performance, 100% silicone sealant in the color(s) as selected. Must be used in conjunction with Latasil 9118 Primer per manufacturer's recommendations.
- b. Mapesil T, 100% silicone sealant in the color(s) as selected.

- 2. For joints behind the coping, or other horizontal deck joints:

- a. Deck-O-Seal, two component (gun-grade or pourable, self-leveling), high resilience, non-sag, non-flowing, polysulfide-based sealing compound in the



color(s) as selected. Must be used in conjunction with Rezi-Weld LV per manufacture's recommendations.

B. Material Storage

1. Materials must be stored in the original unopened factory containers in a cool dry location at 60 to 80 degrees F. Protect from the elements and the hazards of construction.

C. Joint Preparation

1. Clean the joints of deleterious material, to sound, clean and dry substrate.
2. If the joint is existing and part of a renovation, inspect and verify that joints have firm, solid sub-surface support up to the underside of the structural slab. Identify those joints that do not have such support and fill voids under the joint with a cement slurry (being careful not to fill the joint space itself) consisting of the following:
  - a. Two (2) parts water (by weight) 10 gallons
  - b. One (1) part Portland cement 47 lb. bag
  - c.  $\frac{1}{4}$  to  $\frac{1}{2}$  part bentonite  $\frac{1}{2}$ , 50 lb. bag
3. In mixing the slurry it is recommended that the water be added first, then the cement, and finally the bentonite. The more bentonite the faster the set. Do not get the slurry on the joint itself.
4. Joint must be formed or filled with an approved, resilient, non-asphaltic, closed cell, polyethylene joint filler material down to firm substrate. Allow space at the top of the joint for the installation of approved closed cell polyethylene backer rod and install same to the required depth below the surface of the slab to control the depth of the sealant bead to within manufacturer requirements.

D. Surface Preparation

1. Concrete surfaces to receive sealant must be fully cured, clean, dry, and free of dirt, dust, curing compounds and other foreign material that might compromise the adhesion and performance of the sealant. Curing aids, form release agents and joint former residue must be completely removed, if necessary, by sand blasting and/or grinding. Loose dust must be brushed off.
2. Prime surfaces to receive Latasil sealant with Latasil 9118 Primer prior to sealant application, and surfaces to receive Deck-O-Seal sealant with P/G Primer prior to application.

E. Application

1. Apply sealant in accordance with the manufacturer's recommendations.
2. Tool the joint immediately after application to ensure a firm, intimate contact with the joint interface.
3. Remove excess sealant and smear from adjacent surfaces with Xylol or Toluol before sealant cures.
4. After the sealant has fully cured (generally a minimum period of five days at 72 degrees and 50% humidity), paint the surface of the sealant with a chlorine resistant

chlorinated rubber or equivalent pool paint, such as Ramuc, in a compatible color as selected by the Architect. NOTE: Latasil cannot be painted.

## 2.16 WATER FEATURES AND SUPPORT EQUIPMENT

### A. FS Waterfall 3 (Alternate AC-04)

1. Product Code: 0010-4592
2. Characteristics: The Waterfall 3 main columns and arms must be constructed of schedule 10 stainless steel structural tubing. The lower section of the main column must be straight and house a rotational hub. The rotational joint must be free of pinch points and protrusion hazards and contain no flexible hoses. The upper main column must have a 40° bend and stainless-steel mounting plate. An acrylic plate with a 120° curve and one (1) drainage hole must be fastened to the mounting plate with stainless steel hardware. The waterfall lower arm columns must be constructed of schedule 10 stainless steel structural tubing with 70° bends. Three (3) acrylic plates with a 120° curve must be provided with the Waterfall 3 assembly. One (1) acrylic plate must have two (2) drainage holes and a five (5) piece urethane weir mounted on a stainless-steel axle and fastened to one end of the acrylic plate. One (1) acrylic plate must have a bucket consisting of two (2) acrylic bucket wheel panels and a curved stainless steel bucket body must be fastened to a stainless-steel axle and must be mounted to the opposite end of the acrylic plate. One (1) acrylic plate must have a stainless-steel slider shaft suspended on two stainless steel shafts that are mounted at each end of the acrylic plate. Two (2) star shaped urethane water wheels must be threaded on the slider shaft allowing for free movement. The acrylic plate assemblies must be mounted to the waterfall arms with stainless steel hardware.
3. Dimensions: The overall height of the structure must be no less than 57 inches above final grade. The overall width of the structure must be no less than 86 x 76 inches.
4. Recommended Flow Rate: The hydraulic requirements must be 15 gpm @ 8 psi.
5. Nozzle Count: N/A
6. Water Display: The water must flow through an opening in the top of the main column and the top of the arm columns. Water from the main column can be directed on the lower arms by rotating the acrylic channel. Water from the arm basins will flow through the drainage holes in the bottom of the acrylic plate or the flow on the lower panel can be manipulated by the finger weirs, bucket wheel or water shaft weirs located on each acrylic plate.
7. Anchoring/Levelling System: The stainless steel playPHASE anchoring system must provide the ability to add, remove and interchange products without having to change infrastructure as long as a sufficient sized footing is installed for the new feature. The component must be fastened directly to the playPHASE base flange with an EPDM gasket to provide a water tight seal between the component flange and the playPHASE flange. The playPHASE base is flush-to-grade with no exposed bolts or dome covers.

### B. FS Slosh 1 (Alternate AQ-4)

1. Product Code: 0011-1478
2. Characteristics: The Slosh 1 consists of a straight column constructed of 3-inch schedule 10 stainless steel structural tubing with an acrylic bowl measuring Ø23-3/4 inch mounted above. A spindle extension must be installed inside the bowl. The spindle extension must have a splash orb feature installed. This splash orb has three (3) urethane panels with five (5) holes in each, acrylic separator panels, and one (1) Monster 5 nozzle installed in the end. Tamper resistant fasteners must be used to hold all components together to prevent leakage. One (1) blank acetal nozzle must be provided for winterization.
3. Dimensions: The overall height of the structure must be no less than 28 inches above final grade. The overall length x width must be no less than Ø24 inches.
4. Recommended Flow Rate: The hydraulic requirements must be 15 gpm @ 4 psi.
5. Nozzle Count: One (1)
6. Anchoring/Levelling System: The stainless steel playPHASE anchoring system must provide the ability to add, remove and interchange products without having to change infrastructure as long as a sufficient sized footing is installed for the new feature. The component must be fastened directly to the playPHASE base flange with an EPDM gasket to provide a water tight seal between the component flange and the playPHASE flange. The playPHASE base is flush-to-grade with no exposed bolts or dome covers.

C. Wubit Feature (Alternate AC-05)

1. Provide one (1) Wubit FastTrack 3 feature suitable for a shallow water depth. The feature must include a buildable course for individual races or group contests. The modular feature must include the following: one (1) hurdle, one (2) step and one (1) wiggle bridge 3. The feature must be able to accommodate a maximum of eight (8) users. The feature must have an approximate inflated dimensions of 50'-10" x 8'-2" x 1'-0" and have an approximate setup time of 20 minutes. The feature must come standard with an accessory kit that has the following items: two (2) 30" connector straps, two (2) Velcro adapters, one (1) manometer, one (1) hand pump, two (2) electric blowers, four (4) 16' straps with loop and four (4) double buckle straps. Four (4) 10' bungees must be provided for anchoring. The Wubit FastTrack feature must be product #31053 or approved equal.

2.17 POOL CONCRETE COPING (ALTERNATE AC-01 & AC-04)

A. Cast-In-Place Coping

1. The coping must have the shape as shown on the construction drawings. Concrete must have an equal strength and reinforcing per Division 3 – Concrete, Section 13 1102 Swimming Pool Pneumatically Applied Concrete and/or Section 13 1101 Swimming Pool Cast-In-Place Concrete. The concrete forms must be by Stegmeier Corporation, Commercial Form part number 3CF000 or approved equal. The expansion joint control must be done with Stegmeier (Frontier Deck Joint) part number SDJ1 and (Frontier Nose Cap) 3NC or approved equal. Joint strip and nose clip color must be selected by Architect from manufacturer's standard color options. Control joints must be saw cut joints, deep hand tooled joints, or must utilize the same Frontier Deck Joint system as expansion joints and

placed at a maximum of 4'-0" on center. Full depth expansion joints must be placed at radius points along perimeter of pool or at a maximum of 20'-0" spacing. Expansion joint detailing and locations must conform to the manufacturer's recommendations.

2. Follow manufacturer guidelines and recommendations for the concrete mix and concrete finishing procedure. Per Stegmeier's recommendations, the minimum concrete mix design requirements are the following:
  - a. A minimum of 3500 psi.
  - b. Use pea gravel or an equivalent small 3/8" size stone aggregate.
  - c. 4 1/2" to 5 1/2" slump.
  - d. Air entrainment, if added, must not exceed 6%.
  - e. Fiber-mesh must be considered if structural steel is lacking.
3. Schedule an on-site training session on proper installation technique with Stegmeier Corporation at the time of purchasing.

#### 2.18 POOL DECK TRENCH DRAIN (Alternate AC-02)

- A. A factory fabricated perimeter deck drain system consisting of stainless-steel channel covered by a 3/4" thick UV protected HDPE grating according to the details shown on the project drawings must be supplied around entire perimeter of pool. System must conform exactly to architect and/or the aquatic drawings deck plan, matching design deck space requirements continuously around perimeter of the pool(s). Deck drain grating must match in materials and aesthetics to all pool gutter and deck drain grating on associated project.
- B. Stainless steel drain manufacturers must provide stainless steel certificate showing type of stainless and chemical composition. Stainless certificate will show stainless steel used for manufacturing of this gutter to be purchased from a U.S. owned and U.S. located mill. The system basis of design must be manufactured by Paddock Pool Equipment Company, Inc., of Rock Hill, South Carolina or approved equal. Contact Andrew Roberts at (803) 504 – 1252 or via email at [roberts@paddockindustries.com](mailto:roberts@paddockindustries.com) for all enquiries.
- C. Materials
  1. Drain sections must be fabricated entirely from Type 304L stainless steel. All angle anchors and support brackets must be stainless steel and prefabricated and welded. Grating must be textured slip resistant HDPE, 3/4" thick.
- D. Drainage Connections
  1. Drain sections with plumbing connections must have a prefabricated stainless-steel dropout (throat) centered within the section, 2" in diameter. The plumbing contractor must connect 2" pipe to the dropout with a Fernco connection piece, or similar at discretion of the contractor. Contractor to supply and install p-traps as necessary.
  2. Manufacturer must include a stainless-steel mesh guard to cover every 2" dropout to protect it from debris. The manufacturer must provide extras for the customer.

E. Drain Channel and Grating

1. All areas of the drain channel must be accessible for inspection and cleaning. Channel must be covered by a protective grating formed of prefabricated, textured HDPE, 3/4" thick, with slots designed to drain water and reduce slipping hazard. Grating must be identical throughout the entire drain system. Grating color to be selected by the Architect.

F. Anchorage

1. Manufacturer must provide adjustable anchoring system to support the deck drain sections, with which the height and level of the drain trough can be field adjusted by installing contractor. Manufacturer must provide all coupling support brackets, threaded rods, epoxy, epoxy gun, caulk, and rivets.
2. The entire deck drain system section must be anchored to concrete pads with commercial quality threaded rods and leveling nuts installed as shown on plans. Anchor assemblies must be provided by the manufacturer placed at every corner elbow and a typical eight-foot on center layout around pool. Every section of the drain must be prefabricated to fit within prefabricated angle support brackets. Brackets must be identical in size and allow for adjusting and leveling in the field. Drain sections must be caulked into each anchor to form a water-tight seal, and the excess wiped clean from the trough.

G. Installation Requirements

1. Trench must be created wide enough for 12" square concrete footers to be poured, with room for contractor to work on the sides. Trench must be continuous around pool perimeter as specified by drawings, everywhere the drain will be. Plumbing pipe (by others) must connect to prefabricated 2" dropouts on drain sections, which are placed every 24' on center, or as specified in the drawings. Drain ships in standard 8' sections, so plumbing dropouts must be approximately every third section. Corner elbows must be prefabricated and already welded to their own support brackets.
2. Plumbing dropouts are in the middle of their respective 8' drain sections, and a 2" drain pipe (by others) must connect using a Fernco connection, or similar water-tight connection determined by the plumbing contractor. This plumbing will not have a concrete pad beneath it, so supporting the drain pipe is the responsibility of the installing plumber.
3. Drain must be aligned with a laser or string line, and support coupling brackets (provided) must be used as templates to drill holes in the concrete pad for the threaded rod. Drill holes and remove debris from the holes before installing threaded rods and epoxy. Once threaded rods are installed, coupling brackets must be placed on top of leveling nuts on threaded rods as shown on drawings. Adjust as necessary to obtain level throughout the length of drain. Once level, secure bracket position by tightening nuts above the bracket to hold it in place on the threaded rods. Repeat for all sections, ensuring entire deck drain system is level.
4. Each 8' section of drain will connect to the next by sitting on the support bracket (coupling) as shown in drawings. Caulk to create water-tight seal with the caulk provided and wipe clean if excess gets into the trough. Once caulked, drill

anchoring hole into the trough from the outside through the pre-drilled hole on the support bracket, and pop-rivet the deck drain to the support bracket (coupling). There must be a total of four (4) rivets per coupling bracket. Repeat for every coupling bracket in the drain system.

5. After the plumbing connections are complete, backfill the trench with gravel or dirt until about 2" beneath the drain itself, then fill the rest with concrete. Ensure the entire system is secured before pouring concrete.

## 2.19 POOL COVER (Alternate AC-06)

1. The swimming pool cover system must be the standard catalogued product of a company regularly engaged in the manufacture of such products. Alternate swimming pool cover systems must not be considered unless equal to the specified product and must be submitted for approval not less than ten (10) days prior to bid date. Submittal data must include complete documentation relating to all the specified features and include manufacturer's sales literature, specification sheets, energy conservation audit, installation/maintenance manuals and engineering drawings.
2. The swimming pool cover system for the pool must be anchored to the pool deck and must be used when the outdoor pool is winterized.
3. Material
  - a. Construction: ASTM D3775, threads/inch 37 x 20
  - b. Yarn Size and Type: ASTM D1907, warp-525F denier monofil PP, fill-1120 denier fibrillated PP, Weight: ASTM D5261, oz/sq.yd 5.7. Grab Tensile: ASTM D4632, lb warp-320 fill-300. Burst: ASTM D3786 PSI600. Percent Shade: 98%.
  - c. Air Flow: ASTM D737 cfm40.
4. Thread
  - a. Black Polyester UV, count 38 x 19.
5. Webbing
  - a. 1" wide Polypropylene, minimum break strength 2400 lbs – single layer.
6. Chafing Strips
  - a. 1" wide x 30" long, sewn on every cross web at perimeter with recessed strip for unexposed thread.
7. Springs
  - a. 4500 break strength double bar compression type. Available-smoke color spring covers.
8. Anchors
  - a. Brass 4000 lbs break strength at neck-screw type.
9. Installation Tool
  - a. Zink coated steel tool, plastic grip handle to install/remove cover.

10. Web Spacing
  - a. 3'0" x 3'0" spacing-all webs sewn under cover for added strength and smooth top surface.
11. Warranty
  - a. 12-year pro-rated warranty, 1st year full.
12. The swimming pool cover system and its accessory items must be manufactured by Anchor Industries or approved equal.

### PART 3 - EXECUTION

#### 3.1 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 General Contractor of defects requiring correction. Do not start work until conditions are satisfactory.
- B. Verify that work by others, related to this section, has been completed. This includes earthwork, concrete work, and mechanical, electrical, and plumbing connections.
- C. Protect materials and work completed by others from damage while completing the work in this section.

#### 3.2 FIELD MEASUREMENTS

- A. Verify benchmark and pool location prior to layout.
- B. If field measurements differ from the construction drawing dimensions, notification must be given to the Architect prior to proceeding with work.

#### 3.3 EXCAVATION, REINFORCING STEEL AND SWIMMING POOL PNEUMATICALLY APPLIED OR CAST-IN-PLACE CONCRETE

- A. Reference Division 31 - Earthwork
- B. Reference Division 3 - Concrete
- C. Reference Section 13 1102 – Swimming Pool Pneumatically Applied Concrete
- D. Reference Section 13 1101 – Swimming Pool Cast-In-Place Concrete

#### 3.4 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. Ground wires or grade pins, if used, must be installed in such a manner that they accurately outline the section of the pool shell as indicated on the plans. They must be located at intervals sufficient to ensure proper thickness throughout and must be

maintained tight. Grade pins or grounding wires must not be permanently embedded in the pool shell.

### 3.5 WATER TIGHTNESS TEST

- A. The water tightness test described within the following section is in accordance with the Hydrostatic Tightness Testing of an Open Concrete Containment Structure as required by American Concrete Institute (ACI) 350.1-10 Section 2. Test reports must be provided and must include test locations within the structure, dates of testing, water level measurements, amounts of evaporation or precipitation, measured volume corrections, retest results (if applicable), actions taken, and final results.
- B. This test applies to the surge tank and the gutter system. The pool must be water tested prior to demolition and renovation as indicated on the drawings. This will provide a baseline water tightness report for the existing pool. The pool should be tested again for water tightness after the renovation is complete. The pool must return to the baseline or better water tightness post renovation.
- C. The water tightness test must be completed prior to the application of the finishes.
- D. Water Tightness Test Procedure
  1. Preparation
    - a. For the surge tank and gutter system: Allow the concrete structure to set 28 days for curing purposes. Once the shell has gained sufficient strength to withstand the test load and after the outlets have been securely sealed, the gutter/surge tank must be filled with water.
  2. Fill: Fill and then isolate the surge tank 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 unlined vessel(s). This is .1% of the total vessel volume. For example, if 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
Surge Tank		
Gutter		

4. Measurement



- a. Measurements must be taken at the pool, the surge tank, and the 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 General Contractor must check the pool, surge tank and gutter system for water loss with the Architect 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/Precipitation 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 and precipitation.

Vessel	12 hrs.	24 hrs.	Day 1 Total	36 hrs.	48 hrs.	Day 2 Total	60 hrs.	72 hrs.	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 (Pre-Construction)									
Pool (Post-Construction)									
Surge Tank									
Gutter									
Evaporation/Precipitation Pan									

6. Calculate Daily Loss

- a. Calculate the total daily water loss for the vessel(s) 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)  $\text{Daily Loss} = 7.481 \times \text{Structure Surface Area (SF)} \times [\text{Total Water Loss per Day (FT)} - \text{Evaporation per Day (FT)} + \text{Precipitation per Day (FT)}]$
- b. For 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)  $\text{Day 1 Loss} = (7.481 \text{ gallons per cubic foot}) \times (3,500 \text{ SF}) \times [(.031 \text{ ft water loss}) - (.014 \text{ ft evaporation}) + (0 \text{ ft precipitation})] = \underline{445 \text{ gallons Day 1 loss}}$
  - 2)  $\text{Day 2 Loss} = (7.481 \text{ gallons per cubic foot}) \times (3,500 \text{ SF}) \times [(.035 \text{ ft water loss}) - (.015 \text{ ft evaporation}) + (0 \text{ ft precipitation})] = \underline{524 \text{ gallons Day 2 loss}}$

- 3) Day 3 Loss = (7.481 gallons per cubic foot) x (3,500 SF) X [(0.039 ft water loss) – (.016 ft evaporation) + (0 ft precipitation)] = 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 (Pre-Construction)				N/A	N/A
Pool (Post-Construction)				N/A	N/A
Surge Tank					
Gutter					

7. Absorption

- a. Waiting 3 days after the initial water fill will allow the concrete to absorb water and must be sufficient to minimize the effect of absorption on the test results.

8. 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.

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

10. 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.

### 3.6 PIPING INSTALLATION

#### A. General

1. Provide and erect, according to the best practices of the trade, piping shown on the drawings and required for the complete installation of these systems. The piping shown on the drawings must be considered as diagrammatic in indicating the general run and connections and may or may not in parts be shown in its true position. The piping may have to offset, lowered, or raised as required or as directed at the site. This does not relieve responsibility for the proper erection of the systems or piping in every respect suitable for the work intended as described in the specifications and approved by the Architect. In the erection of piping, it must

be properly supported, and proper provisions must be made for expansion, contraction and anchoring of piping. Piping must be cut accurately for fabrication to measurements established at the construction site. Pipe must be worked into place without springing and/or forcing, properly clearing windows, doors, and other openings and equipment. Cutting or other weakening of the building structure to facilitate installation will not be permitted. Pipes must have burrs and/or cutting slag removed by reaming or other cleaning methods in strict accordance with the manufacturer's instructions. Changes in direction must be made with fittings. Open ends of pipes and equipment must be properly capped or plugged to keep dirt and other foreign materials out of the systems. Plugs of rags, wool, cotton waste or similar materials will not be used in plugging. Piping must be arranged so as not to interfere with removal and maintenance of equipment, filters, or devices, and so as not to block access to manholes, access openings, etc. Flanges or unions applicable for the type of piping specified must be provided in the piping at connections to items of equipment. Piping must be installed to ensure noiseless circulation. Valves and specialties must be so placed to permit easy operation and access.

**B. Pipe Hangers and Supports**

1. Pipes must be adequately supported by pipe hangers and supports as specified.
2. Horizontal PVC Schedule 80 piping must be supported in accordance with the manufacturer's recommendations for fluid temperature not exceeding 120-degree F and as listed below:

Nominal Pipe Size	Hanger Support Spacing	Minimum Rod Size for Single Rod Hanger
1-1/4" and less	5'-0"	3/8"
1-1/2" to 3"	6'-0"	1/2"
4" to 6"	8'-0"	5/8"
8" to 12"	10'-0"	7/8"
Greater than 12"	12'-0"	1"

3. Horizontal CPVC Schedule 80 piping must be supported in accordance with the manufacturer's recommendations for fluid temperature not exceeding 140-degree F and as listed below:

Nominal Pipe Size	Hanger Support Spacing	Minimum Rod Size for Single Rod Hanger
1/2" and less *	4'-0"	3/8"
3/4" to 2"	6'-0"	3/8"
2-1/2" to 3"	7'-0"	1/2"
4" to 8"	8'-0"	7/8"
Greater than 12"	10'-0"	1"

4. Round rods supporting the pipe hangers must be of the following dimensions:

Nominal Pipe Size	Rod Diameter
1/2" to 2" pipe	-3/8" rod
2-1/2" to 3" pipe	-1/2" rod
4" to 5" pipe	-5/8" rod

6" pipe	-3/4" rod
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5. Hanger rods must be galvanized steel. Provide for controlling level and slope by turn buckles or other approved means of adjustment and incorporate lock nuts.
6. Provide means of preventing dissimilar metal contact such as plastic-coated hangers, copper colored epoxy paint, or non-adhesive isolation tape.
7. Provide hangers to provide a minimum of 1-inch space between finished covering and adjacent work.
8. Place a hanger within 12 inches of each horizontal elbow.
9. Support vertical piping independently of connected horizontal piping. Support vertical pipes at every floor. Wherever possible, locate riser clamps directly below pipe couplings or shear lugs.
10. Where several pipes can be installed in parallel and at the same elevation, provide trapeze hangers as specified. Trapeze hangers must be spaced according to the smallest pipe size or provide intermediate supports according to the support spacing schedules. Provide heavier members as required for the load supported for the entire span distance. Hanger rods must be as specified above and properly sized for the load supported, but not less than 5/8 inches diameter.
11. Piping must be rigidly supported from the building structure by means of hanger assemblies properly selected and sized for the application in accordance with the manufacturer's recommendations and specifications. Do not support piping from other pipes, ductwork or other equipment that is not building structure. Do not modify the building structure for hanger installation.
12. Attachment of piping hangers to the building structure must be provided in a manner approved by the Architect. Provide concrete inserts installed by the General Contractor in the building construction at the time the concrete is poured, and hangers must be attached to these inserts.
13. The use of pipe hooks, chains, or perforated iron for pipe hanger supports will not be permitted.
14. A design for piping in a service tunnel, if required, supported by a structure must be submitted for approval. The structure must be non-corrodible and must be of a size and configuration to rigidly support the piping as shown in the plans at a minimum spacing as shown below.

C. Concrete Inserts

1. Provide inserts for placement in form work before concrete is poured.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Where concrete slabs form finished ceilings, inserts must be flush with the slab surface.
4. Provide hook rods to concrete reinforcement section for inserts carrying pipe over 4 inches.

D. Piping Installation – Below Grade

1. Trench bottoms must be smooth and free of rocks and debris. If the trench is dug in ledge rock, hardpan or where large boulders are not removed, place 3 inches of sand or compacted fine-grained soil below the pipe. Pipe must be supported over its entire length with firm, stable material. Blocking will not be used to change pipe grade or provide intermittent support over low sections in the trench. Surround the pipe with backfill meeting the requirements of Section 31 2000 with a particle size of 1-1/2 inch or less and in accordance with the project geotechnical report. Compact in layers not to exceed 6 inches with vibratory method. Follow installation methods of ASTM D2774 "Underground Installation of Thermoplastic Pressure Piping".

E. Flushing, Draining and Cleaning Pipe Systems

1. Flush out water systems with water before placing them in operation. Other systems must be cleaned by using compressed air or nitrogen. After systems are in operation and during the test period, strainer screens must be removed and thoroughly cleaned.

F. Expansion and Contraction

1. Make necessary provisions for expansion and contraction of piping with offsets, loops, flexible connections, and anchors as required to prevent undue strain. Provide shop drawings for method and arrangement for control of expansion and contraction of piping.

G. Testing

1. Piping installation and pressure testing must be reviewed by the Owner's testing agency before commencement of backfilling. A minimum notice of one (1) week is required prior to review. Results of review must be documented.
2. Pool related piping must be hydraulically pressure tested (with water, not air) to a pressure of not less than 50 PSI for a period of no less than two (2) hours. Pressure testing must be conducted in accordance with ASTM D2774. The temperature of the water used for the test must be between 40°F and 90 °F.
3. Maintain a sustained 20 PSI pressure on pool related piping throughout the course of construction.
4. Adhere to the applicable provisions of Division 22 - Plumbing, "General Provisions" and "Basic Materials and Methods" for installation of piping system.

### 3.7 EQUIPMENT AND SYSTEMS INSTALLATION

- A. Provide and assemble equipment, special parts and accessories as shown on pool drawings, specifications, and shop drawings of the equipment suppliers.
- B. Provide anchors and inserts imbedded in the deck including fittings, inserts and structure sleeves and required anchorage as shown on the plans and as indicated in this section of the specifications. Equipment must be set true and plumb, using factory jigs where available. Removable equipment items must be easily removable from anchors and must fit without noticeable wobble.
- C. Provide templates for equipment anchors. Provide anchor bolts of the size and spacing as required by the equipment manufacturer. Anchor bolts must be stainless-steel Type 316L and of a length capable of adequate anchorage into rough slab-on-grade allowing

for finish deck. Anchors must be set and cast into place during building concrete work. Inspect anchor settings for horizontal and vertical alignment prior to placing concrete.

- D. Provide equipment and systems in accordance with manufacturer's directions. Equipment must be assembled and in place for final observation.
- E. Items necessary to complete this section are shown on the plans or described in the specifications including items that may be purchased by the Owner. Items are detailed and specified as a guide for dimensional purposes. Make provisions accordingly and submit shop drawings and submittals based on that data.

### 3.8 START-UP AND INSTRUCTION

- A. Supply the services of an experienced swimming pool operator/instructor for a period of not less than two days (total 16 hours) after the pool(s) have been filled and initially placed in operation. During this period, the Owner's representatives who will be operating the pool(s) must be thoroughly instructed in phases of the pool's operation. Deliver six (6) complete sets of operating and maintenance instructions for the swimming pool, structures, finishes and component equipment. 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. Include the cost of two (2) additional days (total 16 hours) of instruction and operational check out by the qualified representative during the first season of operation.
- 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 Architect/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