OJAI UNIFIED SCHOOL DISTRICT

NORDHOFF HIGH SCHOOL SWIMMING POOL SYSTEM IMPROVEMENTS

1401 Maricopa Hwy
Ojai, CA 93023

PROJECT MANUAL
June 2020

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SECTION 01 11 00

SUMMARY OF WORK

PART 1 - GENERAL

All applicable portions of Division 1, including the drawings and general provisions of the contract, the general and supplementary conditions and Division 1 specification sections which apply to work of this section as if printed herein.

1.01 DESCRIPTION

A. Section Includes:

1. Description of the Work (refer to 1.02).
2. Duties of the Contractor (refer to 1.03).
3. Permits and fees (refer to 1.05).
4. Layout of work (refer to 1.06).

1.02 WORK COVERED BY CONTRACT DOCUMENTS

A. The scope of this project includes, but is not limited to: preparation and coating of existing swimming pool concrete decking and the removal and replacement of the existing pool filter, heaters and their associated piping and valving, and other work as shown and specified in the construction documents. All other items as required to provide a completely operational aquatic facility. Project is located at Nordhoff High School, 1401 Maricopa Hwy, Ojai, CA 93023.

B. Work of this contract generally consists of demolition, preparation and new construction and such other items not mentioned that are required by the Contract Documents, law and governmental codes and regulations.

C. For convenience, the Specifications are divided into sections as set forth in the Table of Contents, but such segregation shall not be considered as limiting the work of any subcontract or trade, and the Owner will not be responsible for any division of work by subcontracts. Unless otherwise provided, the Contractor shall be solely responsible for all subcontract arrangements of work regardless of the locations of provisions in the Specifications.

D. Compensation for bid items not specifically identified in these Special Provisions shall include all labor, materials, tools, equipment, safety measures, and supervision required to complete the work to grades and dimensions shown on the plans or staked in the field. There shall be no compensation except for bid items specified in the Bidder's Proposal. The cost of all work in the Contract Documents not specifically identified as a bid item or described within a bid item shall be included in related bid items, and no additional compensation shall become due the Contractor by nature of compliance with the Contract Documents except as provided for in the General Conditions of the Contract for Construction, under "Changes in the Work."

1.03 CONTRACTOR DUTIES

A. Construct the work under a single prime contract in strict conformity with the Contract Documents.

B. Accept the site and the character of the work as they exist on the first day of work under this Contract.

C. Coordinate work of employees and subcontractors.

D. Expedite the work to assure compliance with schedules.

E. Coordinate the work with that of other contractors and work done by the Owner.

F. Comply with orders and instructions of the Owner's Representative.

1.04 CONTRACTOR FURNISHED PRODUCTS

A. Contractor Responsibilities:

1. Designate needed submittals and delivery date for each product in progress schedule. Coordinate deliveries with Owner's Representative.
2. Receive product(s) at site. Store until incorporated into the work.
3. Inspect deliveries jointly with Owner's Representative, record shortages and damaged or defective items.
4. Protect product(s) from damage, theft and from exposure to the elements.
5. Assemble, install, connect, adjust and/or finish product(s) as required under provisions of the Contract Documents.
6. Repair or replace products damaged or stolen subsequent to receipt, at no cost to the Owner.

1.05 PERMITS AND FEES

A. The Contractor shall obtain and pay for all permits, fees and licenses required by all government agencies and necessary for successful completion of the work. The Contractor shall maintain copies of all required permits on site and shall, upon request, furnish the Owner with copies thereof.

1.06 LAYOUT OF WORK

A. Field surveys for control of all grading and construction shall be the responsibility of the Contractor. All such surveys, including construction staking, shall be under the supervision of a California licensed surveyor or civil engineer. Staking shall be performed on all items ordinarily requiring grade and alignment at intervals normally accepted by the agencies and trades involved. Payment for construction survey staking shall be considered as included in the various items of work and no additional allowance will be made thereof. Bench marks shall be provided by the Owner as shown on Drawings.

PART 2 - PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

SECTION 01 33 00

SUBMITTALS AND SUBSTITUTIONS

PART 1 - GENERAL

All applicable portions of Division 1, including the drawings and general provisions of the contract, the general and supplementary conditions and Division 1 specification sections which apply to work of this section as if printed herein.

1.01 DESCRIPTION

A. Section Includes:

1. Submit to the Architect shop drawings, product data and samples required under the various Sections of these Specifications.
2. Prepare and submit with Construction Schedule, a separate schedule listing dates for submission and dates reviewed shop drawings, product data and samples will be needed for each product.

1.02 PRODUCT HANDLING

A. Make all submittals of Shop Drawings, Samples, and requests for substitution in accordance with the provisions of these Specifications.

PART 2 - PRODUCTS

2.01 SCHEDULE OF SUBMITTALS

A. Compile a complete schedule of all submittals required for the project, complete with major division and subdivision headings and broken into individual trades. Format shall be 8-1/2" x 11". The schedule shall be in such a form as to allow for notations next to each required submittal including, but not necessarily limited to, submission dates, action taken, approvals and re-submittals. Submit such a schedule to the Architect for their comments and approval. The approved Schedule of Submittals shall be kept current at all times and an updated copy shall be kept in the Project Field Office for review.

2.02 SHOP DRAWINGS AND PRODUCT INFORMATION SUBMITTALS

A. Unless otherwise specifically directed by the Architect, make all Shop Drawings accurately to a scale sufficiently large to show all pertinent features of the item and its' method of connection and interface to the Work.

B. Submit all Shop Drawings in the form of four (4) blueline prints of each Shop Drawing. In the case of Product Information, submit no less than four (4) copies for review. Where contents of submitted product information include data not pertinent to the submittal, clearly indicate which portion is being submitted for review.

C. Submittals are required on all items to ensure the latest and most complete manufacturer's data is available. The Contractor assumes full responsibility for problems which could have been noted on valid submittals not furnished.

D. In the event that an item or items specified by the Architect will not be available in time for installation during orderly progress of the Work, so notify the Architect prior to receipt of bids. Verify that all items specified will be available. Costs of delays because of non-availability of materials will be back-charged as necessary and shall not be borne by the Owner.

E. Of the four (4) bluelines required; two bluelines will be returned to the Contractor upon completion of the Architect's review, one will be sent to the Owner and the other will be kept on file in the Architect's office.

2.03 SAMPLES

A. Unless otherwise specifically directed by the Architect, all Samples shall be of the precise article proposed to be furnished.

B. Submit all Samples in the quantity which is required to be returned, plus one (1) which will be retained by the Architect.

2.04 CALCULATIONS

A. Where required, the Contractor shall retain a licensed Civil or Structural Engineer to provide structural calculations sufficient to show the adequacy of all members and connections to be reviewed.

2.05 COLORS

A. Unless the precise color and pattern is specifically described in the Contract Documents, whenever a choice of color or pattern is available in a specified product submit accurate color charts and pattern charts to the Architect for their review and selection.

B. Unless all available colors and patterns have identical costs and identical wearing capabilities and are identically suitable for the installation, completely describe the relative costs and capabilities of each.

2.06 MANUALS

A. Where manuals are required to be submitted upon completion of the installation, prepare all such manuals in durable plastic binders approximately 8-1/2" x 11" in size and with at least the following features:

1. Identification readable through the outside of the cover, stating the general nature of the manual and the project to which it pertains.
2. Neatly typewritten Index near the front of the manual, furnishing immediate information as to location in the manual of all data regarding the installation.
3. Complete instruction regarding operation and maintenance of all equipment involved.
4. Complete nomenclature of all replaceable parts, their part numbers, current cost and name and address of the Vendors of the parts.
5. Copy of all guarantees and warranties issued on the installation.

6. Copy of the approved Shop Drawings with all data concerning changes made during construction.

B. Where contents of manuals include manufacturer's catalog, clearly indicate the precise items included in this installation and delete, or otherwise clearly indicate, all manufacturer's data with which this installation is not concerned.

C. Unless otherwise specifically directed by the Architect, deliver two (2) copies of the manual to the Owner and one (1) copy to the Architect.

2.07 RECORD DRAWINGS

A. Where required by the Contract Documents or where changes to the Contract Documents have been made by change order, revision to clarification drawings, or where minor changes to the Contract were required because of unforeseen conditions or as may be required by the Architect, prepare accurate Record Drawings indicating all pertinent data and dimensions necessary to adequately describe the contract deviations to the Owner for their future use.

2.08 SUBSTITUTIONS

A. Reference in the Contract Documents to any material, product, or process by name, make or catalog number shall be interpreted as establishing a standard of quality and design intent and not construed as prohibiting substitutions of any other such material, product, or process, provided such substitution is specifically approved by the Architect prior to receipt of bids. Requests for substitutions shall be submitted no later than ten (10) working days prior to bid date.

B. Acceptance of substitutions will not relieve the Contractor from responsibility for complying with the Contract Documents.

C. At the discretion of the Architect, testing of samples of materials proposed for substitutions may be required. The testing shall be done by an independent testing laboratory selected by the Owner, the costs of which shall be borne by the Contractor.

D. At the discretion of the Architect, the Contractor may be required to furnish a written guarantee, in addition to that already required, ensuring the satisfactory performance of the proposed substitutes.

E. All additional labor and materials which may be required for the proper installation of any substitution, or required as a consequence of any substitution, will be provided at no additional cost to the Owner.

F. Bids shall be based upon the data given in the Contract Documents, or upon previously approved items or techniques as "approved equals" by the Architect. Where calculations or shop drawings are required for approval, allowance shall be made for meeting the requirements of the Contract Documents and all applicable codes and ordinances.

G. Bidders may, in addition, submit separate bids using materials and equipment of other manufacturers, providing the difference in cost is stated for each item proposed to be substituted.

H. Provide to the Architect all information necessary and required to evaluate proposed substitutions. Do not base bid on the assumptions that a material will be approved as equal by the Architect unless the item has been specifically approved for this Work by the Architect prior to the receipt of bids.

I. The Contractor assumes full responsibility that substituted items or procedures will meet the job requirements and is responsible for the cost of redesign and of modifications to this and all other parts of the work caused by substituted items.

J. Submittals will be checked for general conformance with the design concept of the project, but acceptance does not guarantee quantities shown and does not supersede requirements to properly install work. Submittals for proposed alternatives will be judged not only for the acceptability of the items themselves, but of the items as they are used under the conditions of this particular project.

PART 3 - EXECUTION

3.01 IDENTIFICATION OF SUBMITTALS OR SUBSTITUTIONS

A. Completely identify each submittal and re-submittal by showing at least the following information:

1. Name and address of entity submitting information, plus name and telephone number of individual who may be contacted for further information.
2. Name of project for this Work.
3. Drawing number and Specification Section number to which the submittal applies.
4. Number of all submittals sequentially, whether this is an original submittal or a re-submittal, and if a re-submittal, what number re-submittal.

3.02 COORDINATION

A. Prior to submittal for Architect's review:

1. Fully coordinate all submittals by determining and verifying all field dimensions and conditions, materials, catalog numbers, and similar data.
2. Coordinate as required with all other trades and with all public agencies involved.
3. Secure all necessary prior approvals and signify by stamp, or other means, that they have been secured.
4. Clearly indicate all deviations from Contract Documents.

3.03 TIMING OF SUBMITTALS

A. Make all submittals within ten (10) days of the date of the award of the contract for the Work, and far enough in advance of scheduled dates of installation to provide adequate time for all required reviews, both by the Architect and their consultants, for securing necessary approvals, for possible revision and re-submittal, and for placing of orders and securing delivery. In scheduling, allow a minimum of ten (10) full working days for the Architect’s review. Cost of delays occasioned by the tardiness of submittals will be back-charged as necessary.

3.04 ARCHITECT'S REVIEW

A. The Architect's review will be only for conformance with the design concept and with the information given in the Contract Documents. The Architect's review and approval of Shop Drawings and Samples shall not relieve the Contractor of responsibility for deviation from the requirements of the Contract Documents unless the Contractor has informed the Architect in writing of such deviation at the time of submittal and the Architect has given written approval to the specific deviation, nor shall the Architect's approval relieve the Contractor from responsibility for errors and omissions in the Shop Drawings and Samples. Should the Architect be required to review any submittal more than three (3) separate times due to the inadequacy of the submittal and due to no fault of the Architect, the Contractor shall render to the Architect the Architect's direct cost for review of all subsequent re-submittals.

3.05 COMPLIANCE WITH APPROVALS

A. Do not commence any portion of the Work requiring approval of Shop Drawings or Samples by the Architect until the submittal has been approved by the Architect. All such portions of the Work shall be in accordance with the approved Shop Drawings and Samples.

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

All applicable portions of Division 1, including the drawings and general provisions of the contract, the general and supplementary conditions and Division 1 specification sections which apply to work of this section as if printed herein.

1.01 DESCRIPTION

A. Section Includes: Temporary facilities and controls required for this work include, but are not limited to: temporary utilities such as water, electricity and telephone; field offices and sheds; haul roads; enclosures such as fences, barricades, and canopies; sanitary facilities; scaffolding and safety equipment. All such temporary facilities shall be located for convenience and safety and maintained in a safe and sanitary condition at all times until completion of the Contract, then removed from the site and disposed of as required or as directed.

1.02 COMPLIANCE WITH CODES AND REGULATIONS

A. Compliance with all requirements of pertinent safety regulations is described in the General Conditions of the Contract for Construction and shall include, but not necessarily be limited to: Federal Occupational Health Administration (OSHA) and latest edition, Uniform Building Code (with California Amendments) and ADA (American Disability Act).

1.03 PRODUCT HANDLING

A. Use all means necessary to maintain all temporary facilities and controls in proper and safe condition throughout progress of the work. In the event of damage or loss, immediately make all repairs and replacements necessary and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 TEMPORARY UTILITIES

A. General:
1. Provide and pay all costs for all utilities required for performance of the work.
2. Provide safe distribution of required utilities to the job areas for use of all trades.

B. Temporary Water: Furnish and install all necessary temporary piping and, upon completion of the work, remove all such temporary piping.

C. Temporary Electricity: Furnish and install all necessary temporary wiring; furnish and install distribution boxes within 100 feet of each portion of the work so located that the individual trades may use their own construction-type extension cords to obtain adequate power and lighting at all points where required by inspectors and for safety.

D. Telephone: Maintain in the Contractor's field office or in a protected location on the job site for the use of the subcontractors; the telephone may be coin operated.

2.02 ACCESS FACILITIES

A. The Contractor shall provide access facilities to the construction area as are necessary and required for carrying out the work and the same shall be kept passable at all times. Contractor shall be responsible for any damage to streets, curbs and sidewalks due to the use of such facilities, and such damaged portions shall be repaired as required to place them in the same condition as existed prior to the commencement of the work. Contractors shall comply in every respect with applicable Building Codes regarding the use of public streets and sidewalks and provide the proper barricading and lighting of public thoroughfares surrounding the construction activities.

2.03 ENCLOSURES, FENCES, BARRICADES AND CANOPIES

A. Furnish, install, and maintain for the duration of construction, all required scaffolds, fences, barricades, canopies, warning signs, steps, bridges, platforms and other temporary construction necessary for proper completion of the work in compliance with all pertinent safety regulations. In addition, it is recommended that all existing improvements which are not to be altered or removed be protected by means of temporary barricades or other suitable means.

2.04 PUMPING

A. Keep the site, excavations, and structures free of accumulation of water at all times, whether from underground seepage, rainfall, drainage, or broken utility lines.

2.05 SANITARY FACILITIES

A. Furnish and install all required temporary toilet buildings with sanitary toilets for use of all workmen. Comply with all minimum requirements of the Health Department or other public agency having jurisdiction. Maintain in a sanitary condition at all times.

2.06 FIRE PROTECTION

A. Temporary fire extinguishers shall be provided and available at the job site in accordance with the appropriate NFPA Bulletins and good practice.

PART 3 - EXECUTION

3.01 SPECIAL CONDITIONS OF THE SITE

A. The area to be set aside for the use of the Contractor is indicated on the Drawings as "Limit of Work." Except for sub-surface utility work, curb and gutter, temporary roads and any other work specifically shown or noted, the Contractor shall confine their exterior operations within the limits-of-work so indicated.

B. Work shall not proceed for the site or buildings until all temporary work such as utilities, barricades, field office and sanitary facilities are furnished and installed.

C. Parking of vehicles by construction personnel shall be limited to areas outside the limits-of-work in locations as designated by the Owner's Representative.

3.02 MATERIAL STORAGE AND PROTECTION

A. During the progress of the work, products and materials shall be neatly stored in accordance with the appropriate manufacturer's recommendations and shall be properly cared for and protected from weather, vandalism and theft.

B. All installed products and materials shall be adequately protected until such time as the Owner accepts the Project.

3.03 CONDITIONS AT THE SITE

A. The Contractor shall make all necessary inspections of the job site and of the work to be fully aware of the conditions of all temporary facilities and controls at all times.

B. The Contractor shall take all steps necessary to prohibit any part of the premises, the buildings, or structures to be overloaded by setting thereon any material or equipment, or performing thereon any of their work, which could cause any loss, damage, and/or injury to person or property.

C. The Contractor shall make a close inspection of all materials as delivered and shall promptly return all defective materials without waiting for their rejection by the Architect.

3.04 REMOVAL

A. Maintain all temporary facilities and controls as long as needed for the safe and proper completion of the work. Remove all such temporary facilities and controls as rapidly as progress of the work will permit, or as directed by the Architect.

3.05 RESTORATION OF AREAS

A. Upon completion of the project, all temporary facilities shall be removed from the site and all areas not otherwise improved but which were adversely affected by the Contractor's work shall be returned to their original condition to the satisfaction of the Architect.

3.06 FINAL SITE CLEAN-UP

A. Prior to final inspection, thoroughly clean the entire site and restore to a neat, acceptable condition. Remove from the entire site all construction waste and unused materials, dunnage, loose rock and stones, excess earth, roots, weeds, and all debris of any description resulting from the work. Hose down and scrub where necessary all new concrete and asphalt pavement and paved walks, and all existing concrete and asphalt pavement and walks dirtied as a result of the work. Thoroughly remove mortar drippings from concrete walks and other pavements, where they occur.

END OF SECTION

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 - GENERAL

All applicable portions of Division 1, including the drawings and general provisions of the contract, the general and supplementary conditions and Division 1 specification sections which apply to work of this section as if printed herein.

1.01 DESCRIPTION

A. Section Includes: The work includes, but is not necessarily limited to, performing all operations necessary for and properly incidental to closing out the project and assisting in Owner's final inspection as hereinafter specified.

1.02 FINAL COMPLETION

A. When the Contractor considers the work, or a designated portion of the work complete, submit written request to Owner's Representative for inspection. By submittal of request, Contractor certifies that:

1. Contract Documents have been reviewed.
2. Work has been completed in accordance with the Contract Documents and is ready for inspection.
3. Equipment systems have been tested, adjusted, balanced and are fully operational.

B. Submit request a minimum of five (5) working days in advance of requested inspection date. Contractor shall be responsible for allowing sufficient time during contract period to complete inspections and any corrections.

C. Should Owner's Representative inspection find work incomplete, Owner's Representative will notify Contractor in writing, listing observed deficiencies.

D. Contractor shall remedy listed deficiencies and send a request for final inspection. At the Owner's option, a reinspection(s) of the work to identify additional deficiencies, if any, may be required. Owner's costs associated with reinspection(s) are subject to provisions of Article 1.04 of this Section.

E. When Owner confirms work is complete, and close-out submittals as referred to in Article 1.05 of this Section are provided, Owner's Representative will notify Contractor of date of completion in writing.

1.03 REINSPECTIONS

A. Should status of completion of work require reinspection(s) by Owner due to failure of work to comply with Contractor's claims on initial inspection, Owner may deduct the amount of compensation for reinspection services from final payment to Contractor. Observed deficiencies in excess of ten (10) will be reason for reinspection.

B. Inspections initiated at the request of the Owner will not be subject to the provisions of this Article.

1.04 CLOSE-OUT SUBMITTALS

A. Project Record Documents

B. Operation and Maintenance Data

C. Warranties and Guarantees

D. Spare Parts and Maintenance Materials

E. Evidence of Payment and Lien Releases along with a list of all subcontractors which contributed labor or materials to the project.

F. Other data and materials as may be required in individual Sections of the Specifications.

1.05 APPLICATION FOR FINAL PAYMENT

A. Submit application for final payment in accordance with provisions of the Contract for Construction.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 02 05 00

DEMOLITION

PART 1 - GENERAL

All applicable portions of Division 1, including the drawings and general provisions of the contract, the general and supplementary conditions and Division 1 specification sections which apply to work of this section as if printed herein.

1.01 DESCRIPTION

A. Section Includes:

1. The scope of this project includes, but is not limited to: preparation and coating of the existing swimming pool concrete decking and removal and replacement of the existing swimming pool filter, heater and their related piping and valving and other items as noted on the construction documents.

B. Site Visitation: In preparing a proposal, visit the site, carefully examine the Drawings and Specifications, and determine that the work can be properly executed in accordance with the Contract Documents. No allowance will be made for any error through negligence in observing the site conditions.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 TREATMENT OF EXISTING FACILITIES

A. Protection: Use necessary procedures, caution and covering to protect from damage existing facilities, equipment and accessories not noted to be replaced or restored. Maintain active utilities traversing the project site in operating condition.

B. Replacement: In the event of damage, immediately notify the Owner, and make all repairs and replacements necessary to the approval of the Architect without change in contract amount or time.

3.02 REMOVAL OF DEBRIS

A. All items noted for demolition shall be immediately removed from the project site and hauled and dumped in compliance with all local codes and regulations, including payment of any associated fees.

3.03 SAFETY BARRICADES

A. Provide substantial barricades around and at all areas and openings as soon as such areas and openings are created. Barricades must be adequate to block access and give warning to the general public.

3.04 CLEAN-UP

A. Upon completion of the work of this Section, immediately remove all broken concrete, debris and rubbish occasioned by this work to the approval of the Architect.

END OF SECTION

SECTION 13 11 06

SWIMMING POOL EQUIPMENT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Swimming pool equipment items required for this Work as indicated on the Drawings and specified herein.

1.02 QUALITY ASSURANCE

A. Qualifications of Workers:

1. The entity performing the work of this Section shall have been successfully engaged in the respective trade for at least five (5) years immediately prior to commencement of the Work.
2. For actual construction operations, use only trained and experienced workers with a minimum of three (3) years experience with the materials and methods specified.
3. Provide at least one person who shall be present at all times during execution of the work of this Section, with a minimum of five (5) years experience with the type of materials being installed, the referenced standards, and who shall direct all Work performed under this Section.

B. All equipment supplied or work performed shall comply with regulations governing public swimming pools and spas as contained within Chapter 31 of California Building Code, latest edition.

1.03 SUBMITTALS AND SUBSTITUTIONS

A. Provide submittals in conformance with the requirements of Section 01 33 00.

B. Required submittals include:

1. Swimming Pool Mechanical Equipment as specified in Article 2.01 and 2.02 of this Section.

C. Submit proof of qualifications as specified in Article 1.02.A of this Section.

D. The equipment shown on the plans represent the first listed items in the technical specifications. The Contractor shall be responsible for all required field coordination and installation of any approved equal product to provide a fully working and warranted system. The Contractor shall submit detailed shop drawings for any products used other than the first listed specified items. Contractor provided shop drawings shall include details and quality equal to the original plans and construction documents. The Contractor shall provide any and all required engineering including but not limited to structural and anchorage requirements for any proposed equipment other than the first

listed specified equipment. The Contractor is responsible to provide a factory certified representative(s) to start-up and provide on-site training for all swimming pool mechanical equipment provided.

1.04 PRODUCT HANDLING

A. Protection: Use all means necessary to protect swimming pool equipment items before, during and after installation and to protect the installed work specified in other Sections.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner's Representative.

PART 2 – PRODUCTS

2.01 HIGH RATE SAND FILTRATION SYSTEM (Eko3 Systems GEN2, Stark, EPD, or approved equal)

The filter system specified herein shall be the standard cataloged product of a company regularly engaged in the manufacture of water treatment equipment. The purpose of this specification is to establish the minimum design, performance, quality, and service standards for the proposed equipment. The equipment shall consist of fiberglass filter vessel(s) with internal distribution and collection system, immediate face piping, operating valves, backwash sightglass valve, air relief systems, gauges, hydraulic pressure supply system, electronic operational control systems, system operating setup/startup and fifteen (15) year non-prorated limited warranty.

Requests for substitutions: refer to Section 131106 SUBSTITUTIONS for requirements. Requests for substitutions must include, but not be limited to:

- List containing contact name and telephone number of ten like systems, each of which shall utilize all specified features and employ fiberglass filament wound vessels, and electronic filter control devices.
- Complete documentation and that proves proposed unit includes all the specified features.
- Manufacturer's sales literature.
- Engineering drawings, structural and seismic calculations prepared by a licensed Civil Engineer.
- Certification listings.
- Installation/operation/maintenance manuals.
- Name and address of the site-local, factory-authorized startup and service representative with affidavit of last date of certification.

Failure to provide this or any other information necessary to confirm that all specified features are provided will be cause for rejection of substitution request.

A. Filter Performance Criteria

1. The filter system shall be of the pressure type, horizontal in its configuration, suitable for a single grade of filter media, and shall bear the listing mark of the National Sanitation Foundation (NSF) Standard 50 for a maximum flow of 20 gallons per minute per square foot of filter area.
2. The filter system shall consist of two (2) high-rate permanent media filter tanks, each with 21 square feet of filter area, #EKO-42175-0606-T-2. The system shall have a total effective filter area of 35 square feet. When operating at 15 gallons per minute per square foot of filter area, the filter system will have a capacity of filtering 525 gallons per minute.

B. Filter Vessel

1. Vessel

a. The filter vessel will be 42” inside diameter, will have 17.5 square feet of filter area and shall be designed for a maximum working pressure of 100 psi with a 5 to 1 safety factor for minimum burst. The design shall be capable of withstanding, without leaks or structural failure, a repetitive pressure test consisting of 250,000 cycles of 0 to 100 psi. This is required to ensure long service life, reduce potential liability and guarantee safe operation.
b. Each filter tank(s) shall consist of a body and two dished heads manufactured with a dual wall structure consisting of a contact molded inner structure and a filament wound outer structure. The inner structure shall be manufactured with Woven Roving and Chop Strand Mat on a male mold in a two or three-piece design, depending on length, and joined together with secondary joint(s) before applying the outer structure. The outer structure shall be filament wound in both radial and axial geometric patterns to provide maximum strength in all load directions. The dished heads and body thicknesses shall be designed according to ASME Section X requirements confirmed through calculations and a Finite Element Stress Analysis. The outer structure of the tanks shall be seamless and constructed of pigmented resin to provide a professional exterior finish.
c. The filter tank(s) shall be mounted on two FRP saddle supports that are permanently bonded to the tank through the use of a structural adhesive system. The tank support saddles shall be designed in compliance to all relevant seismic code requirements when anchored to the manufacturer’s specifications.
d. A 16” round flanged manhole, complete with FRP cover, clear acrylic viewing window, combination gasket/ O-ring and bolts shall be located in the dished head of the filter tank(s). All O-ring contact points on the manhole flange and cover shall have a smooth finish to provide a continuous watertight seal. Manways or manholes located in the side shell of the vessel will not be permitted. Manways or manholes with metal reinforcement will not be allowed, due to inherent weaknesses.
e. A molded 3’’ media dump port and separate ¾” water drain complete with a ABS media retainer shall be located on the front side shell of the filter tank(s).
f. A molded ¾” external air relief complete with PVC ball valve shall be located on the top side shell of the filter tank(s).
g. The influent and effluent ports shall be Victaulic grooved to facilitate proper connection of both internal and external piping. The influent/ effluent ports shall consist of Sch. 120 PVC designed according to NSF/ANSI Standard 50

requirements. The ports shall be molded into the top section of the shell and shall be placed in such a manner as to eliminate interference between internal components and the internal port connections. Through flanges fastened to tank side shell by means of mechanical fasteners shall not be acceptable for this application.

h. Following fabrication, the entire vessel shall be cured to ensure uniformity of strength.

i. Each filter vessel shall be subjected to an in-shop hydro pressure test of 100 psi for a period of four (4) hours. Verification of this test and results shall be available to the owners upon request.

2. Distribution and Collection System

a. The filter tank equipment shall include an upper distribution system and lower collection system, hydraulically balanced to prevent filter media migration during filter operation and/ or backwash.

b. The upper distribution system shall include hydraulic diffusers manufactured of injection molded PVC plastic, located in multiple sets of two over the filter bed. They shall be piped to a Schedule 80 PVC distribution header with PVC pipe and fittings appropriately sized to maintain proper flow velocities throughout the entire distribution system.

c. The lower collection system shall consist of a molded ABS header and molded ABS plastic laterals with .009” tapered slots designed to retain a single grade of filter media with a .3 mm particle size. Laterals with a flow velocity not exceeding 6 feet per second at designed filter flow rate shall be utilized. Non-molded laterals will not be considerable acceptable for this application. Collection system hydraulic design calculations shall be available upon request. The internal collection system shall be designed to promote media bed circulation during backwash while providing minimal head loss during filtration.

3. Air Relief System

a. An automatic air bleed system shall be provided. An anti-plug protective shield screen shall be a part of the assembly. A manually operated external air relief shall also be provided for the vessel.

4. Winterizing/Drain and Media Dump Port

a. At the lowest point of the front of the vessel a three-inch (3") port shall be provided. The port shall allow the evacuation of all water from the vessel for the purpose of winterizing or service. No media shall be allowed to leave the vessel during the draining process. The port shall also facilitate the removal of the filter media from the vessel.

C. Backwash Valving and Piping

Each filter vessel within the system shall be cleaned individually using filtered water provided by adjacent filter vessels. Reverse flow backwash with raw source water will not be allowed.

1. Backwash Valve

    a. One (1), two-way, three-port, six-inch (6") backwash valve shall be supplied with each vessel. The valve body shall be injection-molded of ABS plastic all external components will incorporate UV inhibitors. Valves using metal bodies and covers, coated or non-coated, will not be approved. Grooved-type fittings shall be provided at each of the valve ports for connection to the filter vessel and manifold piping. Couplers shall be provided at each of the valve ports for connection to the filter vessel and manifold piping. The couplers shall be injection-molded of Isoplast 101LGF40NAT plastic and shall contain UV inhibitor. Each valve shall be fitted with a hydraulic diaphragm designed to operate a sliding flow direction piston. Valve internal shaft, nuts, washers and bolts shall be 316 stainless steel. All stainless-steel components shall be passivated and rinsed after forming and machining.
    b. The backwash valve shall be designed to allow for continuous circulation pump operation during the backwash of the filter system that will prevent the loss of circulation pump prime and damage to boiler, chemical feed systems and piping that can result by repetitive on/off cycling of circulation pump. Valves requiring external linkage for synchronization of their operation will not be allowed.

2. Rate of Flow / Priority Valve

    a. System shall be provided with either an electrically actuated butterfly priority valve or manual rate of flow valve. A priority valve is required on all two and three tank systems, as well as a four-tank system operating at flow rates below 15 GPM per square feet of filter area. A rate of flow valve is required on all single tank systems, and four or more tank systems.
    b. The priority valve shall be an electrically actuated butterfly valve supplied for use on the effluent manifold. The priority valve shall have 150psi operating pressure, one-piece body constructed and NSF 50 listed. External operating linkage valves will not be allowed.
    c. The rate of flow valve shall be a manual butterfly valve, 150psi operating pressure, one-piece body constructed and NSF 50 listed ensuring proper system flow rate. The rate of flow valve shall be manually set during system commissioning by a factory trained technician.

3. Backwash Sightglass Valve

    a. A tamperproof, butterfly valve shall be supplied for use on the waste manifold. The valve shall have a 150psi operating pressure, one-piece body constructed, include a flanged connected sightglass piping system to inspect backwash flow and be NSF 50 listed. The sightglass shall be field-adjustable, ensuring proper system backwash flow rate. The backwash rate shall be manually set during system commissioning by a factory trained technician.

4. Piping

a. To minimize floor space requirements and provide unhindered access to filter controls, backwash valves, media dump port, and vessel access openings, all piping shall be located on top of the horizontal filter vessel. All manifolds shall be fabricated from Schedule 80 PVC pipe and fittings. In manifold sections exceeding more than two tank lengths, additional Victaulic couplings will be supplied to join piping sections. Influent and effluent manifolds shall be 6" IPS and the waste manifold shall be 6" IPS. All piping shall be factory assembled and pressure tested.

D. Operational Control:

1. Automatic Backwash Control

a. An automatic backwash control system shall be provided (in conjunction with the automated water chemistry/mechanical room controller (refer to Section 131106, 2.12) which shall allow for the automatic and manual manipulation of the filter backwash operation.
b. The backwash control system shall include a Filter Interface Panel manufactured by BECS Technology to be installed on the filter system influent piping manifold. The Filter Interface Panel shall utilize sealed solenoids with 4mm orifice and ½" push fittings.
c. The Filter Interface Panel shall include two (2) four-inch (4") pressure gauges to indicate influent and effluent pressure of the filter. The gauges shall be mounted with the solenoid block on a manufactured PVC backplate.
d. Differential pressure shall be calculated by the automatic backwash control system (refer to Section 131106 2.11).

E. Hardware:

1. All fasteners (nuts, bolts, washers) employed in the system shall be cadmium-plated steel.

F. Service Access:

1. Access to manway, backwash valves, and filter control console shall be from the front of the filter system and shall not require disassembly of any piping or climbing over or around vessel, manifolds or valves to perform operation, service or routine maintenance.

G. Filter Media:

1. Filter media depth shall be as indicated on the drawings; measurements will be taken at the site and will be from top of the collection laterals to the top of the media. The media shall be of a single grade, consisting of uniformly graded, angular shaped, crushed silica sand which shall be free of limestone or clay.
2. Filter system manufacturer shall provide a filter media analysis for the media being utilized. Contractor shall supply manufacturer's representative with two (2) pounds of filter media from installation site. Consulting engineer, prior to its installation, must approve filter media analysis.

3. Filter Media

   a. #20 Sand:

      1) Filter media shall be Grade #20, effective size .45 millimeter with a uniformity coefficient of 1.5 maximum.

MEDIA ANALYSIS

Sieve No. US Series	MM Opening Percent Retained On	Sieve (By Weight)
20	0.833 (0.333 in)	2
30	0.589 (0.023 in)	58
40	0.417 (0.016 in)	36
50	0.295 (0.012 in)	4

H. Pressure Amplification System

1. The pressure amplification system systems shall consist of a stainless steel centrifugal pump, hydro-pneumatic pressure sustaining tank, adjustable pressure switch, 50 feet of 3/8-inch Nylo Seal® tubing and all necessary tubing connectors.
2. Pump

   a. The pump housing shall be made of stainless steel and the impeller shall be
   b. molded of Lexan®. A mechanical seal shall be provided and shall be a precision-lapped, highly- polished, carbon-ceramic stainless steel shaft seal, ensuring drip-proof protection. The motor shall be a 1/2 HP, single phase, 60 cycle, 3450 RPM, suitable for service with filter control console. The motor shall be a NEMA ‘C’ face flange mounting with a drip-proof enclosure. The motor shall be equipped with sealed ball bearings. The pump shall be performance rated at 5 gallons per minute at 80 feet of head.

3. Tank

   a. Pressurized water shall be contained in a hydro-pneumatic steel tank that shall be lined with an epoxy coating. The tank will employ a flexing diaphragm, separating wet and dry chambers. The steel tank shall be designed for a maximum working pressure of 100 psi. Tank connection shall be 3/4” NPTM.

4. Pressure Switch

   a. A pressure switch shall be mounted directly to the pump motor and shall be rated for the operation of a 1-1/2 HP motor at 115 volt, single phase. The switch will allow for adjustment of cut-in and cut-out pressure.

5. Check Valve

   a. A half-inch, spring-loaded check valve shall be supplied as part of the assembly. The check valve shall be installed on the pump suction and shall be designed to retain water pressure accumulated within the amplification system.

6. Tubing and Fittings

    a. Fifty (50) feet of 1/2-inch Nylo Seal® tubing and all necessary tubing to pipe fittings shall be supplied for the connection of the HydroForce system to the filter system and the filter control.

7. Finish

    a. The system shall be coated with an industrial-grade polyurethane high-gloss protective finish.

I. Packaging

1. To protect and safeguard filter vessel, it shall be skidded and supplied with a plastic wrapping to facilitate shipment, handling, and/or storage on job site. The plastic wrap shall also act as a protective barrier during installation. All other components shall be packaged in a manner that will ensure damage-free transportation and facilitate storage at job site.

J. Instructions

1. Printed and bound operating, installation and service manual with exploded parts list shall be supplied with the system described herein.

K. Certification

1. Certified/stamped engineering calculations and drawings will be required for the structural strength of filter vessel and seismic loading. The filter supplied must be listed by the National Sanitation Foundation (NSF) ANSI 50 for a flow rate of up to 20 gallons per minute, per square foot of filter area. Proof of National Sanitation Foundation (NSF) listings will be required.

L. Commissioning/Start-Up, Owner Training and Annual Maintenance

1. Local factory representation for the equipment contained herein is mandatory. A site specific, local factory certified, trained and authorized service specialist shall provide system commissioning/start-up to include adjustments to the filter system and all its controlling components, calibration and setup of the control system, and instructions to the owner/operator of the system’s workings.
2. Prior to the completion of one (1) year's service, the certified, trained and authorized manufacturer’s service specialist shall visit the filter system installation site. With the owner/operator present, the service specialist shall inspect the filter system components for signs of wear/malfunction at that time. Any and all worn or malfunctioning items shall be repaired or replaced at no expense to the owner. The service specialist shall also provide a scope and proposal for continued annual preventative maintenance service should the owner choose to outsource the required annual maintenance required.

M. Warranty

1. A limited manufacturer warranty shall be provided covering all components of the filter system specified herein. Warranty initiates as of the date of system commissioning with the first year as unconditional to be free from defects in material and workmanship. Filter tank shell shall carry a 15-year non-prorated warranty. Filter tank internal components and backwash valves shall carry a three (3) year warranty, face piping shall carry a three (3) year warranty, and all accessories, including but not limited to valving, pressure gauges, air relief assembly and drain assembly shall carry a three (3) year warranty. Owner shall refer to manufacturer warranty document for required warranty claim procedures and/or contact manufacturer's authorized representative.

2.02 POOL HEATER

A. Indirect fired heating package system: 'Aquas' Crest with smarttouch control condensing modulating boiler, titanium plate and frame heat exchanger with CPVC connections, factory assembled skid mounted package, California Code Controls, 1½" natural gas connection, 2" water connections, 8" diameter vent size, PVC vented, 1,250,000 BTU per hour input, 97% efficient, with ¾" cold water connection and condensate neutralization kit. 'Lochinvar AP01250N, weight = 3,100 lbs. One (1) total. Lochinvar Aquas, Raypak equivalent, or approved equal.

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

A. Inspection:

1. Prior to installing the items of this Section, carefully inspect the installed Work of other trades and verify that all such Work is complete to the point where this installation may properly commence.
2. Verify that the swimming pool equipment items may be installed in strict accordance with original design, pertinent codes and regulations, and the manufacturers' recommendations.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the Owner's Representative.
2. Do not proceed with installation in areas of discrepancy until all such discrepancies are fully resolved.
3. Failure to notify the Owner's Representative and give written notice of discrepancies shall constitute acceptance by the Installer of existing conditions as fit and proper to receive its Work.

3.02 INSTALLATION

A. Supply and install items of swimming pool equipment in strict accordance with applicable codes and regulations, the original design, and the manufacturer's published recommendations, anchoring firmly and securely for long life under hard use.

B. All equipment shall be braced and/or anchored to resist a horizontal force acting in any direction using the criteria shown on the Drawings.

3.03 EQUIPMENT ACTIVATION

A. All water chemistry and filtration mechanical equipment shall be operational upon start-up. Chemicals and other related support items as supplied by Contractor, shall be in supply at start-up.

B. Start-up and provide qualified personnel to operate pool equipment for a period not less than seven (7) days after the pool is placed in operation, or until the Owner takes occupancy of the facility or letter of substantial completion. During this time, Contractor shall instruct and supervise the Owner's personnel in the various operating and maintenance techniques involved. Contractor shall be responsible for supply of chemicals during this not less than seven (7) day period. (Owner's personnel shall be fully trained and capable of assuming swimming pool maintenance tasks, training may begin before Owner takes occupancy).

3.04 CLEAN-UP

A. Upon completion of swimming pool equipment, remove all debris, materials and equipment occasioned by this Work to the approval of the Owner’s Representative.

END OF SECTION

SECTION 13 11 07

SWIMMING POOL MECHANICAL

PART 1 GENERAL

1.01 WORK INCLUDED

A. Swimming pool mechanical piping as indicated on the Drawings for circulation and filtration systems, pool water heating systems, chemical control system and appurtenances.

B. Domestic water system from points of connection within swimming pool mechanical equipment room.

C. Filter backwash piping to point of connection with backwash receptor as required.

1.02 QUALITY ASSURANCE

A. Qualifications of Workers:

1. The entity performing the work of this Section shall have been successfully engaged in the respective trade for at least five (5) years immediately prior to commencement of the Work.
2. For actual construction operations, use only trained and experienced workers with a minimum of three (3) years experience with the materials and methods specified.
3. Provide at least one person who shall be present at all times during execution of the work of this Section, with a minimum of five (5) years experience with the type of materials being installed, the referenced standards, and who shall direct all Work performed under this Section.

B. Standards:

1. All equipment supplied or work performed shall comply with Chapter 31 of California Building Code, latest edition.
2. Work shall be performed in accordance with the applicable editions of all National, State and local codes, laws, regulations and ordinances, including the following:

    a. American National Standards Institute (ANSI).
    b. American Society for Testing Materials (ASTM).
    c. American Waterworks Association (AWWA).
    d. American Welding Society (AWS).

3. Do not construe anything in the Drawings or Specifications to permit Work not conforming to these requirements.

1.03 SUBMITTALS AND SUBSTITUTIONS

A. Provide submittals in conformance with the requirements of Section 01 33 00.

B. Required submittals include:

1. Pipe and Fittings as specified in Article 2.02 of this Section.
2. Valves as specified in Article 2.03 of this Section.
3. Pressure / Vacuum Gauges as specified in Article 2.04 of this Section.
4. Pipe Hangers and Supports as specified in Article 2.05 of this Section.
5. Sleeves and Waterstops as specified in Article 2.06 of this Section.

C. Submit proof of qualifications as specified in Article 1.02.A of this Section.

1.04 PRODUCT HANDLING

A. Delivery: Deliver all materials to the Project Site in the manufacturer's original unopened containers with all labels intact and legible.

B. Storage: Store all materials under cover in a manner to prevent damage and contamination, and store only the specified materials at the Project site.

C. Protection: Use all means necessary to protect swimming pool mechanical items before, during and after installation and to protect the installed Work specified in other Sections.

D. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner and at no additional cost to the Owner.

1.05 JOB CONDITIONS

A. Cooperate with entities performing Work specified in other Sections to so that no conflict of new construction or occupied space may occur. Should any installation Work be done without such craft coordination, that Work so installed shall be removed and re-installed.

PART 2 PRODUCTS

2.01 PRODUCT QUALITY

A. Materials and equipment shall be new, of the best quality for the purpose intended, and shall be clearly marked with the manufacturer's name and nameplate data or stamp and rating. As far as practicable, materials and equipment shall be of one manufacturer.

2.02 PIPE AND FITTINGS

A. PVC Schedule 40: Type 1, normal impact, NSF approved for solvent welding applications, ASTM Specification D-1785, color shall be white. Dura, Lasco, or approved equal.

B. PVC Schedule 80: Type 1, normal impact, NSF approved for solvent welding applications, ASTM Specification D-1785, color shall be gray. Dura, Lasco, or approved equal.

C. CPVC Schedule 80 Influent/Effluent Heater Piping: Type 1, normal impact, NSF approved for

solvent welding applications, ASTM Specification D-1785, color shall be gray. Dura, or Lasco.

D. PVC DR25: Conforming to ATSM D-1784, use with epoxy coated bell and spigot-type fittings or epoxy coated mechanical joint by flange adapters with epoxy coated cast iron fittings as specified in Article 2.02 (F), below. Johns-Manville "Big Blue", Diamond Plastics, or approved equal.

E. Copper Tubing: ASTM Specification B-88, hard drawn, with ANSI Standard B16.22 wrot copper fittings.

F. Steel: ASTM Specification A-120, Schedule 40 black or galvanized pipe with ASTM A-47 150 lb. banded malleable iron threaded fittings.

G. Cast Iron: ASTM Specification B16.1, cast iron flanged fittings, provide epoxy coating as required for use with chlorinated water.

2.03 VALVES

A. Ball Valves:

1. For pool system: True-Union design, PTFE seat material with FPM or FKM Double O-ring stem seals, locking handle, NSF certified. PVC schedule 80 body for below grade installation. PVC Schedule 80 body for above grade installation. Furnish ball valves on all pip diameters 2 ½" or less with a rating of at least 200psi at 73° F, Asahi, Ipex or Nibco.

2. For copper pipe system: 3-piece full-port Bronze body valve with Teflon seat, 'Apollo', 'Nibco' or approved equal.

B. Butterfly Valves:

1. Epoxy coated cast or ductile iron body, 316 stainless steel disc and stem, viton seat material, furnish hand wheel/gear operators on all valves 8" and larger. DeZurick, Keystone, Ipex or equal.
2. PVC body, PVC disc and EPDM construction suitable for chlorinated water applications. Stem shall be of 316 stainless steel and non-wetted. Valves shall be self-gasketed design with a convex sealing arrangement. Valves 1-1/2" – 10" shall be rated to 150 psi and 12" valves shall be rated to 100 psi at 70°F. Asahi Pool-Pro, no known equal.

C. Check Valves: Wafer-type, epoxy coated cast or ductile iron body, 316 stainless steel plates and shaft, viton seat material. Centerline, Metraflex, or approved equal.

D. RP Backflow Preventer: Febco #835-B for 2" and smaller; #825 for 2-1/2" and larger. Febco, Watts, or approved equal.

2.04 PRESSURE / VACUUM GAUGES

A. Furnish and install pressure and vacuum gauges on the discharge and suction sides of all pumps. 2” or 2 1/2" diameter dial, bottom connection, chrome ring, shut-off cock and snubber. Ranges shall be selected to indicate between mid-point and two-thirds of maximum range under design conditions. Marsh, Trerice, or approved equal.

2.05 PIPE HANGERS AND SUPPORTS

A. General:

1. The requirements of this Section relates to various requirements of the Agreement, General and Supplementary Conditions, Specifications, Drawings, and modifying documents which are part of the Construction Contract. Responsibility for coordination of all such applicable requirements will be that of the Contractor.

B. Description:

1. This section provides guidelines and limitations for the support of all mechanical, electrical, plumbing or architectural items from the building structure, and for the seismic bracing of such items.
2. Design and install all support and bracing systems as required for the swimming pool systems. Provide for attachment to portions of the building structure capable of bearing the loads imposed. Design these systems to not overstress the building structure.

C. Quality Assurance:

1. Design and install all support systems to comply with the requirements of the 2007 California Building Code, Chapter 16A.
2. Seismic bracing is to be designed by a professional engineer licensed in the State of California.
3. For the seismic bracing of mechanical, electrical and plumbing system, refer to “Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems” by Sheet Metal and Air conditioning Contractors National Association, Inc., (SMACNA) for guidelines.

D. Submittals:

1. Submit shop drawings for all substructures and attachment methods.
2. Submit proposed alternative methods of attachment for review and approval by the Architects, prior to deviating from the requirements given below.
3. For all pipe hangers and support systems, submit structural calculations and details which include all resultant forces applied to the building structure and are prepared and signed by the Contractor’s licensed California professional engineer. Calculations will be reviewed for compliance with design criteria, not for arithmetic.

E. Materials:

1. Use Kin-Line, Grinnel, or approved equal.
2. Support all pipelines individually with hangers, each branch having at least one

hanger. Lateral brace as noted and required.

3. Support piping near floor with steel stanchions welded to end plates secured to pipe and floor.
4. Support vertical piping at each floor level. Install coupling in piping at each support. Coupling shall rest on and transmit load to support. Isolate copper from steel supports with vinyl electrician's tape around pipe and coupling.
5. Use Stoneman "Trisolator," Unistrut, or approved equal, isolators at each hanger and other support points on bare copper tubing system.
6. For PVC pipe, space hangers four (4) feet apart for pipe sizes 1" and under, five (5) feet apart for pipe sizes 1-1/4" to 2", and six (6) feet apart for pipe sizes over 2". Space hangers for horizontal pipes at a maximum of six (6) feet for copper 2" and smaller and for steel 1-1/4" and smaller; ten (10) feet for copper 2-1/2" and larger and for steel 1-1/2" and larger.
7. Size hanger rods, screws, bolts, nuts, etc., according to manufacturer's sizing charts.
8. Trapeze hangers may be used for parallel lines.
9. Use galvanized or cadmium plated hangers, attachments, rods, nuts, bolts, and other accessories in pool mechanical room, high humidity areas, or where exposed to weather. Hot dip galvanize all items which are not factory furnished. Plating for hinged movements must be done at the factory.
10. Lateral Bracing: To prevent swaying of the piping systems, provide angle iron bracing and anchor into wall or overhead framing. Piping shall be braced or anchored in such a way as to resist a horizontal force of 50% of its operating weight in any direction.
11. Do not use wire or other makeshift devices for hangers.
12. Furnish all substructures and fasteners required to comply with the limitations given below. Use material as specified in the various sections and as appropriate to their use.

F. Guidelines & Limitations:

1. Each Contractor will coordinate the load requirements from all subcontractors so that no combination of loads overstresses the building structure or exceed the limitations given below.

2. Concrete Structure:

   a. Support all loads hung from concrete structure with cast-in-place inserts, unless drilled-in anchors are specifically approved in writing prior to placing the concrete.
   b. Concrete anchors must not penetrate into reinforcing bars. Where the anchors boring indicates the presence of reinforcing bar, patch hole with an epoxy type grout and relocate anchor 12 diameters away.
   c. Individual expansion anchors cannot support any loads greater than 300 pounds or manufacturer’s specified load capacity without approval.

3. Steel Structure:

   a. Hang no more than 20 pounds per metal deck rib in any span.

b. At beams, hang all beam loads greater than 40 pounds concentric to beam, not off the flanges.
c. Attached no loads to the beams or girders greater than the following without specific approval from the architect;

i. Roof beams and girders: 300 pound point load or 600 pound total load for a single span.

G. Seismic Bracing:

1. Design and install seismic bracing to not ground out vibration and sound isolation systems.

2. All items of mechanical and electrical equipment 60” or more in height are to be seismically braced whether such bracing is shown or not.

2.06 SLEEVES AND WATERSTOPS

A. Provide sleeves where work of this Section passes through fire rated partitions, floors and ceilings, concrete slabs or exterior of structure. Caulk clearance space using sealant appropriate for application in conformance with manufacturer's recommendations and Title 24 of California Code of Regulations. 3m, Dow Corning, or approved equal. In lieu of sleeves and caulking, "Link Seal" products may be used.

B. Provide prefabricated waterstops as indicated on the Drawings at all pipe penetrations through structures containing stored water (i.e., swimming pools, etc.) to insure leak-proof seals.

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

A. Inspection:

1. Prior to Work of this Section, carefully inspect the installed Work of other trades and verify that such work is complete to the point where this installation may properly commence.
2. Verify that items of this Section may be installed in accordance with the original design and referenced standards.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the Owner’s Representative.
2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.
3. Failure to notify the Owner’s Representative and give written notice of discrepancies shall constitute acceptance by the Contractor of existing conditions as fit and proper to receive his work.

3.02 ABBREVIATIONS AND SYMBOLS

A. Abbreviations and symbols on the Drawings are those most commonly used. Obtain clarification from the Owner's Representative on any questionable items before bid.

3.03 GENERAL PIPING REQUIREMENTS

A. Size any section of pipe for which size is not indicated or any intermediate section erroneously shown undersized the same size as the largest pipe connecting to it. Sizes listed are nominal.

B. Cut pipe accurately to job measurements and install without springing or forcing, true to line and grade, generally square with building and/or structures and adequately supported to prevent undue stress on pipe, fittings and accessories.

C. Make changes of direction with manufactured fittings. Street ells, bushings, reducing flanges, close nipples or bending of pipe is not allowed.

D. Use great care to install piping in accordance with best practice. Plastic pipe shall be "snaked" in trenches to allow for thermal expansion.

E. All above grade, below grade and buried or imbedded PVC shall be installed using solvent weld fittings. Also, each and every fitting and pipe end shall be prepared with solvent primer. Fittings shall be joined individually and with enough time between assembly of adjacent joints to allow them to seal solidly. After joining, an even ring of primer must be visible around the entire fitting. If any fittings are installed without visible primer, the fitting shall be removed and discarded and piping recut, rechamfered and joint made up again using a new fitting. All procedures, methods and techniques used to make up solvent weld joints shall be in strict accordance with manufacturer's recommendations.

F. Arrange pipe and hangers to allow for expansion, contraction and structural settlement. No pipe shall contact structure except penetrations as shown on the Drawings.

G. Provide dielectric connections between copper and dissimilar metals. In copper systems, threaded piping including connections to equipment shall be brass pipe and fittings. Install dielectric connections in vertical sections of piping only.

H. Run pipe full size through shut-off valves, balancing valves, etc. Change pipe size within three (3) pipe diameters of final connection to control valves, fixtures and other equipment.

I. Provide unions or flanges at connections to equipment, on service side of valves and elsewhere as required to facilitate ease of maintenance.

J. Locate equipment shut-off valves as close to equipment as possible maintaining easy valve access.

K. Make all connections between domestic water systems and equipment or face piping with

approved backflow prevention devices as required.

L. All PVC pipe exposed to direct sunlight shall be painted with two coats of Exterior Acrylic Semi-gloss Paint, Sherwin Williams or equal. Color to be selected by the Architect. Prior to painting the PVC pipes, the exterior of all PVC pipes shall be wiped with Methyl Ethyl Ketone, or an approved equal, to remove the glaze from the pipes.

M. The Main Drain pipe must run either level or uphill from the main drain sump, through the surge pit (if applicable) and then to the circulation pump.

3.04 TRENCH EXCAVATION AND BACKFILL

A. Excavation:

1. Excavate and backfill trenches as required for the Work of this Section.
2. The Contractor shall perform all excavation of every description and of whatever materials encountered, to the depths indicated on the Drawings or as necessary. The Contractor shall dispose of the excavated materials not required or suitable for backfill as directed and shall perform such grading as may be necessary to prevent surface water from flowing into the trenches. The Contractor shall provide adequate equipment for the removal of storm or subsurface waters, which may accumulate in the excavated areas.

B. Trenching:

1. Excavate trenches to lines and grades as indicated on the Drawings and with banks as nearly vertical as practicable.
2. Bottoms of trenches shall be accurately graded to provide uniform bearing on undisturbed soil for the entire length of each section of pipe.
3. The width of the trench at and below the top of the pipe shall be such that the clear space between the barrel of the pipe and the trench wall shall not exceed 8” on either side of the pipe. The width of trench above the top of pipe may be wider if necessary.
4. Over-depth excavations shall be filled with tamped sand to required grades.
5. Excavations of five (5) feet or more in depth shall be shored or supported in conformance with rules, and regulations of State and Federal Governments. Shoring shall be constructed, maintained and removed in a manner to prevent caving of the excavation walls or other load on the pipe.

C. Backfilling:

1. Material for backfilling of pipes shall be approved granular material less than two (2) inches in diameter obtained from the excavation. No material of a perishable, spongy or otherwise unsuitable nature shall be used as backfill.
2. Backfilling of pipe trenches shall commence immediately after installation and testing to preclude damage to the installed pipe. Backfill around pipe shall be carefully placed so as not to displace or damage the pipe and shall be carried up symmetrically on each side of the pipe to one foot above the top of the pipe. The material shall be carefully compacted or consolidated before additional backfill is

placed.

3. Backfill above an elevation of one foot above the top of pipe in conformance with requirements of this section. Material for balance of backfill shall be approved granular material less than six (6) inches in diameter taken from the excavation.
4. Unless otherwise indicated on the Drawings, all pipe shall have a minimum of eighteen (18) inches of cover.

3.05 GENERAL EQUIPMENT REQUIREMENTS

A. Position equipment to result in good appearance and easy access to all components for maintenance and repairs.

B. Install piping, flues, breeching and ducts so that they do not interfere with equipment access.

C. Install level, secure and out of moisture. Provide shims, anchors, support straps, angles, grouted bases, or other items as required to accomplish proper installation.

D. All screws, nuts, bolts and washers shall be galvanized, cadmium plated or stainless steel. After fabrication, hot-dip galvanize unfinished ferrous items for outdoor, below grade or other use subject to moisture.

E. Extend 1/2” Schedule 40 black steel pipe lubrication tubes from all hard to reach locations to front of equipment or to access points. Terminate with proper type of lubrication fitting.

3.06 VALVES AND STRAINERS

A. If no shut-off is indicated, provide ball valves at inlet connections and balance valves at outlet connections to fixtures and equipment. Provide proper valve trim for service intended.

B. Use no solder end valves unless noted otherwise; provide adapters in copper tubing systems.

C. Locate valves with stems above horizontal plane of pipe. In general, locate valves within six (6) feet of floor, out from under equipment, in accessible locations with adequate clearance around hand wheels or levers for easy operation.

D. Provide all valves, cocks and strainers, full pipe size unless indicated otherwise.

E. Provide hand wheel operators on all valves 6” and larger, under 6” lever operators may be used.

F. Provide tool operated valve with stainless steel shaft extension and 'on deck' tool operation for surge chamber butterfly isolation valve.

3.07 IDENTIFICATION OF PIPING

A. Identify each valve by a numbered brass tag with hole and brass chain mounted on valve

stem or handle. Tag to be a minimum of 1" in diameter and numbers at least 1/4" high stamped into tag. Valves and plumbing lines shall be labeled clearly with the source or destination descriptions.

B. Install an identification chart in a plastic or glass framed enclosure, which schematically illustrates the proper operation of all piping systems and indicates number and location of all valves and control devices within the system.

C. The direction of flow for the recirculation equipment shall be labeled clearly with directional symbols such as arrows on all piping in the equipment area. Where the recirculation equipment for more than one pool is located on site, the equipment shall be marked as to which pool the system serves.

3.08 TESTS

A. Perform tests in presence of Owner's Representative with no pressure loss or noticeable leaks.

B. Do not include valves and equipment in tests. Include connection to previously tested sections if systems are tested in sections.

C. Perform tests as follows:

System	Test Pressure	Test Medium	Duration
Skimmer Lines and Lawson Main Drain sump lines	20psig	Water*	4 hours
Pool Piping	50 psig	Water*****	4 hours
Pool Main Drains	30 psig	Water*	4 hours
Domestic Water	150 psig	Water*****	4 hours

***Never test PVC pipe or fittings with air or other gases, always use water.**

3.09 PIPE MATERIAL APPLICATION

A. PVC Schedule 40: Below grade swimming pool piping and domestic water piping up to 12" line size; use standard solvent weld fittings.

B. PVC Schedule 80: Above grade swimming pool piping up to 12" line size; use solvent weld Schedule 80 or epoxy coated cast iron fittings.

C. Type L Hard Copper: Above grade domestic water piping.

D. CPVC Schedule 80; Pool Heater Piping.

E. Schedule 40 Steel: Natural gas piping.

3.10 CUTTING AND DRILLING

A. Cutting or drilling necessary for installation of Work of this Section shall be done only with approval of Owner's Representative.

3.11 CLOSING-IN OF UNINSPECTED WORK

A. Do not cover or enclose Work before testing and inspection. Re-open Work prematurely closed and restore all Work damaged.

3.12 QUIETNESS

A. Quietness is a requirement. Eliminate noise, other than that caused by specified equipment operating at optimum conditions, as directed by Owner's Representative.

3.13 FLUSHING OF LINES

A. Flush or blow out pipes free from foreign substances before installing valves, stops or making final connections. Clean piping systems of dirt and dust prior to initial start-up.

B. Just prior to plastering the pool, under the observations of the IOR, the pool mechanical system shall be flushed using the pool circulation pump. Circulate water through the mechanical system until the effluent water from the pool return heads runs clean.

3.14 CLEAN-UP

A. After all Work has been tested and approved, the Swimming Pool Subcontractor shall thoroughly clean all parts of the equipment installations, including all pool pipe and fittings in the pool mechanical room. Exposed parts shall be cleaned of cement, plaster and other materials and all grease and oil spots removed with solvent.

B. The Swimming Pool Subcontractor shall remove debris from the Project site. Cartons, boxes, packing crates and excess materials not used, occasioned by this work shall be disposed of to the satisfaction of the Owner's Representative.

C. If the above requirements of clean up are not performed to the satisfaction of the Owner's Representative, the Owner reserves the right to order the work done, the cost of which shall be borne by the Swimming Pool Subcontractor.

END OF SECTION

SECTION 13 11 08

SWIMMING POOL ELECTRICAL

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide labor, materials and equipment as required to install the swimming pool electrical system including but not limited to:

1. A complete and operable system of service equipment, panelboards, conduits, switches, time clocks and wiring for power and lighting.
2. Junction and/or pull boxes, conduits, disconnects, starters, contactors, wiring and connection of all motors and mechanical equipment, including connection and wiring of line voltage controls associated with the mechanical systems.
3. Complete grounding system as required and shown on the Drawings.
4. Complete equipotential bonding system as required and shown on the Drawings.
5. Adjusting and preliminary operation of the completed electrical system as described in Article 3.06, A of this Section.
6. Cleaning of all completed Work and installation adjustment of all trim and decorative items.

1.02 QUALITY ASSURANCE

A. Qualifications of Workers:

1. The entity performing the work of this Section shall have been successfully engaged in the respective trade for at least five (5) years immediately prior to commencement of the Work.
2. For actual construction operations, use only trained and experienced workers with a minimum of three (3) years experience with the materials and methods specified.
3. Provide at least one person who shall be present at all times during execution of the work of this Section, with a minimum of five (5) years experience with the type of materials being installed, the referenced standards, and who shall direct all Work performed under this Section.

B. Ordinances and Codes: Materials and construction shall conform with all applicable code requirements, including:

1. National Electrical Code, latest edition; Electrical Safety Orders of the State of California; Department of Industrial Relations; regulations of the State Fire Marshal; rules and regulations of the Board of Underwriters of the Pacific, UL 50, 50E and NEMA 250 rating.
2. Chapter 31 of California Building Code, latest edition.

C. Verification of Conditions:

1. The locations shown on the Drawings are diagrammatic only and the exact finish location of equipment and materials cannot be indicated. Therefore, locations of all

Work and equipment shall be verified to avoid interferences, preserve head room and keep openings and passageways clear. Changes shall be made in locations of equipment and materials which may be necessary to accomplish these purposes.

D. Preliminary Operations and Testing:

1. Motor driven equipment shall be tested for correct rotation and completion of all connections.

1.03 SUBMITTALS AND SUBSTITUTIONS

A. Provide submittals and substitutions in conformance with the requirements of Section 01 33 00.

B. Required submittals include:

1. Conduit and Fittings as specified in Article 2.02 of this Section.
2. Panelboards as specified in Article 2.06 of this Section.
3. Circuit Breakers as specified in Article 2.07 of this Section.
4. Motor Starters as specified in Article 2.10 and 2.11 of this Section.
5. Fuses as specified in Article 2.13 of this Section.
6. Time Clocks as specified in Article 2.14 of this Section.
7. Ground Fault Circuit Interrupters as specified in Article 2.15 of this Section.
8. NEC required corrosion resistant enclosures, cabinets and boxes as specified in Article 2.08, 2.11, 2.16 & 218 of this Section.

C. Submit proof of qualifications as specified in Article 1.02.A of this Section.

1.04 PRODUCT HANDLING

A. Delivery: Deliver all materials to the Project Site in the manufacturer's original unopened containers with all labels intact and legible.

B. Storage: Store all materials under cover in a manner to prevent damage and contamination, and store only the specified materials at the Project site.

C. Protection: Use all means necessary to protect swimming pool electrical materials before, during, and after installation and to protect the installed Work specified in other Sections.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

A. Materials shall be new, in unbroken packages and bear the U.L. label of approval.

B. Equipment of one type shall be by same manufacturer. One type of equipment for classifications such as:

1. Switchboards, panels, buss duct, disconnect switches and allied items.
2. Conduit.

3. Wire.
4. Conduit fittings.
5. Fixtures of the same general type.
6. Wiring devices.

2.02 CONDUIT AND FITTINGS

A. Conduit within or under buildings or where exposed outdoors shall be rigid metal threaded, hot dipped galvanized, or U.L. approved plastic except where noted otherwise on the Drawings. Metallic conduit shall be of the same metal between outlets or terminals.

B. Use flexible metallic conduit only for short connections of motors and where specifically called for on Drawings. Maximum length shall be 40". Use only liquid tight flexible metal conduit. Install an unbroken #12 AWG insulated copper grounding conductor in each liquid tight flexible conduit with permanent connection at motor junction box and service panel ground.

C. Protect, before installation, metallic conduit runs in all slabs laid on grade or in contact with the earth or exposed in damp locations, with two (2) heavy coats of asphaltum rust-resisting compound.

D. Encase conduits 2-1/2" or larger run underground, outside, or under buildings, in concrete envelopes a minimum of 3" thick, except as indicated otherwise on Drawings or stubouts. Conduits 2 and smaller laid 18" below finish surface in soil.

E. Low voltage runs underground outside buildings, 1-1/4" or smaller, may be G.I. or sherardized steel conduit, with machine applied wrapping equal to double wrap or Scotch-Wrap #50 tape, half lapped and quadrupled at joints in lieu of concrete encasement.

F. Service conduits through foundations or concrete members shall run through metal sleeves with adequate clearances for full movement of the conduit. Do not run conduits through footings.

G. Secure conduits run exposed on surfaces with one hole heavy-duty straps or fasten with matching fittings to inserts or trapezes, parallel to building walls and ceilings.

H. Cap all conduit or duct stub-outs with standard factory caps; except cap threaded steel conduit with B.I. water pipe caps in outdoor locations.

I. Use conduit fittings as manufactured by Crouse-Hinds Company, Appleton Electric Co., or approved equal.

J. Employ U.L. liquid tight fittings for use with liquid tight flexible metal conduit.

K. Use unions as manufactured by Appleton, O-Z/Gedney, or approved equal. The use of running threads will not be permitted.

L. Exposed conduit and fittings in chemical rooms shall be nonmetallic rigid polyvinyl chloride, corrosion resistant rated suitable for installation in corrosive environments and in

accordance with the latest NEC requirements.

2.03 EQUIPOTENTIAL BONDING/GROUNDING

A. Bond together and ground to a common ground at a single point all metallic conduit, piping systems, metal parts and the like. The solid copper bonding conductor shall not be smaller than #8 copper.

2.04 WIRING CONNECTIONS

A. Make connections without strain on conductors, allowing the conductors to take a natural position after connections or taps are made. Include all strand of wire in making the connection.

B. Make connections for wiring by one of the following means:

1. Make all taps or connections to conductors with compression type connectors except those smaller than #8 B&S gauge may have soldered connections. Solderless connections for #10 AWG or smaller may be used and shall be "Scotchlok", Buchanan, or approved equal. For #8 AWG or larger, they shall be T&B "LockTite", Burndy "Versitaps", or approved equal.
2. All cable or conductor terminal lugs shall be Burndy "Quicklug", Ilsco, or approved equal. Two piece stamped lugs and solder lugs will not be approved.
3. Paint taped splices in damp or outdoor locations with two (2) coats of insulating paint.
4. Tag all branch circuit wires with circuit number at the panelboard and at each point of use with linen or plastic tags.

2.05 CONDUCTORS

A. Copper RHW or THW. Do not make splices between boxes.

2.06 COLOR CODING

A. Neutrals (identified conductors shall be white).

B. Phase conductors shall be red for phase B; blue for phase C.

C. Green shall be used for mechanical equipment and receptacle grounds only.

2.07 MOTOR WIRING

A. Make final connections to motors with the required AWG (Minimum #12), Flamenol machine tool wire, 19 strand. Control wiring for equipment shall be Flamenol machine tool wire, 19 strand of required AWG. Provide corrosion resistant junction boxes at each item of equipment to change from standard building wiring to machine tool wire.

B. Phase motors as proper in direction of rotation.

2.08 PANELBOARDS

A. Panelboards shall be flush or surface mounting as indicated with circuit breakers as shown on panel schedule, hinged lockable doors, index card holders and proper bussing.

B. Where indicated on the drawings, panelboards shall be furnished with subfeed breakers and/or lugs, split bussing, contractors, time switches, relays, etc., as required.

C. All panelboards shall be keyed alike.

D. All panelboard enclosures shall be corrosion resistant rated in accordance with the latest NEC requirements.

E. Furnish corrosion resistant panelboard enclosures and terminal cabinets with Yale 46515 flush locks and LL806 keys except where indicated otherwise herein. Fasten the trim to panel boards and terminal cabinet by means of concealed, bolted or screwed fasteners accessible only when the door is open.

F. Panelboards 208/120 volt, three phase, 4 wire, S/N or 120/240 volt, single phase, 3 wire, S/N.

Panelboard types as manufactured by:	
Westinghouse	Type B10B
General Electric	Type NLAB
Square D	Type NQOB

G. Panelboards for 480/277 volt, three panes, 4 wire, S/N.

Panelboard types as manufactured by:	
Westinghouse	Type Pow-R-Line 2
General Electric	Type AE
Square D	Type NEHB
Sylvania	Type NH1B
I.T.E.	Type Approved Equal

H. Panelboard for bussing sizes thru 400 amp shall be 20" wide surface mounted type. Recess mounted type shall have a 20" wide (maximum) recess metal enclosure with trim plate cover extending 1" on all sides of enclosure. Depth shall be 5-3/4" nominal. Height of panel as required for devices.

I. Provide 6" additional gutter space in all panels where double lugs are required, or where cable size exceeds bus size. Minimum bottom gutter space shall be 6" high. 12" additional gutter space may be required for aluminum feeders where used.

J. Panelboards shown on the drawings with relays, time clocks or other control devices shall have a separate metal barriered compartment mounted above panel with separate hinged locking door to match panelboard. Provide mounting sub-base in cabinet for control devices and wiring terminal strips.

K. Panelboard shall have a circuit index card holder removable type, with clear plastic cover. Index card shall have numbers imprinted to match circuit breaker numbers.

2.09 CIRCUIT BREAKERS

A. Breakers shall have a minimum short circuit interrupting rating of 10,000A symmetrical for panelboard voltage thru 240 volt and 14000A for panelboards thru 600 volts or as specified on the drawings. In no case shall the interrupting rating be less than the bus withstand rating unless noted otherwise on the drawings.

B. Circuit breakers as manufactured by the following companies only are acceptable:

1. General Electric Company
2. Square D Company
3. Westinghouse Company
4. I.T.E. Company

C. Circuit breakers shall be arranged in the panels so that the breakers of the proper trip settings and numbers correspond to the numbering in the panel schedules on the drawings. Circuit numbers of breakers shall be black-on-white micarta tabs or other previously approved method. Circuit number tabs which can readily be changed from front of panel will not be accepted. Circuit number tabs shall not be attached to or be a part of the breaker.

D. Where two or three pole breakers occur in the panels, they shall be common trip units. Single pole breakers with tie-bar between handles will not be accepted.

E. All circuit breakers shall be padlockable in the "off" position. Locking facilities shall be riveted or mechanically attached to the circuit breaker (submit sample for approval). Other means of attachment shall not be accepted without prior written approval of Architect.

F. Where branch circuit breakers supply the power to motors and signal systems, the breakers shall be furnished with lockout clips, mounted in the "on" position. The breakers shall be able to trip automatically with lockout clips in place.

G. Panelboard circuit breakers shall be bolt-on type.

2.10 BUSSING

A. Bussing shall be rectangular cross section copper, or full length silver or tin-plated aluminum.

B. Bussing shall be braces to withstand symmetrical short circuit ratings as follows or as noted on drawings. In no case shall bus short circuit bracing be less than specified circuit breakers.

C. Each panelboard shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.

2.11 POOL MECHANICAL EQUIPMENT ENCLOSURES, TERMINAL CABINETS & MISC CABINETS

A. All pool mechanical equipment enclosures, terminal cabinets and miscellaneous cabinets in the pool mechanical room or chemical storage rooms shall be corrosion resistant rated in accordance with the latest NEC requirements. Enclosures and all cabinets shall be flush

mounted (except where noted a surface) of the size indicated on the drawings, and complete with hinged lockable doors and the number of 2-way screw terminals required for termination of all conductors. Terminal cabinet locks to operated form same key used for panelboards. The trim to terminal cabinets shall be fastened by means of concealed bolted or screwed fasteners accessible behind door to terminal cabinets. Terminal cabinets shall have 5/8" plywood backing.

B. Provide engraved nameplate on each enclosure and cabinet indicating its designation and system (i.e., Swimming Pool - Panel 'SP').

2.12 MOTOR CONTROL INDIVIDUAL STARTERS

A. Manual Motor Starters:

1. Provide flush or surface mounting manual motor starters with number of poles and size of thermal overload heaters as required for the motor being controlled (equipped with overload heaters, one for each motor lead). Back boxes shall be supplied with all flush mounting starters whether they are toggle type requiring only a 4" square outlet box or the larger type requiring a special box and cover designed to accept the particular unit. All box types shall be corrosion resistant rated in accordance with the latest NEC requirements.
2. Unless otherwise noted on the drawings, all manual starters for single phase motors, smaller than 1 h.p., shall be the compact toggle type. Manual starters for all single phase motors, 1 to 5 h.p., and all three phase motors up to 5 h.p. shall be the heavy duty type.
3. Where manual motor starter is shown with pilot light, the pilot light shall be installed in a separate outlet box adjacent to the starter outlet, and engraved nameplate in indicate function of pilot light.
4. The following motor starters as manufactured by:

Manufacturer	Single Phase 1HP and Below	Others
Arrow Hart	Type RL	Type LL
General Electric	CR 101	Class CR 1062
I.T.E.	Class C10, C11 or C12	Class C20
Square D Company	Class 2510, Type A	Class 2510, Type B & C
Westinghouse	Type MS	Type A100
Allen Bradley	Approved Equal	Approved Equal.

B. Individual Magnetic Motor Starters:

1. Magnetic motor starters shall be A.C. line voltage, across-the-line units in a corrosion resistant rated enclosure in accordance with the latest NEC requirements.
2. All starters located outside of a building whether or not indicated shall be W.P. (weatherproof), and all starters noted W.P. shall be furnished in a corrosion resistant rated stainless steel enclosure in accordance with the latest NEC requirements.
3. Starter shall be horsepower rated for the motor controlled, and shall be equipped with properly sized overload elements. Every pole shall be with overload element.
4. Verify the exact motor current and voltage characteristics with the Contractor supplying

the motor before installation of a starter.

5. Each starter shall be equipped with "Hand-Off-Auto" switch or stop-start pushbutton as required.
6. Coils shall be designed to operate on voltage indicated on control diagrams and have built-in-under the voltage release for coil circuit to drop motor starter off the line when the line voltage drops below normal operating voltage.
7. The coil control circuit shall be independently fused, sized to protect coil.
8. Starters to be equipped with running pilot light indication with a "Push-to-Test" feature.
9. Magnetic starters shall have a minimum of two auxiliary contacts. Additional auxiliary contacts shall be provided as required to comply with the requirements of the wiring diagrams on the electrical and mechanical drawings and the description of the function in the Mechanical Section of the Specifications.
10. Starters shall comply with NEMA standards, size and horsepower ratings as indicated on drawings.
11. The following types of magnetic motor starters as manufactured by:

Manufacture	Type
General Electric	Class CR 106
I.T.E.	Class A20
Square D Company	Class 8536
Westinghouse	Type A200 (Size 4 Max.) or Class II-200 (Sizes 5-8)

2.13 INDIVIDUAL COMBINATION MOTOR STARTERS

A. Combination starter shall incorporate fused disconnect switch and individual magnetic motor starter. Combination starters shall be mounted in a corrosion resistant rated enclosure in accordance with the latest NEC requirements.

B. Starters shall comply with NEMA standards, size and horsepower ratings as indicated on drawings General Electric, Square D, Westinghouse or I.T.E.

B. The disconnect handle used on combination starters shall control the disconnect device with the door opened or closed. The disconnect handle shall be clearly marked as to whether the disconnect device is "ON" or "OFF", and shall include a two-color handle grip, the black side visible in the "OFF" position indicating a safe condition, and the red side visible in the "ON" position indicating an unsafe or danger condition.

C. All starters used in combination starters shall be manufactured in accordance with the latest published NEMA standards, sizes, and horsepower ratings. These starters shall be furnished with three melting alloy type thermal overload relays.

D. Thermal units shall be of one-piece construction and interchangeable. The starter shall be inoperative if a thermal unit is removed.

2.14 MOTOR CONTROL CENTER, INTERLOCKS AND CONTROL DEVICES

A. Refer to mechanical and plumbing drawings and specifications and provide all control devices including time switches, relays and interconnection of starters as required.

B. Mount all relays and time switches in a separate compartment in motor control center unless otherwise indicated.

C. Whether shown on mechanical and plumbing drawings or control center schedules or not, where motors are controlled by external devices (i.e., thermostats, relays, float or pressure switches, etc.) or interlocked with other motors, each motor starter to be equipped with a "Hand-Off-Auto" selector switch in starter cover. Other starters equipped with a "Start' Stop" pushbutton station in starter cover. The Contractor shall be responsible to submit a complete and detailed set of shop drawings, electrical schematic design along with electrical component cut sheets from the MCC panel or the interlock control device manufacturer. RSD Total Control: Allan Pearson 949-380-7878, South Coast Controls: Anthony Ellis 714-998-5656 or approved equal.

2.15 FUSES

A. Fuses shall be dual element, current limiting type, U.L. Class RK5 unless otherwise indicated on the drawings. Provide one spare set of fuses of each size and type in each motor control center.

2.16 TIME CLOCKS

A. Time clocks shall be provided for all underwater lighting systems and swimming pool circulation pumps not controlled by filter microprocessors.

B. Contacts shall have a minimum rating of 40 amperes at 277V.

C. Timing motor shall be heavy duty synchronous, self starting, high torque type, and shall be rated at 120, 208, 240, 277 volt 60 Hz.

D. Motor shall operate normally at temperature range of -60 degrees Fahrenheit to +120 degrees Fahrenheit.

E. Dial shall be 3" diameter, clearly calibrated with day/night zones and 24 hour rotation, with gear to provide one revolution yearly which automatically varies the on/off settings each day according to seasonal changes. Day and month of the year shall show clearly through calendar window on the dial.

F. Time clocks shall be equipped with 7-spoke omitting wheel marked with days of the week.

G. Time clocks shall be housed in a corrosion resistant rated enclosure in accordance with the latest NEC requirements.

H. Acceptable manufacturers are Intermatic, Tork, Paragon, or approved equal.

2.17 GROUND FAULT CIRCUIT INTERRUPTERS

A. Minimum rating shall be 20 amperes, 125V, 5 milliampere trip setting, Class A per UL943.

B. Manufacturer to be Crouse-Hinds, Leviton, or approved equal.

2.18 BOXES

A. Boxes shall be of the size required by ordinances or larger, must be corrosion resistant in accordance with the latest NEC requirements where concealed or exposed on ceilings or walls.

B. Outlets to be surface where wiring is exposed and flush in areas where conduit is concealed.

B. Provide surface outlets with proper corrosion resistant surface covers. Box and cover shall be deep enough to provide at least 1/4" clearance between back of device and back of box. Where box contains more than one device, use a corrosion resistant rated gang box with proper cover in accordance with the latest NEC requirements. Surface outlet boxes shall be of the threaded hub type wherever below 8'0".

C. If necessary for cable installation, additional pull boxes or junction boxes may be installed in accessible locations. Exposed pull boxes and junction boxes shall be corrosion resistant rated in accordance with the latest NEC requirements.

E. Where exposed to weather pull boxes larger than outlet boxes are required, galvanized code gauge sheet steel boxes may be used with covers attached by brass machine screws may be used. Boxes exposed to the weather shall be approved for the purpose, and conduit entrances shall be on the bottom made by means of an interchangeable hub with gasket and adapter nut. Pull boxes not shown on Drawings may be added only after approval of size and location is obtained.

F. For outlets exposed to weather or where noted, cast outlet boxes shall be Crouse-Hinds, Appleton, or approved equal. Boxes shall have proper number and size hubs. Device plates, covers, adapters and boxes shall be as manufactured by Crouse-Hinds, Appleton, or approved equal.

G. Exposed junction boxes, outlet boxes and pull boxes for pool chemical rooms shall be non -metallic suitable for a corrosive environment and in accordance with the latest NEC requirements.

2.19 IDENTIFICATION MARKINGS

A. Plainly mark all motor and electrical appliance control equipment indicating the equipment controlled with engraved metal tags.

B. Provide laminated plastic nameplates on panelboards on the outside of the door at the top indicating panel designation and feeder source.

C. Provide laminated plastic nameplates on distribution switchboards and motor control centers at the top center indicating panel designation and feeder source.

D. Identify each distribution switchboard and motor control center circuit breaker with a laminated plastic nameplate indicating its' use.

E. Type panelboard directories on the forms provided with the equipment, indicating the use of each branch circuit breaker.

F. Fasten all laminated plastic nameplates to surfaces with two (2) or more screws.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify conditions at the Project site before submitting bid. Be responsible for providing all necessary wiring for the new electrical systems. Wherever wiring is being disrupted due to remodeling or changes, reconnect existing and provide new wiring circuits to accomplish a fully operable system at no additional cost to the Owner.

3.02 COORDINATION

A. The Drawings are essentially diagrammatic and indicate the desired location, size, routes, connection points, etc., and are to be followed as closely as possible. Proper judgment must be exercised in executing the Work so as to provide the best possible installation in the available space and to overcome difficulties, limitations or interference wherever encountered. Be responsible for the correct placement of this Work, the proper location and connection in relation to Work of other trades, for determining the exact location of all conduits, outlets and equipment, and for installing the conduits in such a manner as to conform to the structure, avoid obstruction, preserve headroom and keep openings and passageways clear. Particular attention is directed to the close coordination required on exposed Work. Locations shown on Architectural or Mechanical Drawings if different than those shown on Electrical Drawings should be communicated to the Owner's Representative in writing for clarification.

3.03 INSTALLATION

A. Trenching and Backfill: Provide minimum cover as required by Code.

B. <u>Conduit Installation:</u>

1. Conduit and metallic raceway systems shall be mechanically and electrically continuous from sources of current to all outlets in a manner to provide a continuous grounding path. Close ends of conduit during construction to prevent entrance of dirt or moisture.
2. Securely fasten conduit to the building construction within three feet of each outlet and within every ten feet thereafter. Secure it to boxes, cabinets, pull boxes, terminals with two locknuts and ends equipped with bushings or a terminal fitting. Cut square with ends carefully reamed.
3. Make bends or elbows so that the conduit will not be injured or flattened.
4. Use insulated metallic bushings in all places where bushings are required.
5. Run exposed conduits level or plumb and parallel to the construction members of

the building. No cutting across or diagonal runs will be permitted. Neatly surmount structural obstructions encountered on conduit runs by the use of fittings or pull boxes.

6. Identify feeder conduits by stamped metal tags secured to exposed section of conduit in main or sub-panels.
7. Make up all threaded conduit joints gas and watertight with conductive sealer except conduit above ground in dry indoor locations.
8. Rigidly support all boxes independently of the conduit system.

C. Connections to Equipment:

1. Fully connect, in an approved manner, all electrical outlets, apparatus, motors, equipment, fixtures, wiring devices and appliances whether they are installed under the Electrical Contract or not, which require electrical connections, to the corresponding electrical system outlet.
2. Where the Work of this Section requires connections to be made to equipment that is furnished and set-in-place under other Sections, obtain such roughing-in dimensions from the manufacturer or supplier of each item as required and assume full responsibility for the installation of the connections thereto.

3.04 ADJUSTMENT AND CLEAN-UP

A. Preliminary Operation: Should the Owner's Representative deem it necessary to operate the electrical installation or any part thereof prior to Substantial Completion of the Work, consent to such preliminary operation and supervise conduction of same. Subcontractor shall pay all costs occasioned by such operation. Preliminary operation shall not be construed as an acceptance of any Work installed under this Contract.

B. Clean-up: Upon completion of the Work of this Section, immediately remove all swimming pool electrical materials, debris and rubbish occasioned by this Work to the approval of the Owner's Representative.

END OF SECTION